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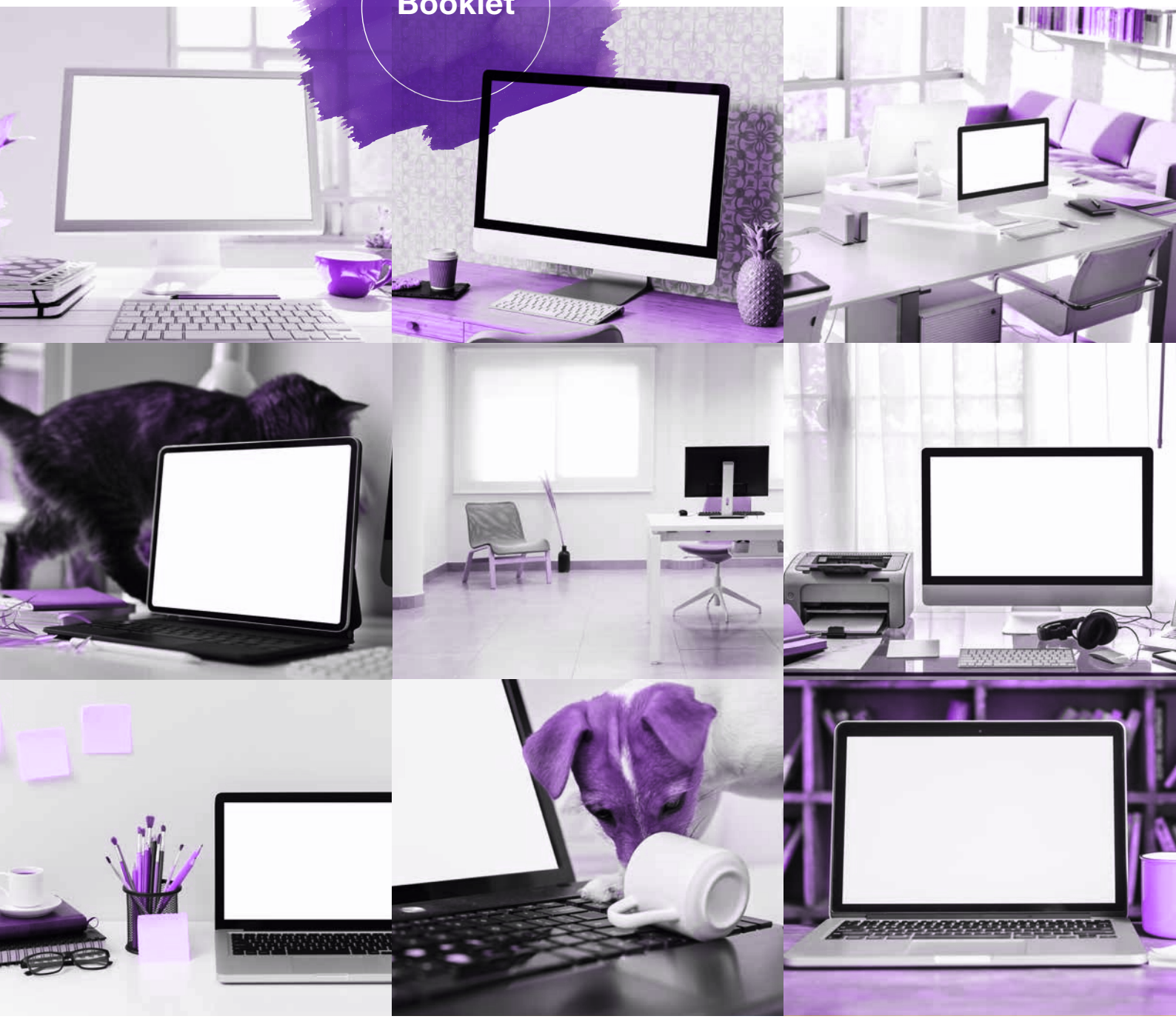
european society of
head and neck radiology

ESHNR 2021
Stay-at-home Edition

33rd Annual Meeting and Refresher Course

September 2–4

Booklet



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ESHNR 2021
Virtual Gala Dinner

Friday, 3rd of September 2021

Dear colleagues, dear ESHNR registrants,

we would have loved to host you in Salzburg and show you the city of Mozart with its outstanding buildings surrounded by stunning mountains and its rich cultural heritage. It would have been our wish to see you again in person or get to know you this year, discuss with you, hear your ideas and suggestions. To enable some interactivity, we have aimed at leaving enough time for discussion and interaction throughout the programme and hope to get a lot of feedback from you! Nonetheless, we will miss your company and thought, we could be vitually united during a joint virtual Gala evening.

Our Head and Neck Trio (Nicole Freling, Marieke Stordiau and Marco Gonçalves) from the Netherlands will provide us with the appropriate musical flair on channel 2, where you can also find many other interesting affiliated topics.

We can't come and serve you a Gala dinner, but have prepared some typically Austrian recipes for you. They are easy enough to prepare, even, if you do not consider yourself a top chef and you should also be able to prepare the meal, despite attending the lectures, unless you can motivate a family member or friend to do it for you or join a (vaccinated) colleague and split the preparation. We provide you with the shopping list well in advance and recommend you get the ingredients before the conference. The Sachertorte keeps moist, so you are also ok to bake it on the day before the lectures start.

We hope to whet your appetite: not only for the Austrian Gala dinner, but also for an interesting conference with top-class lectures, cutting-edge research presentations, many additional articles and recordings with some astonishing revelations related to head and neck radiology on channel 2 and maybe even also some surprises!

Looking forward to seeing you soon,
the congress presidents Christian Czerny & Soraya Robinson

Download the virtual Gala Dinner recipes:

www.eshnr.eu

The Head & Neck bassoon trio

on Channel2

Dear Soraya, dear Christian, dear organizers, dear colleagues in H&N radiology,

after nearly 4 years of being retired I still feel much affection for ESHNR and I am deeply aware that meetings aren't any more like they were in the past.

Salzburg, where we were invited to meet this year, sounded so promising: mountains, historic buildings and music would create a perfect atmosphere for our annual meeting. Mozart was born here.

To pay tribute to the organizers of this year's virtual meeting I would like to present in a totally different way.

With my bassoon teacher, Marieke Stordiau and Marco Gonçalves, a talented student at the Conservatory of Amsterdam, whom I lent one of my precious bassoons and who passed his bachelor's a few days ago, I offer you some moments of musical leisure in between or after the strenuous radiological presentations – or when preparing an exquisite Austrian dinner.

Soraya Robinson came up with this idea and we, musicians, were enchanted by the invitation and very happy to have a new project to work on in this bizarre corona period.

We will play some arias from Mozart's famous opera Don Giovanni, an arrangement made by a Dutch bassoonist, Henk de Wit jr, whose father was my first bassoon teacher and made me love this weird instrument.

I hope you enjoy our efforts and remember Vienna and all other cities in Europe, where we once were happily together during our inspiring annual ESHNR meetings.

As a present to Soraya, who has been taking Flamenco lessons in her spare time over the last couple of years, we included some tango's for 3 bassoons – in an arrangement by Ernst-Thilo Kalke (1924-2018).

Enjoy!

Nicole Freling, Amsterdam
nfreling@xs4all.nl

The Head & Neck bassoon trio

Marco Gonçalves 1st bassoon
Marieke Stordiau 2nd bassoon
Nicole Freling 3rd bassoon

Mozart – from his opera Don Giovanni

Notte e giorno fatigar
(Donna Anna, Don Giovanni, Commendatore, Leporello)

Madamina, il catalogo è questo – Nella bionda, e gli ha l'usanza
(Leporello)

Giovinette, che fate all'amore
(Zerlina)

Origin unknown – Gassenhauer

Minuetto
(instrumental)

Vedrai carino, se sei buonino
(Zerlina)

Fin ch'han dal vino, calda la testa, una gran festa
(Don Giovanni)

Batti, batti, oh bel Masetto
(Zerlina)

Gia la mensa è preparate
(Don Giovanni, Donna, Elvira, Commendatore, Leporello)

Arrangements by Henk de Wit jr.
After an arrangement for 2 flutes and bassoon (1815-1821)

Tangos

El Choclo

Albeniz' Tango

Tango Pizzicato

Tango Habanera

Tango Bolero

Tango Ritmico

Arrangements by Ernst-Thilo Kalke (1924-2018)

The Head & Neck bassoon trio on Channel2

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Greetings from the ESHNR president

Bert De Foer

Dear Friends,

I would like to take this opportunity to welcome you to the 33rd Annual Meeting and Refresher Course of the European Society of Head and Neck Radiology, also known as the "Stay-at-Home" edition of our annual congress.

As you will be aware, the last couple of years have had significant challenges. Last year, our annual meeting had to be cancelled due to the Covid 19 pandemic. This was replaced by our online teaching weeks containing 20 excellent lectures on various head and neck radiology topics. This proved to be a great success with nearly 400 participants and allowed us to maintain an annual educational event. The teaching weeks have recently been put online again with free access for ESHNR members.

This year, the annual meeting has been replaced by a complete online version with an interesting and innovative head and neck radiology program composed by both our congress presidents Soraya Robinson and Christian Czerny. I would like to express my sincerest thanks to both of them as well as to the ESHNR office for having organized this meeting and for their tremendous efforts in changing this meeting from an onsite one to an online one.

I would also like to thank my colleagues at the ESHNR executive committee for their dedication and hard work. In particular, special thanks to Minerva Becker who after decades of service to the ESHNR executive and education committees will be resigning and taking on the role of ESR Education Committee Chair. Congratulations and best wishes to her on this prestigious role.

The pandemic has resulted in a significant and near complete shift from onsite teaching to online lessons and webinars. The ESHNR webinars continue to be well received since their inception in 2018. In addition, the more recent joint ASHNR-ESHNR "2 Heads and Necks are Better than One" webinars with the Americans have proven to be a tremendous success. They have substantially contributed to the ESHNR online teaching efforts during this pandemic, and I am pleased to say that we will continue with these educational platforms for the foreseeable future.

Our diploma continues to be a great success with record numbers applying for the examination. This is contributing to our ever-increasing numbers of Fellows. For those who are interested, more information is available on our website. In addition, our educational efforts have resulted in the development of our "Masterclass". The first programme will take place this year in December and allow both lectures and interactive case-based discussions.

ESHNR has recently started the mentorship scheme which allows mentees to be matched with mentors and this has proven to be a great success. If you would like to be a part of this, then please refer to our website for more information.

The society continues to grow in numbers with a particular increase from our international members brought by our increased global online and social media presence. Please follow us on twitter @ESHNRSociety where we have nearly 3000 followers and be part of an increasing network of head and neck radiologist worldwide.

No one has a crystal ball but let us hope that we will be able to return to the 'new normal' in the near future, probably with a nice mix of online and onsite congresses. ESHNR will do its best to continue state-of-the-art head and neck radiology education by all means.

Enjoy this "Stay-at-Home" annual congress and see you hopefully next year in Tallinn, Estonia.

Warm regards

Bert De Foer
ESHNR President

Message from the Head of the Department of Biomedical Imaging

Medical University of Vienna

Christian J. Herold

Dear Meeting Participants,

It is my pleasure and privilege to extend a warm welcome to you on behalf of the Department of Biomedical Imaging and Image-Guided Therapy of the Medical University of Vienna. As this year's meeting was originally planned to take place here in Austria, I was asked, in my function as the chairman of the above-mentioned department, to write a note of welcome to you. I take the liberty of writing such a note despite the fact that, because of the ongoing pandemic, the meeting has been moved to an online-only format.

As many of you have visited Vienna, mostly at the various occasions of the European Congresses of Radiology, you might already be familiar with the fact that culturall city life and the possibility for various sporty leisure time activities are within easy reach, which is even more valid for Salzburg; this city of music is surrounded by picturesque mountains, flanked by the river Salzach and watched over by fortresses and palaces, which you are most welcome to visit, when you have the opportunity.

Vienna has always been a hub for education and science. When the University of Vienna was founded in 1365, the medical faculty was one of its founding pillars. For centuries, it offered medical education at the highest possible level. The university hospital, the Vienna General Hospital (Wiener Allgemeines Krankenhaus) was designed to serve all patients, independent of status and wealth, by empress Maria Theresa and Emperor Joseph II, both of whom ruled in the 18th century. Many academic clinical departments, among them medical and surgical clinics, were founded in the mid 19th century, and radiology followed at the beginning of the 20th century. Due to enormous demand and great success, the hospital continuously outgrew its original buildings. Consequently, the new Vienna General Hospital was built and opened in 1991. It now serves as the home for all academic departments, including radiology.

The Department of Radiology in the new Vienna General Hospital unified more than 20 small units and sections, previously distributed over the old Vienna General Hospital. Because of its sheer size, it allowed multidimensional subspecialization (organ-oriented, methodology-oriented, as well as patient- and disease-oriented), which provided a strong basis for modern radiology education and successful research. After a merger with nuclear medicine in the year 2012, the department now hosts 110 radiologists and nuclear medicine specialists and more than 80 full-time researchers. Its growing success is demonstrated by the fact that it is ranked 5th among the departments of the Medical University of Vienna in terms of scientific output, and has been ranked between positions 25 to 33 worldwide in all recent Shanghai rankings ("Medical Technology" comprising radiology, nuclear medicine, and medical imaging).

In the Department of Biomedical Imaging and Image-Guided Therapy of the Medical University of Vienna, Head and neck radiology is one of three subspecialties organized in the Division of Neuroradiology and Musculoskeletal Radiology. Head and neck imaging has a great tradition here in Vienna built by pioneers such as E.G. Mayer and A. Schueller, and has always profited from outstanding radiologists and excellent researchers in the field. These specialists have also contributed continuously to the success of ESHNR by serving in several leadership positions of the society, including the society and congress presidents Herwig Imhof, Christian Czerny, and Soraya Robinson. Members of our department have also diligently contributed to this year's scientific program, both as members of the program-planning committee, as well as educational and scientific speakers. This year's meeting will continue to fertilize the exchange of knowledge, ideas, and experiences in this important field.

Let me wish you, the participants of the ESHNR 2021, an enjoyable meeting, great attendance, and lots of success!

Christian J. Herold, MD
Professor and Chairman

Greetings from the local organizers of ESHNR 2022

Riste Saat & Martin Reim

Dear Colleagues,

It is our pleasure to invite you to attend the 34th Annual Meeting and Refresher Course of the European Society of Head and Radiology, taking place in Tallinn, Estonia from October 6-8, 2022. The meeting will be organized in collaboration with the Estonian Society of Radiology and the Baltic Congress of Radiology.

Our Scientific Programme will offer a wide spectrum of lectures covering the scope of head and neck radiology, including spatial anatomy, cancer imaging, the orbit, sinonasal and nasopharyngeal region, temporal bone, larynx and hypopharynx, thyroid, parathyroid and salivary glands, led by distinguished speakers from our society and worldwide. As always, there will be sessions dedicated to scientific presentations where you can familiarize yourself with the latest developments in head and neck radiology.

This year we will have a special focus on dentomaxillofacial imaging with a whole day of parallel sessions dedicated to this topic. Together with the Baltic Congress of Radiology and guest speakers from the ASHNR we will have joint highlight sessions on emergency imaging and guidelines in H&N radiology. As a novelty, a special session on education in head and neck radiology, will be aimed at our junior colleagues with deeper interest in the field. Our collaboration session with the ESNR will have its focus on meningeal diseases.

It is the first time for the annual meeting of ESHNR to be held in the north-eastern part of Europe and we hope that you take the opportunity to explore its hidden treasures! Tallinn, a medieval hanseatic town and the capital of Estonia, is a perfect destination if you are looking for a combination of modern comforts in a unique, historical setting: the Old Town is a designated UNESCO World Heritage Site since 1997.

The meeting venue, located in the North Tallinn district, is engulfed by the Baltic Sea from north and overlooked by the St. Olav's Church in the picturesque old town from the south. From the congress venue you can stroll along the seaside to enjoy the many museums and cafes of the old Kalamaja neighborhood – an ancient fishing harbour that today is known for combining its industrial heritage with bohemian charm. In just as five minutes you can also reach the famous Old Town to discover the well-preserved limestone wonders of its rich medieval architectural legacy.

We will keep our fingers crossed to be able to host you onsite and offer you the Social Programme, including Welcome and Gala Dinners as well as sightseeing tours to nearby destinations of interest. Your presence at our conference will be much appreciated!

On behalf of the local organizers, we look forward to seeing you in Tallinn!

Riste Saat
President of the
ESHNR 34th Annual Meeting
and Refresher Course

Martin Reim
President of the Estonian Society
of Radiology and the
8th Baltic Congress of Radiology

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Booklet

Country & society news

The Nigerian Way: Head & Neck Radiology

Andrew Brai MBBS, FMCR
Consultant Radiologist
National Ear Care Center, Kaduna, Nigeria

Nigeria, Africa's most populous country, is home to over 200 million people. A population only matched by about 75,000 medical doctors, 250 to 300 of whom are radiologists. Roughly a doctor per 2,667 persons and a radiologist per 566 thousand people. Even with these figures, Nigeria is said to have the densest population of doctors and radiologists in Africa. If a Nigerian doctor is not plotting an exit for better life abroad, residency training is a well-established option.

Nigerian radiology residency training, which dates back to 1976 is currently managed by the National Postgraduate Medical College of Nigeria (NPMCN) and the West African College of Surgeons (WACS). Medical graduates require success in radiology primaries examination in any or both colleges to apply for residency programme in radiology. The duration of the programme used to be at least 4 years, but has now been reviewed upwards to entertain subspecialty training. While this new development is still budding, interested existing radiology fellows have to sponsor themselves abroad or hope for some government funding to achieve this feat. To this end, it is clear that formal head and neck radiology subspecialty training is non-existent in the country for now. It is uncharted territory for us. So, while there is an abundance of head and neck diseases, there is also an enormous dearth in imaging expertise.

In Nigeria, the imaging of head and neck diseases is plagued by a plethora of problems championed by poverty. For one, healthcare financing is expensive business mainly due to the inadequacies of our health insurance scheme. A vast majority of Nigerians have to "pay out of pocket" for investigations.

Following clinical diagnosis, the choice of radiological investigation is most likely to be governed by what the patient can afford rather than logic. X-ray paranasal sinuses, mastoids et cetera, are still done for those who cannot afford CT scan or MRI, even for suspected malignancies. The high costs of CT scan and MRI also ensure that they are rarely used complimentarily to evaluate same disease in a patient.

Patients that filter-in for head and neck imaging are usually seriously ill, because late presentation is the norm. Early-stage diseases may be seen incidentally, but rarely is it the primary indication for imaging. Many patients first try out traditional or religious options before opting for medical therapy. Some trivialize their illness preoccupying themselves with more "serious challenges" which usually borders around poverty.

Our clinicians do their best, but sometimes they demonstrate poor application of imaging in disease management. Also, there is heavy reliance on old surgical treatment methods which negates the need for further imaging. At the other end, though rarely, sub-specialisation amongst clinicians brings about demands beyond what the current state of our imaging capacity and expertise can resolve.

CT scanners are becoming more readily available in the country. However, it is extremely rare for MRI to be used in evaluating head and neck diseases in Nigeria. Either it is locally unavailable or for many of the above reasons, not used. Available MRI machines in the country for now, are a few 1.5 Telsa MRIs sprinkled in the major cities but more of the 0.2 -0.3 Telsa MRIs. Don't bother bringing radionuclide imaging, PET-CT scan, radiomics or AI into the conversation.

Another drag is follow-up of patients. Patients are lost to follow-up at every stage of the management cascade. At the end, only a handful of patients can be followed up after investigations. This is one of the many factors contributing negatively to the quality of research conducted in the country.

Our political will is also yet to deliver on radiology. Individuals positioned to provide public hospitals with imaging equipment, hardly rely on appropriate expert advice. Any high-end radiological equipment is most likely to be deemed highfalutin and unnecessary. The high cost of radiology equipment guarantees that well-equipped privately-owned facilities are few and largely unaffordable for the Nigerian majority. Not forgetting lack of adequate electricity supply to run these machines. »

The Nigerian Way: Head & Neck Radiology

Andrew Brai MBBS, FMCR

However, there is one positive aspect to our story. The Nigerian government established a 'one-stop' referral institution (the National Ear Care Center), situated in North-western Nigeria, burdened with training personnel, disease management and research. Even though ENT departments exist in teaching hospitals, this center was exclusively founded to champion feats like endoscopic/microscopic surgeries as well as cochlear implantation. In terms of head and neck imaging the center provides large patient pool for learning, research and potential international collaboration. No doubt this center requires expertise in head and neck imaging and have radiologists keen in achieving this goal. We hope that one day it may serve as a destination for subspecialty training and even exchange fellowships.

Finally, our few interested radiologists will certainly benefit from the existing fellowship opportunities and conferences. But, paying for these events can be financially arduous for an African-remunerated doctor. Also, it is difficult to put a substantial amount of the newly gained knowledge from such events into practice for many of the above-mentioned reasons. ESHNR-organized webinars and other similar initiatives do well, but can only provide aliquots. What holds a lot of promise is the recently flagged-off mentorship programme. We hope it gives us the perfect head start in the marathon towards head and neck imaging sub-specialisation. Perhaps, this can be eclipsed by specially designed on-site learning experiences, if the COVID-19 pandemic allows.

There might just be a shining light at the end of this tunnel afterall. Watch this space. ■

Brazilian Protocol for Training in Radiology and Diagnosis by Imaging

2018 – Colégio Brasileiro de Radiologia (CBR)

Regina Lucia Elia Gomes

HEAD AND NECK

Fundamental knowledge: Normal anatomy and variations of the skull base, face and neck. Conventional radiography; contrast radiographs - videodeglutogram, sialography and dacryocystography; ultrasound; computed tomography; PET-CT; and MRI and protocols; the role of US and CT guided punctures.

Temporal Bone: Cochlear aplasia/hypoplasia, incomplete partitions, enlargement of the vestibular aqueduct/endolymphatic sac; otosclerosis, Ménière's disease, and temporal bone inflammatory disease and cerebellopontine angle tumors. Facial nerve; temporal bone and cerebellopontine angle tumors. Trauma and complications; cholesteatoma; external auditory meatus atresia and tumoral lesions; middle ear pathologies; cochlear implants and compatibility/non-compatibility in MRI; vascular tinnitus.

Skull base: Chordoma, meningioma and pituitary macroadenoma; glomus tumor/paraganglioma; pseudolesion, diverticulum and dehiscent of the jugular bulb; jugular foramen schwannoma and meningioma; fibrous dysplasia, plasmacytoma, Langerhans cell tumor, chondrosarcoma, and metastases; cranial nerves; craniofacial skeleton trauma and complications. Skull base infectious and inflammatory lesions, including osteomyelitis.

Orbits: Coloboma; dermoid tumor, epidermoid cyst, cavernous hemangioma, lymphangioma, rhabdomyosarcoma, and retinoblastoma; type I neurofibromatosis; optic neuritis, abscesses, sarcoidosis, and idiopathic inflammatory diseases; meningioma, optic/chiasmatic glioma, orbital hemangioma, and benign mixed lacrimal gland tumor; ocular melanoma, orbital lymphoma, optic/chiasmatic glioma, and adenoid cystic carcinoma of the lacrimal gland.

Nose and paranasal sinuses: Anatomical variations and congenital anomalies; inflammatory diseases and tumors; choanal atresia and cephaloceles; rhinosinusitis, fungal sinusitis, nasosinusal polyposis, mucoceles and Wegener's granulomatosis; complications of infections; functional endoscopic surgery (FESS); inverted papilloma, juvenile nasoangiofibroma, hemangioma, osteoma, fibrous dysplasia, squamous cell carcinoma, adenocarcinoma, melanoma, esthesioneuroblastoma, and nasosinusal lymphoma; imaging features after surgery; Tornwaldt's cyst, tumors, inflammatory and infectious lesions of the nasopharynx.

Oral cavity: Tumoral dermoid, epidermoid cyst, accessory salivary tissue, lymphangioma, and lingual thyroid gland; abscesses, retention cysts, sialoceles, sialoadenitis, and ranula; benign mixed tumors, squamous cell carcinoma, and malignant minor salivary gland tumors.

Larynx: Squamous cell carcinoma of the hypopharynx and larynx and chondrosarcoma of the larynx; typical imaging characteristics after surgery and after radiotherapy; vocal cord paralysis; trauma; tracheal stenosis; laryngoceles and pharyngoceles; aspiration and primary and secondary cricopharyngeal muscle dysfunction.

Maxilla, mandible and TMJ: Dental implants; TMJ dysfunction; neoplasms; dentigerous cysts and keratocysts; infectious and inflammatory lesions, including osteomyelitis.

Salivary glands: Inflammatory disorders and tumors; periglandular lesions; mumps, Sjögren's syndrome, and benign lymphoepithelial lesions in HIV-positive patients; Warthin's tumor and mixed benign tumor, adenoid cystic carcinoma, mucoepidermoid carcinoma, lymphoma, lymph node metastases, and malignant skin tumors.

Thyroid gland and parathyroid glands: Congenital, inflammatory, benign and malignant lesions; findings of Tc-99m scintigraphy in thyroid gland diseases; fine needle aspiration biopsy in easy cases; thyroiditis and multinodular goiter; thyroid adenomas, carcinomas, and lymphoma; parathyroid hypertrophy, adenomas, and carcinoma. »

Brazilian Protocol for Training in Radiology and Diagnosis by Imaging

2018 – Colégio Brasileiro de Radiologia (CBR)

Regina Lucia Elia Gomes

Neck: Branchial cleft, thyroglossal duct and thymic cysts; vascular malformations; type I neurofibromatosis; fibromatosis colli; lymphnode nomenclature and cervical levels; lymphnodes in metastatic, inflammatory and infectious diseases; reactive lymphadenomegaly, suppurative lymphadenitis, Kimura's disease, and Castleman's disease; lymphoma and metastases.

Supra and infrahyoid cervical spaces: Embryology; retropharyngeal abscesses; vascular diseases; denervation atrophy, benign muscular hypertrophy, and pterygoid venous plexus asymmetries; abscess formation, tumors of the peripheral nerve sheath of the trigeminal nerve; ectatic carotid arteries, carotid artery pseudoaneurysm, carotid artery dissection, and jugular venous thrombosis; carotid body and vagal paragangliomas, Schwannoma, and neurofibroma; cervical esophageal carcinoma; Zenker's diverticulum.

II – Fundamental skills: Carry out and prepare reports of the face, neck and skull base imaging methods; guide CT scans according to the guidelines for dose reduction as low as possible (ALARA) and to the situation; guide head and neck MRI exams according to protocol. Perform multiplanar, MIP and 3D reconstruction, observe the performance or perform, under supervision, image-guided interventional techniques such as fine-needle aspiration puncture (FNAB) and ablations;

III – Skills and attitudes: Justify and choose the most appropriate method and imaging parameters; reduce exposure doses in radiographic and CT scans; supervise and create protocols for CTand MRI exams; supervise and teach the technical/biomedical team; recognize suboptimal quality images and their causes; interpret and report examinations; report oncological examinations in accordance with TNM; recognize its limitations and identify when it is appropriate to obtain assistance in interpreting and reporting images; identify urgent and/or unexpected findings and communicate them timely and appropriately; communicate adequately with patients to explain procedures or even the findings; assist and lead, under supervision, the realization of multidisciplinary and oncological meetings for head and neck diseases. ■

The Leuven Courses on Head and Neck Imaging

Robert Hermans

Leuven is a small but busy city in the centre of Belgium, harbouring one of the oldest and largest universities in Europe. Downtown Leuven is full of ancient heritage, worthwhile visiting. The large student population guarantees a lively atmosphere. And one of the world's largest breweries has its headquarter in Leuven!

A good reason to pay Leuven a visit is one of the Leuven Courses on Head and Neck Imaging. It all began with a course on Ear Imaging, back in 2003, soon followed by a course on Head and Neck Cancer Imaging. Later, a third course was introduced; this last one starts from the patient's symptoms, explaining how imaging can help to reach a final diagnosis. Since 2012, the courses are organized yearly, alternating the topic, so that each course is organized every three year.

The concept is: lectures during the morning, workshops in the afternoon. During the workshops, the participants can examine patient cases on PC's, using the original DICOM-images, mimicking a "real life" situation, and illustrating the topics that were reviewed during the morning lectures. As the teachers are present, active interaction is possible and questions are encouraged. Each case is then reviewed by one of the teachers, highlighting the important findings and explaining how a (differential) diagnosis was reached.

The course takes two and half or three days, depending on the topic, running from Thursday morning to Saturday noon or afternoon. The first evening, a course dinner is offered to all participants in the Faculty Club, serving French-Belgian cuisine. The Faculty Club is situated in the historic Great Beguinage, recognized as a world heritage site by UNESCO. And the second evening…well, Leuven has plenty of restaurants to choose from.

The faculty is different for each course; the local organizer (Robert Hermans, Leuven/BE) is always part of the team. The other faculty members are (or have been) Bert De Foer (Antwerp/BE), Marc Lemmerling (Gent/BE), Hervé Tanghe (Rotterdam/NL), Berit Verbist (Leiden/NL), Ilona Schmalfuss (Gainesville, FL/USA), Frank Pameijer (Utrecht/NL), Harriet Thoeny (Bern/CH), Ann King (Hong Kong/CN), Vincent Chong (Singapore/SG), Davide Farina (Brescia/IT), Yannick De Brucker (Brussels/BE) and Lukas Boomgaert (Sint-Truiden/BE).

The next courses are scheduled to take place in Leuven on November 4-6, 2021, and June 9-11, 2022. The programme and further details can be found on www.headandneckimaging.be. A registration form is available on this website. Since the very first one, the Leuven courses have always been sold out, so early registration is recommended.

Maybe we will meet in Leuven in the near future? ■

Sign of the rising sun – view of a Sicilian resident

Francesco Lombardo

It is fairly surprising how many radiological signs took their name from a wide range of scenarios from real life; just think about the “Oreo”, or the “string of pearls” or, moreover, the “batwing” signs.

It is somewhat poetic – and a little bit funny, I must admit – the attempt to fill the gap between the world in shades of grey, in which every single radiologist is completely absorbed for most of its life, and everyday’s stuff.

One of the very first signs I learnt to recognize was the “rising Sun” appearance of the maxillary pseudocysts. I was a first-year-trainee, trying to understand the basics of radiology while being put between the progressively falling of my social life and the increasing responsibilities of my whole-new role. In a context like that, looking for a solid path to follow, I found head and neck radiology as my very first passion.

It wasn’t so easy at the beginning, I must say; following the drainage pathways of the paranasal sinuses looked more similar to playing a Labyrinth-game session to me; even more, trying to keep in mind the names of Palermo football club’s bench players was way easier than memorizing all that small foramina scattered in the skull base.

I personally think that I saw more “rising suns” in the maxillary sinuses than the “real” rising suns from my flat’s balcony for a while. But after all that work filled with devotion, I began to understand. I began to feel more confident and to keep all the pieces together. Now that I recall it, all of this would not have been possible without the help of my colleagues; in my residency department it wasn’t so easy to be apart, as one could always be surrounded by other people in every single moment of day and night (yes, even in night shifts!). It could look surprising at a first glance, but it’s normal if you think that we used to be around 80 residents in one place. We learnt the Darwinian way to gain the possess of the few PACS locations available for us, we learnt to discuss, laugh, respect and – why not – love with each other. And we ate. We ate really a lot. I don’t know how many of you have been in Sicily but believe me, we ate so much that before to learn how to correctly classify the depth of olfactory fossa we had to learn how not to get fat.

I have been in lots of places other than my former department, even in other countries, but in no place but Palermo I found that “melting pot” in which social matters overlap with personal life. A place where you learn to handle the special bond between doctor and patient in a very peculiar way. A place where you can always open the window and see the mountains on one side and the deep blue of the sea on the other side. A place where you may face lots of obstacles, but you won’t face them alone.

A place where you can always see the rising sun, even if you are literally imprisoned in your “dark room”, filled with lots of reporting to do.

And even now, surrounded from the snowy peaks of the Alps in Valtellina, I think again about the old good times spent in the place that made me the radiologist I am. And I smile. ■

The Japanese approach

Shinji Naganawa, M.D., Ph.D.
Professor and Chair, Department of Radiology, Nagoya University Graduate School of Medicine
President of the Japanese Society of Head and Neck Radiology

On behalf of the Japanese Society of Head and Neck Radiology, I would like to congratulate the great success of ESHNR in these years. Due to the pandemic, the live meetings cannot be conducted recently, however the spread of On-line meeting made the world more connected than before. Invitation of international speakers became easier, making the exchange of knowledge is getting faster than before pandemic.

Japanese medical care is characterized primarily by the universal health insurance system and free access to medical institutions. All citizens can receive advanced medical care at a small cost. In addition, the fact that patients themselves can freely choose the medical institution or department to be examined is a characteristic of Japan. However, since ambulances can be used free of charge, excessive use of ambulances and emergency rooms has become a social problem.

A characteristic of the current state of diagnostic imaging in Japan is that the number of CT and MRI per population is the largest in the world. For this reason, CT and MRI examinations in which the radiology report is written are only about half of all Japan due to the shortage of the radiologists. Regarding head and neck radiology, the Japanese Society of Head and Neck Radiology (JSHNR) has about 700 members and about 160 participants in the annual meeting. The annual meeting of JSHNR is held every year in conjunction with the fall congress of the Japan Radiological Society.

The meeting of the JSHNR is only one day, and all presentations and discussions are in Japanese currently. The content consists of many case reports, four educational lectures, and two image interpretation sessions, in addition to general scientific presentations. Since Japan has a population of about 120 million, many medical textbooks in its native language have been published. There are many excellent Japanese textbooks for head and neck radiology. There are also many educational commercial journals on diagnostic imaging, so there is no problem with self-study opportunities for Japanese residents and fellows. There are also many live educational lectures in various cities in Japan. This is one reason why the Japanese doctors are not so good at English.

One of the features of Japan's head and neck imaging is that it has the advantage of being able to perform extremely detailed imaging by taking advantage of the large number of CT and MRI units. For example, I was able to develop various endolymphatic hydrops imaging methods. At present, only the diagnostic criteria for Meniere's disease in Japan include diagnostic evidence of endolymphatic hydrops by MRI in the world. The presence of endolymphatic hydrops on MRI makes it possible to diagnose "certain Meniere's disease". In MRI, double dose administration of gadolinium-based contrast agent is permitted only for brain metastasis in Japan, and other than that, only the single dose can be used. Therefore, a method has been developed in which the above-described endolymphatic hydrops can be diagnosed by intravenous administration of a single dose of gadolinium-based contrast agent.

There is the Asian-Oceanian Society of Neuroradiology and Head & Neck Radiology (AOSNRHNR). The AOSNRHNR hold the congress of AOCNR (Asian-Oceanian congress of Neuroradiology) every 2–3 years. Previous meeting was held in Taipei in 2018 and the next one will be held at Seoul in April 2021 in virtual format. Official language of AOCNR is English. In Taipei meeting, we have many guests from US and Europe. The Japanese radiologists studied with Asian-Oceanian friends as well as European and American friends. ■

Bulgarian perspective

Nikoleta Traikova

Studying medicine in Bulgaria takes 6 years and ends with state exams. For enrollment for specialization in various medical specialties there must be opened vacancies by the Ministry of Health. In the presence of such, each Medical University opens up a competition, which is in written and oral form and upon successful presentation the graduate doctor begins his specialization. The specialization in Diagnostic Imaging in Bulgaria takes four years. It includes 400 lecture hours and 11 current exams according to systems, distributed in the four years of study. It ends with a state exam before a National Commission appointed by the Minister of Health and includes two parts – practice and theory.

Each trainee and imaging specialist is a member of BAR – the Bulgarian Association of Radiology, which safeguards the interests of the guild at the national level, provides ongoing medical training and professional training of doctors. The association also performs coordination functions related to the organization of national and international scientific events (congresses, conferences, symposia), the publication of a medical journal, as well as the establishment of lasting international relations and exchange of young scientists.

There are no officially recognized subspecialties in Bulgaria. There are companies (groups) by subspecialties that organize short scientific events and have separate sessions of national congresses. Such (for a small country like ours) are in Thoracic and Cardiac Imaging, in Neuroradiology and Head and Neck Radiology, in Interventional Radiology, Uroradiology, in Breast Imaging. In this regard, the specialists conduct their training in various subspecialties by participating in courses and trainings abroad, and in recent years there are colleagues who have obtained a European diploma in neuroradiology.

