eshnr
european society of
head and neck radiology

ESHNR 2017

30th Annual Meeting and Refresher Course

September 28–30, 2017, Lisbon, Portugal

FINAL PROGRAMME

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DEAR COLLEAGUES,

On behalf of the European Society of Head and Neck Radiology (ESHNR), it is my pleasure to welcome you at the 30th Annual Meeting and Refresher Course, in the beautiful city of Lisbon. Founded in 1987, the ESHNR commemorates this year its 30th birthday. This active and growing society has been successful in joining professionals with different clinical and research backgrounds dealing with head and neck disease whose common goal is to develop and foster head and neck radiology as a science.

This year's programme nicely reflects the multidisciplinary approach to head and neck disease by including interactive sessions where radiologists and ENT surgeons will share their views and complement crucial information for adequate management of patients. Particular emphasis will be given to the increasing trend for quantitative, multiparametric, computer-based imaging analysis and homogeneous structured reporting as well as on new developments on specific topics such as head and neck oncology, swallowing disorders, sleep apnea, brachial plexus and paraganglioma imaging. For those less experienced, educational reviews and refresher courses will cover most areas of head and neck pathology while for those interested in research, new questions and future challenges will be raised. This will also be the place for participants to present their work as scientific sessions and e-posters.

A wide international faculty was gathered to share their knowledge and expertise during this meeting taking place at the newest clinical and research hub of Lisbon, facing the river Tagus, in the sunny city of Lisbon. Hopefully, you will find some leisure time to stroll along the river margins and explore the nearby most emblematic monuments. I also invite you to join the gala dinner at the castle of St. George, in the old city center and to take advantage of the breathtaking views over the city!

My sincere gratitude goes to the scientific committee and faculty who kindly agreed to contribute to this meeting and to all involved with the organization of this event.

Wish you all a fruitful meeting and a pleasant stay in Lisbon!

Yours sincerely,

Alexandra Borges
Meeting President ESHNR 2017

PRESIDENT, COMMITTEE & FACULTY

Meeting President 2017
Alexandra Borges, Lisbon/PT

Local Scientific Committee
Ana Germano, Amadora/PT
Leonor Fernandes, Lisbon/PT
João Lopes Dias, Lisbon/PT
Mariana Horta, Lisbon/PT

Faculty
P. Alves, Lisbon/PT
T. Beale, London/UK
M. Becker, Geneva/CH
K.S.S. Bhatia, London/UK
S. Bisdas, London/UK
A. Borges, Lisbon/PT
J.W. Casselman, Bruges/BE
J. Castelijns, Amsterdam/NL
V. Chong, Singapore/SG
H. Curtin, Boston/US
Ch. Czerny, Vienna/AT
D. da Costa, Lisbon/PT
B. De Foer, Antwerp/BE
P. De Graaf, Amsterdam/NL
M. de Win, Amsterdam/NL
F. Dubrulle, Lille/FR
H.B. Eggesbø, Oslo/NO
H. Estibeiro, Lisbon/PT
D. Farina, Brescia/IT
L. Fernandes, Lisbon/PT
T. Ferreira, Leiden/NL
N. Freling, Amsterdam/NL
A. Germano, Barcarena/PT
S. Golding, Oxford/UK
M. Horta, Lisbon/PT
C. Karaman, Aydin/TR
A. King, Hong Kong/HK
R. Kohler, Sion/CH
S. Kösling, Halle/DE
V. Leite, Lisbon/PT
E. Loney, Darlington/UK
J. Lopes Dias, Lisbon/PT
M. Mack, Munich/DE
R. Maroldi, Brescia/IT
N. Martin-Duverneuil, Paris/FR
P. Mundada, Singapore/SG
J. Olliff, Birmingham/UK
B. Ozgen, Chicago/US
F. Pameijer, Utrecht/NL
N. Papanikolaou, Lisbon/PT
S. Petrovic, Nis/RS
B. Purohit, Singapore/SG
S. Qureshi, Manchester/UK
M. Ravanelli, Brescia/IT
G. J. Riegler, Vienna/AT
S. Robinson, Vienna/AT
B. Schuknecht, Zurich/CH
K. Surlan Popovic, Ljubljana/SI
F. Torrinha, Lisbon/PT
A. Trojanowska, Lublin/PL
P. Trojanowski, Lublin/PL
V. Vandecaveye, Leuven/BE
A. Varoquaux, Marseille/FR
B. Verbist, Leiden/NL
A. Whyte, Perth/AU