At this stage, the Medical University of Sofia organizes a two-year training in Interventional Radiology and issues a university diploma. The training is on two levels: First level: Invasive imaging (entitles to perform diagnostic procedures – eg angiography) and second level – Interventional Radiology (entitles to perform therapeutic procedures by imaging). The requirement for enrollment in the course is having an acquired specialty. The practical training is carried out in medical institutions with a higher frequency of intervention procedures. Each level ends with an exam before a Committee appointed by the Rector of the Medical University. The Bulgarian Society of Interventional Radiology has made a proposal to the Ministry of Health for recognition of a subspecialty in Interventional Radiology, based on the university program, and a decision is still pending. ■

The Chilean Perspective

Ricardo Wenger

In Chile, about 65% of radiologists work in the public system. Throughout the country, the geographic distribution of radiologists is not homogeneous, with approximately 60% of radiologists working in the capital, Santiago, and about 80% in the three main cities of the country. This centralism in a country with complex geography generates significant deficiencies in critical specialties. Among them radiology, which shows limited accessibility, particularly in remote, rural, or regional areas distant from the main cities. Although the Chilean government has made efforts to provide more specialists to regional hospitals, the incentives to fill these positions are still limited, mainly because of poor infrastructure, lack of equipment and significant budgetary and salary disparity between public and private sectors. As a result, access to specialist care is unequal and limited.

Every year, approximately 60 radiologists are trained in Chile through a 3-year fellowship university programs. In our country, the department of health does not explicitly recognise medical specialities. The lack of formal recognition and clear guidelines leads to different specializations with diverse backgrounds have a significant clinical overlap in the field.

Head and Neck Imaging has no clear definition as a radiological subspecialty and therefore its contents have been for many years considered “no man’s land”, largely assumed by neuroradiologists. There seems to be no intention of generating an exclusive training program in head and neck in our country, most probably because the casuistry is usually small in each clinical center. It could be said that in recent years there has been a new impulse to include head and neck issues in the training of general radiologists and/or in the training of neuroradiologists, according to those in charge of the different programs throughout the country.

During the exercise of my profession, like many other radiologists, I noticed that head and neck pathology, in particular cervical pathology, was one of my missing areas. My training as a neuroradiologist included orbital pathology and cranial nerves, but not oral, pharyngeal, laryngeal, and cervical pathology. Therefore, after working for years in the public and private system in the south of my country, I became interested in reinforcing these missing areas. Since there is no single centre in our country dedicated to Head and Neck Radiology, many of us have looked to the European and American societies as references. Through the Chilean Society of Radiology, I applied for a short internship scholarship at Hospital Clinic in Barcelona, under the supervision of Dr. Laura Oleaga and an experienced group of colleagues, who shared their knowledge not only with me but with many radiologists who year after year pass through that unit. As a result, after returning to my regional hospital, I was asked to take charge of head and neck examinations in CT and MRI modalities in a preferential but not exclusive way.

In 2019, I signed up as a member of ESHNR and travelling to Palermo seemed like a new adventure. Without much thought, I embarked on a 20-hour trip from Valdivia to Cinisi. The trip was worth it not only because of the knowledge that I acquired but also for interacting with colleagues from different parts of the world with similar concerns. My conversations with my European colleagues allowed me to reflect that the radiologist’s relationship with the health system goes through moments of tension. Factors that I think contribute to this problem are the commoditisation of our work, the difficulties of young colleagues to renew their jobs, and the impact of teleradiology as a replacement for the presence of radiologists. A significant highlight in my trip was the experience that I had in Palermo, because of the remarkable ability of mentors to share their knowledge, far from the elitism that often haunts the medical field. I still maintain communication with colleagues I met in Europe, and I hope to add more to this thriving society. »

The Chilean Perspective

Ricardo Wenger

In our country, most radiologists are grouped in the Chilean Society of Radiology, acting as a scientific and trade association. It is organized in different chapters according to Imaging subspecialties. In previous years, the chapter on Head and Neck within our society did not attract much interest from fellow radiologists. Despite the adversity derived from the pandemic, it has served as a promoter to reactivate the chapter with virtual meetings, which may have been influenced by the push given by Dr. Lorena Sanchez, who, together with other colleagues, has led the chapter in this last period. During this time, training centres have been invited to participate in meetings, allowing doctors in training to host conferences and present cases to more experienced peers. Furthermore, colleagues from remote areas, including myself, have been invited to participate, attracting the interest of the regional teams. In the last few years, our society has been working to make more visible the importance of the radiologist in the clinical management of patients. To achieve this, we have to leave the isolation of our reporting rooms and get closer to the patient and the medical team. To know the specific requirements of our patients and put them at the centre of our work. This change of focus has been an opportunity to standardise diagnostic processes, reorganise our work, understand our weaknesses, and strengthen our team.

My professional experience as a regional specialist has emphasised the need to de-centralise the profession by promoting the training of imaging specialists and subspecialists, including Head and Neck Radiology, to fill regional positions. A strategy for the future is the interrelation with experts from other societies. Hopefully, maintaining close and effective communication, sharing cases and experiences, all of which will undoubtedly benefit our patients. ■

City of Valdivia, Chile

ESHNR Congress 2019, Cinisi, Italy;
Drs Atis Svare, Ana Ecénarro and Laura Oleaga

Upper airway – down under

Andy Whyte
Perth Radiological Clinic, University of Western Australia and the University of Melbourne

Why is a condition that affects 35% of middle-age adults, is an independent risk factor for cardiovascular events, stroke and cancer, is eminently treatable, has multiple imaging findings yet is barely mentioned in the radiological literature? Obstructive sleep apnoea (OSA) is primarily caused by a narrow and elongated upper airway that is predisposed to collapse when the tone of the pharyngeal dilator muscles decreases during sleep. Reduced nasal airflow, most commonly due to rhinitis, contributes to pharyngeal narrowing.

Who images the upper airway multiple times every day? Head and neck radiologists of course; but is assessing the calibre of the upper airway part of your routine reporting check list? Why would you check the dimensions and length of the upper airway when reporting on imaging of patients with rhinosinusitis, headache, memory impairment, sensorineural hearing loss or cancer of the upper aerodigestive tract? Why – because they are all strongly correlated with moderate to severe OSA. For example, 66 % of patients presenting with stroke have significant OSA as do 80% with head and neck cancer at first presentation.

The global rise in OSA parallels the global rise in obesity; both conditions are a major cause of ill-health, inefficiency in the workplace and significant rise in all causes or morbidity and mortality. MRI and CT, can image the nose and enlargement of specific soft-tissues which surround and the upper airway (Fig. 1). Enlargement is due to deposition of fat or hypertrophy of the lymphoid tissue of Waldeyer's ring. Deposition of fat also leads to impaired function of the pharyngeal dilator muscles, especially genioglossus and can be measured by CT or m Dixon MRI. A small mandible or maxilla also constricts the airway and is a contributing factor to airway narrowing. Sleep MRI: dynamic assessment of the upper airway during natural sleep provides the optimal assessment of the upper airway in patients with OSA. However, it is prohibitively expensive and requires extensive resources. More importantly and of practical relevance, simple measurements of the airway from an erect lateral cephalogram and awake CT or MRI correlate closely with actual airway narrowing observed during sleep MRI.

So what is the relevance of Australia or "down under" to the upper airway and OSA? From my observation and extensive reading, it provides an equivalent amount of high quality research and innovation in the sub-specialities of epidemiology, physiology, sleep medicine, otolaryngological surgery and oral medicine/oral and maxillofacial surgery to the USA or Europe. There are world class research centres and multi-disciplinary treatment units in most capital cities in the Australian states. This is an astounding achievement for a population of 24 million. The sad fact remains that involvement by radiologists is virtually nil. »

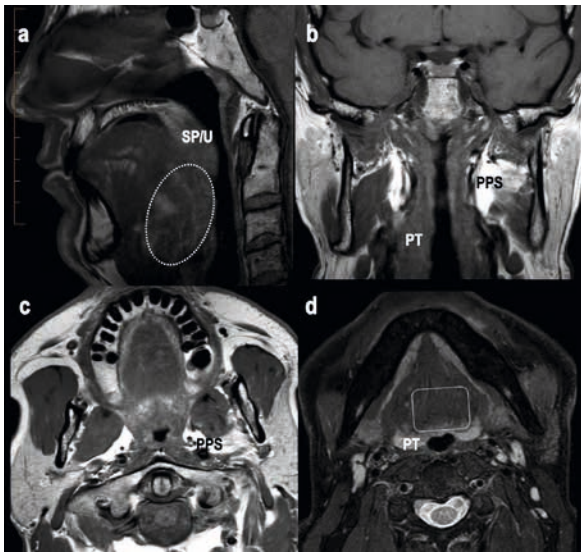

Fig. 1: Midline T1 sagittal (a), T1 coronal of the oropharynx (b), T1 axial of the upper oropharynx (c) and fat-saturation T2 axial of the inferior oropharynx (d) in a middle-aged obese male patient with severe OSA. There is marked narrowing of the upper oropharynx (c) secondary to enlargement of the parapharyngeal spaces (PPS), palatine tonsils (PT) and the soft-palate and uvula (SP/ U). The oropharynx is also elongated (a) and there is marked fatty infiltration of the tongue base (dotted oval in a +d).

Upper airway – down under

Andy Whyte

The didgeridoo is an indigenous Australian wind-playing instrument that requires a unique circular-breathing technique and much practice! Published research in of all places: Switzerland, demonstrated that playing the didgeridoo was a highly effective technique in reducing the severity of OSA attributed to improved function of the pharyngeal dilator muscles and expansion of the upper airway (Fig.2). Another surprising fact to impress your friends over a chilled beverage is that one of the world's best didgeridoo players is Czech: Ondřej Smeykal!

Unlike most chronic illnesses prevalent in modern society, OSA can be successfully treated and usually cured by weight loss, attention to sleep "hygiene" and application of positive airway pressure (PAP) by a face-mask worn during sleep. Novel surgical techniques for OSA are increasingly being used, either to decrease the bulk of soft-tissue surrounding the upper airway, improve nasal patency or by trans-cutaneous or direct simulation of genioglossus during sleep. If modern medicine does not appeal, those with OSA can learn from the Aborigines and take up playing the didgeridoo. ■

Fig. 2: Playing the didgeridoo in outback Australia.

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ESHNR Mentoring

Steve Connor

Whilst mentors may act as teacher, counsellor, coach and supervisor, the mentor can best be described as a trusted advisor and “guide” who helps the mentee develop and re-examine their own ideas, learning and development. There is increasing awareness of the benefits of formal mentorship programmes in radiology with mentees gaining from professional support, knowledge, advice and career-specific skills, whilst mentors receive intellectual stimulation, learn new skills and are fulfilled by giving back to their institutions and specialty. In the context of the COVID 19 pandemic which impacted on education, professional engagement and networking within the wider radiological community, the European Society of Radiology (ESHNR) decided to develop a formal mentoring programme. The ESHNR mentoring initiative commenced in December 2020 and is novel in its scope: European and international members of a subspecialty radiology society are matched into mentor-mentee pairings to disseminate good practice, knowledge and ideas.

Formal mentoring within an international subspecialty radiology society offers an array of benefits for both the society and its individual members, and is enriched by the diversity of participants and matching. The operational objectives of the formal mentoring programme were to bring together ESHNR members in appropriate mentor-mentee matchings, to prepare them for the mentor-mentee relationship and to guide them through the one year mentorship period. The key components to the programme are to provide information on the intentions of the mentoring, administration of the programme, vetting of applicants, timely mentor-mentee matching, training resources, clear expectations and advice on conducting meetings, a defined duration of the programme and a process of feedback

At six months into the programme, there have been 33 mentors and 27 mentees enrolled with international representation. There are 24 mentors from Europe (including United Kingdom [n=6], Austria [n=4], Germany [n=4] and Italy [n=3]) and nine from outside Europe (including Brazil, USA, Singapore, India and Australia). The mentors have a mean of 17.5 years’ experience [range 5-34] in head and neck radiology. There are 19 mentees from Europe (including United Kingdom [n=6], and Italy [n=4]), and eight from outside Europe (including Brazil, Argentina, Mexico, Pakistan, Malaysia, Egypt, Nigeria and Australia).

So far, 24 mentor-mentee pairs have participated in 2.6 (mean) meetings. Although there has been an emphasis on discussing specific head and neck radiology topics, protocols and techniques (e.g. head and neck cancer, salivary gland imaging, molecular imaging), a number of more general issues have also been discussed (e.g. work-life balance, diploma preparation, educational resources, dealing with difficult colleagues, how to teach, academic systems, variations in healthcare organisations, radiology departmental workflow).

A questionnaire at six months following the start of the programme revealed that 80 % of mentors and 88 % of mentees strongly agreed that the mentoring programme was rewarding rather than an obligation. All participants reported that they would recommend the scheme to colleagues, and 96% of the participants felt that they had a good “match”.

The early experience of the ESHNR mentoring programme is encouraging and suggests that it is both useful and sustainable. It attempts to harness the unique qualities of the ESHNR, and to bring together the benefits of international diversity with a common interest and focus on head and neck radiology. ■

1st Masterclass in Head and Neck radiology upcoming

Berit Verbist

The postponement of the 2020 edition of the European Congress fo Radiology (ECR) shortly before the WHO declared the coronavirus (COVID-19) outbreak a global pandemic ushered in a new era of virtual conferences and courses. Also the European society of Head and Neck Radiology (ESHNR) adapted to this new situation and quickly turned their annual meeting into a virtual event, examined candidates for the ESHNR diploma online and doubled the number of webinars by joining forces with ASHNR. Through this and with the help of the ESHNR social media team we stayed connected to and even expanded our head and neck community.

Redefining virtual teaching even further, ESHNR is now offering a live virtual **Masterclass in Head and Neck radiology** focused on interactive case-based training. During this 3-day course, taking place on **Dec 9-11, 2021** you will have the opportunity to discuss clinically relevant topics and cases with expert tutors in a multidisciplinary setting.

To find out more click

https://eshnr.eu/meetings/masterclass-2021/

Since we'll be working in small-group wokshops the number of attendees is limited and early registration is recommended. ■

ESHNR 2021

Booklet

Practical advice part 1: Radiology

ESHNR Fellowships: A Personal Experience

Alexandra Borges, MD
Graduate Consultant, Radiology Depatment,
Instituto Português de Oncologia de Lisboa

Since very early in my radiology training, I have developed a special interest in radiology education. Having had a radiology tutor dedicated to head and neck radiology and to education in that specific area, at a time where the first steps of head and neck radiology as a subspeciality of radiology in Portugal were being taken, was quite a thrill. I can say I belong to the second generation of a very small group of pioneer Portuguese radiologists dedicated to this field. At that time, 1995, the European Society of Head and Neck radiology founded in 1987 was in its early years and there were no formal head and neck fellowships in Europe. I was lucky enough to be accepted for a fellowship at the University of Los Angeles California in the US to be trained in Head and Neck and Neurorradiology by Prof. Robert Lufkin and Prof. John Bentson.

Since then, education in Head and Neck radiology took a major step ahead, particularly after the creation of the European School of Radiology (ESOR) in 2011, founded by Prof. Gourtsoyiannis. From the beginning I was engaged on this new educational adventure and my Institution, the Cancer Institute in Lisbon (Instituto Português de Oncologia de Lisboa), became one of the training centers offering 3-month fellowships in Head and Neck Radiology. My educational experience was built up by more than 15 years providing 3-month rotations in Head and Neck imaging to radiology residents coming from different institutions from all over the country as well as 3-months sub specialization programs in head and neck radiology. Therefore, it was easy to embrace newcomers from other countries. Up to this date we have received ESOR fellows, Bracco Fellows and Trainees coming from Portuguese speaking countries around the globe, particularly from Brazil under a luso-brazilian cooperation protocol between the Brazilian college of Radiology and the Portuguese society of radiology and nuclear medicine.

During these 3 months, fellows rotate through CT, MRI, US, US-guided procedures and MCDTs in ENT, Head and Neck surgery and endocrinology. They attend weekly lectures on different subjects of head and neck radiology and discuss their reports on specifically selected imaging studies on that specific subject. They are also invited to attend the weekly meeting of the radiology department. During this period, they are also challenged to do clinical research and/or to select a review subject or an interesting clinical case to present or to be sent for publication. In the end, residents and fellows are required to take a written, multiple choice, examination including practical clinical cases.

I am often asked “why do I keep doing this?” and I always reply with the old Latin principle “Teaching is the best way of learning”. From where I stand, I find it a win-win situation. Teaching helps me refresh my knowledge, increases my communication skills and keeps me updated. Different students have different points of view, different needs and different ways of learning, challenging me to find new ways of teaching and explaining concepts and even giving me new ideas for research and clinical reviews. On the other end it is our duty to attract youngster to this field of knowledge and to keep Head and Neck Radiology alive and kicking, for the benefit of our patients and, who knows, even ourselves!

I was pleased to witness a growing interest on this Head and Neck rotation and sub specialization since I have first started, which translates on a booking system for a 5-year period, now having a waiting list. The need to increase the offer is obvious and new mentors are urgently required. For that purpose, the ESHNR has recently launched a mentoring program with the aim of finding new mentors and matching mentors with mentees. This will help overcome several problems, namely economic and related to language. Finding full funding for a fellowship is not always easy and although, in my department, teaching is provided in English when we receive foreign fellows, the actual reporting, digital reporting systems (PACS and RIS) and MCDTs are in the native language, which is definitely a downside.

I have had great feedback from foreign trainees, keep close contact with some and have very fond memories from others. I thank each and one of them for keeping my excitement and thrill on this field of radiology. This is probably the most important reason to keep me going!

You can get detailed information on Head and Neck fellowship applications at the ESHNR and ESOR websites. ■

Grant application

Prof. Dr. Jonas A.Castelijns
A.V.L.-Netherlands Cancer Institute, Amsterdam, The Netherlands

A grant application is a proposal in which an applicant submits a specific project to a donor organization to consider funding. It is therefore a medium for the donor to decide who will be funded and for researchers to get funding. The application clarifies research goal and the plan, which the researcher wishes to perform and requests resources from a donor. Although writing a grant might appear as a time-consuming activity, it also has many benefits. Writing an application helps researchers to makeover a project from an idea to a reality. During this process the applicant has to elucidate, clarify, provide more project details, (re)test and prove. Funding organizations have the opportunity to understand goal and plan of investigation.

Writing a grant needs competence and extensive experience. Some tips might well improve skills to write a grant application. These concern firstly the goals of the funding organization, secondly the content/ description of the proposal and thirdly the feasibility of the project.

At first, the goal of your research must agree with the mission of the funding organization. Therefore, you should know the funder's aims, values, and priorities. Familiarize yourself with the requirements and guidelines of the application, including basic formatting, the directives for each section and the evaluation criteria. Describe what you are doing and who is going to benefit. The funder should feel confident after reading the proposal.

Secondly, the content/ description the application should have a beginning (background and the problem), middle (plan of investigation and the solution), and an end (expected results and which have impact). Clearly describe the problem and how you achieve project's aims. Describe of what is original about your research and why it matters. Emphasize its relevance and how it will advance research and be of value to potential users. Grant adjudication processes generally involve multi-stage review by both subject matter experts and a multidisciplinary panel. Therefore write your application in understandable language and avoid abbreviations and over-use of jargons. Write concise and with clarity, using topic sentences. Using the grant-review criteria as subheadings in your proposal, makes it easier to fill out their review forms. A good summary describes the important aspects of the grant application clearly. Any requirements of the funding organization should be accentuated.

At last, convince the reviewer that your project is feasible. The methods should be directly related to the goals of investment. Demonstrate that goals are achieved by your research team, detailed work plan and budget. The project budget is critical and should demonstrate sound project planning. You should carefully consult the funder guidelines on permitted expenses. Collaborate with senior investigators who have conducted similar projects. Finally, present evidence that you have conducted smaller-scale feasibility studies. ■

How to publish a High-Impact Study

Birgit Ertl-Wagner, MD, PhD, MHBA
Derek Harwood-Nash Chair in Medical Imaging, Division Head, Neuroradiology
Senior Associate Scientist, Research Institute, The Hospital for Sick Children
Professor of Medical Imaging, Vice Chair Research, Department of Medical Imaging University of Toronto

The crucial first step in publishing a high impact article is finding an important topic. Prior to embarking on a research study, ask yourself whether your chosen topic will answer an important question or address an unmet need. Make sure to diligently look for the relevant literature – a few hours of literature search may save you months of hard work. Once you decided on a relevant topic, clearly formulate your hypothesis (if applicable – some research projects may be hypothesis-free). Define your hypothesis a priori and not after gathering your data – otherwise you may land on the slippery slope of circular reasoning. Next, you usually need to define your sample size by performing a sample size calculation – again, this must be done a priori and not post hoc to be valid.

You will then need to submit your research proposal to the applicable research ethics board / institutional review board of your institution. These boards have different names in different countries and are vital for any research. They will review your proposal from a standpoint of ethics, data protection, feasibility, and scientific validity, which will help fine-tuning your proposed project prior to embarking on your data collection. Research ethics approval is required for both prospective and retrospective studies. Informed consent may be waived for retrospective studies.

While you are collecting and then analyzing your data, it is a good habit to already start writing your manuscript. Begin with the methods section – it is usually much easier to write while you are performing the study. You can always edit and adapt later but write down what you are doing when you are doing it. This also overcomes blank page anxiety – your paper is already started, there and then.

For data analysis (and even before, at the stage of defining your hypothesis and performing your sample size calculations) it is often a good idea to team up with a statistician or data scientist. Depending on your study, the required statistics may well go beyond a typical radiologist's statistical toolbox.

Now comes the time to write your manuscript and get it ready for publication. This is a very crucial step. So many studies (even well conceived and impactful ones) never see the publishing light of day and stay in a virtual "drawer" forever – don't let that happen to your work. Just start writing and don't become discouraged along the way.

The title should be short and convey the main message of your manuscript. Include a modality and disease in the title, if applicable. Avoid overstatements – in the title and throughout your entire manuscript. Do not phrase your title as a question – titles with questions tend to have a lower acceptance rate.

Key Points should have abbreviated quantitative data to support your statements. Make sure your statements are short, succinct, and comprehensible.

Your Abstract is very important and usually read first by your editors and reviewers. Abstracts are commonly written as the last chore prior to submitting a manuscript – make sure you give the abstract the attention and time it deserves. Most radiological journals require structured abstracts. Your background statement needs to pertain to the topic and fit your purpose. Avoid generic statements. Your purpose statement should exactly correspond to the purpose statement at the end of the introduction – double-check this prior to submission. The methods section of the abstract should include the type and beginning and end dates of your study and include a short statement on statistical analysis. The abstract's result section should contain basic demographic information on your participants. Make sure to provide quantitative information for your results. The conclusion should follow your data – again, don't overstate.

The Introduction is commonly to long. Keep it brief and concise. It should end with a clear purpose statement that precisely matches your abstract. If applicable, state your hypothesis directly before your purpose statement. ››

How to publish a High-Impact Study

Birgit Ertl-Wagner, MD, PhD, MHBA

Your Methods section needs to start with a clear statement on ethics approval and informed consent. If applicable, information on animal care and data protection regulations may need to be added. Specify your study design and beginning and end dates of your study. Be explicitly clear about your inclusion and exclusion criteria. Provide pulse sequences and reading details, including initials and experience levels of your readers, if applicable. The last paragraph should be on statistical analysis. It should include sample size calculations and how you corrected for multiple comparisons, if applicable. Overall, your Methods section needs to provide enough information for your study to be reproduced.

Your Results section should provide baseline demographic and clinical characteristics of your participants. A flowchart providing the initial patient population, those excluded for any reason and final sample size is usually helpful. Quantitative information must be provided throughout the Results section. Numerators and denominators need to be provided in addition to percentages. Avoid excess decimal digits.

The first paragraph of your Discussion should briefly summarize your study. Subsequently, succinctly review the relevant literature and how your findings correspond or differ. The second to last paragraph should be your limitations paragraph. All studies have limitations – include potential bias and other factors limiting the generalizability of your study. Finally, end with your Conclusions and future perspectives. Choose Figures and Tables that best convey and illustrate the message of your study.

When you hear back from your chosen journal make sure you closely read the decision letter. Does it indicate that revisions are required for eventual acceptance? That is usually good news. Make sure to address all comments and elaborate this in your response letter. If it is a clear reject letter, don't become discouraged. Where applicable, take the reviewers' comments to improve your manuscript – and resubmit to another journal that best fits your manuscript.

All the best for your research endeavours! ■

MDMs … making them work for the head and neck radiologist

Steve Connor

The head and neck radiologist first became familiar with the multidisciplinary meeting (MDM) in the context of cancer care, but now we play a key role in patient management through our input to a whole range of non-cancer clinic-radiological meetings.

MDMs are a force for good

MDMs and clinico-radiological conferences help standardize care and encourage open decision making, whilst providing a record of definitive treatment plans and outcomes. An effective MDM can also provide a forum for training, feedback, quality improvement exercises, peer review, data capture and clinical trial recruitment. Moreover, they may improve health care efficiency by guiding appropriate investigation and treatment, and there is some evidence that patient outcomes may be improved by a well conducted MDM. They are particularly helpful where there are difficult decisions, particularly when there is a paucity of evidence, or where there needs to be a careful balance between the impact of patient management on survival and quality of life.

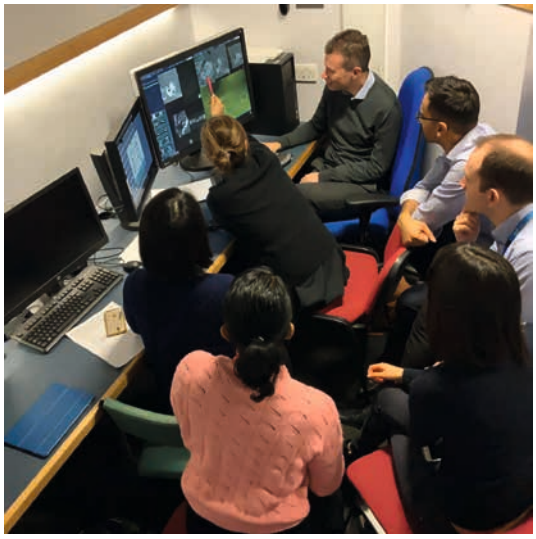
The radiologists role is (obviously) key with the MDM allowing for the provision of a second imaging review, a "verbal-visual" communication of the imaging findings, a development of common terminology amongst the clinicians and an opportunity to refine the radiological interpretation in the light of clinical findings and other imaging investigations. The MDM represents an opportunity for the head and neck radiologist to become embedded within the clinical teams and to increase our value.

So all good so far ...

Or are they?

But there are challenges… There is no doubt that MDMs have led to an increase in workload for the radiologist with time required to adequately prepare for and to attend the meeting. Depending on the functioning of the MDM, it may enhance the radiologist's job satisfaction through collegiate working and educational experience, or it may become the most stressful part of their week.

Just sometimes we observe inefficiencies with our MDMs … There may be multiple unnecessary discussions when cases straddle different subspecialties (as they are passed between the different multidisciplinary teams in a game of "MDM ping pong"), or when the relevant clinical team is not in attendance at the MDM (just imagine if the radiologist did not turn up?!). IT issues can also be a challenge; I have twice spent several hours providing a verbal description of the imaging appearances at an MDM when PACS was malfunctioning (although some said it was an improvement). Whilst a finite time needs to be scheduled, it is difficult to cater for the disproportionate impact of complex cases (eg. another discussion about how best to treat a bulky T3 laryngeal cancer), such that the final cases are discussed at break neck speed- whilst the next MDM team peer accusingly through the door! »



A particularly attentive gathering at the Otology MDM

MDMs … making them work for the head and neck radiologist

Steve Connor

How can we make things better? The top 10 bits of "advice"

Note this is all aspirational and a case of ... "Do as I say and not as I do"[1].

1. Take back control[2] – our role is pivotal and we should insist on adequate job planned time (and new radiologist appointments if necessary), appropriate deadlines for submitting cases, and a restriction on numbers of patients that can be safely discussed in one meeting.
2. There should be a unified imaging outcome (which may require a supplementary radiology report). Also make sure the formal MDM outcome is correctly recorded as there are medico-legal implications.
3. Ensure adequate IT support, processes for transfer of images and MDM infrastructure
4. Don't get bullied into reviewing an unprepared case(s) at the end of the meeting-politely decline and think what is in patients' best interests
5. Become involved in imaging pathways, turnaround and scheduling so that imaging is available in a timely fashion for the MDM
6. Be inquisitive and learn (time allowing) and use it as a forum to see how imaging pathways and services can be improved.
7. Attempt to document and quantify the work done for MDMs (termed 'non-countable' activity) and make a case for adequate administrative support.
8. Avoid "status hierarchy" and ensure all opinions are valued. Everyone should have a role. Training and being trained is a particularly important role.
9. Engage with radiologists from other regional network hospitals to avoid them losing interest and becoming deskilled as services become more centralized.
10. Use humour (appropriately and within reason) – "laughter is the best medicine"

The future

MDMs have surreptitiously grown in number and size which is an indication of their perceived value. However, we face increasing pressures with ageing populations and demands upon radiology services, and there will need to be a review of whether the discussions should be restricted to the more complex clinical problems. Maybe electronic communications between team members (with suitable data availability and audit trail) could start to function in real time, without the delay imposed by waiting for the next meeting? The complexity of patient data for discussion will increase (eg. advanced imaging techniques and tumour molecular analysis) and this will be supported by improvements in data management. More active processes such as clinical decision support platforms have already been trialled in the setting of MDMs; these may aid evidence-based decision making, substantiate their effectiveness and may possibly facilitate patient involvement in MDMs.

Despite all this, it seems likely that MDMs are likely to persist in some form, and with the increasing impact of Artificial Intelligence and our evolving role as radiologists, the innate two-way dialogue of an MDM will continue to enhance our expertise and status as "clinical" head and neck radiologists. ■

1 This phrase (now commonly used by parents) can be tracked back to our Anglo-Saxon ancestors in the 12th century and hence should be attributed to our colleagues in continental Europe!
2 A slogan credited to the chief "Vote Leave" strategist in the Brexit campaign but certainly not being used in that context

ESR Educational activities

Laura Oleaga
Radiology Department, Hospital Clínic Barcelona, Spain
EDIR Scientific Director

The European Society of Radiology (ESR) offers a wide range of pre and postgraduate education and research activities for radiologists and radiographers with numerous teaching and examination programmes.

The ESR European Training Curriculum (ETC) and the European Diploma in Radiology (EDIR) represent the main pillars of radiology education necessary for the standardisation of training in Europe.

The ESR European Training Curriculum (ETC) is a guide to standardise education and harmonise skills and competencies among radiologists in Europe endorsed by the European Union of Medical Specialists (UEMS)[1].

The European Diploma in Radiology (EDIR) is an instrument for measuring competence in radiology. It is officially and fully endorsed by the UEMS and the ESR[2].

The ESR educational activities or resources can be divided into two groups: the live events and the online events.

Live Events

- The European Congress of Radiology (ECR) and the courses organised by the European School of Radiology (ESOR) are the two most important ESR live events. The ECR covers a wide range of topics in radiology by internationally renowned speakers and joint sessions organised together with interdisciplinary organisations with whom the ESR cooperates formally.
- The ESOR programme includes courses in Europe, Latin America and Asia as well as visiting Scholarships and Fellowship Programmes in Europe, visiting Scholarships und Fellowships in USA[3].

Online Events

Education is evolving; new technologies and innovative approaches are being incorporated in the radiology field. The ESR's online services, which have further developed over the years, are among the ESR's greatest achievements. These new instruments are available to all members of the ESR[4].

E-Learning activities are designed to individualise the learning experience with the possibility of being granted Continuing Medical Education (CME) credits.

- The ESR's e-Learning platform "Education on Demand" contains video-based courses, ESOR courses, self-assessments and literature-based courses.
- EPOS is the portal for electronic scientific posters with electronic exhibits in the repository, supervised by the ESR Editorial Committee.
- EURORAD is a peer reviewed teaching case data base with peer reviewed cases, available online.
- ESR connect is the latest online resource provided by the ESR with a selection of innovative contents and lectures in all topics and on all levels of radiological education. »

ESR Educational activities

Laura Oleaga

- EDIR examination preparation material:
  · "EDIR: the essential guide" is the new book released by the EBR available online based on the ESR European Training Curriculum (ETC) with the same pattern as the EDIR examination to help candidates in the preparation for the EDIR examination.
  · EDIR app with self-assessment material.
  · EDIR blogs with interesting cases of each of the subspecialties.
  · Dedicated "ESOR for EDIR" courses organised by the ESOR. ■

Image highlighting all the training resources provided by the European Society of Radiology. Available to all members of the ESR

1 https://www.myesr.org/education/training-curricula
2 European Board of Radiology (EBR). The European Diploma in Radiology (EDiR): investing in the future of the new generations of radiologists. Insights Imaging 9, 905–909 (2018). https://doi.org/10.1007/s13244-018-0665-7
3 https://www.esor.org/
4 https://www.myesr.org/education/online-services

Circle of teaching-learning: Teaching a teacher

Bela Purohit

„There is still so much more to the facts of the knower, knowing, knowables, and knowledge about which we have hardly ever thought, let alone experience. Delving into this rigour all throughout life is an end in itself.“

Rigveda

The “circle of teaching-learning” is neither an abstract nor a concept. It is just a constellation of musings and observations. It has nothing to do with the popular scientific ways of learning-teaching.

Education is a vital mission of teaching hospitals. Traditionally, teaching-learning in medicine happens in a linear-cascading fashion. A professor teaches many students, of which a few join a teaching hospital and dissipate the knowledge to the subsequent batches of students; thus, an onward cascade is formed. Various educational systems are meticulously structured and undergo rigorous reforms, but the linear-cascading knowledge dissemination format remains unaltered. To be effective teachers, faculty require diverse skill sets such as observing and assessing learners, providing feedback, mentoring, and developing and evaluating curricula. All this must be done while dispensing quality patient care. Indeed, it is a herculean task to balance clinical work, teach students, and keep abreast with rapid advances in medical science. This highlights the need for formally structured faculty development programmes. However, a faculty development programme requires funding, salary support, protected time, and, most importantly, a culture of faculty upgrading in the institution. Unfortunately, many teaching hospitals lack such programmes due to various constraints and inherent system barriers. The lack of such a programme may lead to a knowledge gap and unquantifiable quality depreciation.

Many senior radiology teachers who had predominantly worked in the era of plain radiographs, IVUs and barium studies taught these radiological skills to their mentees. Unfortunately, many of these radiology procedures became near-obsolete with the rapid advancement of clinical techniques like endoscopies and the increased use of cross-sectional imaging. This made otherwise dedicated skilled teachers partially redundant well before their retirement. This untimely redundancy may not have caused an apparent loss to the patient care aspect of the department. However, the institutions lost valuable skill sets in terms of time-tested teaching acumen. Similarly, today, many of us at various stages of our professional lives may be staring at potential redundancy especially in new emerging fields like artificial intelligence, radiomics, etc. This pattern can be changed, or fear of imminent redundancy can be reduced by establishing circles of teaching-learning at various stages of one’s career. Such a circle can be formed by designing a programme and developing an institutional culture of junior faculty (who has learnt recent advances or new skill sets) teaching a former mentor. Akin to the mentor-mentee program of ESHNR, a reverse system of “teaching a teacher” might help to complete the circle of teaching-learning and benefit teaching institutes and individual learners immensely. ■

ESHNR webinar

Salman Qureshi

ESHNR has been providing monthly webinars since 2018. These were set up by Professor Minerva Becker as Chair of Education and our first ever speaker was Professor Soraya Robinson, Congress President 2021 hence bringing us full circle! Little did we know at the time when this was set up that this would constitute the mainstay of educational activity in subsequent years making ESHNR one of the pioneers in utilising this platform.

The subsequent year continued with many excellent European speakers familiar to many of us who have attended head and neck radiology meetings. From autumn onwards, invitations were sent to speakers from around the world starting with Richard Wiggins from Salt Lake City presenting on facial nerve imaging. Since then, we have had many global speakers including North America but also Singapore, South Africa and Australia. In fact the latter was an excellent presentation by Jennifer Gillespie (Brisbane) on the difficult topic of post treatment neck imaging and since our sessions are done live, she delivered this at 3am her time!

The world changed in 2020 and with the cancellation of our annual meeting, the importance of the webinars was bought into prime focus. This also resulted in a significant increase in participants with approximate tripling of attendees in comparison to the preceding year. Having started in 2018 certainly gave the society a head start using this medium in what was to become a fairly crowded space. »

ESHNR webinar

Salman Qureshi

In addition to our own webinars, we entered into a collaboration with the American Society of Head and Neck Radiology. The two societies had worked on plans to collaborate with each other for a few years predating the pandemic. This included cooperation on social media as well as planned speaker exchange at the annual meetings. Sadly the latter could not come to fruition given the circumstances however another project was to undertake joint webinars with a plan of going through the subject matter systematically reviewing the rad-anatomy and rad-pathology in each section. I am pleased to say that these have been a huge success globally with speakers from both sides of the Atlantic sharing their expertise. The first ever joint webinar took place in September 2020 and fittingly was given by Minerva Becker on the topic of “Larynx” along with Amy Juliano from Boston. These have continued to be a great success under the title of “Two Heads and Necks are Better than One” utilising the hashtags #HNxHN and #HNRad.

In terms of the future, despite hopefully some green shoots of recovery with the possibility of in person meetings taking place towards the end of this year, the society will continue its program of webinars given that these sit nicely with the educational objectives of the society. In addition, both ESHNR and ASHNR are committed to continuing the joint webinars which have proved so popular around the world.

I would like to take this opportunity to thank Ricarda and the rest of the ESHNR office for organising these webinars. Also I would like to thank the moderators including Minerva Becker, Davide Farina, Berit Verbist, Steve Connor and Elizabeth Loney. However much more importantly, thank you to all the speakers who given the time and effort to complete the lectures as well as all the attendees for their interaction in making these projects successful. ■

Head and Neck Radiology only for the tertiary referral centre?

Soraya Robinson

Our fascinating profession comprises so many interesting areas and after hospital training we should be able to cover “all” questions from top to toe, from the prematurely born to the senile, all genders and if at all possible all subspecialties, even though our main workload might be degenerated spines of too inactive people, as well as knees, which have suffered from too much inappropriate activity.

It takes little wonder that head and neck radiology might not be on the forefront of general radiologists’s minds. In fact, it is not unheard of that some have developed an unconscious blind spot, when it comes to the area between skull base and clavicles. It is one thing to depict nasal septal deviation, paranasal sinus opacification, cortical discontinuity in orbital floor fracture and a solid lesion in the inner auditory meatus in acoustic neurinoma, but a completely different issue, if something looks malignant and you have that awful hint of a memory that TNM staging classifications keep changing faster than the seasons or you have a slight inkling that the patient in question has a different, namely head and neck problem, which was not expected from the referral and therefore not adequately examined, but is unfortunately nonetheless partly visible on your study. One solution would be to retreat to the German saying “What I do not know/see, does not upset me” or consequently the referring physician or patient, who might be highly reluctant to undergo surgery, anyway. And was there not also the topic of exploding health care costs and futile examinations? Are you not, in the end, doing everybody only something good, if you restrict yourself to reporting on the original purpose of the study?

Well, while being fully aware that it takes an extra effort and additional initiative, I would now like to give you a couple of examples, where turning a blind eye to an incidental head and neck pathology is not the ideal approach.

Chances are that your brain exams performed for headache also cover the eye and an asymmetry of the globe is not caused by cataract surgery, but retinal detachment or choriodal melanoma, which should prompt immediate ophthalmologic consultation to save the patient’s eye sight or even life.

It would be virtually impossible to look for intracranial causes of vertigo and dizziness without covering the temperomandibular joint and once you start looking for it, you will notice, how many people have slipped disks and deranged joints and would actually profit from simple splint therapy to correct their malocclusion, which often is also connected to inner ear problems.

Do you always thoroughly compare neck vessels with the contralateral side to exlude dissection or thrombosis?

Hand to your heart: do all your paranasal sinus CTs also cover the alveolar process of the maxilla? Not knowing about the efficiency of dental hygiene in your country, I dare to postulate that you will encounter a not neglectable number of dental apical inflammation or even worse oroantral fistulas kindling maxillary sinusitis and unless the dentist sets to work for some serious restauration, FESS will never help your patient.

The same holds true for tumour patients: after couragously having tackled that oral cavity tumour including size, border, morphology, vascularization, lymph nodes, and relationship to vessels, nerves, bone and midline, don’t forget periapical lucencies-they are only waiting to flare up during radiation therapy, or even worse in candidates for biphosphonate treatment and once jaw osteonecrosis has developed, there is very little, medicine can offer.

Last comment to paranasal sinuses: a narrow sinus ostium is bad, but a dilated, opacified ostium, unclear skull base, as well as intraluminal calcifications absolutely qualify the patient for contrast MRI to depict that expansile tumour or the slowly growing fungal sinusitis. »

Head and Neck Radiology only for the tertiary referral centre?

Soraya Robinson

Not knowing, how narrow your field of view is in brain and spine MRI, it is not unheard of to delineate cervical masses. And here I am not talking of reactive lymph nodes in young patients (go for their short axis diameter and don't get excited about prominent craniocaudal measurements). Start to scrutinize the borders of your study and you might detect paragangliomas in the carotid bifurcation or centrally necrotic or calcified lymph nodes in early and treatable thyroid cancer. Think twice, before you call something a lymph node, if it is located far in the back-it might be a neurinoma, actually causing neck sensations, if you don't find the disk herniation or a parathyroid adenoma, especially, if the patient has already suffered from kidney stones.

Recommending unnecessary examinations causes anxiety to the patient and contributes to the financial health care dilemma. But beware: no matter, how smoothly delineated a salivary gland tumour is and how reluctant the patient is to see the ENT-doctor, histology needs to be acquired to exclude malignancy.

And however convenient it is to call something a neck cyst: get your bearings right, be absolutely convinced that the compartment, as well as its content fit, otherwise you might overlook descended periodontal inflammation, malignant lymph nodes or the tip of the iceberg in lymphangioma with involvement of deep compartments, which might have gone undetected even until middle adulthood.

Finally, if prevertebral soft tissue diameter seems a little thickened, margins are blurred and parapharyngeal fat triangles look only so slightly opacified: be aware that patients might underestimate symptoms of inflammation and that you might be the one to prevent phlegmone or abscess from descending to life threatening mediastinitis.

Agreed, all of the above are not necessarily encountered on an everyday basis. But they do have tremendous effects on your patients' wellbeing. I can assure you: once you overcome your reluctance to master head and neck issues, your eye will be sharpened for it and you will become more confident, especially when you start to get feedback from your clinicians, which means that they respect you as a trustworthy partner, who makes a difference.

And remember: rehearsing your anatomy will work wonders! ■

Social Media and the Head & Neck Radiologist

Dr Matt Bull FRCR
Frimley Health NHS Foundation Trust, Berkshire, UK (@mattdbull)

Dr Phil Touska FRCR
Guy's & St. Thomas' Hospitals NHS Foundation Trust, London, UK (@PTouska)

Radiology is a specialty that prides itself on embracing new technologies, and social media (SoMe) has been no exception. Even before the mass societal shift online prompted by the COVID-19 pandemic, social media was being used by radiologists for both educational and clinical purposes in ways that were unheard of 15 years ago. This was accelerated by an ability to transgress the barriers of geography and hierarchy, building friendships and collaborations with colleagues across the globe. If you have yet to join the social media revolution, below is a brief guide on where to start.

What is SoMe?

SoMe refers to websites and applications that enable users to create and share their own content and/or interreact (socially) with content posted by others.

What are the options?

Many applications and websites exist, with new platforms emerging almost daily.

Facebook is by far the largest, with around 2,853,000,000 active users[1], and as such has an unparalleled reach. Users can post pictures or videos for others to comment upon. Many radiology websites and societies have Facebook pages, which often link to preexisting content elsewhere, rather than original content specifically for the site.

Instagram is a picture sharing site with over 1.2 billion active users. As it is based on images, it lends itself beautifully to radiology. There are many radiology-based accounts that regularly post images.

Twitter is, at first glance, rather small compared to others with just 353 million active users. Despite this, it has cemented itself as a firm favourite of the medical world. Many of the major radiology societies joined within a few years of Twitter's launch in 2006 (e.g. @RSNA in 2007, @RCRadiologists and @RadiologyACR in 2009), with Head and neck radiology societies joining somewhat later (@ASHNRsociety in 2011, @BSHNI_UK in 2014 and @ESHNRSociety joining as recently as 2019). It was through Twitter that radiologists from Europe and the USA eventually came together, largely thanks to the efforts of ESHNR's Salman Qureshi, and have launched a highly successful series of joint online lectures (webinars) figure 1.

Fig. 1: Example of the joint international webinar programme and @ESHNRSociety Twitter account.

Furthermore, various societies and individuals regularly post interesting cases on which you can test your knowledge. It has also become an effective portal for advertising courses, webinars and conferences, reaching a worldwide audience with the touch of a button. »

Social Media and the Head & Neck Radiologist

Dr Matt Bull FRCR & Dr Phil Touska FRCR

Pitfalls of SoMe:

There are several potential pitfalls with SoMe. The first, and greatest, surrounds information governance, since the sharing of images risks inadvertent transmission of patient identifiable data.

Various regulations exist on SoMe use, including the EU's General Data Protection Regulations (GDPR), the UK's General Medical Council guidance and the USA's Health Insurance Portability and Accountability Act (HIPAA). Whilst they all differ in scope and detail, the bottom line is that medical professionals shouldn't share patient identifiable data on unsecure platforms, which includes all of the SoMe providers mentioned above, as well as the ubiquitous WhatsApp. Table 1 offers some tips on addressing risks (NB. Always check regulations in your own country before posting content).

Table 1: Sharing radiological images online (tips)

» **Consent:**	If you have the specific written consent of the patient, you can share what they've agreed to. However, obtaining such consent is typically impractical in routine radiological practice. Some departments request consent for use of imaging material in teaching/education as part of their standard registration documentation, although this is imperfect.
» **Anonymise:**	Any material shared online should be anonymised (unless there is specific consent and justification to the contrary). Whilst this may seem simple at first glance (an anonymised radiograph of a common wrist fracture is unlikely to be recognised), it can be more complicated in practice (e.g. images of a rare genetic disorder could risk individual identification; similarly, images of traumatic injuries may be identifiable if the incident is unusual and its circumstances corroborated by a quick Google search).
» **Minimise:**	A useful heuristic is to share only the minimum data required to preserve educational value (e.g. only using a cropped area on a single CT slice and omitting, limiting or changing the history and demographic information).
» **Formats:**	Where possible, avoid using data-rich formats such as Digital Imaging and Communications in Medicine (DICOM), since the associated metadata contains patient identifiers that need to be specifically removed (there are various applications that can do this). It is also worth noting that even common image compression formats (e.g. jpeg) can contain data on the time and place of image acquisition.
» **GDPR compliant apps:**	Some messaging services are specifically designed to be secure for the transmission of patient data, such as Hospify and Siilo. These are, by definition, less "social" than Twitter etc. because they are not open to all, but are built to comply with GDPR rules. It is still good practice to avoid sharing any patient data that isn't absolutely necessary, but it adds a layer of protection and legitimacy.

Whilst platforms such as Twitter and Instagram may bring together medical staff from around the world, they are also open to members of the public. It is therefore critical to appreciate that material posted on SoMe platforms is often seen by a variety of individuals, including those without medical training, those who might misunderstand the context of a post or may not share the poster's sense of humour. In the UK, it is not uncommon for Twitter users to threaten doctors with referral to their medical regulator (the GMC) for offenses such as using bad language or simply suggesting people should wear mask. »

Social Media and the Head & Neck Radiologist

Dr Matt Bull FRCR & Dr Phil Touska FRCR

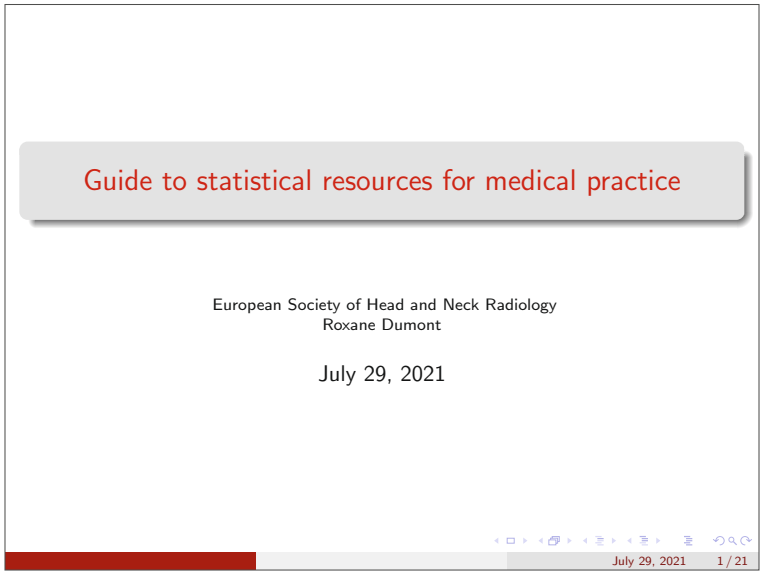
What's next for SoMe?

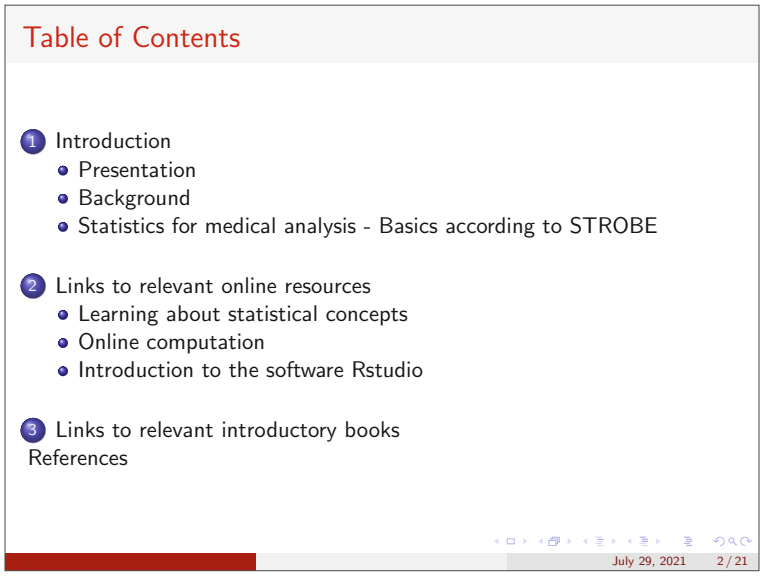
The global pandemic has highlighted the benefits of SoMe where other forms of interaction have been curtailed, and whilst interactions over SoMe cannot replace those made in person, they can undoubtably augment them. SoMe platforms will therefore continue to aid radiologists' professional development, facilitate instant interactions and foster relationships with colleagues worldwide. SoMe platforms are also now beginning to include virtual reality applications, which enable users to meet and chat in virtual 3D environments. It is only a matter of time before we have the option to immerse ourselves in a virtual lecture theatre and interact with scans. ■

References:
1. https://www.statista.com/statistics/264810/number-of-monthly-active-facebook-users-worldwide/
2. https://www.gmc-uk.org/ethical-guidance/ethical-guidance-for-doctors/doctors-use-of-social-media/doctors-use-of-social-media
3. https://www.hipaajournal.com/hipaa-social-media/

Guide to statistical resources for medical practice

Roxane Dumont





Guide to statistical resources for medical practice

Roxane Dumont

Presentation

"My name is Roxane Dumont and I live in Geneva. I studied economics at the University of Lausanne and then spent one year in Taiwan and Cambodia for different projects and obtained a master's degree in statistics at the University of Geneva. I have been working at the epidemiology unit of Geneva University Hospital for the past year, helping epidemiologists and physicians with data management and analysis while learning a lot about public health, especially in the current pandemic era. I have recently started a PhD in Epidemiology."

Background

- **Statistical knowledge is essential nowadays**, not only in designing and conducting medical research trials, but also in understanding medical literature and evidence-based studies that guide medical practice.(Evans, 2010).
- Statistics are involved in medical research at different levels: design, data management and analysis. **The quality of the study, leading to important conclusions for medical practice, depends on well performed statistical data analysis.** Significant negative implications may result from errors in statistical design and analysis

Background - ESHNR

Statistics in radiological research and literature is just as important as in other medical fields with specificities in **analysing efficiency and reliability of diagnostic tests in detecting pathologies, monitoring them and evaluating response to treatment**. Implying the use of different statistical tools and parameters (Anvari, Halpern, & Samir, 2015).

Guide to statistical resources for medical practice

Roxane Dumont

Organisation

- The first part of the document introduces online material such as websites, videos and articles dedicated to acquire basic notions in probability theory and statistics.
- In the second part, online statistical calculators will be presented as well as their limitations.
- The third part introduces an open source software called R studio. It is frequently used in the scientific community for researchers who would like to conduct their own analysis. This software requires programming skills

Overview with STROBE

The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies presents a checklist that summarizes information that needs to be reported to provide complete statistical analysis in different types of studies including cohort studies, case-control studies, cross-sectional studies, etc (Von Elm et al., 2007)

Overview - Checklist

Extract of the STROBE checklist

METHODS		
Study design	4	Present key elements of study design early in the paper
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection
Participants	6	(a) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants (b) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
Bias	9	Describe any efforts to address potential sources of bias
Study size	10	Explain how the study size was arrived at
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen, and why
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding (b) Describe any methods used to examine subgroups and interactions (c) Explain how missing data were addressed (d) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy (e) Describe any sensitivity analyses

Guide to statistical resources for medical practice

Roxane Dumont

Overview - Structure of an analysis

Step-by-step :

- 1) Plan your research design and write your hypotheses
- 2) Collect the data and clean the data (the hardest part...)
- 3) Descriptive analysis also known as Exploratory Data Analysis (EDA) is a critical step in the analysis, it enables the understanding of the underlying structure of the data, detect outliers and anomalies, extract important variables and test assumptions based on descriptive tables and plots
- 4) Hypothesis testing or inferential statistics
- 5) Interpretation of the results

Aim of this work

Basic statistical knowledge is required to understand current medical literature, to define research questions and report results. Most of the time, detailed knowledge of the mathematical aspects of statistics is not required and **this document aims to give access to trustworthy online links where basic notions of statistics are available as well as more advanced notions of statistics**.
The internet has become a gold mine of knowledge however with the abundance of available information, it is important to identify trustworthy resources.

Links to relevant online resources

Khan academy, Udacity

Start to build your statistical knowledge with the following websites

- A first basic overview of statistics from a friendly and clear online source.**Khan Academy** is a free website that presents basic notions of probability and statistics with online explanations, videos and exercises. *https://www.khanacademy.org/math/statistics-probability*
- **Intro to Statistics by Udacity** are 8 weeks of free courses organized by Stanford University with great teaching tools. *https://www.classcentral.com/course/udacity-intro-to-statistics-361*

Guide to statistical resources for medical practice

Roxane Dumont

Links to relevant online resources

Open University

Follow the free courses from the **Open University** and **Stanford Online**
The Open University's vision is to break down barriers to education by reaching millions of learners each year, through free educational resources.

- **Introduction to medical statistics** is an online class introducing the vocabulary and tools for statistics in the medicine and epidemiology.The pdf fo the book is available on the website.*https://www.open.edu/openlearn/science-maths-technology/medical-statistics/content-section-0?intro=1*
- **Statistical Learning** from the Stanford School of Humanities and Sciences presents many applied exercises and introduction to statistical software. *https://online.stanford.edu/courses/sohs-ystatslearning-statistical-learning*

Links to relevant online calculators

Presentation

- The statistics online calculators
  https://www.statskingdom.com/
- Statistics Calculator
  https://www.meta-calculator.com/statistics-calculator.php
- Online Statistics Calculator - DATAtab
  https://datatab.net/statistics-calculator/descriptive-statistics
- Easy-to-Use Power and Sample Size Calculators
  http://powerandsamplesize.com/

Links to relevant online calculators

Limitations - WARNING

The biggest problem that one can encounter using online calculator is the lack of informations concerning **the mathematical assumptions that need to be respected in certain mathematical settings**. If the assumptions are not followed, the results do not hold.
Therefore, one should always pay attention to the technique that is used and the underlying structure.

Roxane Dumont

Links to relevant online calculators

Limitations - WARNING - Example

- **Linear regression** is one of the oldest statistical techniques used to understand the behaviour and the dependence structure between variables.
- Its most basic form corresponds to

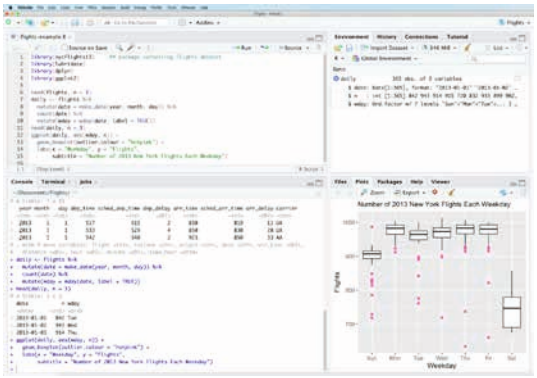
$$Y = \alpha + X^t\beta + \epsilon,$$

where Y is the response variable, α represents the intercept of the regression line, the vector $(X_1, \ldots, X_p)$ contains all the predictors, the vector $(\beta_1 \ldots, \beta_p)$ is the coefficient of each predictor and finally, ϵ corresponds to the error.

- **Basic assumptions must be respected or the estimation of the parameters is wrong.**
  The error ϵ must be identically and independently distributed
  The variance of the residuals must be the same for any value of X.
  The error term is often assumed be normally distributed.
  The true regression function must be linear in the predictors.

Introduction to the software R studio

- R studio is an open source programming software used widely for data analysis.It has become a powerful tool in statistics; user-friendly (at least more than other software).



Introduction to the software R studio

- R requires programming skills, however, unlike other programming software the community of users is big and many resources are available on the internet. Help files and forum can help solving (almost) any types of problems.
- In R you can import your data in excel or csv files, clean them and different packages of the software will help you for the testing or statistical modelling.

Guide to statistical resources for medical practice

Roxane Dumont

Introduction to the software R studio

First steps in R studio with the following links

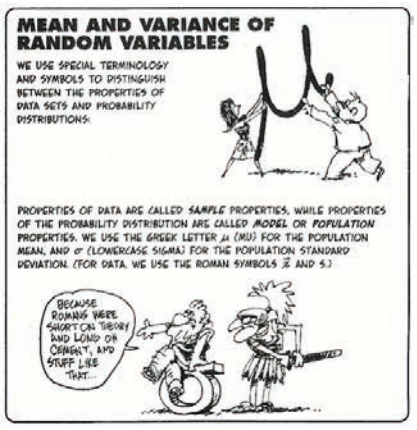
- **R Studio for beginners** presents a beginner-friendly installation instructions with many resources to get familiar with the software *https://education.rstudio.com/learn/beginner/*
- **Datacamp** will help you with the basics of data analysis by manipulating common data structures such as vectors, matrices, and data frames and introduce the general "thinking" of R. *www.datacamp.com*

List of recommanded books

There are many great introductory books.

- Oxford handbook of medical statistics (Peacock & Peacock, 2011)
- Elementary statistics (Triola, Goodman, Law, & Labute, 2014)
- How to report statistics in medicine: annotated guidelines for authors, editors, and reviewers (Lang, Lang, & Secic, 2006)
- Lectures on biostatistics: an introduction to statistics with applications in biology and medicine(Colquhoun, 1971)
- Statistics and medicine: the indispensable know-how of the researcher (Romano & Gambale, 2013)

Questions ?



Thank you ! (Gonick, Smith, & Smith, 1993)

Guide to statistical resources for medical practice

Roxane Dumont

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ESHNR 2021

Booklet

Practical advice part 2: Personal

Physician Resilience: A Path to Improved Work-Life Balance

Lily M. Belfi MD

Physician burnout has been described in the literature as a work-related syndrome involving emotional exhaustion, depersonalization, and a sense of reduced personal accomplishment. Burnout has reached epidemic levels in recent years with nearly 50 % of practicing physicians and trainees reporting symptoms. Stressors contributing to physician burnout are largely related to a work-life imbalance and include issues of work overload, work inefficiencies, limited control over work/ learning environment, and loss of meaning in work.

The cost of physician work-life imbalance and resulting burnout is great. There are associated negative impacts on patient care, professionalism, and the health and safety of physicians themselves. Burnout has been associated with increased medical errors, decreased productivity, and increased faculty turnover. Multidimensional solutions have been employed to combat physician burnout including mitigating the structural drivers of burnout in the workplace and bolstering individual resilience resulting in better work-life balance.

Resilience is defined as the capacity to respond to and rebound from adversity in a healthy way. It is a key element in physician wellness. Increased physician resilience has been linked to stress reduction, better connection to self and colleagues, improved self-care, and overall sense of well-being. Resilient individuals report an increased sense of hope, better sleep quality, more self-compassion, and a healthier balance between their work and home life. Fortunately, resilience is a skill that can be learned and cultivated over time. In his book titled, “Resilience: The Science of Mastering Life’s Greatest Challenges,” Dr. Dennis Charney, an expert in neurobiology who has been studying resilience for over 30 years, describes ten steps for building resilience.

Step 1: Optimism.
Optimists believe that good things will happen and tend to cope better during challenging times. Optimism helps to increase resilience by positive reappraisal whereby individuals reframe negative situations in a positive light and find opportunity in adversity. Optimists tend to deal with stressful situations by using problem solving strategies. They are more inclined to see “the bigger picture” and put everyday experiences within a larger framework of meaning. Optimistic individuals are more resilient because they maintain hope for a brighter future.

Step 2: Facing Fear.
Sustained fear causes anxiety that can result in a chronic stress response over time, with potential long term health effects. Overcoming fear builds resilience because it gives us the self-confidence to know that we can conquer what scares us and prepares us to face the unknown challenges ahead.

Step 3: Moral Compass.
Following a set of core values and doing what is right and altruistic imparts greater meaning to our work and life. This builds resilience because we can be sustained by these ideas and values and continue working toward something that is greater than ourselves despite any setbacks we may face.

Step 4: Religion and Spirituality.
Drawing on faith provides strength and comfort during difficult times. One may have faith in God, the universe, a higher power, or interconnectedness with all beings. Practices such as prayer, meditation, mindfulness breathwork and yoga help build resilience because they allow us to accept what is and trust in what may be.

Step 5: Social Support.
Interdependence with others provides a foundation for resilience. Social support protects against physical and mental illness. Resilient individuals understand the importance of asking for help when they need it and offering help to others when they can. ››

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Lily M. Belfi MD

Step 6: Role Models.
It is helpful to find a resilient role model whose beliefs, attitudes, and behaviors inspire you. We can then mirror the attributes we would like to embody.

Steps 7: Physical Exercise.
Regular physical exercise decreases perceived stress and helps protect against the adverse effects of chronic stress. Adequate sleep and proper nutrition are also essential to good health and well-being. Creating space and time in our schedules to tend to our physical selves restores balance in our lives.

Step 8: Brain Fitness.
Intellectual training and emotional training are closely linked practices. The practice of mindfulness which is attentive appreciation of the present moment without judgment, facilitates the development of attention and awareness skills, and is associated with enhanced emotional well-being.

Step 9: Flexibility and Acceptance.
Acceptance is an important component of cognitive flexibility. Gratitude is a form of cognitive reappraisal. Together, acceptance and gratitude build resilience by helping us to acknowledge a challenge or setback and shift our perspective around it. A failure or rejection becomes understood as part of the growth process, and we can recover from it in a healthy and productive way.

Step 10: Meaning and Purpose.
Finding purpose and a deeper meaning in our work helps us to cultivate resilience. Using challenges as an opportunity for continued growth period and having a clear purpose and mission allows for sustained engagement in the face of failure or adversity.

As physicians, following these ten steps can help us prioritize our own individual well-being and ultimately, cultivate a better work-life balance. The simple acts of meeting a friend for coffee, unplugging from technology from time to time, taking time for reflection or meditation, preparing a nutritious meal, or going for a walk, are steppingstones toward restoring balance in our lives, and becoming more resilient individuals. ■

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How to keep fit

Heidi B. Eggesbø

There is plenty of people out there who wants to tell us how to do it. A Google search of “How to keep fit” gives more than 1 500 000 results. But what we can rely on is that exercising and eating healthy can be an insurance for a good and long life with good health, full of energy in daily life.

To feel fit is not only about physical endurance, weight or look. You have to find your golden mean, and balance this with a busy work-life. Not easy if you work as a radiologist from 7 am till 7 pm.

It is said that the Norwegians are born with skis on their feet. However, only 1/3 of the adult population satisfies the recommendations for physical activity. According to a survey done by YouGov in 2019, Norwegians think they exercise more and are thinner than the rest of the Scandinavians. The survey stated that Norwegians, Danes and Finnish people define preparing dinner, dishwashing, vacuuming and going out with the garbage as physical activity. In the contrary, Swedes define exclusively fitness centre and jogging as physical activity, and they do not even consider mountain trekking as physical exercise if one should trust the survey.

Swimming, running and biking are activities with high calorie output, and strengthens your core musculature, more than you think. However, in the long term I think these are monotonous activities. Hence, to challenge myself, I went to aerobics, salsa, tango etc. These activities are far out of my comfort zone, and very close to my panic zone. After four months, the aerobics instructor boasted me; now you are going in the correct direction almost each time …

I admire people who get up for morning exercise. Maybe a little jealous too, since I am an evening exerciser. Hence, I am happy that recent studies have shown that evening exercise has greater metabolic health benefits. However, exercising in the morning or evening induce similar improvements in cardiorespiratory fitness. If you don’t have time for morning or evening activities, you can always leave the car at home and walk, at least to the public transport, or run or bike to work.

Walking as exercise should not be underrated. It boots both your mental and physical health and improves your cardiac output and also prevents weight gain. Exercising with maximum heart rate is not necessary to get fit. If you walk with a friend and have to stop talking, your heart rate is possible passing 130 beats/minute, and you are doing great!

Walking throughout the day, easily gives 5 km. Include the weekends, and the week result will be 35 km, and 1825 km a year! In 22 years, you will be around the earth.

One-hour walking burns 230–300 calories, depending on your speed, weight and backpack. By comparison, sitting burns only 60 calories. Walking will not make you thin very fast, but it will still get you more fit. If you burn 200 calories extra each day, the yearly result will be 73 000 calories. And, if one kilo of body weight is a result of 7 300 calories, this will give you a weight gain or loss of 10 kg.

But let’s not get too stuck with the numbers, nor the bathroom scale. However, bear in mind that for the purpose of weight loss, it is said that food is kilos and exercise is grams. Think of that next time you go for a second piece of chocolate or a second glass of wine. Rather take a second-deep breath through your nose and get all the nitric oxide produced inside your paranasal sinuses down into your lungs. Nitric oxide expands blood vessels and lower your blood pressure. This discovery was awarded the Nobel Prize in 1998. In addition, nitric oxide is cytotoxic to viruses and bacteria. So, let’s start with a deep breath while we step into the walking shoes. ■

Nobody leaves the conference tense

Maria Mauhart

The European Agency for Safety and Health at Work (EU-OSHA) focuses 2020-22 with a campaign on the prevention of work-related musculoskeletal disorders (MSDs).

MSDs continue to be one of the most prevalent type of work-related health problem in Europe.

Posture-related risks, exposure to repetitive movements or to tiring or painful positions, carrying or moving heavy loads — all of these very common workplace risk factors can cause MSDs. Given how widespread work-related MSDs are, it's clear that more needs to be done to raise awareness of how they can be prevented.

Musculoskeletal disorders usually affect the back, neck, shoulders and upper limbs, but lower limbs can also be affected. They cover any damage or disorder of the joints or other tissues. Health problems range from minor aches and pains to more serious medical conditions requiring time off or medical treatment. In more chronic cases, they can even lead to disability and the need to give up work.

Most work-related MSDs develop over time. There is usually no single cause of MSDs; various factors often work in combination. Physical causes and organisational risk factors include:

- Handling loads, especially when bending and twisting

- Repetitive or forceful movements

- Awkward and static postures

- Prolonged sitting or standing in the same position

There is growing evidence linking MSDs with psychosocial risk factors (especially when combined with physical risks), including: High demand of work, low autonomy, low job satisfaction …

There is no single solution, and expert advice may occasionally be needed for unusual or serious problems. However, many solutions are straightforward and inexpensive, for example providing a trolley to assist with handling goods or changing the position of items on a desk.

Preventive actions could include changes to:

» **Workplace layout:** adapt the layout to improve working postures

» **Equipment:** make sure it is ergonomically designed and suitable for tasks

» **Workers:** improve risk awareness, provide training in good work methods

» **Tasks:** change working methods or tools

» **Management:** plan work to avoid repetitive work or prolonged work in poor postures. Plan rest breaks, rotate jobs or reallocate work »

Nobody leaves the conference tense

Maria Mauhart

Health monitoring, health promotion and rehabilitation and reintegration of workers already suffering from MSDs also need to be considered in the management approach to MSDs. ■

Read more about preventing work-related MSDs: **osha.europa.eu**

In Austria the AUVA (Allgemeine Unfallversicherungsanstalt – the Austrian Workers' Compensation Board) has also the duty to prevent occupational accidents and diseases.

AUVA is a member of the leading international social security institutions and offers information in all questions related to occupational safety and health.

See the Leaflets: M35 Compensatory Exercises, M26 Office ergonomics – **www.auva.at/publikationen**

Exercise videos are available here: **www.auva.at/youtube**

Two examples:

AUVA M35 elevate alternately knees and elbows, 1 minute

AUVA M35 twist thoracic spine 5-7x, begin small range and increase, then repeat

Preparing for retirement – will the retirement you get be the retirement you want?

Julie Olliff

I first started thinking about retirement when I was about forty years old. I had been far too busy learning my trade, working full time and bringing up a family to think about a nebulous state a long time ahead. At that point I was reassured by the knowledge that without actively acknowledging it, I had been paying into the National Health Service Pension scheme since starting my career and therefore didn't need to do anything else. Time does pass more quickly as you get older and so it was a shock to reach fifty years of age. I started to really think about how much money I would need to have a "good retirement ". Since I couldn't formulate any ideas about what constitutes a good retirement it was difficult to come to any meaningful conclusions. I calculated how much I should receive if I worked to differing ages and was fairly complacent although I did recognise that there would need to be certain adjustments to lifestyle. I was surprisingly angered (I was not surprised that I was angry but at how angry I was) when the government introduced new legislation which significantly reduced the size of the pension that I had calculated I should receive when I was in my mid fifties with not a lot a time to alter retirement planning tactics. The lesson that I learnt from this was never to make assumptions about financial planning and indeed the recent Covid-19 pandemic has at times, reduced the amounts in saving plans enormously. Don't assume that retirement planning is just about the amount of money that you will have available.

What else have I learnt having been partially or totally retired for more than four years?

I had no idea in mid career what constitutes a good retirement. For people who thrive in and on their careers leaving behind that source of enrichment can be extremely daunting and there may be a degree of guilt involved in this. "How will they manage without me? I can answer that extremely important research question if I can just write one more successful grant application." Some people really do enjoy their jobs and there is no double blind randomised trial to tell us whether they would have enjoyed retirement more. The wake up call for me was a serious accident (going home from being on call) which forced me to take 4 months away from work. I had presumed that I would be able to work in some capacity but that proved impossible. I was invited to join a local book club, I started to do some rehabilitation by going to a local sports club and discovered that I didn't miss work one bit.

My brain started to wake up. I felt that my exploratory nature had been blunted by the demands of modern medicine. We continue to explore as members of the medical profession but in a limited way designed to progress our particular medical interests rather than to enrich our minds. Our lives are very busy in a service industry which has increasing demands upon our time. We often perform very repetitive tasks and our intellect and motor system may not be challenged very often. An example of this for was that early on in retirement I went to aerobic exercise classes but had to be in a line by myself because I was unable to"keep up" with the fairly swift and seemingly random changes in movement that the instructor demanded. Now it is no longer a problem because my brain has adapted from its very routine assessment of the head and neck to many different routines and activities.