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GALA DINNER

We cordially invite you to the ESHNR 2017 Gala Dinner.
Take a chance and get in touch with experts and colleagues from Europe and from all over the world.

We are looking forward to seeing you!

Friday, September 29, 2017
Restaurante Casa do Leão
Castelo de São Jorge

One ticket per person is required.
Please check your event ticket for detailed information.

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GENERAL INFORMATION

Onsite Congress Office

In case of any questions, kindly consult the ESHNR registration desk. Staff members will be happy to assist you.

Registration/Badge/Tickets

You are kindly asked to wear your badge visibly on the congress grounds at all time.
Pre-ordered evening event tickets will be handed out additionally to the congress badges.
Evening event tickets may be purchased onsite at the registration desk upon availability.

Certificate of Attendance

The Certificate of Attendance/CME Accreditation can be viewed and printed after the congress upon entering your ESHNR MyUserArea at the ESHNR website (www.eshnr.eu).
To enter your MyUserArea, please use your last name in combination with your personal ID printed on your congress badge

CME Credits

Continuing Medical Education (CME) is a programme of educational activities to guarantee the maintenance and upgrading of knowledge, skills and competence following completion of postgraduate training. CME is an ethical and moral obligation for each radiologist throughout his/her professional career, in order to maintain the highest possible professional standards.

The 30th Annual Meeting and Refresher Course of ESHNR is designated up to a maximum of 17 CME credits by the European Accreditation Council for Continuing Medical Education (EACCME). Each medical specialist should only claim those hours of credit that he/she actually spent in the educational activity.

Conference Language

The meeting will be held in English and no simultaneous translation will be offered.

Onsite Registration Fees

ESHNR Member*	€ 450.00	*Only available if the ESHNR 2017 membership is paid
ESHNR Non-Member	€ 585.00	
Resident**	€ 330.00	**Requires confirmation of the institution's head by way of proof
Single Day Ticket***	€ 310.00	***Only available once per person/ registration

Fee includes: Admittance to scientific sessions and exhibition, final programme including book of abstracts, refreshments during breaks, certificate of attendance and opening ceremony.

Payment

Onsite payment can only be made by credit card (Visa or Mastercard) or in cash (Euro). Please understand that no other payment facilities like debit cards, cheques, etc. will be accepted.

Congress Venue

Champalimaud Foundation
Avenida Brasília
1400-038, Lisbon, Portugal

Disclaimer/Liability

The Education Congress Research GmbH/ESHNR cannot accept any liability for the acts of the suppliers to this meeting or the attendees' safety while travelling to or from the congress. All participants and accompanying persons are strongly advised to carry adequate travel and health insurance, as ECR GmbH/ ESHNR cannot accept liability for accidents or injuries that may occur. ECR GmbH/ESHNR is not liable for personal injury and loss or damage of private property.

Name Changes

Name changes will be treated like the cancellation of the registration and a new registration of the other participant.

Mobile Phones

Please do not forget to switch off your mobile phones before entering any of the lecture rooms.

Organising Secretariat

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GENERAL INFORMATION

Media Center

Speakers are reminded to check in at the Media Center at least two hours prior to their scheduled presentation. Trained staff will be available to assist you with the equipment. The Media Center should only be used for a test run of the presentation(s). Please note that the Media Center should not be used to prepare your entire presentation(s) and that due to the large number of speakers the workstations are only available for minor editing.