We lead fairly sedentary lives at work away from daylight and with increasing pressures and demands. How often do you simply enjoy the day that you have been given? For many working radiologists there is very little social interaction sitting in front of a PACS system and using voice recognition. There is always yet another urgent scan to report or a meeting to prepare for. There are always time pressures associated with any patient doctor interaction which again reduce the job satisfaction. The word "burnout" is increasingly used in the media and apparently is a concern for radiologists. The burnout rate for diagnostic radiologists has been reported to be greater than that for physicians. (Harolds JA et al). There are many definitions of burnout in the literature. The term was used in the 1970s by Herbert Freudenberger who used it to describe the consequences of severe stress and high ideals in "helping" professions, resulting in exhausted listless people who were unable to cope. Early retirement is one of the recognised consequences, as is suicide. It is therefore a state to be avoided if a good retirement is our goal. It is impossible to avoid stress in the modern medical world but strategies can be put in place to make it easier to deal with. I found that having one booked activity a week outside work allowed me to have some control over my working hours. I would never be able to go to meetings on Thursday evenings because I had tennis coaching at 6pm. When after several years it became apparent that I was never going to be able to hit a tennis ball over a net, »

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it morphed into a different activity. Having that control and an activity outside the endless reporting of CT and MRI scans (but with never having the satisfaction that all the work was done) was important to me. Google tells me that practicing good self-care will help resilience and reduce vulnerability to stress. What I have noted is that I eat considerably less chocolate now, than I did when I was working!

Adoption of new pastimes or interests can be challenging but hopefully (if chosen well) will be enjoyable. A radiologist's life can be lonely with only your PACS monitor or grumpy clinicians to talk to. I have found that my social interactions have increased since I retired and I value my new friendships enormously.

So what is a good retirement? The simplest answer has to be a way of life that you enjoy at least as much as if not more than the one you had before you retired. So how do you achieve this? I think that important components are to enter retirement with your physical and mental health in as good as condition as possible.

Don't overplan.

Have realistic achievable expectations, but that doesn't stop you being ambitious and trying new things. Remember what John Lennon said: "Life is what happens while you are busy making other plans". Take time to enjoy simple pleasures. Watching light reflected on water is one of mine. After so many years working in departments with little or no natural light it still feels like an enormous privilege to be outside during the day. You may worry that you will miss your established routine but a new one will emerge which hopefully you will have more control over. I usually book fitness classes in advance and sometimes I find myself wishing that I had "more free time". I am writing some of this during enforced isolation due to the dreaded virus. So far I have enjoyed having a "lie in" rather than having to get up and go to the gym but I know that physical activity is very important during retirement in order not only to stay physically fit but also to remain happy (the endorphin release is as good as a bar of chocolate). There is a very truthful saying "If you don't use it, you will lose it". This applies to physical fitness as one ages.

Mental fitness is equally important. My husband loves quizzes and number games. I hate both. For me the complexities of learning a new language (Italian) have helped my brain to stay "trim". I was pleasantly surprised when I recognised myself using the subjunctive tense in my native language (English) recently. Silversmithing has helped my manual dexterity and also provided Christmas presents for friends and relatives.

I like spontaneity but really dislike uncertainty. I have become aware that the dislike of uncertainty increases as one gets older. The best laid plans of mice and men often go awry ("The best laid schemes o'mice an'men/Gang aft angly" from "To a Mouse" by Robert Burns) so it is important to remain flexible. I have had two holidays cut short by the Covid-19 pandemic. One was easily managed by booking an earlier flight to leave Northern Italy (where I was studying at a language school) to enable me to have 14 days at home before I left to go on a birdwatching holiday with my husband and friends in Belize. I am a fledgling birdwatcher but wanted to try a new activity and my friends are avid birdwatchers. We travelled via Miami but when the US closed its borders it became apparent that a new way home had to be found. Belize then started closing its borders. There was a possibility of being "stuck" in Belize so a slightly anxious nine hour taxi ride was taken through the only remaining open border to Mexico, where we stayed for four days waiting for a direct flight back to the UK. Our 17 day holiday in Belize had been reduced to 4 days. In the "old days" I would have relished the challenge of reorganising a difficult situation but on this occasion I was very grateful for a very helpful and organised travel agent.

It was very useful when writing this article to get other people's views on planning for retirement. It became apparent that preparation for retirement is very different for different people. One said that it may be helpful to have an interest that you can continue with, but is golf enough? Another discussed possible problems with interaction with a longstanding spouse/ partner that you haven't spent much time with before retirement. You will have to be prepared to be kind to one another and to compromise. I am unusual in that I shared an office with my husband (an interventional radiologist) for 28 years. Retirement is a bonus because I get to see much more of him than I did when working. »

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Julie Olliff

Some people like to gradually reduce their working hours until the time feels right for them to be able to give up work completely. Other people cannot retire and continue to work, whereas many will go straight from full time working one day to complete retirement the next day. My own retirement had a transition period with a long holiday travelling around Australia seeing the sights and visiting old friends. This suited me very well and I had no intention of going back to work when I returned to the UK but I was persuaded to "help" reduce the ever increasing workload, working when I wanted to, for as long as I wanted to. This worked very well for a while but eventually I realised that I had stopped enjoying work and enjoyed retirement far more.

So do I have a good retirement? The answer to this is a definite yes at the moment. One always has an increasing sense of vulnerability as one ages which in turn may reduce the amount of risk that one is prepared to take. I thought nothing of backpacking around the world (a significant amount of time was spent on my own) in my mid twenties which I would be loathe to do now. I like a comfortable bed and good food but two years ago I really enjoyed a "proper" camping holiday in the USA sleeping in an "A" frame tent in a sleeping bag on a mat. This was the only way to view a total eclipse of the sun, no hotel rooms available despite booking 18 months in advance. It was a wonderful holiday and I really wanted to buy a tent when I returned to the UK but my long suffering husband pointed out that the climate here is a little different.

I enjoy new experiences. My brain and intellect seem really alive. My curiosity about non medical matters has reawakened. I find enjoyment every day using all my senses. I have become once more a receptive being in every sense rather than a reactive person, reacting to the latest email or request to report yet another urgent scan.

I started writing this article in the autumn/ early winter of 2019 before the world had heard of Covid-19. All our lives have changed considerably since then. Planned activities and trips have been cancelled or postponed, even ECR 2020 did not take place at its normal time in March 2020. ESHNR 2020 had to be postponed and the meeting of 2021 is being held online. My gym/sports club has closed temporarily several times.

At the time of first writing this we in the UK were only allowed out for essential shopping, essential work and once a day for exercise. Having isolated myself once last year for two weeks having returned from Northern Italy, I was sitting at home again wondering whether I had managed to avoid the virus having been in a crowded airport in Cancun and on a crowded plane for nine hours. I wrote "Two days ago however I participated in my book club using Zoom (an online meeting app similar to Skype) and it went very well. This morning I "attended" a yoga class given by one of the fitness trainers from my club again using zoom. This went "as well as can be expected" given my inability to touch my toes without bending my knees! I might try an abs blast this afternoon..... What this tells me is that we do need to be able to adapt to rapid change at any age so it is very important to avoid the increased rigidity of thinking that often occurs as one gets older. By the way, I enjoyed the book club and the yoga. We are thinking of "enjoying" some other different social gatherings using zoom. So we must remain open to and retain the ability to enjoy change." We are all now expert users of Zoom, Skype, Microsoft Teams etc. I have Italian conversation lessons with a lovely teacher in Bologna every week. My evening class in Birmingham is also held online. The opportunities available to me have increased enormously with online courses in so many subjects. However I have not yet been able to attend my usual (pre-Covid) silversmithing class which of course requires expensive specialist equipment.

I wrote last year: "I may turn out to be the wrong person to write this article since I have just been informed by the GMC that they will re-register me during this emergency. I have yet to be told whether my Health Authority has any use for me but there is the possibility that I may no longer be retired." In fact a retired radiologist was not needed initially.

My advice is to protect and nourish your physical and mental health as much as possible during your working life. Look at financial planning but remember that legislation and financial markets can rapidly change any predicted income. Recognise that your priorities and attitudes to risk may well change as you age. Allow yourself to feel the world around you. Be open to change both rapid and gradual. Retirement should be wonderful. Don't "what if ..." it, just prepare yourself to "do it". ■

Why to be mindful and meditate?

Peter Riedl
translation Soraya Robinson

One does not need to meditate and be mindful, but if one does, one should do it appropriately.

Over the last couple of years, a real hype has developed over meditation and mindfulness. This bears risks and chances.

The first, who taught this method, was Buddha Shakyamuni 2500 years ago. His message was: „The only way to overcome worry and misery, to lead to decline of pain and sorrow is to practice mindfulness." He has not preached this as a religion or esoterism, in which one has to believe. He meant it as a mental training, which is not only still valid today, but under extensive scientific investigation.

Susanne Fritz even critically remarks in deutschlandfunk.de in the programme entitled „Achtsamkeit ist politisch – und problematisch" (Mindfulness is a political issue and poses a problem) that global players like Google, SAP or Apple offer mindfulness training to their staff to boost their resilience and competitive performance.

https://www.deutschlandfunk.de/spiritualitaet-achtsamkeit-ist-politisch-und-problematisch.886.de.html?dram:article_id=499369

Can mindfulness on the one hand heal people, as Buddha taught and, on the other hand, shape them into better employees?

I have been practicing mindfulness for the last four decades: yes, it can achieve both – and at the same time it can't. Mindfulness can be compared with mental weight lifting.

Thinking of getting fit, one can do it leisurely, climb steep rocky walls or win the Olympic gold medal. But one can also miss all these targets or even seriously injure oneself. It is comparable with spiritual practice: one can have a little bit of esoteric fun, gain some more self-confidence or enlighten oneself. One can also seriously go wrong, fall into the trap of dangerous gurus or slip into psychotic states.

Everything, which has an effect, can also have side effects and everything, which has an effect, can be applied correctly or incorrectly.

Why are so many people practicing these methods, who are not successful with it? Why are there so many uncertainties?

Shortly after Buddha has found his path and methods, he did not want to talk about it or teach it. He feared to be misunderstood. Why was this the case?

We always think that our problems have their origin in this world, which has become overly complex and because there are armed conflicts; from our constantly annoying fellow humans, because we fall ill, have accidents or die. But this is not the source of our difficulties. They come from within ourselves, from our thoughts and feelings. When I get a cancer diagnosis and accept it and take it in a composed way, then I will feel good, or at least neutral and when I am on holidays and get upset over the rain and the bad quality of food, then I won't feel good.

When I am in a cheerful mood, everything is good; when I feel miserable, everything is daunting, no matter, whether I am sitting in Austrian paradise or in a Middle Eastern hail of bombs.

Meditation and mindfulness won't change the difficult circumstances in the world. But if I manage, I can change myself – and afterwards the world.

Why we get angry and upset, even though we don't want to, has got to do with our unconsciousness and our constant desire and impetus. I do not know, how not to be jealous, if I am jealous. But Buddha has shown a path, how to learn it. »

Why to be mindful and meditate?

Peter Riedl

He has not been born as Buddha. He was born like you and me, mostly unconscious and pretty full of instincts. Science has proven that this forms 90 % of what we are. He became a Buddha, because he enlightened himself and changed himself into a fully conscious human being free of desire. We can't say, how this feels, because we are not. It can be compared to a person born blind, who can't imagine the blaze of colours of this world, but have an inkling of it. Who can have a notion of freedom of a person's life, who is fully conscious and free of craving?

Meditation is a method of focusing, not an esoteric practice. It leads to higher consciousness. *Mindfulness* is a method of introspection leading to resilience. Both methods are helpful, if one wants to perform better at work. If one really wants to take it further to become a truly loving and calm person, it is less easy and requires two more methods: *investigation* in the sense of who we really are, comparable to a scientific approach and *effort* to overcome one's own desires.

I have extracted those four basic exercises of Buddha out of a huge pile of books, various Buddhist views, groups, Asian cultural heritage, religious and esoteric concepts.

The main teaching of Buddha has been overshadowed and became nearly invisible over the last 2500 years. I have compiled them in W.I.S.D.O.M., *Wiener Schule der offenen Meditation* (Viennese School of Open Meditation). Nothing in it is new, but it is a new interpretation of Buddha's beliefs.

They form the mental training; to be really successful and reach even further goals, it also requires knowledge and ethics.

May your practice succeed. ■

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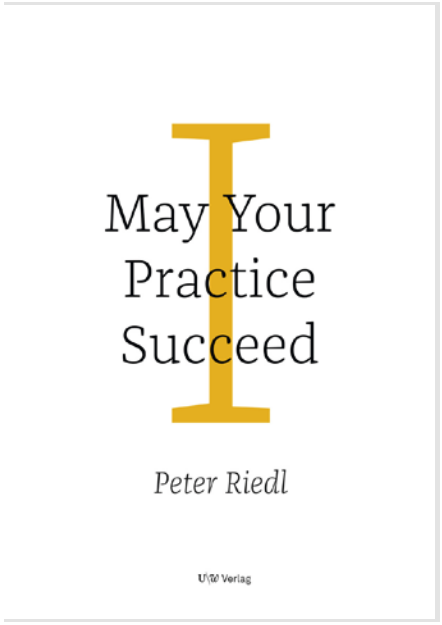
Peter Riedl

The freedom of thinking & feeling



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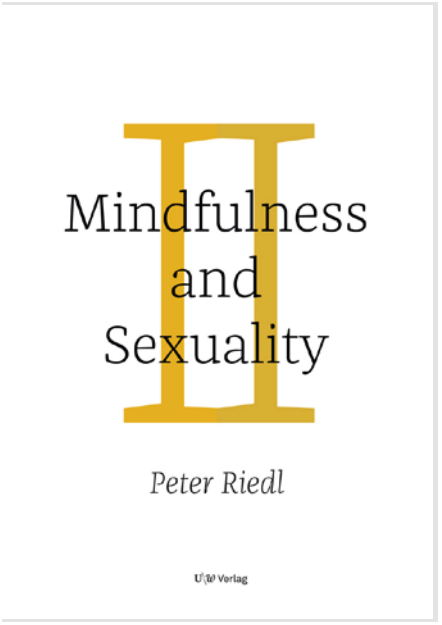

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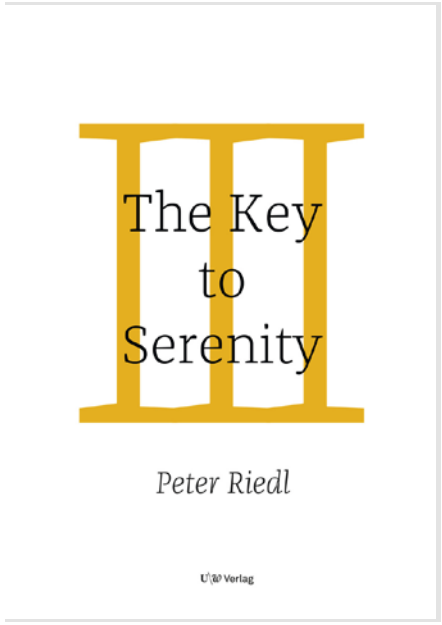

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ESHNR 2021

Booklet

Basics & fancy

Salivary Gland Surgery

Markus Brunner

Indications for surgery consist of benign and malignant tumors, cysts, chronic infections and stones. As the indications, surgical technique and complications vary significantly between the different types of gland, each location will be discussed separately.

Minor salivary glands

Around 1000 submucosal minor salivary glands are distributed over the mouth and pharynx. Operations of these glands are relatively infrequent. The only relevant indications for these glands are tumors, whereas malignant tumors are more common than benign ones. Preoperative imaging consists either of an enhanced CT or MRI of the head and neck to complete staging and determine the extent of the primary tumor. It is usually easy to acquire a tissue sample via transoral biopsy. The extent of surgery depends on the exact location, size and histology of the tumor and often includes bone resections.

Submandibular and sublingual glands

The most common indication for surgery of these glands are recurrent infections, intraglandular stones and tumors whereas benign tumors are about as frequent as malignant tumors. Ultrasound is the imaging modality of choice for infections, stones and tumors. If stones are clinically likely but not visible in the ultrasound than a CT-scan is indicated. The sublingual gland can easily be resected through the mouth although isolated sublingual pathologies are uncommon and mainly consist of cysts (“Ranula”). The by far most common operation is the resection of the submandibular gland through a 5cm horizontal incision of the neck. This operation takes about 45 minutes. Complications are uncommon and include bleeding, infection and damage to the hypoglossal and lingual nerve (both visualized during the operation) as well as the marginal mandibular branch of the facial nerve (usually not visualized during the operation).

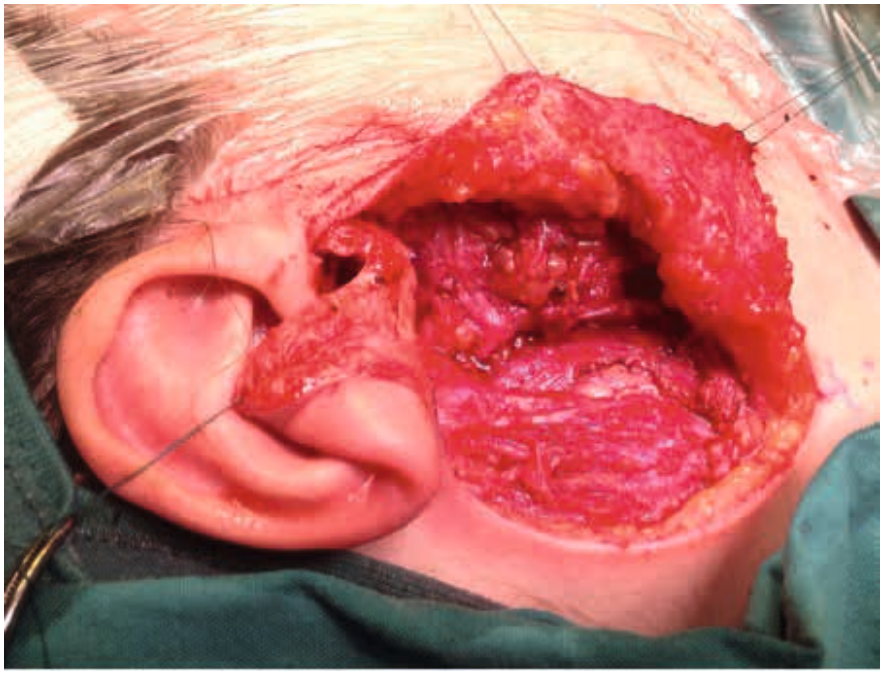
Parotid gland

Parotidectomy – resection of parts or the whole parotid gland – is by far the most common salivary gland operation. The indication basically consists of tumors whereas benign tumors are much more common (80:20) than malignancies. The minimal imaging workup consists of an ultrasound of the head and neck. CT or MRI is indicated for deep lobe tumors as these can often not be properly examined via ultrasound. If malignancy is clinically suspected (enlarged lymph nodes, facial nerve palsy, rapid tumor growth, skin involvement) an MRI is indicated to properly stage the tumor and exclude or confirm paraparyngeal extension and growth along the facial nerve. Parotidektomies are usually performed with operating loupes and facial nerve monitoring. Depending on the extent of the resection, the operation takes 60 to 150 Minutes and is performed via a preauricular incision that is extended horizontally to the neck. The initial step is the visualization of the main trunk of the facial nerve. The tumor is then removed with a cuff of healthy tissue as margin under direct vision of the facial nerve branches. Depending on the location of the tumor only some or all of the facial nerve branches have to be dissected. In malignant tumors the operation is usually combined with neck dissection, and, if necessary, with facial nerve reconstruction/rehabilitation. ››

Salivary gland surgery

Markus Brunner

Possible complications include partial/complete and temporary/permanent facial nerve palsy, infections, delayed would healing due to saliva and gustatory sweating. In this condition postoperative nerve growth to the skin instead of the gland leads to local sweat production whenever the body requires saliva, mainly during meals. However, this problem can relatively easily be treated with cutaneous Botox injections.



The intraoperative picture demonstrates the course of the facial nerve after resection of the complete superficial lobe in a malignant tumor in a 11 year old child. ■

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PET-CT in head and neck

Julia Frühwald-Pallamar

Imaging plays an essential role in staging oncologic patients. PET-CT is a non-invasive imaging method that provides morphological information (CT) and metabolic parameters of tissue (PET). This method has evolved from a research tool into a standard method in pretherapeutic work-up and post-therapeutic monitoring of patients with malignancies.

Who and when do we image?

In an ideal world where everybody has access to this sophisticated imaging method following course of action is desirable (but we all know depending on the availability and insurance reimbursement policy the actual approach might be different)[1].

Patients with a primary tumor in the head and neck: initial staging (one stop shop for TNM-staging) or additional whole body staging in advanced stages for more information on nodal metastases and to assess the M-stage as the incidence of distant metastases increases with stage.

Patients with unknown primary: In patients with unknown primary tumor and metastases PET-CT has proved to have a higher sensitivity than CT and PET alone[2,3,4].

Patients after initial treatment: to evaluate treatment response. The optimal time to detect residual disease after (chemo-) radiation therapy is 11–12 weeks[5]. In patients with a complete metabolic response neck dissection can be avoided not only in N1 necks[6,7,8] but also in advanced nodal stages[9]. Radiation induced inflammation can be seen on images for 2–3 months after the end of treatment.

Surveillance: Reevaluation should be performed 10–12 months after the initial scan[10].

Follow up for local recurrence is mostly made by CT and MRI alone – Patients with smoking history should be monitored also by chest imaging[11]. Most relapses occur in the thirst 3 years, 80 % in the first 2 years[12]. Detection of tumor recurrence at an early stage improves the salvage procedure.

How do we image?

Hybrid imaging in Europe is heterogeneous. In most institutions integrated (combined) systems are used. There is a little variety in PET-CT protocols. A “low dose CT scan” is performed only for attenuation correction and anatomical correlation (not intended for a detailed radiological interpretation – not suitable for T-staging). A “diagnostic CT scan” can be performed with or without iodine contrast. In Europe 90 % of protocols will use iodine contrast[13]. A simple routine protocol includes one multidetector CT scan from skull to thigh followed by PET of the same regions. Some authors suggest a dedicated head and neck protocol with smaller FOVs , thinner slice thickness, iodine contrast and longer acquisition times per bed position[14]. »

PET-CT in head and neck

Julia Frühwald-Pallamar

Which tracers are we using?

As the majority of tumors we image are squamous cell carcinomas FDG (^{18}F- Fluorodeoxyglucose), an analog of glucose is the most frequently used tracer. FDG is also used when searching for an unknown primary tumor as well as inflammatory disease. FDG accumulation in tissue is proportional to glucose utilization, which is increased in tumor or inflammation. The standardized uptake value (SUV) is a measurement of the uptake in a tumor normalized on the basis of a distribution volume. MTV (metabolic tumor volume) and total lesion glycolysis (TLG) are two other parameters applied frequently in literature to assess therapeutic response and prognosis[15].

^{68}Ga-DOTA SSTRTs, Gallium labeled Somatostatin receptors analogs are high sensitive in the detection of neuroendocrine as they specifically bind to SSTR subtypes overexpressed on NET cells. In regard of this they are superior in the in detection of those tumors to ^{18}F-FDG and ^{18}F-DOPA[16]. ■

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Amide CEST in Head and Neck Cancer

Sahrish Qamar, Qi-Yong H. Ai, Ann D. King
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Background

Amide proton transfer-weighted (APTw) imaging is a new functional MRI technique for cancer imaging which detects amide protons found in cancer proteins and peptides (figure 1). APT levels reflect tumour proliferation and overexpression of proteins and peptides, and it is hoped that amide quantification will be useful for characterising tumours and assessment of cancer treatment response.

APTw imaging quantifies the amide concentration in tissues by selectively saturating amide protons (3.5 ppm) and using a chemical exchange saturation transfer technique (CEST) to exchange the mobile amide protons with free water protons. The process of transfer is continuous allowing saturation to build up in the water amplifying the signal so that APTw imaging detects low levels of metabolites which cannot be detected by other techniques such as magnetic resonance spectroscopy. To obtain the final APTw image requires the addition of other sequences such as magnetisation transfer and water saturation shift referencing. The complexities of producing APTw images requires a relatively long scan time which initially limited the technique to a single slice acquisition. Recent advancements in APTw imaging, however, now allow for 3-D imaging of the whole tumour volume.

APTw imaging was developed initially for the assessment of tumours in the brain[1] but recently research has started to expand to assess other tumours including those in the head and neck. Field inhomogeneity, relatively low signal-to-noise ratios, movement and difficulties with fat suppression are always problematic in this region of the body[3]. Despite these challenges early reports show promising results for APTw imaging in head and neck tumours[2-11].

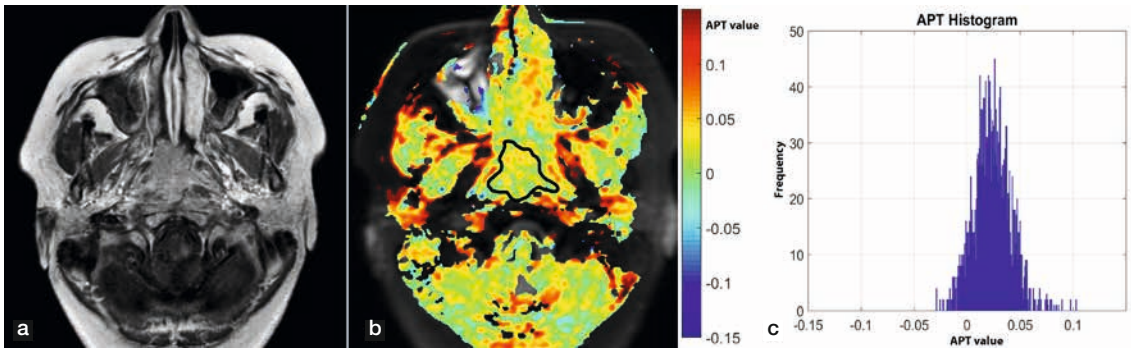

Fig 1: (a) axial T1- weighted contrast enhanced image, (b) axial APTw image and (c) APT histogram (c) of a nasopharyngeal carcinoma.

Tumour characterisation

Initial studies show APT levels are higher in malignant tumours compared to benign tumours or normal tissues[2-7]. Two studies of salivary gland tumours found APT levels were higher in malignant tumours compared to benign tumours, such as Warthin's tumours and pleomorphic adenomas[5,6]. The results of these studies are encouraging because the diagnostic performance of APTw imaging was superior to that of diffusion weighted imaging (DWI)[5,6], dynamic contrast enhanced MRI (DCE)[5] and arterial spin labeling[6] for predicting malignancy. However, in the head and neck there is a wide range of benign and malignant tumours, as well as normal tissues, and so it is unlikely that these findings will apply in all scenarios. Indeed, it has been reported already that normal parotid tissues and benign thyroid nodules, may display higher APT levels than malignant tissues[2,8,9]. Also, unlike DWI, APTw imaging may not have the capability of discriminating between different malignant groups, although the high specificity of APTw imaging could have a complimentary role to DWI in characterisation[3]. »

Amide CEST in Head and Neck Cancer

Sahrish Qamar, Qi-Yong H. Ai, Ann D. King

Treatment response

Radiotherapy/chemoradiotherapy is a primary treatment option for many head and neck cancers, including undifferentiated nasopharyngeal carcinoma and squamous cell carcinoma. The addition of APTw imaging to the anatomical sequences for staging could improve the predictive performance of MRI and aid treatment planning. This is a new area of research for APTw imaging and currently there is a paucity of data. However, in a recent study we found patients with primary nasopharyngeal carcinomas with high APT levels had a poorer outcome at 2 years than those with low APT levels[10]. APTw imaging was especially valuable in predicting survival related to distant metastases[10].

Functional MRI techniques such as DWI and DCE detect changes in cancers soon after the initiation of chemoradiotherapy and quantification of these changes can be used to aid the prediction of treatment response and outcome. Changes in cancer APT levels are also detected 2 weeks after the start of chemoradiotherapy[11]. APT parameters tend to decrease in responders and increase in non-responders[11]. Similar findings have been reported in glioblastoma and carcinoma of the breast. Rising APT levels early in the course of treatment may therefore be a potential marker for treatment resistance.

Summary

Preliminary results suggest APTw imaging is a promising new functional MRI technique for the assessment of head and neck tumours. Research from head and neck radiologists and scientists will be needed to refine the technique in the head and neck, identify additional underlying pathophysiological factors such as pH that may contribute to the APT signal, and establish the role of APTw imaging in the different groups of head and neck tumours, either as a stand-alone or complimentary MRI sequence. ■

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Injectable facial fillers: Time to unveil ‘head-neck cosmetic radiology’ as a subspecialty?

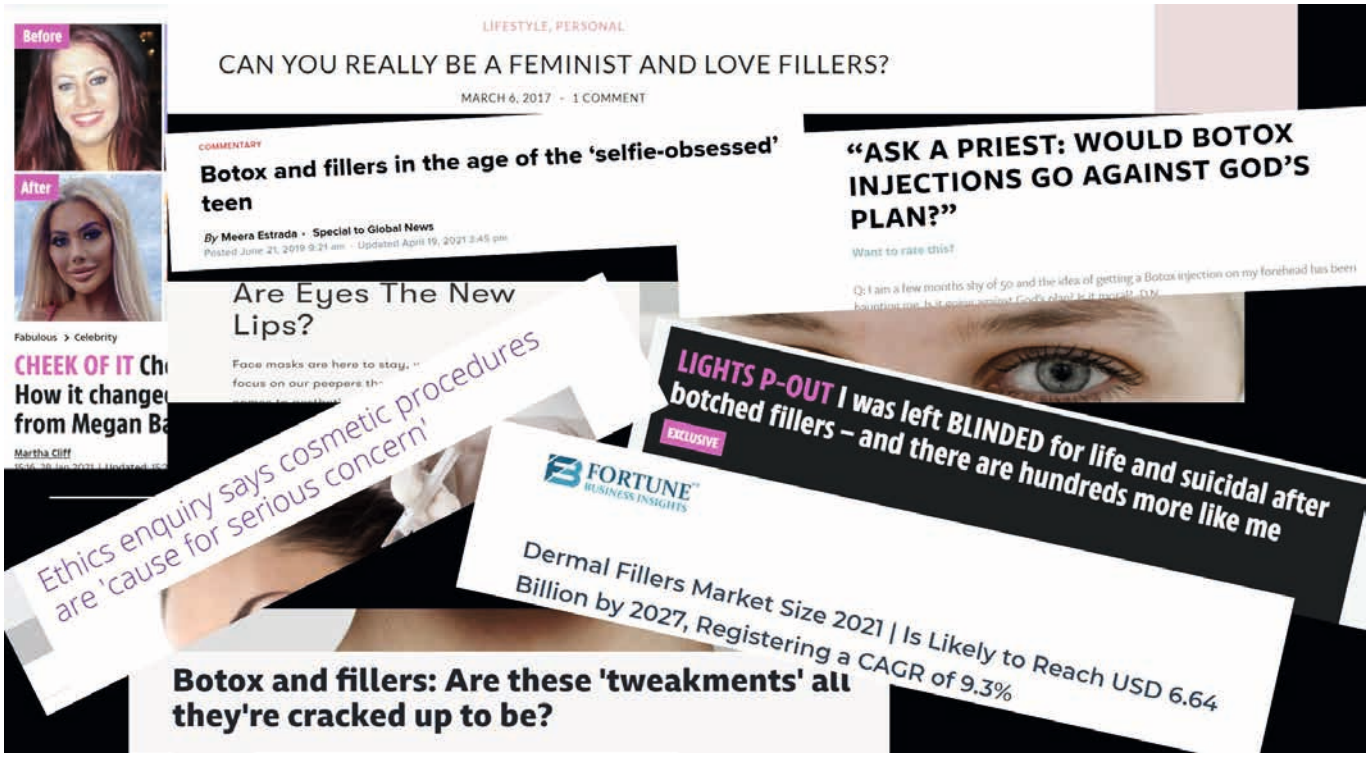
Pravin Mundada

“Am I looking old?”

Indeed, this question is quite politically vexed, and, inarguably, has never been replied to in a confident and clearly audible tone.

Since time immemorial, humanity’s quest for a perpetual youthful look remains unabated. The ancient Indian king Yayati exchanged his ageing face with his dutiful son’s youthful looks. The legendary Cleopatra bathed in milk of donkeys to maintain her exquisite youthful twinkle. The infamous Hungarian baroness Elizabeth Bathory used the blood of young female victims to ward off her paranoia of getting wrinkled. History is replete with many such examples, many quirky and some gory. Fortunately, for today’s generation, one single invention has changed the whole gamut of looking young. The invention of a hypodermic syringe in the 19th century opened floodgates in the field of cosmetic medicine. Nobody now needs to look for donkey farms or ingredients like milk or blood to erase wrinkles. The advent of a much-touted “lunchtime” procedure called facial filler injections made the state of “permayouth” reasonably attainable. These procedures make people look and feel younger and more confident socially. Social media has made these procedures so popular that now people seek “incrementally young” looks. The popularity of these procedures is not confined to middle-aged women. There is a democratization of these procedures across gender-class- age in the last decade. The long attached social taboo with it is replaced by “ social status,” and people often flaunt their filler injection appointments on social media.

A wide range of materials is used as facial fillers. They are classified as rapidly resorbable (<12 months), gradually resorbable (<24 months), and permanent. Rapidly resorbable fillers include hyaluronic acid, collagen, and autologous fat. Gradually resorbable fillers include PLLA, CHA, and dextran, whereas permanent fillers include liquid silicone and PMMA. »



Injectable facial fillers: Time to unveil 'head-neck cosmetic radiology' as a subspecialty?

Pravin Mundada

Facial filler injections are touted as a safer and cheaper alternative to cosmetic surgeries. However, these procedures may be associated with short-term and long-term complications. These complications may be related to the procedure technique, injected material, and delayed host response. Early complications include skin bruising, nodule /lump formation, and infection. Occasionally, acute complications like local soft tissue necrosis, blindness, and cerebral infarct may occur due to vascular occlusion. Long-term complications include foreign body granuloma, abscess formation, migration of filler, disfiguring nodules-scarring, tissue necrosis-ulcer, and permanent discoloration.

For decades, the facial filler injection industry was an unregulated fiefdom of quack, self-trained cosmetologists, and medical tourism operators. However, now it is transformed into a refined and ethically monitored field of medicine. Nowadays, plastic surgeons, aestheticians, and certified family physicians perform most of these facial filler injections. Head-neck radiologists are relegated to perform back-end tasks like evaluating complications of fillers or to look for a migrated filler or telling apart an incidentally detected filler from a pathology. Yet, for inexplicable reasons, the front-end revenue-generating facial filler injections are never performed by head-neck radiologists. The answer to this may lie in the training curriculum of head-neck radiology. Head-neck radiologists are closely familiar with intricate face-neck spaces and dexterous with needles-syringes. In addition, they are trained to perform biopsies, vascular embolization-sclerotherapy, drainage/aspiration procedures, etc., but not trained to perform much simpler facial filler injections.

Furthermore, radiologists are attuned to inject many potentially toxic substances like IV contrasts, chemotherapeutic drugs, sclerosing agents, etc. but have never been introduced to, so bland-inert, facial fillers. The concept of "cosmetic H-N radiology or aesthetic H-N radiology" has never been touched upon in most head-neck training programs. None of the recommended head-neck radiology textbooks have a chapter on aesthetic or cosmetic head-neck radiology. There are no fellowships or workshops in this subject. Head-neck conferences cover all subspecialty topics but draw a blank on cosmetic radiology. But, as they say, it is never too late. Some green shoots are visible on the surface. Prof. Dr. Ziv Hasker from USA is already talking about 'cosmetic radiology'. Dr. Mobin Master from Australia is trying to establishing interventional aesthetic radiology as subspecialty. There are a few more similar examples. Readers would agree with the author that it is time for ESHNR to dwell on developing "cosmetic H-N radiology' as a subspecialty. ■

Ultrasound of the Brachial Plexus

Platzgummer H & Chaudhary SR

Ultrasound (US) of peripheral nerves and muscles is an established standard element for the examination of nerve trauma and neuromuscular diseases[1].

The unmatched high spatial resolution of US by the use of high frequency probes (15+ MHz) allows for detailed insight into the nerve architecture. Nevertheless Magnetic Resonance Imaging (MRI) is indispensable for preganglionic and spinal lesions as well as the evaluation of early muscle denervation changes[2].

A comprehensive clinical understanding of nerve related pathology and its imaging features is essential to develop a thorough examination algorithm that accounts for the broad spectrum of brachial plexopathy. In the ideal patient-centered setting, US and nerve conduction studies work in conjunction with tailored MRI reserved for problem-solving in selected cases. In practice, only few clinics and specialised centres offer this elaborate option. This is particularly true for obstetric brachial plexus injuries in newborns when a multidisciplinary approach is mandatory and imaging is challenging. Probably the most beneficial aspect of ultrasound is the ability to screen large fields of the neck, stem and extremities within minutes in a skilled hand, allowing for a fast and comprehensive diagnosis.

The brachial plexus is formed by the anterior rami of the nerve roots C5-T1 with variable contributions from C4 and T2 (pre- and postfixed variant)[3]. The clavicle is an anatomical barrier for US assessment and separates the supraclavicular from the infraclavicular brachial plexus. The supraclavicular plexus arises in the interscalene triangle between the middle and the anterior scalene muscle.

A helpful technique to reliably allocate the level of C5-C7 roots has been described by Martinoli et al., using the unique cortical bone profile of the tubercles of the cervical vertebral transverse processes as landmarks[4]. Trunk and fascicle formation can be visualised in detail when needed. To assess the clavipectoral space, dynamic manoeuvres consisting of arm abduction and external rotation should be performed. Whenever clinical symptoms aggravate during specific movements, provocative tests might aid in the establishment of a treatable diagnosis.

Thoracic outlet syndrome (TOS) is an umbrella diagnosis to describe different upper extremity symptoms that originate in the cervicobrachial neurovascular bundle[5,6]. Ultrasound can be of great value in the diagnosis (Fig. 1) and is in addition used for the symptomatic treatment of TOS[7]. Immune-mediated Polyneuropathies that regularly affect the brachial plexus might be differentiable with quantitative US[8].

The cervical plexus on the other hand emerges from the anterior rami of the cervical spinal nerve roots of C1-C4. The small nerves of the cervical plexus such as the phrenic nerve, greater auricular nerve, the greater and lesser occipital nerve and the accessory nerve among others, are reliably assessable[9-11]. The superficial course makes the nerves prone to iatrogenic injury and traumatic neuroma formation. US can aid in the localisation and grading of nerve damage and to predict surgery outcome by the use of US-guided diagnostic nerve blocks with small amounts of local anaesthetics.

Although the delicate anatomy of the brachial plexus with its complex disease patterns might be deterrent for the examiner, US is irreplaceable as it combines the most detailed insight into the underlying condition with a large examination area. Structured education should establish a common terminology that is understood by all disciplines in the clinical practise. »

Ultrasound of the Brachial Plexus

Platzgummer H & Chaudhary SR

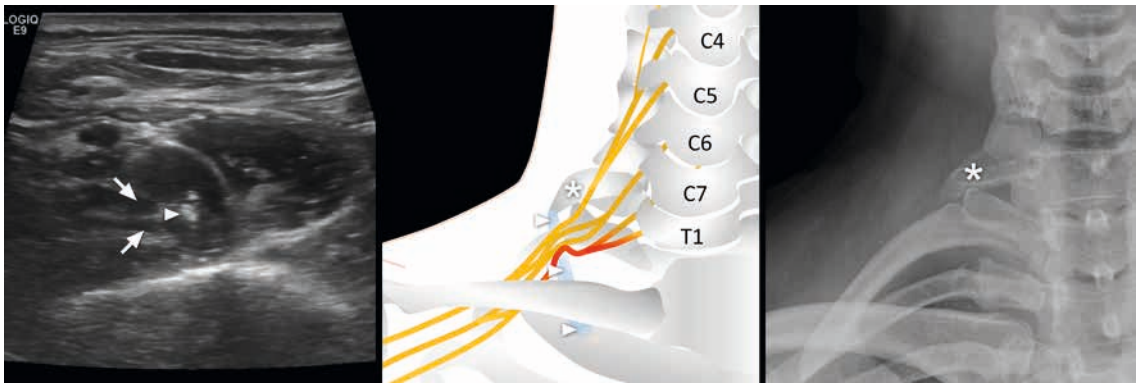


Figure 1: Imaging findings of Neurogenic Thoracic Outlet Syndrome (NTOS). Ultrasound of the brachial plexus and cervical spine radiograph of a 38 year old female patient with numbness and paraesthesia in the fourth and fifth finger. The referrers suspected a diagnosis of ulnar neuropathy or lower trunk plexopathy. No muscle atrophy of the ulnar or C8 innervated hand and finger muscles was found (not shown). Ultrasound of the ulnar nerve was unremarkable (not shown) but the lower trunk (arrows) of the brachial plexus was displaced and the intraneural echogenicity was increased due to irritation from an echogenic tough band (arrowheads) Roos type 2 arising from a congenital costotransversal hyperplasia of C7 (*) and inserting into the first thoracic rib. ■

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An unscientific approach to fetal MRI

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At a time when prenatal ultrasound was already a well-accepted method for fetal imaging, somebody had the idea that one could use magnetic resonance imaging (MRI) for that purpose (Smith, 1984). At that time, fetuses had to be curarized to prevent them from moving during the long sequence acquisition time, of about 2 minutes (Daffos, 1988). So, this method was thought only to be useful for creating new PhDs and Professors: take three cases examined by MRI, describe anything, multiply your cases by ten (virtually) send your unproved results to a highly ranked journal. Reviewers, of course, ignorant to the new method but reluctant to admit it, would accept the papers.

Usually, after some more or less meaningless publications, these methods vanish into oblivion.

However, this was not what happened to fetal MRI: the advent of ultrafast sequences (Levine, 1997) lead to an application without fetal or maternal sedation. In addition, the method was improved continuously, allowing insights into fetal normal and abnormal development that had not been possible by ultrasound so far. Unsurprisingly, this caused an uproar in the ultrasound community, fueling a lot of studies trying to prove the superiority of each method in different clinical questions. (Griffths, 2017; Nilsen, 2017; Paladini, 2017; ENSO working group, 2020).

This kind of feud benefits no one, and the people suffering most from it are the pregnant women and the physicians who perform the examinations. A pregnant woman, looking for information on the internet after a “minor abnormality” is diagnosed on ultrasound, will tell her obstetrician that she wants an MRI, even if she doesn`t know what that really might be. The average obstetrician unfamiliar with the technique then also consults the internet and doesn`t risk to contradict the patient. Consequently, a highly anxious and poorly informed pregnant woman arrives at the MR unit. Sitting in the waiting room, she treats herself with a coffee or coke from the vending machine. The task for the radiologist is now one for which he or she has not been educated. Firstly: you have to talk to the patient to tell her about the course of the examination, and that it would have been better not to ingest caffeine as this might cause a fetus to move (a lot more than without). Secondly: she has to understand that a fetal MRI requires to be free of ferromagnetic jewelry everywhere, often leading to the realization that the piercing her boyfriend gave to her is not made of pure gold. And guess who will be in charge of removing that piercing the patient cannot reach herself anymore because of her pregnant belly? Yes, the radiologist! Finally, you start the examination and there is another situation for which no radiologic training has prepared you to: you don`t know where your patient is, and you have to use the first scout sequences to chase the fetus. Once you have found it, you realize that the clinical question on the referral has very little in common what may be the actual situation here. So after thirty to forty minutes of trying to get useful information out of the MR-images, the sweaty patient comes out of the examination room, thinking you know now everything and her staying in an uncomfortable position for such a long time gives her the right to pester you with questions that you cannot answer yet anyway, as you will have to take a very close look at each of the sequences before you formulate a diagnosis. So, feel free to take revenge on the referring obstetrician, by telling her: “your doctor, who knows you much better than me, will answer all your questions tomorrow.”

Knowing all that – what qualifications should a radiologist have to become good at fetal MRI? In addition to some knowledge on fetal development and MRI your success with this method will depend on whether your personality is masochistic enough to deal with hysterical pregnant women (nobody explains anything to me), discontent obstetricians (what does that mean now, I don´t understand “radiological” language), pissed sonographers (I would have seen that anyway if the pregnant woman wouldn`t have been so fat), and uncompliant patients (as a fetus I have the right to swim everywhere, and at any speed I choose).

We should aim to a patient-centered approach, where the only important thing is offering each patient all the information that is relevant and prepare them to deal with the diagnostic tests and the information that will come out (or not) of them. ■

An unscientific approach to fetal MRI

Daniela Prayer & Mariana C. Diogo

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Kretz, Kratochwil and Zipf

Amy Kover

Beyond bucolic trees and a valley, lies some of the most advanced obstetric and gynecological technology

Nestled in an emerald valley surrounded by snowcapped Alpine peaks, the village of Zipf, Austria, looks like scenery plucked from a travel brochure. A stroll through the 600-person town reveals such charming sites as a church with an onion-shaped steeple, the Zipfer brewery and plenty of sheep grazing on pristine blades of grass.

Yet what transpires in Zipf is far more cutting-edge than its bucolic image suggests. As the site of GE Healthcare's Women's Health Ultrasound division, Zipf is at the forefront of obstetric and gynecological technology. In fact, the region's importance to the field has earned it the nickname "Voluson Valley", referring to a groundbreaking ultrasound scanner developed there.

The area owes that legacy to the engineering vision of the Kretz family. Engineer Paul Kretz came from a wealthy brewing family in Austria. Tired of the beer business, he sold his stakes to create what would now be considered a tech incubator. In 1947, he launched Kretztechnik — initially to manufacture potato baskets out of welded steel. But soon his attention turned to sonar, the same technology used to locate submarines during World War II. The idea worked like this: When high-frequency sound waves travel through a cavernous space, they send back echoes. Like bats in a cave, scientists can measure the timing and strength of these echoes to sketch out contours of concealed objects. In the early days, Paul Kretz applied this technique to material testing, such as identifying holes in steel products — particularly in rails. It was also used to measure the thickness of metal objects submerged in water.

By the 1960s, a young Viennese OB-GYN doctor named Alfred Kratochwil had caught wind of Kretztechnik's work and arrived in Zipf with a strange but intriguing idea: Use sound waves to locate the placenta. Though ophthalmalogists had already begun using Kretz's ultrasound to examine the eye lens, no one had ever applied the technology to prenatal care.

The museum at Voluson Valley

Intrigued at the prospect, engineers collaborated with Kratochwil to invent an articulated arm that ran along a woman's belly, transmitting and receiving sound waves to draw an outline of the fetus within. The system was far from perfect. Because ultrasound essentially creates images out of sound, the tiniest movement — a baby's kick or mother's breath — would cause the machine to draw lines where nothing existed, blurring doctors' and patients' views of the actual fetus. "You had to be a true artist to get the correct image," says Christian Grabner, market development director for GE Healthcare Women's Health Ultrasound, who began working at Kretztechnik in 1982. ››

Kretz, Kratochwil and Zipf

Amy Kover

But Paul Kretz had a nephew with a clever solution. Carl Kretz, a former researcher at Technische Universität Wien, replaced the articulated arm with a motorized wheel holding five different piezoelectric elements. Also known as transducers, piezoelectric elements can translate electrical pulses into sound waves. Spinning those transducers around an axle allows an ultrasound machine to display two-dimensional images in real time rather than only static images, with the ultimate benefit of allowing the examiner to follow fetal movements. The new device became the cornerstone of Combison 100, the first commercially available real-time ultrasound system. With this, Kretztechnik cemented ultrasound's role in prenatal care.

Kretztechnik continued adding new twists. It developed user-friendly ergonomic designs, introduced new materials to lower costs and incorporated a probe that could peer between the patient's rib cage and transmit images twice as fast. "You could really start to look at fast-moving objects, like the mouth and the heart," says Grabner.

In 1989, the company debuted its boldest innovation yet: the world's first 3D ultrasound, the Combison 330. For the first time in history, expectant parents could gaze at fully formed images of their child months before entering the delivery room. They would, however, need to wait an entire day for the ultrasound images to process. And even then, there was a good chance the pictures would not come out at all.

The Combison 330 itself never caught on, but eventually the technology did. Even after Korean ultrasound manufacturer Medison acquired Kretztechnik in 1996, its engineers continued ironing out the system's awkward kinks and adding new features, such as the ability to capture real-time 3D images of the baby. Their inventions were enough to grab the attention of Omar Ishrak, then vice president and general manager of GE Medical Systems' Ultrasound business, which purchased Kretztechnik in 2001. His foresight paid off. The business is now the market leader in women's health ultrasound, making the Kretztechnik acquisition one of the most fruitful in GE's history. More significant, 3D and 4D technology has altered how expectant parents experience pregnancy. Today, they can enjoy seeing their baby for the first time in three dimensions.

Such moments are poised to become even more magical, as GE engineers in Zipf continue to sharpen our view into fetal development and improve prenatal care. Today, blind patients can experience seeing their babies by touching 3D-printed models, and prenatal surgeons can operate on tiny hearts using 3D renderings of fetal hearts.

"Our team never stops innovating in making ultrasound easier to acquire and comprehend for doctors and patients alike," says Roland Rott, general manager of Women's Health Ultrasound at GE Healthcare. "After all, entrepreneurship is in our DNA. We look forward to even more industry-first innovations that will change how ultrasound is performed."

Next on the agenda: speeding up prenatal diagnoses by outfitting ultrasound systems with machine-learning technology. And to think it all started in part because Paul Kretz was sick of beer. ■

Logopedic Therapy in Patients with H&N Cancer

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This article will focus logopedic interventions in ENT patients and patients going through radiation after giving a short insight in other patient groups.

Usually, dysphagia is caused by large tumors or postoperative missing structures, which are crucial for swallowing function. In ENT wards, patients with dysphagia are treated during or after tumor diseases or radiation – a large proportion of patients are tracheotomized.

In addition, there are damages and aftereffects of the radiation such as odynophagia, open wounds in the oropharyngeal area and movement restrictions.

In general, to be able to carry out an effective logopedic therapy, the patients must be awake at least for the duration of the intervention. Motivation, compliance and mental health as well as respiratory stability are therefore important factors for success. The most important thing is to create an individual therapy concept for every patient according to their diseases and vigilance. Before it is obligatory to conduct a swallowing diagnostic. Therefore, a clinical logopedic diagnostic, which is made bedside followed by an apparatus-based swallowing diagnostic like FEES (Fiberoptic (Flexible) Endoscopic Evaluation of Swallowing) and/or video cinematography are possible. Even in the diagnostic process, multiprofessional teamwork is an important requirement.

A clinical logopedic diagnosis is carried out at the first meeting. Here, the underlying disease, vigilance and – if present – the type of tracheal cannula and form of ventilation are recorded. This is followed by an assessment of the structures and functions involved in swallowing without bolus, such as voluntary coughing, throat clearing, saliva swallowing, tongue motility, laryngeal elevation and breath-voice coordination. Direct swallowing of different consistencies according to the IDDSI (International Dysphagia Diet Standardization Initiative) Framework is then accurately assessed and documented.

Both FEES and video cinematography are available for the apparatus-based diagnosis of swallowing disorders. With these examinations, a swallowing status can be determined and assessed using the PAS (Penetration Aspiration Scale) scale. FEES allows visualization of the oral and pharyngeal phases as well as pathophysiologies, whereas video cinematography additionally assesses the esophageal swallowing phase.

The advantages of FEES are that bedside testing is possible, there is no radiation exposure, testing of different consistencies as well as normal food is possible without contrast medium and sensitivity can be tested. However, due to the "whiteout" caused by the epiglottis tilt, no assessment is possible directly during swallowing.

Different consistencies are also tested in video cinematography. The big advantage of this method is that esophageal motility can also be assessed and it is possible to evaluate the entire swallowing process without interruption. However, the examination cannot be performed bedside, a contrast agent is needed for testing, and there is radiation exposure during the examination. Another possibility is to combine both methods, which can be gleaned from SIRFES Study (Simultaneous Radiological and Fiberendoscopic Evaluation of Swallowing) (Scharitzer, M. Roesner, I. et al., 2019).

In both cases, it is recommended that the examination is accompanied by a SLP (Speech and Language Pathologist) because swallowing maneuvers or swallowing techniques can also be performed during the examination to observe their effect on the swallowing process.

SLPs accompany their patients before, during and after necessary interventions such as radiation or operation and adapt our therapy plan at any time to their needs and requirements to enable the best possible rehabilitation of this process. If a tracheal cannula is present, therapy begins with tracheal cannula management. The goal is to increase laryngeal sensitivity through ventilation and to enable the patient to phonate. Efficient coughing and throat clearing can also be practiced to enable secretion management that is sufficient for swallowing. ››

Logopedic Therapy in Patients with H&N Cancer

Ines Kansy & Tamara Wachholbinger, B.Sc

Intraoral stimulation, taste and ice stimulation or NFT (**N**euro **F**unctional **T**reatment) are used to stimulate and elicit these swallowing responses. Elasticity improvement of the musculature involved in swallowing can be achieved through manual techniques. These forms of therapy are applied passively. In contrast, during active logopedic therapy exercises are performed for pharyngeal strengthening, laryngeal elevation, tongue motility and strength. If possible, patients are also given an exercise plan for independent performance and repetition.

Other important therapy components are compensation methods such as chin-down or supraglottic swallowing. Turning the head to the affected side or tilting it to the healthy side while eating can have a positive effect on swallowing.

The goal of logopedic dysphagia therapy is to achieve aspiration-free oral food intake of certain consistencies and to increase the quality of life of our patients which also can be related to decannulation.

Therefore, direct swallowing of different consistencies in therapy also plays an important role to apply the learned compensation techniques and to practice and optimize the swallowing process. Dietary measures are crucial to enable patients to oral food intake as early as possible. Often there are certain consistencies that are more feasible and can be swallowed without aspiration. Examples of this would be to thicken liquids slightly or to use thick pureed food. Finally, the importance of interdisciplinary teamwork should be mentioned again. To create the optimal conditions for successful rehabilitation, close cooperation with phoniatrists, ENT physicians, radiologists, nurses, ward physicians, dieticians, occupational therapists, physiotherapists and psychologists is required. ■

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ESHNR 2021

Booklet

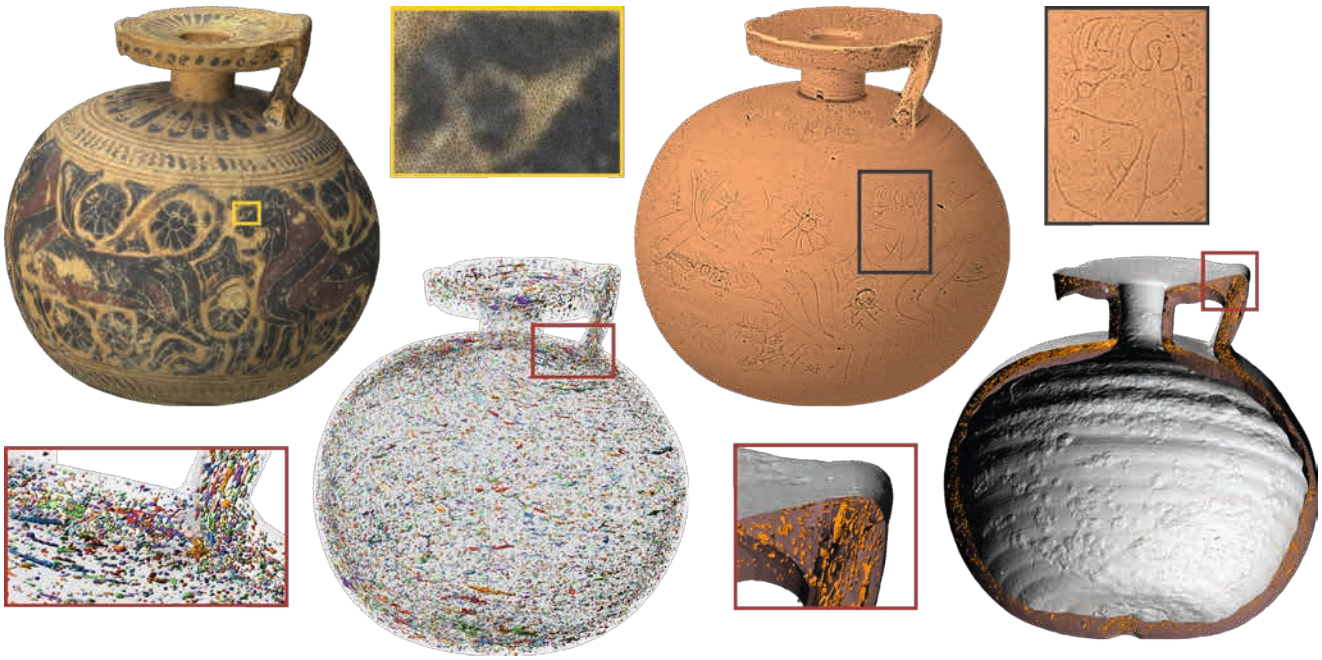
Allied

CT and Ancient Pottery

Stephan Karl & Hubert Mara

Computed tomography (CT) is becoming an indispensable imaging method in archaeology. Especially in the field of pottery studies, it has had an enormous impact on the methodology of shape analysis, identification of manufacturing techniques and fabric analysis. The primary benefit of CT for this special application is the fact that it is a non-destructive, better called “non-invasive” method. As in medicine, it was used to look inside an object without the need for taking samples. Furthermore, imaging a whole object allows it to be assessed in its entirety. However, there are also certain risks and limitations of CT that must be considered, as adequate resolution, maximum of object size and a potential effect of X-rays exposure on subsequent thermoluminescence dating.

Besides these fascinating CT images revealing details of the internal structure – “to see, what is actually not intended to be seen by humans” (Thomas Mann) – it is the exploitation of the added value of CT in answering archaeological questions in pottery research which is tackled in joint research between archaeologists, mathematicians and computer scientists. As known, tomography is derived from the Greek words for cut and write; i.e. medical spiral or industrial fan-beam CT scanners acquire sequences of 2D cross-sectional images with known area and depth of the pixels which can be converted afterwards into a 3D reconstruction. Current interdisciplinary research is focusing on the extraction of quantitative data from this 3D (volume) reconstruction.



Shape analysis

CT provides an accurate, complete 3D documentation of an object with all external and internal structures. Orthogonal views as well as sections (e.g. for vessel profiles) can be generated at any desired location. By mathematically determining the rotation axis, sectional images can be automatically generated, oriented and extracted, e.g. for print templates, only by selecting manually a single point on the vessel surface. Even fine details such as incisions of the black-figure style in vase painting can be visualised; of course, depending on the resolution of the used CT device (in our case an industrial cone-beam CT scanner). Furthermore, the 3D reconstruction of the object allows an exact calculation of the ceramic volume (e.g. for the determination of the bulk density) or of the filling volume of the vase. These properties and the complete representation of the vessel shape enables conclusions to the production technique and even to specific potters and pottery workshops. ››

CT and Ancient Pottery

Stephan Karl & Hubert Mara

Identification of manufacturing techniques

The visualisation of primary manufacturing traces on the surface, which are normally visible only inside closed vessels and thus have been protected from secondary surface finishing, and of specific structures in the ceramic body itself provide sufficient information to reconstruct the manufacturing process in detail and to identify the forming technique. While wheel-thrown pottery is clearly visible in CT due to the diagonal spiral orientation of voids and inclusions in the ceramic matrix, attached vessel parts as handles or necks are recognisable by the change in this microstructure. Due to characteristic alignment properties of voids, inclusions and fissures, CT reveals different primary forming techniques and combinations of these. Pottery is basically classified in hand- or wheel-made by archaeologists, but there is a couple of different forming techniques, as coiling, pinching, slab-building, drawing, wheeling or moulding. The recognition of forming techniques gives valuable information about the dissemination of technical knowledge and its modification in the production of pottery.

Fabric analysis

Depending on the accuracy and resolution of the scan, CT allows to analyse the ceramic fabric morphometrically according to the voids and inclusions. Of course, it cannot replace mineralogical-petrographic analysis, but follows an established method in archaeological pottery studies which is called optical classification of fabric types. The ceramic fabric is divided into the matrix, the basic substance of the clay minerals, the voids and the mineral inclusions, so-called non-plastic components, mostly coming from separate tempering of the potter's clay. With this method the voids and inclusions are analysed according to their size, shape and portion in regard to the matrix. The fact that these inclusions are visible in CT at all is due to the varying specific density of these minerals in the matrix, like quartz, lime, feldspars or iron oxides, and the partial volume effect by which micropores between the clay minerals reduce the attenuation coefficients of X-rays. In pottery research, a characterisation of the ceramic fabric based on quantified properties is essential both for questions of production technology and for the localisation of the production site or workshop.

Conclusions

We can conclude that CT is a powerful method for analysing pottery. The material ceramic is ideal for X-rays. In industry, the increasingly sensitive detectors lead to volume data with higher resolution and contrast quality. The devices are becoming more flexible with shifting detectors and larger sample chambers. This improvement goes hand in hand with higher performance of hard- and software. Of course, a balance must be struck between the use of a sufficiently intense beam and making sure that thermoluminescence dating is not affected by this X-ray exposure.

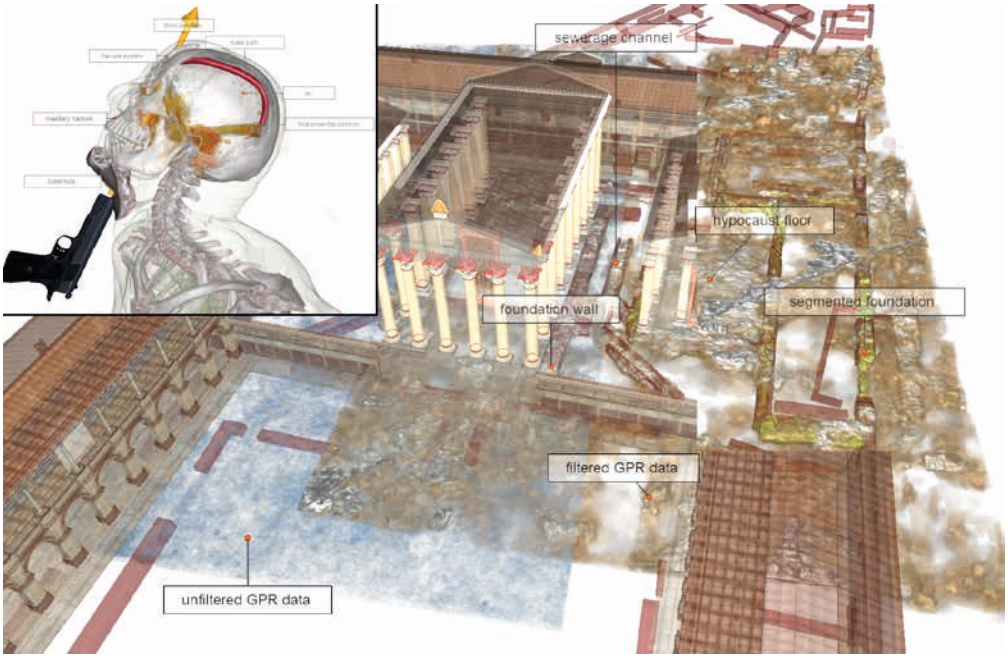
Finally, we see the highest demand for research in the whole process chain at the beginning. Analysing 3D surface data gained from CT volume data is a very effective method in archaeological research, additionally helps to reduce data size. Defects in CT data caused by typical CT artefacts like noise, beam hardening, etc. are main obstacles for a proper segmentation. A future improvement of the volume data reconstruction process by applying mathematical modelling and variational methods can enable most reliable volume data of pottery without technical artefacts. It is up to archaeology to choose the most suitable ways for their particular questions and to develop these in cooperation with mathematics and computer science. ■

The visualisations in the figure were made using the open accessible GigaMesh software framework (https://gigamesh.eu).

3D Imaging in Archaeology

Alexander Bornik & Wolfgang Neubauer

The preservation of our archaeological heritage in the ground is a major societal challenge. The so-called 1992 “Valetta Convention” by the Council of Europe requires the use of non-destructive methods. Traditional archaeological excavations are inherently destructive experiments, which cannot be repeated. The Ludwig Boltzmann Institute for Archaeological Prospection and Virtual Archaeology is dedicated to research and development of non-invasive methods to discover, document, understand and present archaeological sites on a large scale based on imaging: Airborne remote sensing helps to document the surface in detail to identify archaeological sites for further ground-based and underground investigations. Aerial images and airborne laser scans reveal anomalies in vegetation and the ploughed soil indicating subsurface remains of stone or timber buildings. On the ground geophysical sensors like caesium magnetometers are used to record the earth’s magnetic field and tiny changes caused by man-made structures. Multi-sensor arrays towed by all-terrain vehicles support measurements on the hectare scale, revealing ditches, building floorplans, previous fire pits and much more. Ground-penetrating radar (GPR) allows to obtain three-dimensional data from the subsurface depicting the reflectivity of electromagnetic radar waves by the ground at a spatial resolution of around 4 centimetres and hectare scale using motorised multi-antenna arrays. The resulting 3D datasets show man-made changes and structures in the subsurface like the remains of complete Roman towns in three dimensions.



The reconstruction of the past from the material remains is the primary goal of archaeology. We typically use all the above-mentioned methods to locate and analyse sites like the Roman Town of Carnuntum (50km from Vienna, one hour train journey), one of our main case studies, to document and to preserve them in digital form, and to be able to present them based on virtual reconstructions (Wallner et al., 2021).

In archaeological prospection, GPR is the analogue to 3D imaging modalities like CT, MRI, and 3D ultrasound. The data produced are 3D volumes consisting of voxels filled with the respective measurements. We have concluded from this, that the visualisation and processing options should be similar. »

3D Imaging in Archaeology

Alexander Bornik & Wolfgang Neubauer

We use cross-sectional images to detect structures like Roman buildings or sewerage systems in the same way radiologists read tomography data. However, in archaeology we are faced with the fact, that there is no reference like healthy human anatomy. In addition, GPR data strongly varies depending on soil, geology and environmental conditions. GPR data generally appear noisy due to small pedological/geological and archaeological structures like stones, or bricks. Changes of the intensity variation pattern may also indicate human intervention by, e. g. digging or filling a ditch.

While archaeological structures can easily be depicted in cross-sectional images, their exact delineation, the mental reconstruction of their 3D shapes needed for further analysis is almost impossible. We successfully adopted medical 3D volume visualisation techniques. Unlike in medical diagnostics, they are incomparably more useful for us. Based on data filtered using techniques from medical image data analysis we can perceive the outlines and shapes of archaeological structures. Such filters enable to emphasise the boundaries of large structures like wall, ditches or floors. Our flexible 3D volume visualisation approach supports the fusion (combination) of multiple dataset versions, so that the details lost in filtering can be added again. The interpretation of prospection data sometimes requires an explicit extraction of archaeological structures, which can be achieved using segmentation techniques. Again, algorithms originally developed for medical data analysis could be successfully adapted.

Archaeological reconstructions should always be based on all facts known but since missing evidence leaves room for varying interpretations, they are only well based hypotheses. We try to translate our prospection results into visualisations in such a way that the hypothetical reconstructions become comprehensible and free of contradictions. Consistent integrated visualisations combining all available data sources help both, the development of high-quality models of hypothetical nature with the goal to better understand sites like a Roman city, and their dissemination to the interested public to raise awareness for the importance of preserving our cultural heritage. The path towards such visualisations is paved with technical challenges, like how to combine heterogeneous data like 2D images, point clouds and surface 3D models. This requires flexible mechanisms for data reduction, local visibility control, enabling a selection of just the evidence needed.

We developed an integrated 3D visualisation framework supporting the seamless integration of all data sources, most prominently 3D GPR, volumes, point clouds and 3D models (A. Bornik, Wallner, Hinterleitner, Verhoeven, & Neubauer, 2018). The latter are of particular interest for dissemination, since prospection data represents a fragmentary basis for archaeological interpretation, which is often too abstract to be fully understood by non-experts. Combined with materialised three-dimensional data interpretation and virtual models like a Roman temple modelled on top of foundation remains, the picture becomes more complete, comprehensible and credible at the same time.

Similar techniques have already been used in forensics based on the need to analyse and present violent crimes and accidents documented using 3D imaging. Forensic case analysis and illustration also faces the challenges to conjointly visualise heterogeneous 3D data, to visually depict details like injury morphology in post-mortem CT data, and to relate them to superficial findings on in body surface or crime scene 3D scans. Furthermore, there is also the need to convey the information gained to an audience of non-experts in court in an understandable way (Alexander Bornik et al., 2018).

It would be obvious to also use such integrated 3D visualisation in surgery planning or patient education in the future. ■

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Music and Science: CT of String instruments

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It all started in 2017 when I was approached by the Dutch cellist Joachim Eijlander with an unusual request: “Can you make a CT scan of a cello from around 1760”? By chance the instrument had fallen into the hands of Joachim and he immediately fell in love with the sound. However, nothing was known about the instrument. Joachim had many questions: Who built the cello, and where? What was the age of the instrument? What was the condition of the cello, did it have internal damage and/or restorations? In search of answers, Joachim needed a CT scan of the cello to bring to London for specialist luthier’s evaluation. He was especially worried about the presence of woodworm because a few holes on the surface had raised suspicion of the presence of more extensive internal damage.

Why a CT scan?

As early as 1997 reports have come out in the radiological literature about CT Analysis of string instruments[1,2]. A radiologist (Steven Sirr) and a luthier (John Waddle) joined forces and investigated high-quality violins and cellos crafted between 1633 and 1872 by master builders such as Guarneri, Amati and Stradivari. They detected signs of internal damage (e.g., woodworm holes, air gaps, plastic wood deformities) or repair (e.g., glue lines, filler material, wooden patches). Note: these abnormalities were not seen at visual inspection by experts! More reports have followed mainly in non-radiological journals[3].

Since, I am an enthusiastic cello player myself, I took on the challenge. It did not take much time to arrange a CT session at the UMCU (during an on call shift on the weekend) to make the CT scan of Joachim’s cello. The cross-sectional images and 3D reconstructions supplied adequate answers to Joachim’s questions. And after more research which brought him to luthiers and violin dealers in London, Paris, Hamburg, Stuttgart, Basel, Salzburg and Cremona, he decided to buy the cello. In 2019 with help of crowdfunding he acquired the instrument.

The encounter has evolved into both a warm friendship as well as professional cooperation between the radiologist and the cellist. From our experience together we have created a ‘Lecture recital’ called “Music and Science: Cello in the scan”. In this program, the anatomy of the cello is explained and, using CT-images and animation, the audience travels through the interior of the cello. Also, you will hear a lot of sweet music for the cello. »

Please refer to the next pages for illustrations!

References
1. Sirr SA, Waddle JR. CT analysis of bowed stringed instruments. Radiology 1997;203:801-805
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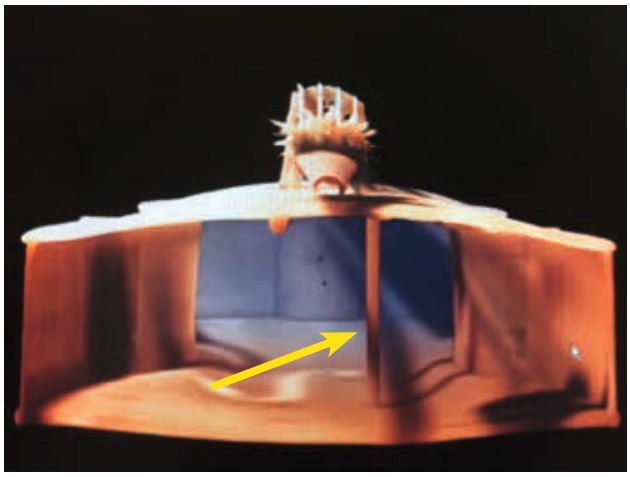
Music and Science: CT of String instruments

Frank A. Pameijer

CT Cello examination UMCU

Joachim's cello just before CT scanning



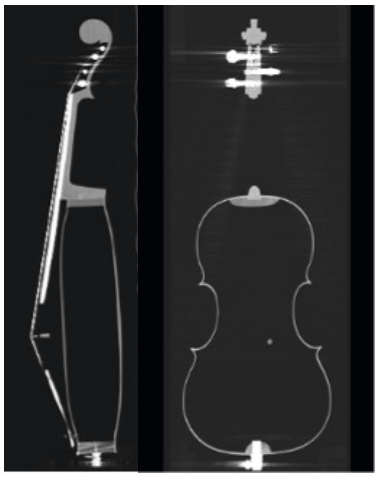
3D reconstruction showing position of the 'soundpost' (arrow); i.e. the stick that connects the front and back plate (also called 'the soul of the instrument').

Music and Science: CT of String instruments

Frank A. Pameijer

Joachim and Frank playing a cello duet during a lecture recital (Photography: Frank van de Loo)

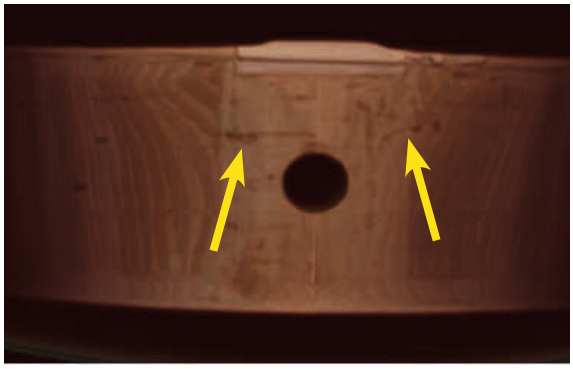
Lecture Recital: Joachim and Frank playing a duet for cello and double-bass (Photography: Frank van de Loo)



Sagittal and coronal CT reconstruction

3D reconstruction

Transparent 3D reconstruction



Transparent view of lower part of (another) cello showing internal holes and corridors due to woodworm damage (arrows).