Opening Hours

Thursday, September 28	07:30 – 17:30
Friday, September 29	07:30 – 17:30
Saturday, September 30	07:30 – 13:30

Registration Desk Opening Hours

Wednesday, September 27	15:00 – 17:00
Thursday, September 28	07:30 – 17:00
Friday, September 29	07:30 – 18:00
Saturday, September 30	07:30 – 14:00

Guidelines for Speakers

All speaker are requested to upload their presentation(s) at the ESHNR Media Center.

- You are kindly requested to submit your presentation two hours before your session starts at the latest (USB sticks are recommended).
- All presentations have to be uploaded to the conference IT-system. No personal computer will be accepted for presentation.
- Please be at the lecture room at the latest five minutes prior to the start of your session and identify yourself to the moderators.
- Kindly observe exactly your presentation time. Each session contains enough time for discussion. Exceeding the time limit will not be accepted and the chairpersons are requested to stop presentations in such cases.

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Poster Exhibition – EPOS™

ESHNR 2017 is using an Electronic Presentation Online System. This offers a much greater flexibility than traditional scientific exhibits and provides better options for scientific communication.

Several workstations are available in the EPOS™ Area at which the current electronic exhibits can be viewed by the congress participants during the congress. All ESHNR electronic posters will be accessible online after the congress via the ESHNR website.

EPOS™ Opening Hours

Thursday, September 28	08:30 – 17:00
Friday, September 29	08:30 – 17:00
Saturday, September 30	08:30 – 13:00

NEW: Connect your own mobile device and browse through ESHNR 2017 posters:
https://cposter.ctimeetingtech.com/eshnr2017/epos

ESHNR Awards

ESHNR awards the following prizes:
€ 750.00 for the best oral presentation
€ 750.00 for the best scientific poster presentation
€ 300.00 for the best educational poster

Free registration to ESHNR 2018 – 31st Annual Meeting and Refresher Course for the second best oral presentation and second best scientific poster presentation.

Breaks

Complimentary coffee, tea and refreshments will be served during the official coffee breaks to all congress delegates.

Future Meeting Desk

This area – located in the foyer of the ground floor – offers you an overview of future meetings in the field of radiology and related disciplines, from all over the world. Feel free to contribute flyers and posters to promote your own meetings and courses.

Recording

Video- or audio-recording of any sessions or presentations is not allowed without the speaker's/organiser's prior written permission.

Diploma Examination

The European Board in Head and Neck Radiology Diploma takes place on Thursday, September 28, 2017. Candidates are asked to identify themselves at the registration desk beforehand.

EXHIBITION

Why visit? Source innovative products, meet new contacts and build networks!
The exhibition area will be located in the foyer and exhibition room.

Thursday, September 28	08:30 – 17:30
Friday, September 29	08:30 – 17:30
Saturday, September 30	08:30 – 13:30

We thank our industry partners for their highly appreciated support of ESHNR.

Bayer · diagnostics an open access journal by imagine · NewTom Cone Beam 3D Imaging what's next

PHILIPS · SIEMENS Healthineers · TOSHIBA

INDUSTRY SYMPOSIA

Friday, September 29, 2017 – 12:30-13:10

Philips

PHILIPS

Spectral CT in the Head and neck
P. Noël, Munich/DE

Informed decision-making for a more confident diagnosis is every radiologist's vision. Philips Spectral CT innovative solutions can help radiology drive cost-effective, more consistent and high quality care across the entire hospital enterprise.

After the lecture, a lunch buffet will be provided by Philips in the exhibition area.

Attendees of any industry symposium agree that their registration details will be forwarded to the company organising that symposium. This agreement may be cancelled at any time by writing to the ESHNR Office.

LISBON INFORMATION

Attractions

The city of Lisbon is rich in architecture; Romanesque, Gothic, Manueline, Baroque, Modern and Postmodern construction can be found all over Lisbon. The city is also crossed by historical boulevards and monuments along the main thoroughfares.