Veterinary Diagnostic Imaging of Head and Neck – what is your diagnosis?

Nadia Pfammatter

Diagnostic Imaging of head and neck in small animals is a very important localisation for CT (computed tomography) and MRI (magnetic resonance imaging) examinations.

Our small patients, mainly dogs and cats, undergo CT in case of nasal discharge, facial swellings, suspicion of a pituitary macroadenoma, signs of otitis media and many more. Imaging helps to define the cause of a symptom as well as to find the exact localisation to perform a biopsy or a fine needle aspiration. MRI on the other hand is mainly used in neurological patients, such as patients with epilepsy, cranial nerve deficiencies, head tilt, ataxia or other neurological symptoms. There are other modalities available, such as radiographs, which is mainly used in dental radiography, or ultrasound to evaluate e.g. the eyes, salivary glands or the thyroid gland. Fine needle aspirations of lymph nodes, salivary glands, musculature or extracranial space occupying lesions can be performed ultrasound–guided. In case of bony destruction, ultrasound-guided fine needle aspiration or biopsy extraction within the nasal cavities or a frontal sinus can be performed as well.

The following cases will bring you the need of Diagnostic Imaging in our patients closer:

Case 1

Shar Pei, 8 years old, male neutered.

Clinical signs: swelling at the ear base of the left ear.

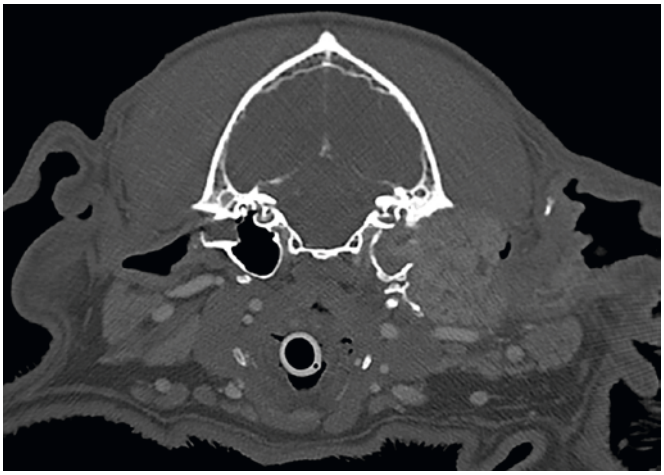
Computed tomographic study of the head of an adult dog in a transverse plane, pre- and post-contrast phase.

There is a large space occupying lesion affecting the left tympanic bulla and the adjacent soft tissues (4 x 3.6 x 3 cm). The bulla wall is destructed with bony fragments ventrally displaced and positioned at the outlining of the space occupying lesion. The tympanic bulla is mainly filled by the space occupying lesion with a small residual space at the dorsal portion filled with air. The auditory ear canal is completely obliterated. The space occupying lesion is irregularly marginated, expansively growing and heterogeneously contrast enhancing. The zygomatic process of the temporal bone adjacent to the space occupying lesion is lytic and mainly destructed. The wall of the cochlea shows a small lytic defect. The space occupying lesion is extending through the defect into the cochlea.

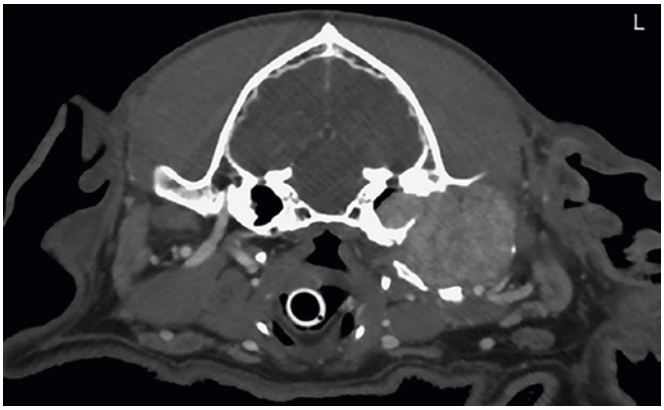
The parotid gland and the adjacent soft tissues are ventrally displaced. The nasopharynx is mildly compressed by the mass.

Diagnosis: » Large, aggressive and expansive space occupying lesion of the left tympanic bulla.
- compatible with a neoplasia, such as a ceruminal adenocarcinoma. Differential diagnoses: Cholesteatoma, nasopharyngeal polyp.

Histology: » Ceruminal adenocarcinoma »



CT of a canine head in transverse plane, bone reconstruction.



CT of a canine head in transverse plane after intravenous contrast media injection, soft tissue reconstruction.

Veterinary Diagnostic Imaging of Head and Neck – what is your diagnosis?

Nadia Pfammatter

Case 2

French Bulldog, 9 years old, female neutered.

Clinical signs: painful cervical vertebral column in motion and a progressive apathy.

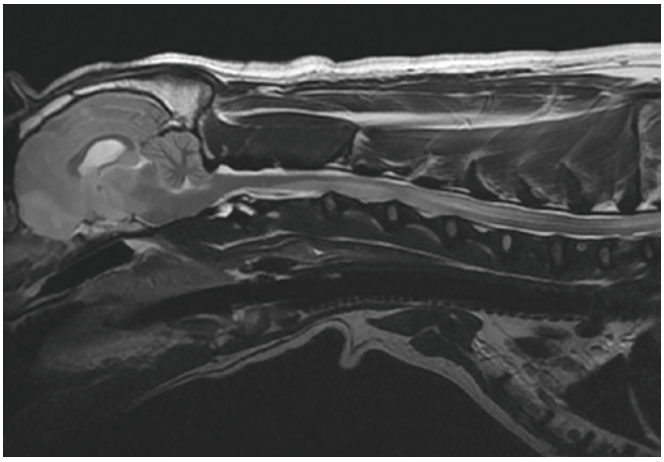
MRI study of the head of an adult dog.

T2W sagittal, T2W transverse, T1W post contrast dorsal are presented.

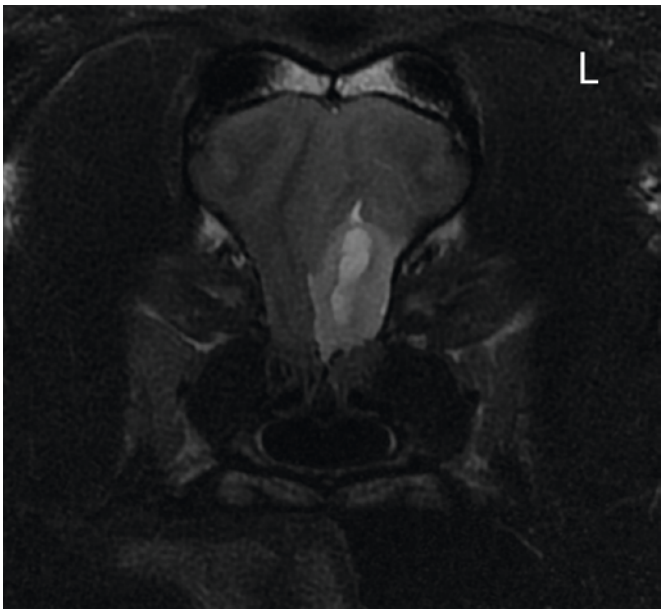
There is a space occupying lesion within the left olfactory lobe. The lesion shows a central, smoothly marginated, cystic region filled with fluid. The fluid is hyperintense in T2W and hypointense in T2W FLAIR and T1W, indicating cerebrospinal fluid. There is no signal void seen in the T2*W. The region shows a hyperintense signal in the DWI sequence and is restrictive in the ADC map. The cribriform plate is irregularly marginated and the adjacent caudal nasal cavity shows a soft tissue intensity. The ethmoidal turbinates are normal in shape without any signs of destruction. The brain tissue surrounding the space occupying lesion is thickened and shows an ill–defined T2W hyperintensity expanding from the left olfactory lobe to the left piriform lobe. Due to this swelling, there is a midline shift of the falx cerebri to the right. The left lateral ventricle is rostrally compressed.

The lateral ventricles are bilaterally mildly dilated. The corpus callosum is dorsally displaced, but of normal size and shape. The cerebellum is caudally displaced and rostrally flattened. There is a transtentorial and a foraminal herniation of the cerebellum. The central spinal canal is moderately dilated along the entire cervical spinal cord. The surrounding tissue shows an ill–defined T2W hyperintensity.

Due to the shortened nose of the brachycephalic breeds such as the French Bulldogs, the nasal conchae are displaced into the choana and the rostral aspect of the nasopharynx. The cranium is shortened and therefore the frontal lobes ventrally and caudally displaced. The cranial and the caudal cranial fossas are small. The soft palate is markedly thickened and the nasopharynx completely obliterated. The tongue is thick and reduces the space within the oropharynx.



MRI study of a canine head and cervical spine, T2W sagittal.



MRI study of a canine head, T2W transverse.

Diagnosis: » Intra-axial space occupying lesion within the left olfactory lobe, with associated marked brain oedema, resulting tentorial and foraminal herniation of the cerebellum and resulting syringomyelia and oedema of the spinal cord.
- Most likely due to a neoplasia, such as a glioma (astrocytoma or oligodendroglioma). Differential diagnoses:, nasal adenocarcinoma, esthesioneuroblastoma. A brain infarct or encephalitis (granulomatous or necrotizing) is less likely.

Veterinary Diagnostic Imaging of Head and Neck – what is your diagnosis?

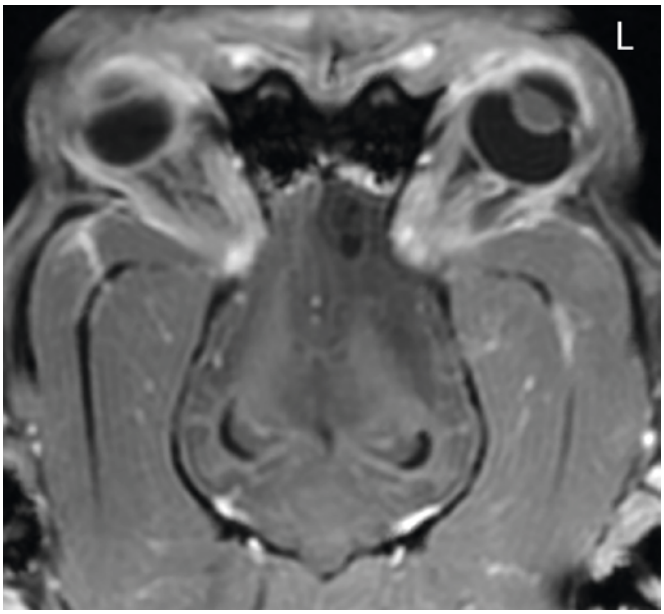
Nadia Pfammatter

» Moderate bilateral symmetric hydrocephalus.
- Most likely due to the brachycephalic breed and the shortened cranial conformation. Less likely resulting from the intra-axial space occupying lesion.

» Brachycephalic syndrome.

Histology: » There is no result from histology as our patients are normally euthanized without pathology. Therefore, a confirmation of the diagnosis was not possible in this case. However, there are studies indicating that brachycephalic dogs suffer to a larger percentage from gliomas than any other breed.

» There are institutions performing a brain biopsy, however this is not performed regularly in veterinary medicine.



MRI study of a canine head, T1W post contrast dorsal/coronal.

I hope you enjoyed the little quiz and I could give you an insight in my daily work as a veterinary radiologist. ■

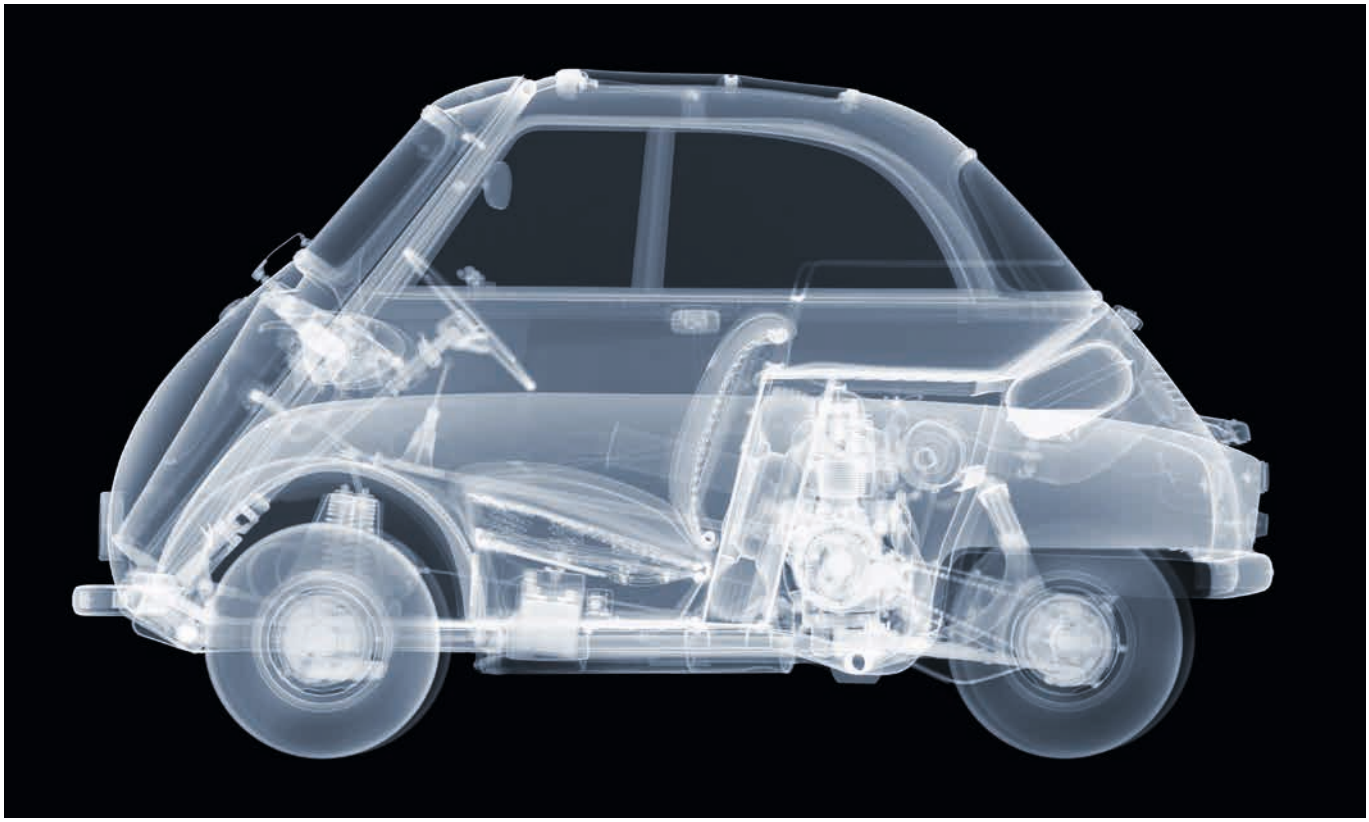
Nick Veasey's X-ray photography

Soraya Robinson

The British photographer Nick Veasey was born in 1962 and worked in the design and advertising industries before starting to create images from X-ray photography. His studio has 60cm thick concrete walls with lead lined doors and houses different X-ray machines typically used in art restoration and to check the integrity of military tanks. Like in diagnostic imaging he varies the amount of radiation, exposure time (often many minutes) and distance from source to object.

Since all images have exactly the same size as the objects, he often has to expose many X-ray films, maybe even 60+. They are then painstakingly pieced together bit by bit in post production re-touching thus creating bigger scenes. At times some images are lateron populated by X-rays of skeletons, which are put into pose. Clothing and accessories are subsequently inserted, which can be a procedure of several months. With the help of Photoshop he also adds colour to some of his pieces of his art, which have won numerous awards and are exhibited in prestigious museums all over the world. He is interested, how things work and wants to show, what is underneath the surface. He finds it especially appealing to use technology normally applied for security controls and surveillance, in order to produce stunning pictures of familiar objects. If one of his next exhibtions is not near your hometown, you can find out more about his intriguing art from his webpage. ■

https://www.nickveasey.com/



1962 BMW Isetta 250 taken in 2015

Round timber grading – from the human eye to a high-speed industrial CT

Andreas Weidenhiller
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a.weidenhiller@holzforschung.at

Introduction

When we think of tall constructions of, say, 100 m of height, steel and concrete come to mind. On the other hand, nature has been erecting such constructions for many thousands of years: trees. The largest trees, the well-known American redwoods, can reach more than 100 m of height, too. We humans have recognized this and have been using wood for construction purposes for thousands of years. There is just one problem: Trees do not come in handy rectangular shapes; their whole design aims at the stability of a round, curved and branched structure in the context of the individual tree's specific environmental and geographical conditions. When we cut a tree into usable rectangular pieces, part of the fantastic material properties – high strength at comparatively little weight – get lost. Therefore, it is of great importance for construction with wood that one knows one's material very well, to make the right cuts to get rectangular shapes which retain as much as possible of the strength of the original tree.

Technology helps to make the best use of the wood

Over the years, a lot of experience and knowledge about building with wood has been accumulated. One outcome of this experience are rules for visual assessment of logs and boards; and in the last sixty years, much effort has gone into the development of devices and sensors to automatize this assessment work.

Often, diagnostic tools from other disciplines have been adapted to work with wood, like ground-penetrating radar, vibration analysis or near-infrared spectroscopy. X-ray imaging can be used to identify or estimate various quality aspects of wood, including knots. Knots are parts of the wood where a branch grows, from the log's core to the log's surface, and are one of the most important strength-reducing wood features. For sawn timber, X-ray imaging is already widely used in the industry, with throughput speeds of 10 m/s and more, often enhanced by further technologies like vibration measurements or optical scanning.

X-ray imaging on the whole log is more challenging, as the absorption is much higher due to the larger size and due to the high moisture content of freshly cut logs. But one can still get a lot of information out of even one or two images per log, useful for deciding about the best use of a log and for choosing the right way of sawing it.

The advent of high-speed industrial CT scanning

Where X-ray imaging is possible, a CT is the logical next step. Wood scientists have been using CT technology on logs since the 1990s, but the wood industry doesn't have the time to wait half an hour to scan a log of four meters – the expected processing speed is rather about 2 m/s, finishing such a log in two seconds.

It took almost 20 years from the first CT scans of a log to the announcement of the first CT scanner for industrial use in 2011 – the "CT Log" by the company MiCROTEC.

The step from a medical CT to the CT Log is a huge one. To achieve a processing speed of 2 m/s with an acceptable resolution, the X-ray source and sensor must rotate about 180 times per minute. Higher X-ray power is needed to scan logs with diameters of 60 cm and more. The logs will not remain still at this feed speed, so their movement has to be tracked and compensated. And finally, the huge amounts of data generated each second must be transmitted and processed.

Will this effort pay off? Many in the sawmilling business believe so – and simulation studies have indicated potential average value gains of 10 % and more just by optimising the way a log is sawn. ››

Round timber grading – from the human eye to a high-speed industrial CT

Andreas Weidenhiller

CT for log grading

The decision on the optimal use of a log is another matter. Mostly, this is still done visually in combination with automatically determined log diameters. Some sawmills also include outer log geometry information from so-called “3D scanners”; partially, X-ray information is used, as well.

How high-tech scanning can be used for production decisions much depends on a sawmill’s product palette. For example, some specialized sawmills already use CT data to routinely identify logs for the production of high-quality knot-free pieces of timber with great success.

For a wider application, however, it seems that sawmills need to improve several processes at once, including sawing technology, internal logistics and production planning. Everything points to more digitalization and process integration. At the same time, research and development are required to provide the sawmills with the proper tools and concepts, so that these improvements and integration steps can be realized. The advent of high-speed industrial CT scanning has prepared the ground; now, the future of sawmilling has to be worked out.

Economic impact

How relevant is this development for Austria and the EU as a whole? Austria’s wood industry creates about 8 Billion Euros of production value per year, second in importance only to tourism. Although half of Austria is covered in forests, and much of this forest land is available for wood supply (annually providing 10 million m³ in sawlogs alone), the wood industry also imports a further six to seven million m³ in sawlogs to provide sufficient raw material for the sawmills. About 60 % of the produced sawn timber is then exported again. So, even 1 % improvement in material and production efficiency can lead to a sizeable effect in production value gain – and using CT for log grading promises improvements of 10 %. CT scanning thus becomes an important enabling technology to boost the further development of wood as a natural, renewable, and beautiful material for building and living. ■

Fig. 1: High-speed round timber CT – the “CT Log” machine (MiCROTEC)

Fig. 2: CT enables a look into the log and helps to optimize sawing (MiCROTEC)

Death of the Iceman – the head & neck story

Gerlig Widmann & Wolfgang Recheis
Medical University of Innsbruck, Department of Radiology

With acknowledgement of the following persons:
Angelika Fleckinger, Michael Verius, Friedrich Tiefenbrunner, Ralf Huttary, Richard Tessadri, and Karl-Heinz Künzel

The famous Tyrolean Iceman, found on 19th September 1991 at an elevation of 3,210 metres in the Ötztal Alps has been identified as Europe's oldest known natural human mummy who lived between 3400 and 3100 BCE. The cause of his death has been extensively debated and is a story of crime.

Examination of the body found bruises and cuts to the hands, wrists and chest, all signs of fight. A CT scan of the Iceman acquired in 2001 revealed the spectacular finding of an arrowhead lodged in his left shoulder, which may have led to a fatal bleeding. However, the arrow's shaft had been obviosly removed before death[1].

Head & Neck Radiology tells another part of the story. The icemean shows a fracture of the right frontozygomatic suture, and the lateral and the medial wall of the right orbit (Fig. 1). These fractures have sharp margins and there is no evidence of a periostal healing reaction. Did the icemean die from head injury? »

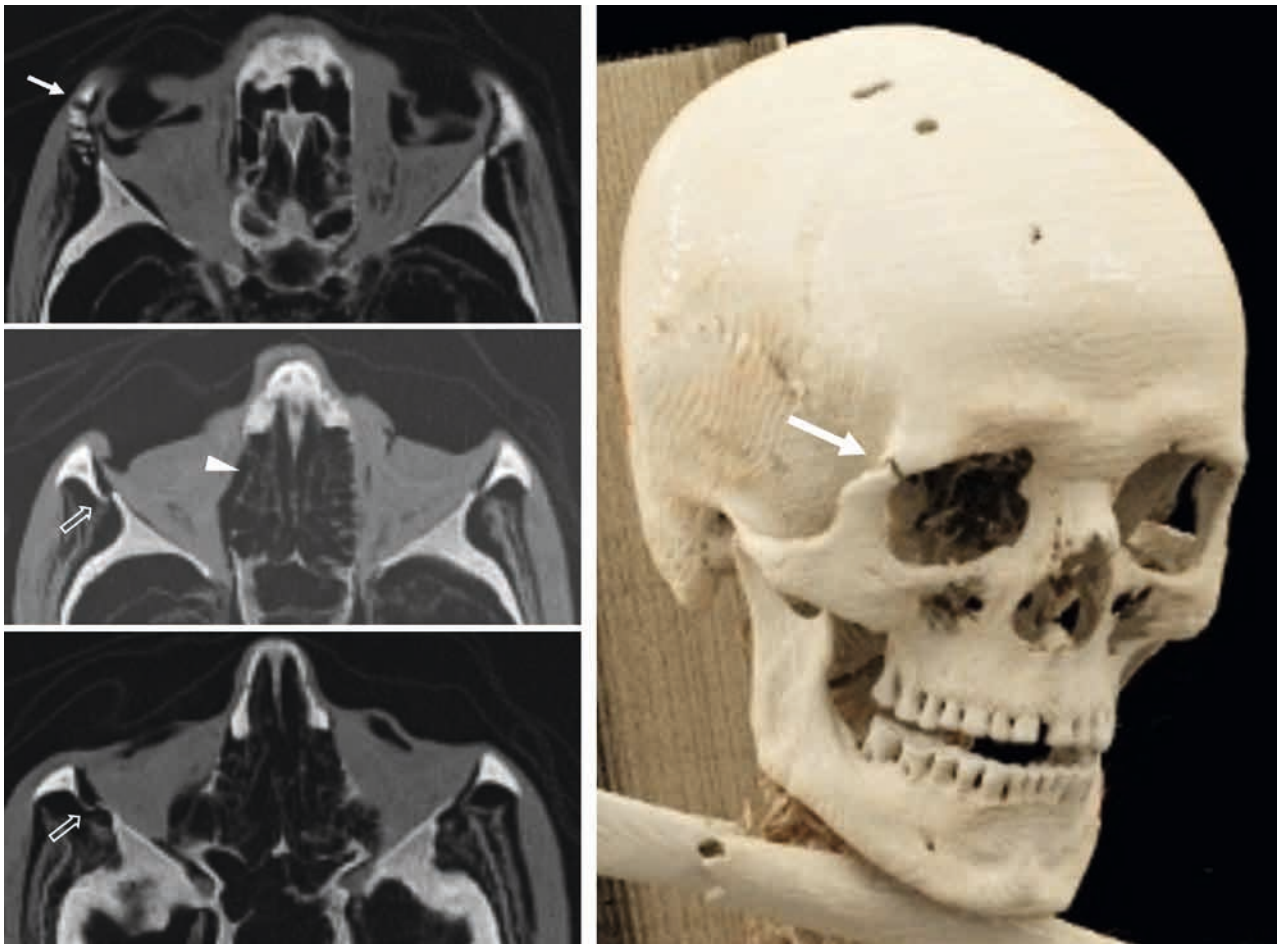


Fig. 1: Axial CT and cinematic volume rendering of the orbital region showing fracture of the right frontozygomatic suture (arrow), and the lateral (open arrow) and medial orbital wall (arrowhead).

Death of the Iceman – the head & neck story

Gerlig Widmann & Wolfgang Recheis

The Iceman has a skin defect directly over the discovered bone defect. Comparing both eyes a yellow color of the lateral part of the right eye was found. This may be attributed to a sub-conjunctival bleeding caused by the nearby injury. Additionally, radiopaque deposits can be seen in the thickened soft tissue of the right supraorbital and zygomatic area (Fig. 2). Tiefenbrunner, Tessardi and coworkers identified them as Vivianite crystals (iron phosphate)[2,3].

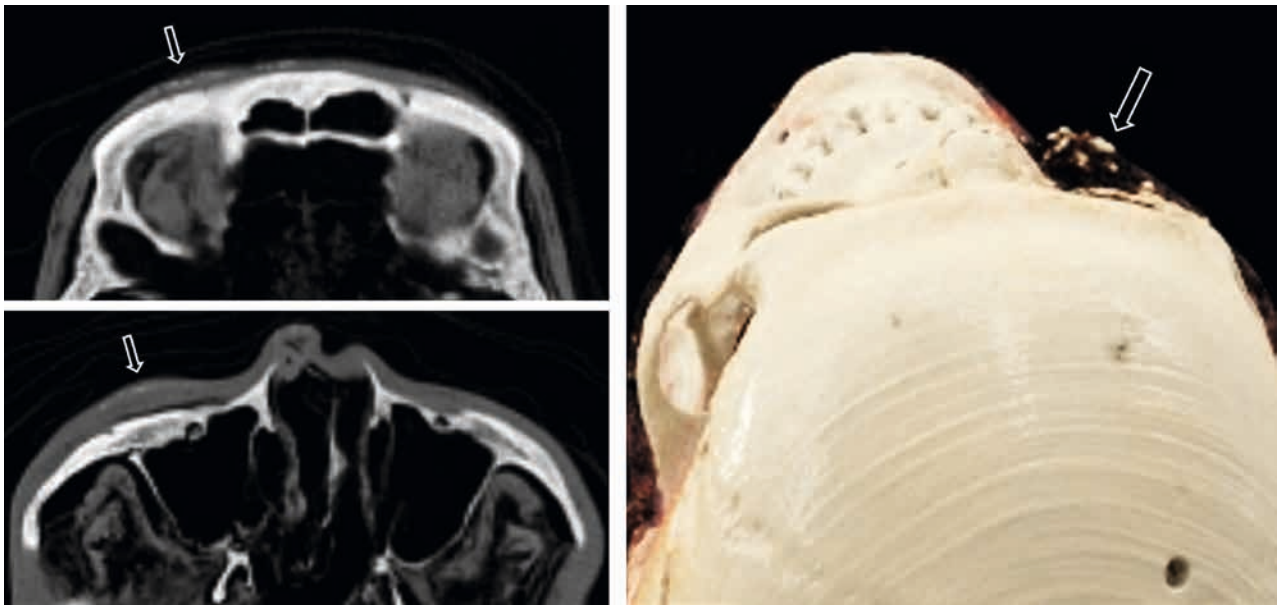


Fig. 2: Axial CT and cinematic volume rendering CT image of the radiopaque Vivianite crystals in the soft tissue of the right periorbital region (open arrows).

Compared to published rock-bone reactions for the generation of Vivianite on mummyfied bodies[4], the lack of iron in the rock of the Iceman´s finding place might be replaced by the iron content of blood caused by the injury discovered. The necessary part of phosphate for the reaction was probably contributed by the Iceman´s skin. So the head trauma most likely occured before death.

In addition to the potential life threatening injury caused by the arrow, the head trauma may have independently contributed to the Iceman's death – a criminal secret well preseved in the ice of the Tyrolean Alps. ■

1. "Zur Anthropologie des Mannes vom Hauslabjoch, Morphologische und metrische Aspekte", Seidler H. et al , pp 149 – 162, Der Mann aus dem Eis, Bd 1, 1992.
2. "Bakterien und Pilze, Problem für unseren ältesten Tiroler?", Tiefenbrunner F, pp 100 – 107, Der Mann aus dem Eis, Bd 1, 1992.
3. "Vivianite from the Iceman of the Hauslabjoch (Tyrol), Austria: preliminay results", Tessadri R., et.al. , Mitt.öst. Min. Gs, Vol. 141, pp 232-233.
4. "Brienzi" - The blue Vivianite man of Switzerland: Time since death estimation of an adipocere body.,Thali MJ, Lux B, Lösch S, Rösing FW, Hürlimann J, Feer P, Dirnhofer R, Königsdorfer U, Zollinger

A radiologist describes Salzburg landscape

Bernhard Szankowsky

translation Soraya Robinson

High piles of stone accumulations can be delineated in the whole range of the landscape, which can primarily be attributed to mountains.

Several irregularly configurated territories of increased transparency are found at their superior ends, consistent with snow fields.

In between, lowlands can be discerned, most probably due to valleys; at the bottom of the latter we can see partly straight and partly curvy liquid formations with considerable movement artefacts, in addition also immobile rectangular artefacts, which give the impression of houses.

Above the pointed stone accumulations there are regions of predominantly homogenously short-waved colour, interspersed with fields of reduced transparency rapidly changing in extension and density, occasionally also covering everything underneath, which make us think of clouds.

Obviously slowly moving along an invisible, seemingly regular track there appears a roughly 3cm in biggist diameter measuring, strongly hyperintense, roundish alteration at the upper rim of the image, presumably caused by the sun.

Big parts of the visible surface are covered by stationary growth of highly variable appearance, especially at the basal aspect, less and less common higher up, whereas the anorganic basic substance of the presumed mountains' apices is largely uncovered.

There are recurrent episodes of passive movements within the above-mentioned growth, most probably due to unspecific position changes of gas accumulations, which fill the whole area.

Especially on the lateral side we delineate mobile soft tissue structures, mostly covered in probably textile equivalent material, which seem to be heading to or coming from the upper ends of the stone accumulations in a string of pearl fashion.

Ever so often they produce sounds, which can be classified with utmost certainty as lingual expressions.

These would be characteristic for hikers, as differential diagnostic entity we could also think of poachers, even though their localisation and demeanour would be atypical.

The area without reduction of transparency is repeatedly being transversed by airworthy creatures of tremendously diverse and sharply delineated morphology, according to previous reports consistent with birds. For further specifications ornithologic consultation is highly recommended.

It would be, however, important to mention that predominantly the inferior areas are crossed by seemingly not idiopathic existent bands of firm, stone like material, covered by an abundance of metallic foreign bodies with many different sizes, shapes and brightness. It cannot totally be excluded that these are steered with certain intentions by incorporated, cognitive capable beings. In the event of larger conglomerations of the above mentioned metallic foreign bodies, a certain tendency of reduced mood of the encased beings cannot totally be ruled out.

Rarely, collisions of these objects can be depicted, often accompanied by acute inflammation, occasionally severe morphological impact or seldom even complete necrosis of the biological inclusions.

Nothing else noteworthy.

Yours sincerely,

Bernhard Szankowsky (senior consultant in Diagnose Zentrum Urania) ■

Head and neck crossword puzzle

Soraya Robinson

Across

1 facial fat pad
2 4th branch of external carotid artery
3 belonging to the lower jaw
4 function of medial and lateral pterygoid muscle
5 hoarseness
6 a wide open laceration is
7 develop in oral mucosa in Behcet's disease
8 syllables referring to usage of liquid nitrogen in trigeminal neuralgia
9 abbreviation for rheumatoid arthritis
10 storage medium for movies
11 brand of electroshock weapon causing contraction of striated muscle with potential eye injury
12 Latin dative singular for eye
13 nonneuronal cellular elements of the nervous system
14 abbreviation for organic psychosyndrome
15 immunoglobuline E
16 difficulties breathing
17 abbreviation for history of present illness
18 abbreviation for „other"
19 abundant in radiology departments
20 chemical element protecting from radiation exposure
21 malignant bone or soft tissue tumour
22 tumour with bigger deep than superficial extension
23 short, often structured summaries of research
24 Asian fruit boosting immune response
25 syllables referring to dead tissue
26 essential mineral

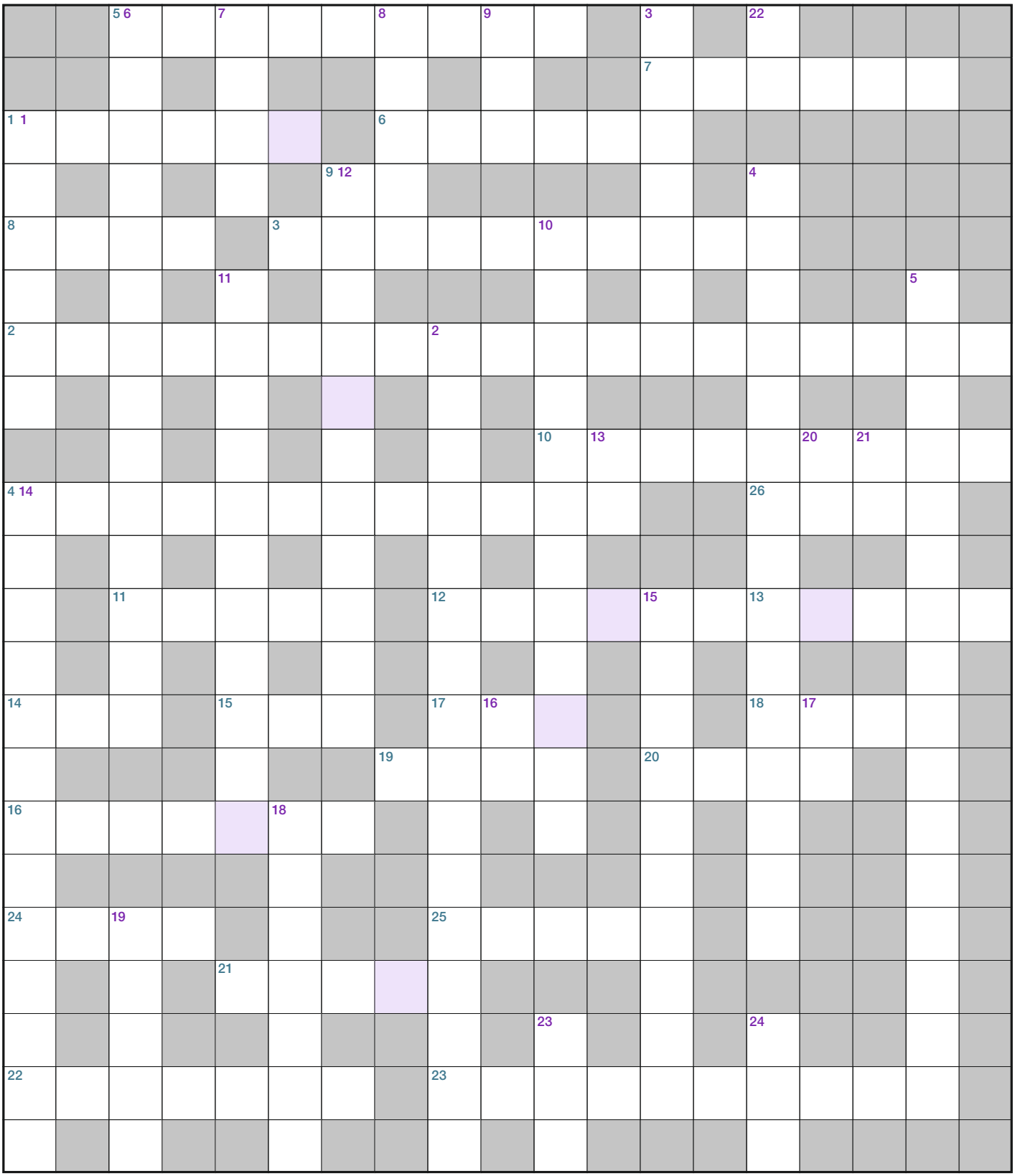
Down

1 towards the oral vestibule
2 IX. cranial nerve
3 skull base opening for nerves and vessels
4 blasted suture in midface fracture
5 disease caused by bacterium Bartonella hensellae
6 inflammation of the lacrimal gland
7 abbreviation for special type of dementia
8 differentiated part oft the body formed by different tissues with own function and vascularization
9 abbreviation for intraocular hypertension
10 branch of medicine aimed at altering a patient's conduct influencing health or adapting to disease
11 dyspepsia
12 terminal continuation of posterior cord of brachial plexus with sensory and motor functions from nerve roots C5-T1
13 inspiratory capacity
14 salivary gland malignoma with neurogenic spread
15 nerve supplying the superior rectus muscle
16 prothrombin time
17 identifying data
18 external
19 different areas (e.g. tongue for tasting)
20 abbreviation for diabetes insipidus
21 phase of gradient echo sequence, where fat and water signals are additive
22 subcutaneous
23 abbreviation for turbo spin echo
24 enzyme increased in sarcoidosis

→ For the solution of the crossword puzzle please refer to page 88.

Head and neck crossword puzzle

Soraya Robinson



→ For the solution of the crossword puzzle please refer to page 99.

Head and neck crossword puzzle – the solution

Soraya Robinson

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22 I	C	E	B	E	R	G		23 A	B	S	T	R	A	C	T	S		
C		S			D			L		E				E				

3D-Printing – bone replacement implants

Stefan Baudis
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Autologous bone grafting is currently the most frequently used method for bone replacement, although key disadvantages like donor site morbidity, graft resorption or limited shaping of these grafts have not been solved. Autologous free bone grafting serves as gold standard and shows good osteoinduction and osteoconduction in the management of smaller bone defects.[1] In larger reconstructions, however, it results in poor osseointegration and graft resorption caused by deficient blood supply. Alternative therapeutic approaches, such as alloplastic bone replacement materials, have been developed. Alloplastic bone replacement materials, however, feature unsatisfying biological and mechanical properties.[2] For this, a steady increase in the demand for bone graft substitutes is expected. Bone grafts for the craniomaxillofacial region have a special position, because they are technologically very demanding as patient-specific implants are highly desired.

Current solutions for the trauma care in the maxillofacial region are complicated and involve a range of semi-finished products, which need to be adapted to the individual shape of the patients' bone by the surgeon. This is of course a high burden for patients, labor-intensive, and generally contributes to high costs of such treatments. Individualized 3D printed implants enable a digital surgery planning and patient-specific templates, e.g., cutting stencils, can be provided. This increases the quality of treatment at decreased costs, which are already reduced by ~one third considering the reduced surgery times alone.[3] Moreover, the average time of hospitalization of 10 d is easily reduced by 2 d.

We address this particular point in our research: We combine cutting edge 3D printing technology[4] with the latest findings in patient specific treatment. The envisioned therapy is based on CT scans of the defected bone area. The surgical procedure is subsequently planned by CAD. Surgical guides are 3D printed and facilitate the removal of the excessive bone for an ideal grafting of the patient-specific implant. This implant itself is also 3D printed and consists of materials, which support the bone regeneration, but will degrade over time.

Polymerization by the aid of light ("Photopolymerization") is a very powerful tool to create materials *in situ*. The very fast transition from liquid formulations to solid materials is exploited in dental restoration and became even more popular with the emerging of 3D printing technologies and biocompatible, biodegradable materials.[5] The techniques enable the provision of patient-specific implants with excellent shape accuracy and reasonable throughput. However, due to the layer-wise manufacturing approach, only carefully selected high-performance materials deliver artefact-free prints. Photopolymers are the state-of-the-art material for dental restoration. The properties of tooth substance are related to bone, however, fundamentally different in many contexts. Dental restoration materials are designed to be non-degradable and are – in general – not in contact with living cells. Most common monomers are methacrylates, which are avoided for bone substitute materials owing their cytotoxicity and their degradation products, which provoke inflammation. This is the reason why this technology became standard in dental industry yet has not reached the breakthrough in clinical applications to heal bone. Our group pioneered to use vinyl esters (VEs) as substitute to acrylics.[6] VEs are up to two orders of magnitude less toxic than acrylates and harmless low-molecular weight polyvinyl alcohol is the major degradation product. Finally, these materials have proved their suitability in *in vivo* models (Figure 1).[7] ››

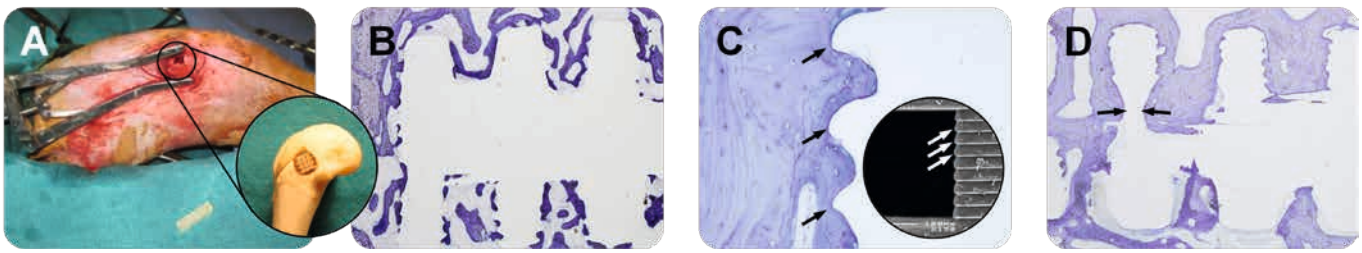

Fig. 1: A) Model defect in the knee of New Zealand white rabbits, treated with 3D printed implants. B) After 4 weeks von Kossa stain indicates formation of new bone. C) The layer-wise manufacturing process creates perfect anchorage points for new bone. D) After 12 weeks first signs of degradation.

3D-Printing – bone replacement implants

Stefan Baudis

Currently, we approach a more relevant model. A critical defect is introduced into the lower mandible of sheep and treated with a 3D printed implant with the exact geometry of the defect (Figure 2).

Fig. 2: Lower mandible of sheep with a model defect introduced by the aid of a 3D printed stencil (left), treated with a 3D printed bone replacement implant (right).[8]

The challenges, we currently face with this approach, are (1) the high material requirements for materials fixated by screws, (2) the imbalanced degradation characteristics, and (3) the insufficient vascularization of the large implants. ■

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CT unmasks air-business: Big boxes and half empty packages inside

Angela Tichy
Austrian Association for Consumer Information
translation Soraya Robinson

Customers have got used to large promotional messages on packaging so that there is hardly any space for the list of ingredients or the expiry date, where you either need eagle eyes or a magnifying glass. Less relaxed are consumers about deceptive boxes and plastic wrappers. German law and the European Breakfast Cereal Association state that the air volume in packaging must not exceed 30% of total volume. There is no such regulation in Austria.

EU abolished standard sizes of packaging in 2009, which opened new doors for manufacturers. Chocolate bars don't come in 100g, but can have any weight. It is not unheard of that prizes stay the same, but weight is reduced. Another option is to offer a product with new, bigger packaging at a higher prize – with the old and therefore smaller weight inside.

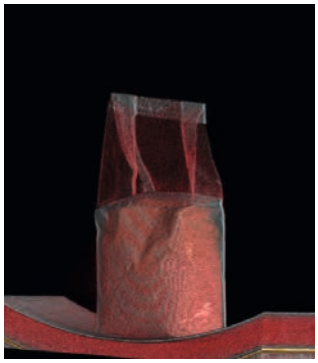
Common practice is also to offer „2 at the prize of one" or „25 % more content" encouraging unplanned purchase. Only at home (if at all) do the customers notice that this was hardly a bargain.

Even though producers should endeavour to keep waste and therefore packaging as low as possible, half empty boxes and bags are not infrequently found. This is often being justified by the fact that high-speed machines fill the goods into plastic bags and boxes and that inadvertently some air is also packed, which should actually also protect fragile cereals and crisps. Furthermore, large boxes can be used for many different goods, which facilitates transport on paletts and reduces number of deliveries. Sometimes it is also argued that some bottles or pots need a certain size to accomodate the label. But boxes show net weights and the basic prize is on the shelve. So isn't all well?

Unless you are a champion in mental arithmetic and can really focus on calculating despite the ever present music in supermarkets and narrow, busy aisles, you might run into trouble, if you have to remember and compare basic prize for 1 kilogram of one product with a basic prize for 100 grams of the product on the next shelf. Things get even trickier, if pickles or olives are immersed in fluid, where you have to go for the drained net weight. All in all comparison is not that easy!

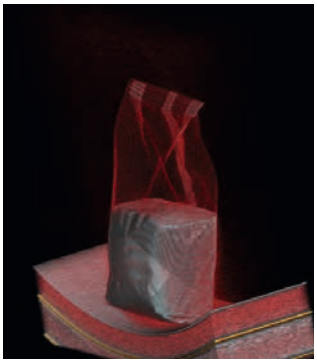
Marketing departments are imaginative to encourage customers to go for their product. Big boxes are known to be more attractive. So the bag is pumped up with air and the customer can't feel the filling quantity. Small inner bags are put in bigger outer boxes and the inspection window is positioned in a way that makes you believe the box is full. Bottles and jars are made of dark glass, so you can't look inside.

And this is, where CT comes in! The Austrian Association for consumer information has visited our institute with their shopping trolley full of consumer goods, which have annoyed customers, when they noticed that they got less than expected. You will be astonished to see, how little content some packages offer!! ■


Brown sugar


Biscuits


Coffee pads


Chocolate powder

On Sinuses in the Cave Bear Group

Gerhard Withalm

A quick overview on a commonly overseen feature of ursid anatomy

The cave bear, originally described as *Ursus spelaeus* ROSENMÜLLER (1794) from Zoolithen cave close to Burggaillenreuth (S-Germany), is a prominent fossil within the caves of Europe and N-Asia as well. Its prominency is based on its abundance and size. The taxon *Ursus spelaeus* remained unchanged until 2014 when it was splitted into four different (sub-)species by RABEDER et al. (2004), based on a combination of traditional morphometrics and paleo-DNA analysis. Actually the cave bear group consists of seven (sub-)species: *Ursus spelaeus spelaeus, U. sp. eremus, U. sp. ladinicus, U. ingressus, U. deningeroides, U. rossicus* and *Ursus kanivetz*. Cave bears were vegetarians, probably feeding on meat only occasionally.

When you take a closer look on the profile of a cave bear skull (Fig. 1a), it is obvious that there is an inflated region, a domed forehead, formed by the ossa frontalia and ossa parietalia, the so called „glabella“, which is typical for members of the cave bear group. Brown bears (*Ursus arctos*) have only a tiny glabella (Fig. 1b) and polar bears have no glabella at all, see Fig. 1c. »

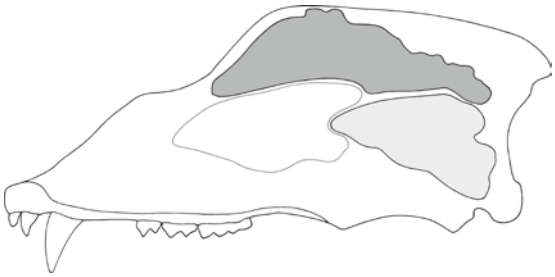


Fig. 1a: Schematised sagittal section of a typical cave bear (*Ursus ingressus*) skull, showing the brain case (light grey) and the sinus frontoparietalis (middle grey).

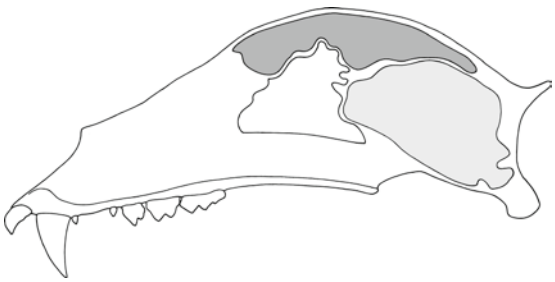


Figure 1b: Schematised sagittal section of a typical brown bear (*Ursus arctos*) skull, showing the brain case (light grey) and the sinus frontoparietalis (middle grey).

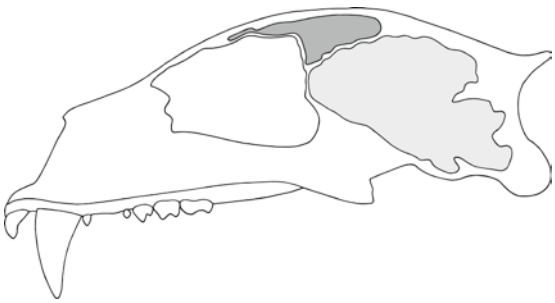


Figure 1c: Schematised sagittal section of a typical polar bear (*Ursus maritimus*) skull, showing the brain case (light grey) and the sinus frontoparietalis (middle grey).

On Sinuses in the Cave Bear Group

Gerhard Withalm

A typical cave bear skull shows the following compartments: the snout with a big and usually emptied room for the ossa turbinalia, the domed (fore-)head with its big sinuses, partly covering even the brain case, and the region of the brain case itself with its internal separation by the tentorium osseum cerebelli. And now for the use of sinuses. There are several theories on the purpose of sinuses in men and bears:

a. Insulation against cold climatic conditions
b. Insulation against heat
c. Enlargement of the surface of the skull
d. Sexual dimorphism, i.e. to look more male, or female
e. To make the skull more lightweight
f. To have a more impressive (voluminous) voice
g. To have a perfect place for inflammations (to support otorhinolaryngologists)

In cave bears, we can exclude some of the aforementioned purposes. We can exclude sexual dimorphism as there is no evidence for it, we can exclude insulation as cave bears mostly lived under temperate climatic conditions and we have no evidence for the sound of a cave bear's voice at all, and lastly, sinuses were definitely not a perfect place for inflammations, otherwise they would have been disadvantageous to the species. »

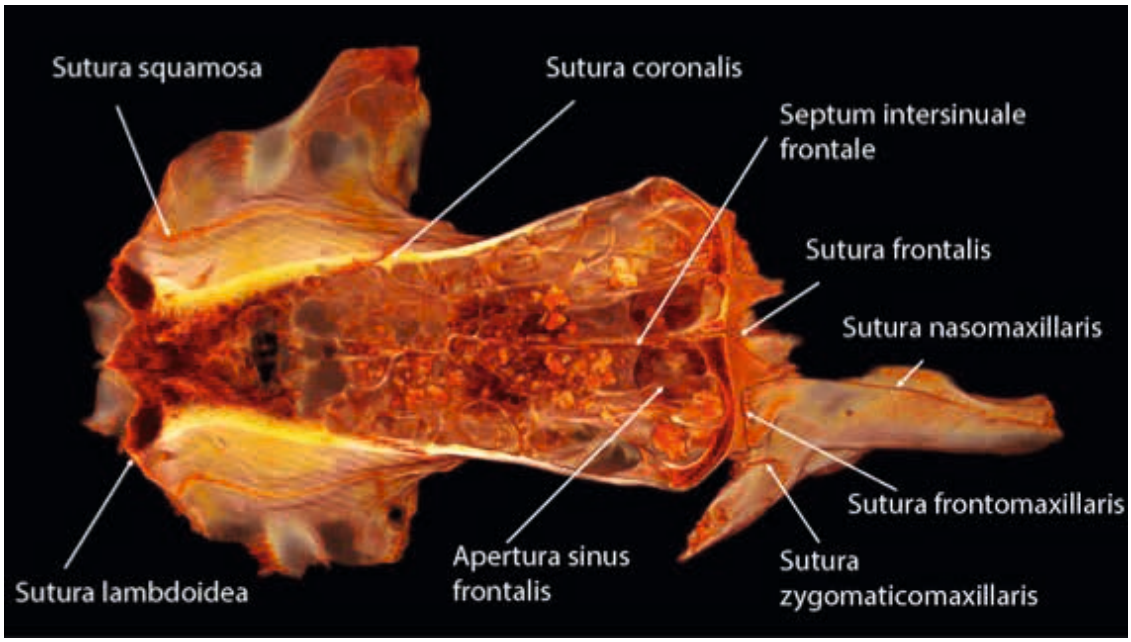


Figure 2: *Ursus eremus* RABEDER et al. (2014): 3D-reconstruction from CT-data of a cave bear skull in norma dorsalis from Medvedija jaskyna (SK), virtually cut off, showing the sinus frontal and s. parietalis.

On Sinuses in the Cave Bear Group

Gerhard Withalm

The hard facts point towards an enlargement of the surface for the masticatory muscles, mainly for the musculi temporalis et masseter. And for a more lightweight construction, which is still rigid enough for its purposes. This makes sense, as cave bears were secondary vegetarians with teeth, in general more suitable for an omnivorous diet. The occlusal surfaces of cave bear's teeth changed by time and the molars became wider and longer, with more cusps for a better mastication of plants, but still far away from features typical for grazers and browsers. Palynology has shown that cave bears preferred this type of plants, cows also like better than grass. Mastication of plants needs higher pressure and a bigger occlusal surfaces of teeth, because it is more exhausting than feeding on meat and carcasses. Thus the size of m. temporalis and also of m. masseter increased as an adaptation for the new diet, directly leading to the need of more surface for their onset.

How to provide the masticatory muscles with a bigger surface within rigid bony structures? The most natural way is to separate lamina interna from lamina externa, leading to internal lacunae, called sinuses. The domed forehead of cave bears, the glabella, originates from a synchronised formation of sinuses in the ossa frontalia and the ossa parietalia as well, leading to more surface for the onset of masticatory muscles. That's the reason why cave bears have not only a frontal-, but also a parietal sinus as well. The latter extends towards the ossa occipitalia to various degrees, thus covering the brain case at least partly, see Fig. 2.

On one hand, sinuses of cave bears were crucial for sustaining extended periods of hibernation, which became necessary due to the approach of the last glacial maximum (LGM) with its prolonged winters with less or no food at all. On the other hand, it limited their ability to adapt their diet to the changing climatic conditions and contributed to their gradual extinction, compare to PÉREZ-RAMOS et al. (2020). A fate, that we all will probably share. ■

Video:
Ursus ingressus RABEDER et al. (2004): 3D-reconstruction of a skull from CT-data, showing the internal structures.
Please note the voluminous sinuses in the frontal and parietal region!

Watch now!

Literature cited:

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PÉREZ-RAMOS, A., TSENG, Z.J., GRANDAL-D'ANGLADE, A., RABEDER, G., PASTOR, F.J. & FIGUEIRIDO, B., 2020: Biomechanical simulations reveal a trade-off between adaptation to glacial climate and dietary niche versatility in European cave bears. — Sci. Adv., 6 (14):eaay9462; DOI: 10.1126/sciadv.aay9462

Unacceptable Rates of Diagnostic Error in Neuro/ENT Imaging: Causes and Solutions

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Part 1:
Causes of Error – The WIDI SIM Experience:
What we know, and what we don't.

Since 2016, the ACGME Milestones require documentation of a resident's competency for the Entrustable Professional Activity (EPA) of requiring independent (distance supervised) imaging interpretation.[1-4] (Figure 1). The expectations of moving through these milestones presume an effective curriculum and effective training methodology. It would be best if the curriculum be well defined and the training methodology based on modern educational principles. If that is true then the progress noted in Figure 1 and related very much to the principles of deliberate practice also illustrated in Figure 1 can be realized. The honest question is there actually a defined curriculum in a particular radiology training programs and does the training program provide adequate directed deliberate practice of the delivered curriculum material. »

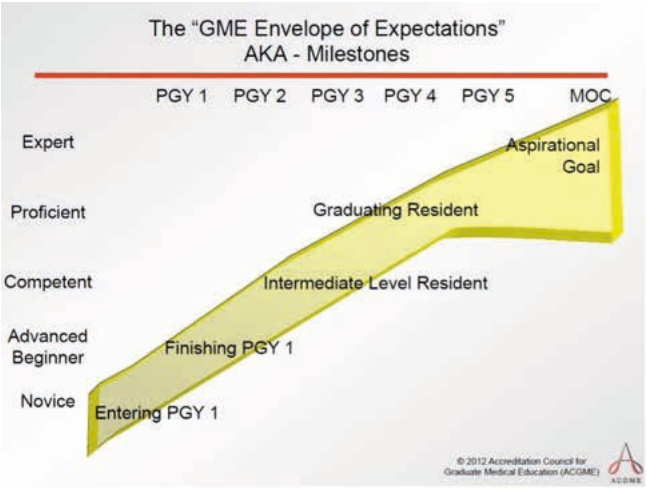
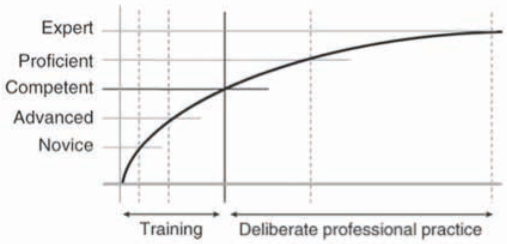


Figure 1. General curve of skills acquisition, using the stages of Dreyfus and Dreyfus (1988Dreyfus HL, Dreyfus SE. Mind over machine. Free Press, New York 1988 [Google Scholar]). Dotted lines signify hypothetical moments at which a trainee reaches a competence threshold level for a given activity.



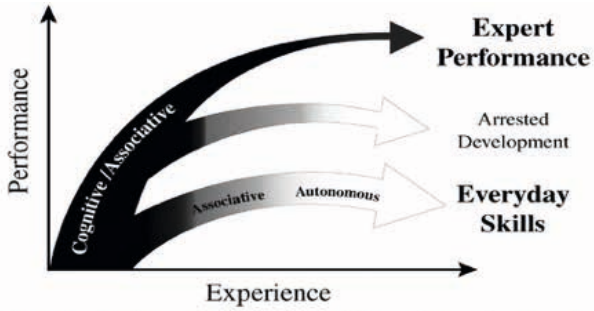


Figure 38.1. An illustration of the qualitative difference between the course of improvement of expert performance and of everyday activities. The goal for everyday activities is to reach as rapidly as possible a satisfactory level that is stable and "autonomous." After individuals pass through the "cognitive" and "associative" phases, they can generate their performance virtually automatically with a minimal amount of effort (see the gray/white plateau at the bottom of the graph). In contrast, expert performers counteract automaticity by developing increasingly complex mental representations to attain higher levels of control of their performance and will therefore remain within the "cognitive" and "associative" phases. Some experts will at some point in their career give up their commitment to seeking excellence and thus terminate regular engagement in deliberate practice to further improve performance, which results in premature automation of their performance. (Adapted from "The scientific study of expert levels of performance: General implications for optimal learning and creativity" by K. A. Ericsson in *High Ability Studies*, 9, p. 90. Copyright 1998 by European Council for High Ability.)

Unacceptable Rates of Diagnostic Error in Neuro/ENT Imaging: Causes and Solutions

Anthony A. Mancuso, MD

Wisdom in Diagnostic Imaging (WIDI) was created as a UF College of Medicine – Department of Radiology e-learning resource in the 2010-2011 academic years anticipating this ACGME specific required EPA process. There are three major components to this online resource. These include WIDI Learn, WIDI Consult (a decision support tool) and WIDI SIM.

The first work product of WIDI was WIDI SIM(ulation). Our experience with SIM to date, including identification of systemic learning gaps in Neuroradiology/ENT, is multifaceted and very revealing. Figure 2 shows that in general over 1200 participants to date demonstrate, that on a 10 point scale, Neuroradiology in general proves to be two points out of 10 more difficult, in the critical care imaging domain, than the other subspecialties. This is illustrated by observing the position of the bars in the “case specialty” part of Figure 2.

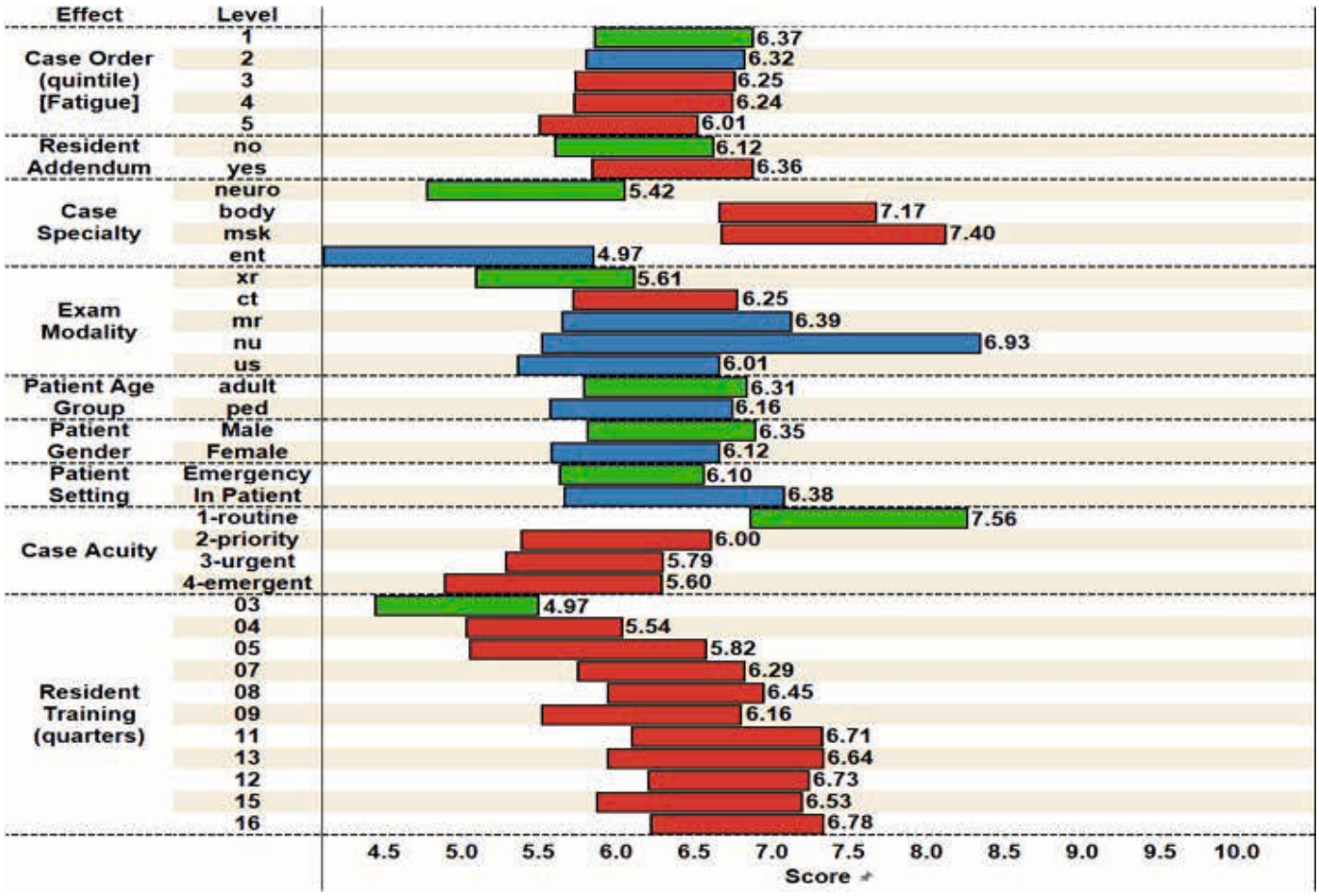


Figure 2 also shows that within the general domain of critical care Neuroradiology, ENT cases appear to be about one half a point more difficult than the already more challenging topic of Neuroradiology compared to other subspecialty areas. The reasons for these differences can be debated. The fact is the differences exist, they are real and they represent the potential for harm. We know that educational gaps are real because this testing methodology is authentic and has been validated.[5,6] Such WIDI SIM data might be used to inform competency based training strategy and the WIDI SIM methodology can be used as a reliable competency based evaluation rubric in diagnostic imaging programs, as well as beyond the training period for lifetime learners, to assure at least achieving and maintaining a reasonable level of peer competency in Neuroradiology inclusive of ENT, brain and spine imaging. ››

Unacceptable Rates of Diagnostic Error in Neuro/ENT Imaging: Causes and Solutions

Anthony A. Mancuso, MD

One might assume that the detection of a case of an invasive fungal rhinosinusitis would be something we teach well, is “know well” or “is done right” and which would consequently have a high WIDI Sim pass rate. Actually, the fail rate in competent detection of invasive fungal rhinosinusitis detection, across institutions, was very substantial on several Simulations. (Figure 3) »

	Avg. Score	residents
	4.22	1,269
suppurative adenitis, ped-ct [1/3]	0.25	103
suppurative adenitis, ped-ct [2/3]	0.56	196
suppurative adenitis, ped-ct [3/3]	1.02	242
mucormycosis, carotid artery and facial n.-ct ..	1.48	239
orbital trauma-ct [1/1]	2.20	238
torticolis, ped-us [1/1]	2.36	327
invasive fungal sinusitis-ct [1/3]	2.45	103
invasive fungal sinusitis-ct [3/3]	3.06	196
invasive fungal sinusitis-ct [2/3]	3.90	126
coalescent mastoiditis-ct [1/1]	3.02	102
fish bone lodged in hypopharynx, ped-xr [1/1]	2.44	327
pharyngitis, complicated, lemierre's-ct [1/2]	1.91	103
pharyngitis, complicated, lemierre's-ct [2/2]	5.36	239
coalescent mastoiditis, ped-ct [1/2]	3.65	126
coalescent mastoiditis, ped-ct [2/2]	3.79	190
angioedema, neck-ct [1/1]	2.73	240
orbital pseudotumor, ped-mr [1/1]	3.82	305
orbital abscess-ct [1/1]	5.29	103
dental infection, cellulitis, no abscess-ct [1/1]	5.35	316
peritonsillar abscess-ct [2/2]	4.15	195
peritonsillar abscess-ct [1/2]	7.43	127
sialadentitis, acute-ct [1/1]	6.15	350
invasive fungal sinusitis-mr [1/1]	7.26	124
necrotizing faciitis, face/neck/chest-ct [1/1]	8.01	325
sinusitis, intraorbital extension, ped-ct [1/1]	8.40	350
epiglottitis, ped-xr [1/1]	8.31	195

Case Name Num	Case Name	Avg Score	Avg Model Estimate	no error	not done	observ	interp	both
mucormycosis - carotid artery and facial n.-ct [1/1]	Mucormycosis - Carotid Artery and Fa	1.45	-2.74		4	229	10	
sinusitis, fungal-ct [1/3]	Sinusitis, Fungal	2.45	-1.2	4		97	1	1
sinusitis, fungal-ct [2/3]	Sinusitis - Fungal	3.9	-1.2	20		93		13
sinusitis, fungal-ct [3/3]	Invasive Fungal Sinusitis	3.05	-1.2	41	1	124	13	18
sinusitis, fungal-mr [1/1]	Sinusitis - Epidural abscess	7.25	2.44	60		40	24	

Case Name Num	Case Name	Avg Score	Avg Model Estimate	no error	not done	observ	interp	both
pharyngitis, complicated, lemierre's-ct [1/2]	Pharyngitis - Lemierre syndrome	1.82	-0.38	3		76	1	
pharyngitis, complicated, lemierre's-ct [2/2]	Tonsillar/Peritonsillar Abscess - Lemirre	5.28	-0.38	3	4	234	2	
abscess, peritonsillar-ct [1/2]	Abscess - Peritonsillar	7.43	0.12	77		1	47	
abscess, peritonsillar-ct [2/2]	Peritonsillar Abscess	4.11	0.12	4	2	96	39	56

Case Name Num	Case Name	Avg Score	Avg Model Estimate	no error	not done	observ	interp	both
suppurative adenitis, ped-ct [1/3]	Retropharyngeal Suppurative Adenitis	0.25	-3.44				103	
suppurative adenitis, ped-ct [2/3]	Retropharyngeal Suppurative Adenitis	0.56	-3.44		1	6	190	
suppurative adenitis, ped-ct [3/3]	Retropharyngeal Suppurative Adenitis	1.02	-3.44	6	1	48	184	4

Unacceptable Rates of Diagnostic Error in Neuro/ENT Imaging: Causes and Solutions

Anthony A. Mancuso, MD

The reason we are detecting such error, in a relatively common task, is likely in part because lack of training in observational discipline. A similar rate of failure is present in the domain of critical care Neuroradiology, in general, is identified with in the detection of hyperdense basilar arteries and epidural abscesses (data not shown). Other areas of unacceptably high failure rates in ENT critical-care imaging are listed in Figure 3. The rate of acceptable/optimal scores in ENT critical-care imaging are also demonstrated in Figure 3. However, in many of those instances the findings may be reasonably detected and a proper general diagnosis is offered but there is frequently added value missing from interpretations in part represented by the gap between the average score and a score of 10. As expert consultants we should be operating in the domain of a 9 or a 10 on every case to assure the delivery of optimal care.

It is likely that there is a lack of effective training both in establishing and teaching specific observations that need to be emphasized in particular clinical scenarios. This is grafted on a general lack of training in observational discipline as well as lack of a training focus of how to determine that studies are negative with a high degree of confidence. After all, one of the most important thing in expert does is determine a study is negative with a very high degree of confidence. Creating a situational awareness and a matching stream of consciousness of observational discipline, while interpreting such studies is essential for expert-like evaluation in all instances of imaging and in all scenarios. Lacking a system for calling a study negative in a particular clinical situation, with a high degree of confidence, is letting our trainees and those seeking postgraduate continuing education down. In other words they are not making enough proper and/or focused observations to assure that the study is, in fact, free of significant findings. This might reflect a bias toward “holistic” (a.k.a. as “Gestalting” in the old days) analysis and interpretation of an image rather than a more disciplined search pattern.

This type of error category detection opportunity is not available in other currently used evaluation methods because in those other evaluation rubrics the person being tested knows **there is an abnormality present so that the “null hypothesis” does not need to be tested; it is just assumed to be false.** This is nothing like real life practice and is a major deficiency in current evaluations, persistent from the earliest adoption of these examinations in formalized radiology training. It is only human nature that the trainee will then keep looking, on board or in-service exams or the like, until he or she finds at least one significant abnormal observation that is likely to provide a suitable and likely correct answer. This is reminiscent of the “gaming” that goes on in multiple-choice tests, wherein two obvious answer options out of four can be immediately eliminated as clearly wrong.

Moreover, in other current testing methods with multiple choice format, the accompanying questions being asked, along with the few related images, are leading. WIDI SIM is a test design deficiency that excludes the possibility of understanding the false positive rate for a trainee as part of his or her competency portfolio. Our estimated false positive rate on the aggregate of all WIDI Simulations to date is in the range of 25–30 %. This is very similar to the now 70 year of a persistent 30% error on positive studies. It is simply the “other side of the coin”.[7-9]

False positive rates often have resource consequences and occasionally result in morbidity due to useless, unnecessary testing. The problem begs for a training methodology that systematically strives to eliminate false positive errors and explicitly trains how to call a study negative with a high (expert level) degree of confidence. It must be clearly understood and emphasized in training that calling a study negative is the hardest thing to accomplish accurately and the approach to this task must be highly systematic and rules-based and not left to a “Gestalt”, “Holistic“ or intuitive approach. Those approaches may be valid added increment of value for an expert image interpreter but they do not serve a novice/trainee well.

While some very talented and experienced individuals may be able to intuitively sense a study is negative, even their strong expertise will eventually let them down. “Gestalt” is an old school trap that can cause serious harm. Looking and hoping to notice an abnormality “jumping out at you” (as our trainees like to say in the front of the classroom when they take cases) is an ineffective way to take care of patients. »

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A skilled, competent radiologist will observe and think about the patient, represented by images of some or all of their body on the workstation, seriously considering the context at hand, and all relevant data available as well as observing agnostically to that context. This dual approach optimizes analysis and diminishes bias effects. If this takes extra time, so be it. We can go a little slower and earn less RVU credit for the benefit of quality and safety of our patients.