Don't miss the many emblematic monuments within walking distance from the congress venue: the Tower of Belem, the Monument to the Discoveries, the Museum of the Combatant (Museu do Combatente), the Cultural Centre of Belém (CCB), the Museum of Art Architecture and Technology (MAAT), the National Coach Museum (containing the largest collection of royal coaches in the world), the Planetarium Calouste Gulbenkian and the Monastery of Jerónimos with its beautiful cloisters. Other museums in close vicinity are the National Museum of Ancient Art, with its breathtaking views over the city and the Orient Museum.

Others worth a visit: Calouste Gulbenkian Foundation and Museum, with its beautiful gardens, the Church and Museum of S. Roque, the National Museum of Contemporary Art of Chiado, Carmo's Convent (Convento do Carmo), Lisbon Cathedral (Sé de Lisboa), the Monastery of S. Vicente de Fora and the Museum of Tiles, housing the astounding church Madre de Deus, carved in gold.

The Lisbon Oceanarium, one of the largest in the world, is located in the post-modern city hub with its iconic new buildings from renowned architects-Calatrava (Gare do Oriente), Norman Foster, Sua Kay e Manuel Vicente and Siza Vieira among others.

For a relaxing evening, we would recommend a visit to LX factory, where you can find upbeat fusion, ethnic and international cuisine and do some street shopping in a very friendly and informal environment.

Restaurants

INSIDER INFORMATION

Close by the venue (@walking distance) you can take a quick bite at Vela Latina, Cafetaria Mensagem at Altis Hotel, have a burger at the van parked in front of the Tower of Belém, called "Três Jota" or have a toast or a salad at Restaurant "À Margem" an open cube in front of the tagus river. If you can spend a little more time try Darwin's café, side by side with the congress venue, the restaurant of the Nautic club, the restaurant of the Naval Association or restaurant "Anfora" at the Governor's Palace Hotel, in the other side of the railway. For a snack, you will find a small kiosk inside Champalimaud Foundation at the ground floor-level.

Along the river, but further south, you will find the brand-new restaurant "Sud" (please get a reservation in advance!). Also, in the vicinity you have "Este-Oeste" a nice restaurant for lunch at the Cultural Centre of Belém where you can have sushi or pizza; in Pedrouços area try "Marisqueira Nunes", at Rua Bartolomeu Dias, 112, for really fresh seafood or restaurant "Descobre" also in Rua Bartolomeu Dias, 65-69, for more traditional Portuguese cuisine.

A couple of suggestions worth trying in Lisbon:

"Palácio Chiado", Rua do Alecrim, 70, is an old palace that has been transformed into a gastronomic destination, with beautiful 18th century rooms, spread over two floors, harboring 7 different cuisine concepts; the "Meat bar" for steaks, "Páteo do Palácio" for traditional portuguese tapas, "Bacalhau Lisboa" for codfish, "Local Chiado" for a light, healthy meal, "Espumantaria do Mar" for seafood and sparkling wine cocktails, "Delisbon" for Portuguese charcuterie and last but not least "Sushic" for sushi lovers.

"Mercado da Ribeira", Av. 24 Julho, 47, is an old traditional market, dating from 1892, recently transformed into a food court, where most of the best Portuguese chefs have their stands and where you can taste a variety of different cuisines. You will find almost everything from meat, to seafood, burgers, sweets, ice creams and a wide offer of drinks. Be prepared for a busy and joyful environment and to pick up your own food from the stands you choose. It can be difficult for large groups to sit together.

"Sushicafé Avenida", Rua Barata Salgueiro, 28, ideal for sushi lovers of both conventional and fusion sushi. In a central area of Lisbon, close by the main shopping avenue in Lisbon, Av. da Liberdade, this fashionable restaurant is ideal to start a night out. You can continue enjoying the night in next-door Guilty restaurant/bar/club

"Restaurante Terraço Tivoli", Av. da Liberdade, 185, located inside Tivoli Hotel, this restaurant offers wonderful meals, including the awarded "mussels soup", in a terrace with breathtaking views. After your meal, take some time to enjoy a drink at the Sky bar or at the lobby bar. Reservation in advance is highly recommended.