We likely believe we are doing well in detection of tonsillar and peritonsillar abscesses complex otomastoiditis believing that these are examples of "what we know" or at least what we are teaching well; however, there is a more acceptable pass range when such cases are observationally and interpretably simple and straight forward. Contrast those more simple cases with those of tonsillar abscess complicated by vaso occlusive disease or the more advanced cases of mastoid and middle ear infection wherein the rate of completely accurate assessment of the case drops off significantly (Figure 3). This is also reflected in the spectrum of cases used to evaluate invasive fungal rhinosinusitis where the fail rate was very substantial in detecting relatively limited disease but detection improved significantly when there was an obvious associated abscess (Figure 3). Invasive fungal rhinosinusitis is a disease that is optimally accurately diagnosed early to avoid significant morbidity and sometimes mortality especially in severely compromised patients which are a growing proportion of many practices.

We must establish "what we know and … what we don't know." Most of the cases that are in 70-80 % or better pass range are common, uncomplicated pathologies. Alternatively, these may represent instances of clinical scenarios which are an area of emphasis in training such as looking at lateral plain films for epiglottitis. This is at times driven by what subjects may or may not appear on standardized board examinations. In the latter instance those being evaluated are sometimes "looking for these questions"; this practice of teaching and studying to the test is a fundamental problem with our entire system of education that will not soon be overcome. Unfortunately currently designed evaluation rubrics do not assess true competency because they are not authentic; authentic competency evaluation rubrics present problems as they actually occur in real life.

It is difficult from our current experience though to understand exactly why trainees consistently do well in certain scenarios/competencies. Obvious factors include that the disease states and scenarios tested are commonly encountered even in our haphazard, apprenticeship training model and those wherein the observations are relatively obvious and the interpretive process simple. There are likely programmatic emphasis factors contributing to securing a "pass" for reasons that are not entirely decipherable. This may include teaching to board exam success rather educating to real life success in patient care. A correct diagnosis will from time to time come from such a regurgitant approach but it is not a reliable method to train the reasoning skills and effective interactions so critical to medical decision making. This training fault becomes most obvious in the domain of interpretive error. While we understand that 80 % of error in diagnostic radiology comes from lack of accurate observations. Some of that is a result of lack of training in observational discipline. However about 15–20 % of error is due to interpretive error. In the critical care ENT imaging domain this is best illustrated by our experience in the evaluation of suppurative retropharyngeal adenopathy. The correct diagnosis, in a scenario where the observational task is simple, leads to an interpretive error in over 95 % of the three cases given to over 500 residents over the last 10 years. (Figure 3) This is not trivial. Calling a suppurative retropharyngeal lymph node which is typically curable by a course of intravenous antibiotics, a retropharyngeal abscess will very often lead to attempts at "abscess" drainage and what is in reality a medical disease. Over 90 % of these cases are in the age range of 1–4 years of age and the consequences of an unnecessary operation are obvious. Our data shows that there is a serious lack of understanding of synthesis of the observations in these cases and assignment of an accurate diagnosis that leads to the most favorable medical decision-making. Another example of what we don't know and apparently failed to teach successfully.

We know better and we can do better by applying the modern educational techniques so familiar to our own primary and secondary school teachers as well as college instructors, professors, and educators and trainers in industry.[10-19] Those dominantly adult educational methods are the underpinning of the WIDI construct for Competency Based Training[10-14] in Diagnostic Radiology/Imaging. »

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As time passes, we will accumulate significant data to determine whether our methods are leading to better outcomes, and where they may still fall short. I look forward to sharing more of our experience in the future. Anyone who would like to see our methods for themselves can make full use of our learning tools at **widionline.xray.ufl.edu** ■

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Unacceptable Rates of Diagnostic Error in Neuro/ENT Imaging: Causes and Solutions

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Part 2:
Solutions for Error-Medical Education and Training – How did we arrive at the current state in Neuroradiology/ENT Imaging Education? How do we achieve a more optimal state?

Historically, our patients have always expected and deserved competent healthcare providers. In essence, they want and deserve an expert looking at their imaging studies. Those images, properly derived and interpreted create part of a foundation for accurate medical decision-making. Rightly or wrongly humans have put their faith in their "healers" from ancient times to the present. This is especially true of their physicians. What guarantees that competence and that their trust is well placed? What is the foundation and process for attaining competence? Moreover, what method establishes mastery of a specific competency? These are all questions under review in the context of the current methods of general medical education. Comprehensive change has been too long in coming.

There is a mandate underway that medical professionals shift our educational model at the medical school level from that established in the early nineteen hundreds in response to the Flexner Report[1] to a curriculum of competency based education and training. The American Medical Association supports this movement toward competency based medical education (CBME).[2]

The Flexner "model" of medical education, generally established as the required standard in the early 1900's, became part of an unwritten social contract that moved the practice of medicine from a craft, in a trade/guild construct, to a profession[3]. This attempt to standardize medical education was born in an era of a largely disorganized and haphazard state of formal education with essentially no reliable evidence (truly zero by even today's Level 2 or even 3 standards of reliability) with regard to how to execute effective medical decision-making and treatment. Still, these Flexner inspired curriculum renovations and educational standards represented a good faith effort to begin to hold the medical profession accountable for a reasonable educational foundation of those who choose represent themselves as professionals competent to diagnose and treat patients. There has been steady improvement in the century since the Flexner Report, in the guidance and oversight that has grown out of the AAMC and ACGME, but that progress fails to meet the current complexity of the practice or medicine as well as might be possible[4].

We currently practice in an era of enormous, virtually daily, advances in our knowledge base, diagnostic tools (including modern imaging) and treatment options; this extraordinary evidence base can now be reasonably consolidated and relied upon to begin to consistently inform and constantly update the practice of medicine as well as the content of medical education and training. There are also parallel, even more rapidly evolving, developments of IT systems that provide an infrastructure for rapid sharing of evidence-based information. The evolving IT tools provide a backbone for whatever guidance of practice or education we might wish to share with one another; not necessarily as a robotic practice of medicine or method of education but one that is much better informed, updated and disseminated more efficiently than ever possible in the past.

Dr. Lawrence Weed anticipated this in the 1960's with his revelations related to the "Problem Based Medical Record"; another bit of revolutionary thinking coming about 60 years after that of the Flexner Report (5-9). The IT tools, anticipated by Dr. Weed, are now available as living and breathing modern guides and "textbooks". Reliable electronic information resources are, in some ways, a natural evolution of the old Merck Manual and similar guides to clinical practice; those works while heavily dog-eared in the past, are now largely relegated to the shelf and history. »

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The need to update and modernize medical education and PGME and the IT infrastructure to support that effort are parts of the necessary revolution that are here and spreading rapidly if not cohesively. The missing pieces are a comprehensive CBE curriculum and the evaluation rubrics necessary to fairly and properly assess mastery/competency of the specific competencies that make up the spectrum of a particular physician's practice.

The Flexner "model of medical education" was established long ago in medical schools and currently remains the base methodology. However, the postgraduate method of training, in both general and specialized medicine, remains essentially in the model of apprenticeship type education. This adherence to the old model leaves post graduate training method fundamentally in a craft/trade/guild construct, albeit much improved and codified, while its graduate trainees emerge as respected, and trusted, competent professionals. This is manifest in the typical internship and residency model, now solely referred to as residency training, which has been in place since the early 1900s. While there has been some refinement of the training standards in approved programs, a comprehensive, detailed written curriculum and pathway to assuring competency really does not exist. We must move us from our historical approach PGME to one aligned with the extraordinary complexity of a modern practice of medicine by creating a comprehensive competency based curriculum or lesson plan. Such a plan needs to be inclusive of well-defined behavioral objectives that compose the individual skills that must be mastered in a specific clinical scenario/competency. The current system must change radically. It must also develop authentic evaluation rubrics to prove that each competency has been attained rather than the currently accepted non-authentic evaluation rubrics. The time has come for CBME with authentic evaluation rubrics to be the educational method of choice for PGME as well as basic medical school education. This will be a natural extension of the process that began in 1904 with the Flexner Report and the formation of the CBME that, frankly, is too long in coming.

We must abandon traditional shortsighted concepts such as "See one, do one, teach one" as we transform our often haphazard approach to post graduate medical training to one that improves our work product and helps us take better care of our patients. In doing this we must apply modern educational concepts wedded to modern educational IT activities. In doing that we must recognize limitations of standalone lectures and reading assignments without follow-up exercises. Those traditional teaching methods have their place in introduction of topics and directing the learner but in the absence of deliberate practice of the knowledge embodied in a specific competency there will be no durable learning. There will be an absence of the foundation that allows for critical thinking under both familiar and unfamiliar circumstances in the complex problems that confront us on a daily basis in the practice of medicine. We need to move away from the idea that putting a bunch of lectures online is somehow a fulfillment of our educational responsibilities.

All of the tools and values discussed in this installment are be explained in far more detail in a series of essays which are available on our UF website at the following URL: https://widi.xray.ufl.edu/2018/05/10/modern-medical-education-essay-series-part-xv/

The principles are generally embodied in the Bloom Taxonomy of Education. Modern learning techniques to those ends include those of Adragogy (Adult Learning) vs Pedagogy, Experiential Learning, the principles of Deliberate Practice and those embodied in modern educational media design embodied by principles such as Understanding by Design.[9-16]

Our method of training using UFL WIDI Learn (widionline.xray.ufl.edu) combines these educational principles with e-learning driven by an extraordinary content management system at its core. The WIDI method of Learning Pathways, in a modular scenario/competency based format, delivers educational material using traditional methods such as targeted, competency specific, lectures with constant expert feedback and provides concomitant deliberate practice opportunities using full sets of DICOM images. The end result, if used with suitable discipline, will be successful competency-based training acquisition of skills that will eliminate the currently unacceptable high rates of observational and interpretive error that persist and are well documented since the 1950s.

The following illustrations correlate the Bloom Taxonomy of Learning[10] as it relates to WIDI e-learning tools and pathways and a visual introduction to those pathways and methods/tools as they exist at **https://widionline.xray.ufl.edu** ››

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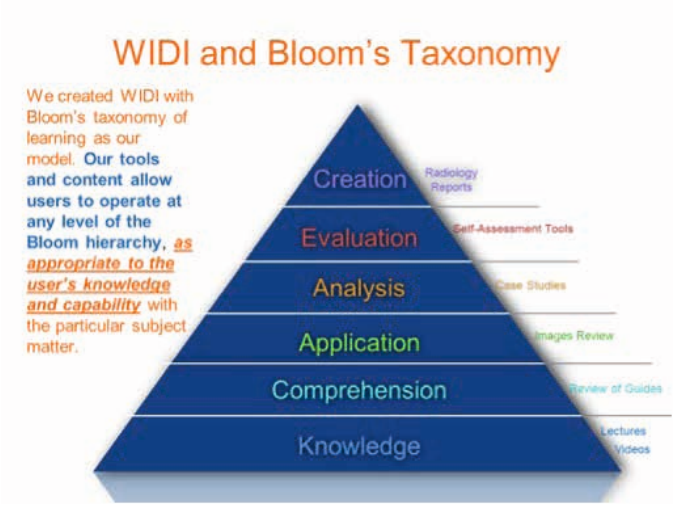

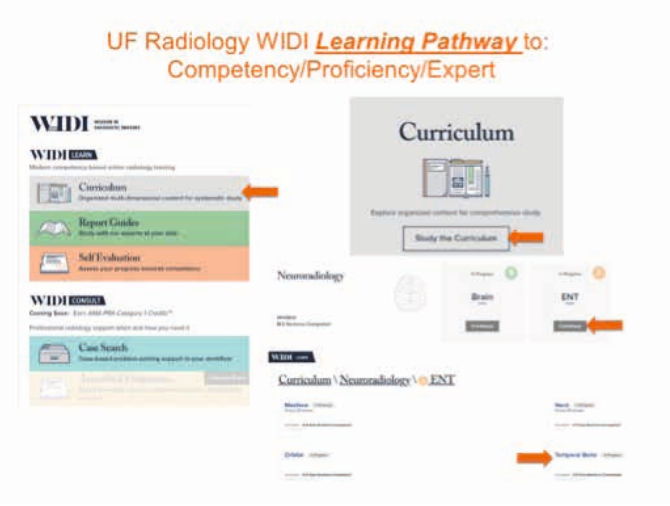

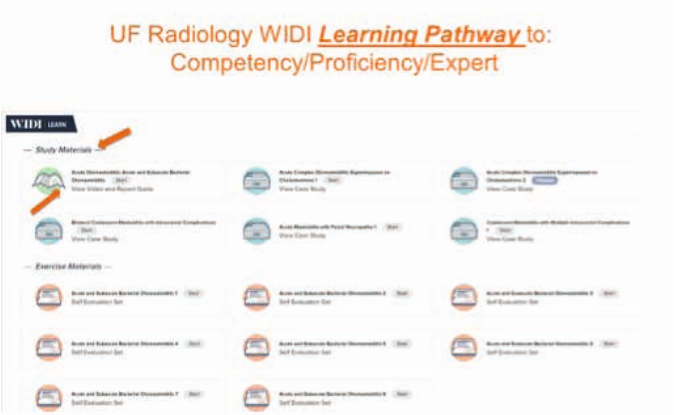

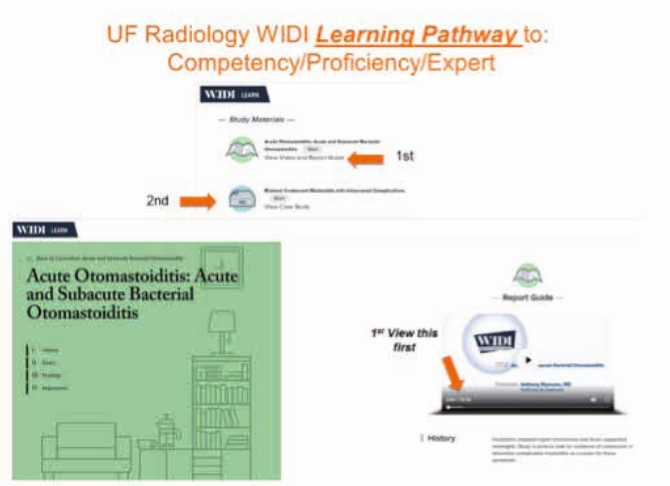

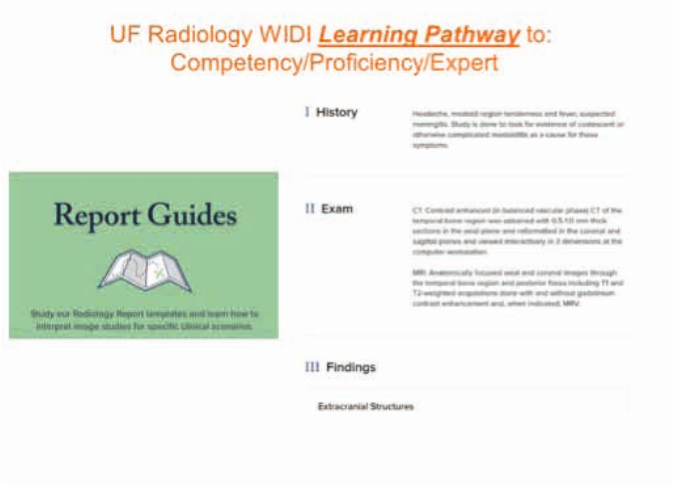

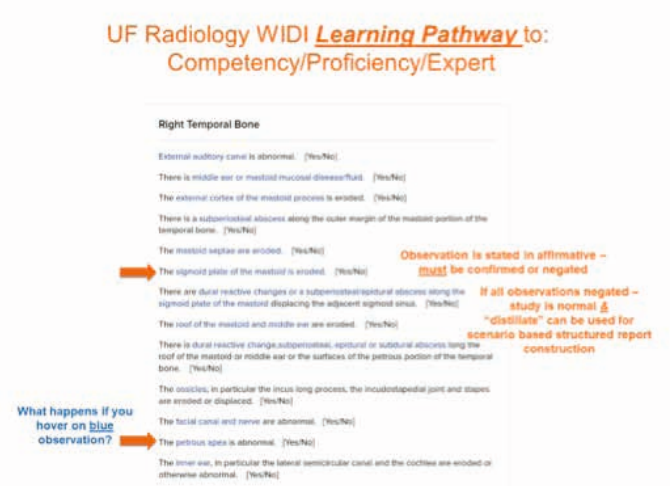

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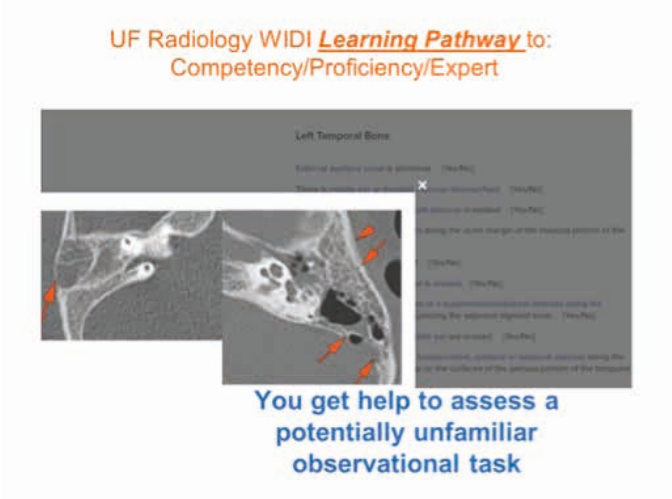

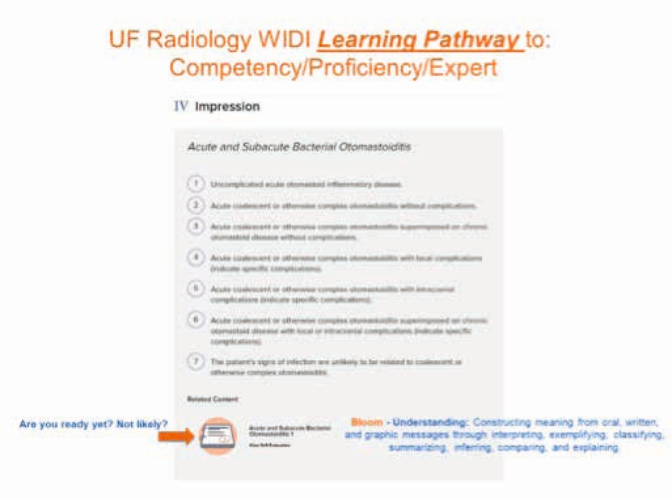

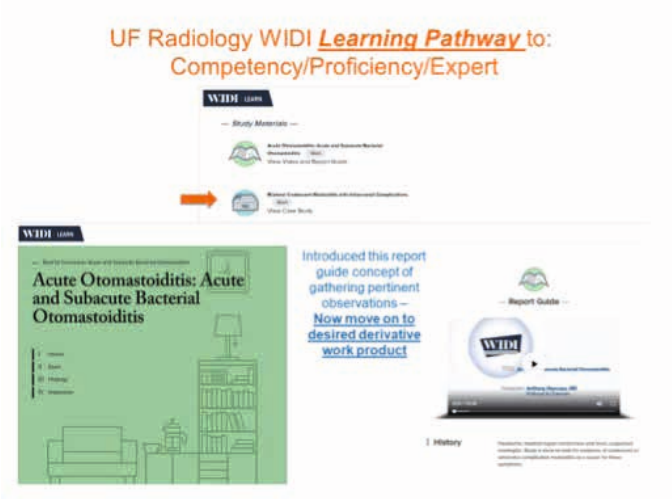

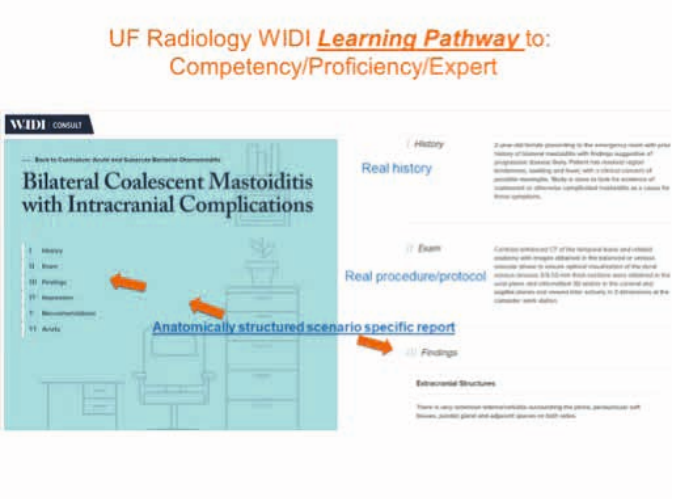

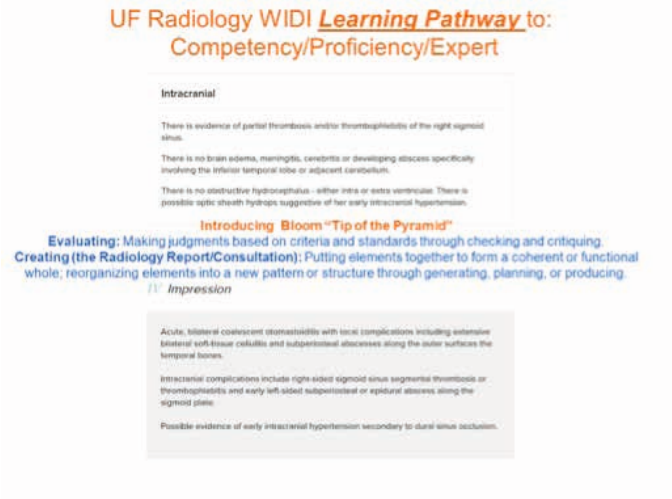

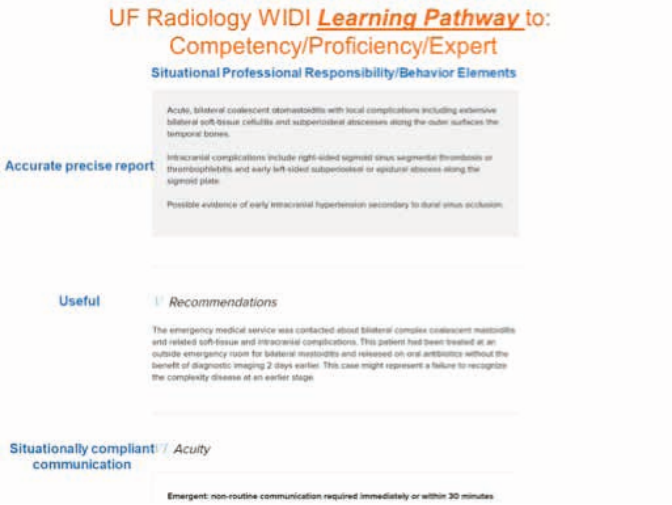

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Psycho-oncological Aspects

Natascha Halasz

A substantial number of cancer patients exhibit psychological stress reactions during disease and treatment, which may develop into severe psychological disorders. Nevertheless, only some disorders requiring treatment are currently recognised and appropriately treated in oncological care. Knowledge about psychosocial stress and mental disorders is therefore an urgent concern for the improvement of psycho-oncological care (Mehnert et al., 2006). This article provides an overview of the prevalence of mental disorders and the main causes of psychological distress in head and neck cancer patients. The objectives and problems of psycho-oncological interventions are explained.

The prevalence of mental illness in tumour patients is significantly higher than in the general population (Leitlinienprogramm Onkologie, 2014). Mehnert et al (2014) describe a 30-day prevalence of 32 % for at least one mental disorder across all cancers. The most common mental disorders in cancer patients are adjustment disorders, anxiety disorders and depressive disorders and – less frequently – Post-Traumatic Stress Disorder (PTSD). Compared to other cancer patients, patients with head and neck tumours are among the most distressed and burdened groups (Moschen & Riedl, 2017), with human pappilomavirus-associated tumors playing a special role.

A chronic disease, cancer may be associated with frequent hospital stays, therapeutic successes, failures and complications, progress and regressions (Mehnert et al., 2006). Particularly critical phases are diagnosis, conclusion of primary treatment and the subsequent period of hope for long-term therapeutic success, recurrence and progression, and palliative treatment (McCormick & Conley, 1995). Patients with head and neck tumors are exposed to high psychological stressors caused by the disease's functional and visual changes and treatment (Grosse-Thie, 2021). Patients are often confronted with disfigurement, stigma, physical disability, pain, chronic fatigue, and suffer impairment of basic human functions such as communication, breathing, swallowing and food intake (Reich et al., 2014). Facing a potentially life-limiting disease and suffering from treatment-related physical aftermaths, may lead to psychological distress, significant reduction of quality of life, sexuality concerns, psychosocial problems (uncertainty about individual roles and tasks, social, financial and occupational problems), psychiatric disorders and increased risk of suicide (Grosse-Thie, 2021). Causes of mental disorders in cancer patients are multifactorial, but often related to the severity of the disease and treatment, lack of individual and social resources, maladaptive, i.e. mainly resignative and passive, coping with the disease, and loss of autonomy and control. Risk factors for mental illness in cancer patients found across studies include: advanced stage of disease, low physical functioning (especially pain), younger age at onset of disease, female gender and history of mental illness (Aschenbrenner et al., 2003).

Psychologists provide clinical services which include diagnosis of mental disorders, psychological counselling, crisis intervention, psychological treatment of mental disorders and psychological support for relatives. Psycho-oncological treatment occurs in an interdisciplinary setting and requires close cooperation among medical and psychosocial professional groups involved in patients' care (Moschen & Riedl, 2017). Healthcare professionals must also recognize when to refer patients for pharmacotherapeutic treatment and/or psychotherapeutic interventions (Reich et al., 2014). Psycho-oncological interventions aim to improve psychological wellbeing and health-related quality of life, reduce side effects and consequences of treatment, facilitate coping with the disease and adherence to treatment, provide information, and strengthen personal and social resources (Mehnert et al., 2006).

Despite the acknowledgement of psychological, social and medical burdens among head and neck cancer patients, studies report that patients receive insufficient screening for emotional distress and lack psychological support (Penner, 2009). Barriers include underreporting of symptoms, insufficient awareness or comprehension of psychological services and lack of recognition of psychological morbidity by the primary oncology team (Pascoe et al., 2004). Unmet psychological needs and comorbid psychological disorders in cancer patients can interfere with optimal outcomes of patients' compliance with care and treatment, negatively impact length of hospital stay and course of therapy, and may lead to poorer medical treatment outcomes (Gold, 2012). Early diagnosis of mental disorders in oncological care and provision of psychosocial support services are of particular importance (Mehnert et al., 2006). Ideally, systematic psychological screening for distress should occur as early as possible, at appropriate intervals if clinically indicated, or repeatedly in the event of recurrence or progression of disease (Leitlinienprogramm Onkologie, 2014). »

Psycho-oncological Aspects

Natascha Halasz

Oncological research and care has traditionally endeavored to first shrink tumours and prolong patients' lives. The effects of cancer on patients' psyches, wellbeing, family and social situations and quality of life were considered secondary to survival. In recent years, psycho-oncology has contributed significantly to connecting between strongly medically-oriented treatment and patients' needs for psychosocial support and accompaniment, thus creating the prerequisite for care as a holistic biopsychosocial model. This new understanding of physical, psychological and social morbidity associated with diagnosis and treatment, places new demands on professionals, highlighting the importance of diagnosis and treatment of psychological symptoms and disorders in cancer patients (Mehnert et al., 2006). The main opportunities for cancer care today lie in improved screening for psychological distress, recognition of the need for psychosocial care, and provision of available psychosocial support within oncological healthcare (Herschbach, 2019). ■

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Immunotherapy of head and neck tumours

Thorsten Füreder

Background

Head and neck cancers comprise a heterogenous group of aggressive malignancies and represent the sixth leading cancer by incidence worldwide[1]. The majority of head and neck tumors (95 %) are squamous cell carcinomas (HNSCC) arising in the oral cavity, pharynx and larynx. Well-known risk factors are alcohol abuse, tobacco smoking, and human papillomavirus (HPV) infection[1]. Standard treatment options include surgery, radiation and systemic therapy. Despite improvements of surgical and radiation therapy techniques and implementation of novel targeted therapies such as cetuximab in the past decade the prognosis of HNSCC patients remains poor with five-year overall survival of 40–50 % in HPV negative disease[2]. In the recurrent or metastatic setting (R/M) the outcome is even worse and long-term survivorship is rarely observed. Therefore, novel strategies for the therapy of HNSCC are desperately needed.

Concept of cancer immunotherapy

Beginning from the 19th century, when William Coley treated cancer with a mixture of "killed bacteria" until the modern era, immunotherapy has evolved to a powerful weapon for anticancer treatment[3].

The significance of an intact host immune response for cancer prevention has been initially demonstrated in animal experiments, which showed and increased incidence of tumors in mice with deficiencies in the innate or adaptive immune system[4,5]. It is well known that immunosurveillance i.e. the recognition and elimination of malignant cells by the immune system constantly occurs in humans as well. Based on the concept of immunosurveillance the term immunoediting was coined.

Immunoediting is a dynamic process consisting of tumor elimination, equilibrium and tumor escape. Tumor elimination represents the successful eradication of the evolving tumor by the immune system. However, if the tumor is not completely destroyed, tumor cells might enter an equilibrium state, where the immune system controls tumor outgrowth but elimination remains incomplete[5,6]. The equilibrium might last for years but negatively selects tumor cells, which can evade the immune system ultimately resulting in tumor spread.

Cancer immunotherapy modulates and boosts the immune system and/or alleviates immune suppression in order to facilitate anti-cancer immune response. Thus, it seems obvious that the term "cancer immunotherapy" represents rather a superordinate concept than a single class of agents. In particular, the landscape of immunotherapy comprises T-cell targeted modulators such as checkpoint inhibitors, cancer vaccines, oncolytic viruses, adoptive T-cell therapy among many others.

Immune checkpoint inhibitors in HNSCC

While the majority of the concepts outlined above are currently investigated in clinical HNSCC trials, immune checkpoint inhibitor (CPI) therapy with pembrolizumab or nivolumab has already entered the clinic and is regarded as the standard of care in the R/M setting. On the molecular level it is well known that T cell regulation i.e. activation or inhibition is mediated via co-stimulatory or co-inhibitory signals. T cells harbor a myriad of both activating receptors and inhibitory receptors (the so-called immune checkpoints) such as programmed death receptor 1 (PD-1)[7]. Activation of this immune checkpoints by ligand/receptor interaction results in T cell deactivation[7]. Hijacking these pathways by tumor cells contributes to their successful immune escape[7]. CPI interact with this interaction and "release the brake" on the immune system resulting in adequate T-cell activation and response.

Very recent data demonstrated impressive long term survival rates (21 % at 4 years) in R/M HNSCC patients treated with single agent CPI, which has never been observed in the pre-immunotherapy era[8]. However, only a minority of patients (approximately 20 %) do respond to CPI[9]. The search for a predictive biomarker (beyond PD-L1 expression) to identify patients, who derive the maximum benefit from CPI therapy is still ongoing. »

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Future perspectives

There is sound scientific rationale that CPI therapy might have superior activity in treatment naïve patients especially in the neoadjuvant setting. Early trial results are encouraging and reported a promising pathological response rate for pembrolizumab when given pre-operatively[10]. Interestingly, we learned from lung cancer studies that there might be a disconcordance between conventional post-neoadjuvant radiographic imaging and definitive pathological microscopic examination of the resected tumor[11]. However, a couple of questions are still open and have to be addressed such as the optimal immunotherapy regimen administered or how to salvage patients, who do not respond.

Taken together, immunotherapy has revolutionized medical oncology and offers exciting new perspectives for patients suffering from HNSCC. ■

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Anna Pelz (*1997, Vienna) has a degree in graphic and communication design and studies trans disciplinary arts at the university of applied arts Vienna since 2018.

She works with a focus on painting that constantly gets influenced by playing and experimenting with language, sculpture and photography. Her works deal with inner and outer worlds and are dominated by bright colors as well as biomorphic forms. Inspirations from her personal world and the influence of the current events merge and create pictures of emotional physicalities and ambivalent tensions.

Since 2019 the artist exhibits at solo and groupshows (ParallelVienna 2019&2020, AUSBRUCH – esNouveauxRichesMagazin @ImproperWallsGallery, KAH @OrpheumGraz…) and thanks to a scholarship she participated at a residency and workshop at the St.Moritz Art Academy.

Have a peek at Annas' work on the following pages – enjoy!

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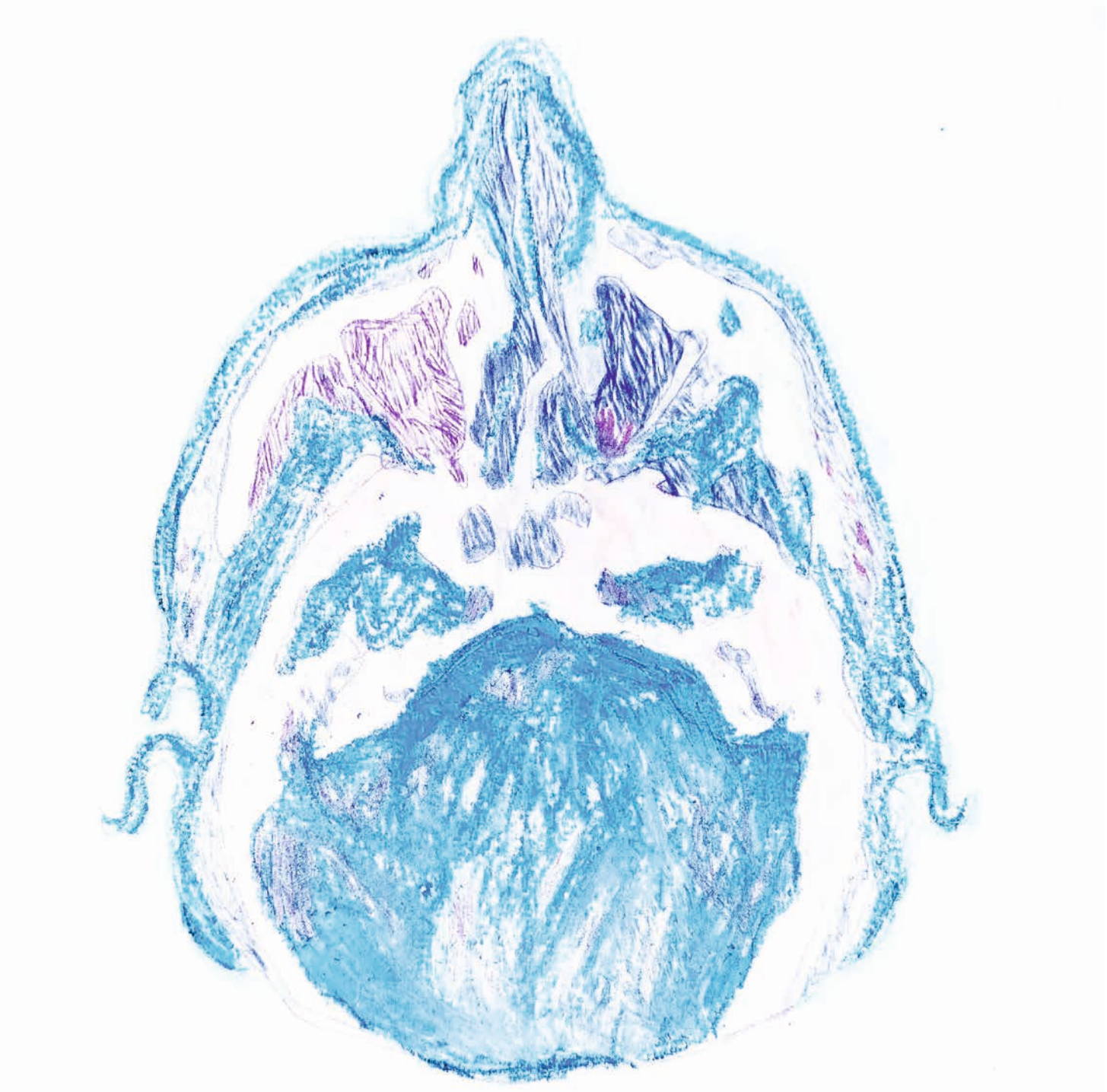

A glimpse of daily routine

Neslihan Kizar, Bsc, Vienna