"Bairro do Avilez", Rua Nova da Trindade,18, and "Mini Bar Teatro", Rua António Maria Cardoso, 58, are two different restaurants owned by the trendy and renowned Avillez chef, also the owner of **"Belcanto"** a two Michelin stars awarded restaurant. The former two, offer some of the most acclaimed Avillez dishes, at an affordable price and in an easygoing environment. I personally recommend the degustation menu at Mini Bar Teatro, located side by side with S. Luis Theater, which is always a wonderful gastronomic experience!

"Sea me", Rua do Loreto, 21, is for fish lovers! Choose your own fresh fish and have a really fishy experience in this modern, fashionable restaurant! If you are in the mood to enjoy a night out, this is the place to go as you will be facing Bairro Alto, with its numerous bars, fado houses, disco clubs and many stores which open at night!

"A Travessa", travessa do Convento das Bernardas, 12. This restaurant housed in a XVII century convent and owned by a Belgium lady is situated between the traditional neighborhood of Madragoa and the elegant neighborhood of Lapa. It offers two spacious, comfortable rooms for dinning and, if the weather permits you may have the chance to enjoy a wonderful meal in the outside cloister.

For **vegetarians** try **"Jardim dos sentidos"**, Rua da Mãe de Água, 3; **"Os tibetanos"**, Rua do Salitre, 117 or **"Organi"** at Chiado, Calçada Nova de S. Francisco, 2, my personal favorites!

History

Lisbon is the capital and the largest city of Portugal.

The city flourished as a trading center during the four centuries of Moorish rule, and Alfama — Lisbon's oldest district — retains its intricate Arab-influenced layout.

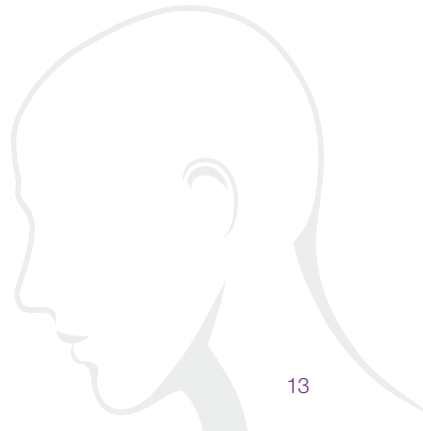
The next great period — that of "Descobrimentos" (the discoveries) — began with the 15th-century voyages led by the great Portuguese navigators to India, Africa and Brazil. During this era, Vasco da Gama set sail to discover a trade route to India in 1498 and Brazil was discovered in 1500. The wealth realized by these expeditions was impressive: gold, jewels, ivory, porcelain and spices helped to finance great buildings and impressive commercial activity.

Late-Portuguese Gothic architecture — called Manueline (after the king D. Manuel I) — assumed a rich, individualistic style, characterized by elaborate sculptural details, often with a maritime motif. The Tower of Belem and the Monastery of Jerónimos, both UNESCO World Heritage Sites, are supreme examples of this period.

In addition, the mosaic Portuguese pavement (Calçada Portuguesa) was born in Lisbon, in the mid-1800s. The art has since spread to the rest of the Portuguese speaking countries. The city remains one of the most expansive examples of the technique, with nearly all walkways and even many streets being created and maintained in this style.

Transportation

Lisbon's public transport network is extremely far-reaching and reliable (buses, trams, trains and metro). The Lisbon Metro acts as its main artery, connecting the city center with the upper and eastern districts, as well as reaching the suburbs. Right in front of the venue you will find the railway, with the closest station, Algés, at at a 10-15 min walk from the venue. Trains are quite a nice and rapid way to commute both to the city center and to Cascais along the coast line. If you don't want to bother at all you may use taxis or Uber which are quite inexpensive and easy to find in this touristic area of Belém.



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PROGRAMME OVERVIEW

Thursday, September 28, 2017

	Room 1	Room 2
08:30	Opening Ceremony	
09:00	Scientific Session 1 Lymphoprolliferative disorders in the head and neck	Scientific Session 2 Temporal bone imaging
09:30		
10:00		
10:30	Coffee Break	
11:00	Scientific Session 3 Imaging in swallowing and sleep disorders	Scientific Session 4 Thyroid gland US: The basics and beyond
11:30		
12:00		
12:30	Lunch Break	
13:00		
13:30	Short Oral Presentation Session 1 Head&neck cancer in the spotlight	Short Oral Presentation Session 2 New developments in temporal bone imaging
14:00		
14:30	New Horizon Session 1 Future trends in head and neck cancer imaging	Interactive Session 1
15:00		
15:30		
16:00	Coffee Break	
16:30	Scientific Session 5 Head and neck imaging: Past, present and future	State of the Art Session 1 Head and neck paragangliomas
17:00		
17:30		

Friday, September 29, 2017

	Room 1	Room 2
08:30	Scientific Session 6 Pediatric head and neck imaging	Scientific Session 7 Imaging the brachial plexus
09:00		
09:30		
10:00	New Horizon Session 2 Imaging globalization	State of the Art Session 2 Autoimune and granulomatous diseases
10:30	Coffee Break	
11:00	State of the Art Session 3 DWI and PWI in the head and neck- Where do we stand?	Scientific Session 8 The jaws
11:30		
12:00		
12:30	Industry sponsored Symposium	
13:00	Lunch Break	
13:30	Short Oral Presentation Session 3 Pot-Pourri of Top best posters!	Short Oral Presentation Session 4 US applications: Alive and kicking!
14:00		
14:30	Scientific Session 9 Imaging in acute head and neck trauma	Interactive Session 2
15:00		
15:30		
16:00	Coffee Break	
16:30	Scientific Session 10 The orbit	Scientific Session 11 Salivary glands
17:00		
17:30		

PROGRAMME OVERVIEW

Saturday, September 30, 2017

	Room 1	Room 2
08:30	Interactive Session 3	Refresher Course 1
09:00		
09:30		
10:00	Coffee Break	
10:30	Scientific Session 12 Skull base	Refresher Course 2
11:00		
11:30		
12:00	State of the Art Session 4 Head and neck cancer	
12:30		
13:00	Closing Ceremony	
13:30		

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PROGRAMME THURSDAY, SEPTEMBER 28, 2017

DON'T MISS!

08:30-09:00 **Opening Ceremony** **Room 1**
A. Borges, Lisbon/PT – Congress President 2017
L. Beleza, Lisbon/PT – President of the Champalimaud Foundation
F. Caseiro Alves, Coimbra/PT – President of the Portuguese Society of Radiology

09:00-10:30 **SS 1** **Lymphoprolliferative disorders in the head and neck** **Room 1**
Moderator: M. Becker, Geneva/CH

09:00 SS 1.1. The many faces of extranodal lymphoma
F. Pameijer, Utrecht/NL
09:30 SS 1.2. Nodal involvement: Role of imaging in the diagnosis and follow-up
T. Beale, London/UK
10:00 SS 1.3. Involvement by multiple myeloma
A. Borges, Lisbon/PT

09:00-10:30 **SS 2** **Temporal bone imaging** **Room 2**
Moderator: J.W. Casselman, Bruges/BE

09:00 SS 2.1. Cone beam vs conventional CT: Advantages and disadvantages
H. Curtin, Boston/US
09:30 SS 2.2. Imaging otosclerosis: Pearls and pitfalls
B. Verbist, Leiden/NL
10:00 SS 2.3. Imaging ossicular chain prosthesis and its complications
B. De Foer, Antwerp/BE

10:30-11:00 Coffee Break

11:00-12:30 **SS 3** **Imaging in swallowing and sleep disorders** **Room 1**
Moderator: T. Beale, London/UK

11:00 SS 3.1. Contributes of imaging in the management of patients with obstructive sleep apnea
A. Whyte, Perth/AU
11:30 SS 3.2. Swallowing disorders: Recognizing the most common clinical patterns – A multidisciplinary approach
P. Alves, Lisbon/PT
12:00 SS 3.3. Cross sectional imaging for functional swallowing disorders: When, how and what to expect
M. Becker, Geneva/CH

11:00-12:30	**SS 4**	**Thyroid gland US: The basics and beyond** *Moderator: M. Horta, Lisbon/PT*	**Room 2**
11:00	SS 4.1.	Normal US anatomy and anatomical variants *A. Germano, Barcarena/PT*	
11:30	SS 4.2.	Doppler, contrast-enhanced US and elastography: Is there a real added value in thyroid nodules characterization? *K. Bhatia, London/UK*	
12:00	SS 4.3.	Implications of the new ATA guidelines on pre-operative thyroid imaging *L. Fernandes, Lisbon/PT*	

12:30-13:30 Lunch Break

13:30-14:30	**SOPS 1**	**Head&neck cancer in the spotlight** *Moderator: S. Bisdas, London/UK*	**Room 1**
13:30	SOPS 1.1.	Peritumoral bone change in oral squamous cell carcinoma: A prospective study through radiologic-pathologic correlation *G.-D. Jo, Seoul/KR*	
13:37	SOPS 1.2.	Utility of routine cranial acquisition in staging 18F-FDG PET/CT scans in Head & Neck cancer *H. Shiwani, Leeds/UK*	
13:44	SOPS 1.3.	Detection of residual head and neck cancer after (chemo) radiotherapy: value of DWI to characterize residual 18F-FDG uptake on PET-CT at the primary tumor site *D. Noij, Amsterdam/NL*	
13:51	SOPS 1.4.	Simultaneous PET/MRI assessment of response to chemo/ radiotherapy in patients with locally advanced head-neck squamocellular carcinoma: Preliminary results *V. Romeo, Naples/IT*	
13:58	SOPS 1.5.	The prognostic value of the combination of 18-F-FDG-PET and diffusion-weighted imaging in head and neck cancer. *R. Martens, Amsterdam/NL*	
14:05	SOPS 1.6.	A multivariate analysis combining DCE-MRI and IVIM derived parameters to improve differential diagnosis of parotid tumors: a proposal for new indexes *F. Patella, Milan/IT*	
14:12	SOPS 1.7.	Ultrahigh-field (9.4T and 17.6T) magnetic resonance imaging of retinoblastoma *M. de Jong, Amsterdam/NL*	
14:19		Q&A	

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THURSDAY, SEPTEMBER 28, 2017

13:30-14:30	**SOPS 2**	**New developments in temporal bone imaging** *Moderator: B. Verbist, Leiden/NL*	**Room 2**
13:30	SOPS 2.1.	Ex vivo delineation of temporal bone substructures in ultra-high resolution using industrial computed tomography *J.-M. Hempel, Tübingen/DE*	
13:37	SOPS 2.2.	The diagnostic accuracy of 1,5 T versus 3 T Non-Echo-Planar Diffusion-Weighted Imaging in the detection of middle ear and mastoid cholesteatoma. *L. Lips, Maastricht/NL*	
13:44	SOPS 2.3.	Preliminary study of electrical distribution within the human inner ear based on computed tomography of vestibular implanted patients *A. Hedjoudje, Baltimore/US*	
13:51	SOPS 2.4.	Computed Tomography and Magnetic Resonance Imaging-based Finite Element Analysis Predicts Current Flow in Labyrinths Implanted with a Multi-Channel Vestibular Prosthesis *A. Hedjoudje, Baltimore/US*	
13:58	SOPS 2.5.	CT or MRI: Which is the best imaging modality to diagnose a large vestibular aqueduct or endolymphatic sac? *M. Gkagkanasiou, Athens/GR*	
14:05	SOPS 2.6.	Fast and accurate diagnosis of an oval or round window perilymphatic fistula on CT and MRI without gadolinium injection *A. Venkatasamy, Strasbourg/FR*	
14:12		Q&A	

14:30-16:00	**NH 1**	**Future trends in head and neck cancer imaging** *Moderator: R. Maroldi, Brescia/IT*	**Room 1**
14:30	NH 1.1.	Image texture analysis and its biologic correlates - A new challenge for radiologists? *M. Ravanelli, Brescia/IT*	
15:00	NH 1.2.	Impact of spectral CT on head and neck oncology *H. Curtin, Boston/US*	
15:30	NH 1.3.	Potential impact of new PET tracers *D. da Costa, Lisbon/PT*	

14:30-16:00	**IS 1**	**Interactive session**	**Room 2**
	IS 1.1.	Tumor boards alive! *H. Estibeiro, Lisbon/PT* *A. Borges, Lisbon/PT*	

16:00-16:30 Coffee Break

16:30-17:30	**SS 5**	**Head and neck imaging: Past, present and future** *Moderator: F. Torrinha, Lisbon/PT*	**Room 1**
16:30	SS 5.1.	The past and the present: Personalities and lessons to be learned *R. Maroldi, Brescia/IT*	
17:00	SS 5.2.	Future: Radiomics and computational imaging *N. Papanikolaou, Lisbon/PT*	

16:30-17:30	**SA 1**	**Head and neck paragangliomas** *Moderator: N. Martin-Duverneuil, Paris/FR*	**Room 2**
16:30	SA 1.1.	New concepts, genetic testing and implications for imaging *V. Leite, Lisbon/PT*	
17:00	SA 1.2.	Role of imaging in the diagnosis, management and follow-up *A. Varoquaux, Marseille/FR*	

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PROGRAMME FRIDAY, SEPTEMBER 29, 2017

08:30-10:00	**SS 6**	**Pediatric head and neck imaging** *Moderator: N. Freling, Amsterdam/NL*	**Room 1**
08:30	SS 6.1.	Fetal and post-natal imaging of congenital head and neck anomalies *C. Czerny, Vienna/AT*	
09:00	SS 6.2.	CT and MRI at the emergency department: When US is not enough *J. Lopes Dias, Lisbon/PT*	
09:30	SS 6.3.	Rhabdomyosarcoma and its mimics *M. de Win, Amsterdam/NL*	

08:30-10:00	**SS 7**	**Imaging the brachial plexus** *Moderator: M. Mack, Munich/DE*	**Room 2**
08:30	SS 7.1.	US: Indications and limitations *G. Riegler, Vienna/AT*	
09:00	SS 7.2.	MRI: Protocols and emerging techniques – MR neurography *P. Alves, Lisbon/PT*	
09:30	SS 7.3.	MRI: What and how to report? *M. Mack, Munich/DE*	

10:00-10:30	**NH 2**	**Imaging globalization** *Moderator: B. Ozgen, Chicago/US*	**Room 1**
10:00	NH 2.1.	Moving on to structured imaging reports *A. King, Hong Kong/HK*	

10:00-10:30	**SA 2**	**Autoimune and granulomatous diseases** *Moderator: S. Robinson, Vienna/AT*	**Room 2**
10:00	SA 2.1.	Spectrum of imaging finding in the head and neck *M. Becker, Geneva/CH*	

10:30-11:00	*Coffee Break*	

11:00-12:30	**SA 3**	**DWI and PWI in the head and neck – Where do we stand?** *Moderator: A. Trojanowska, Lublin/PL*	**Room 1**
11:00	SA 3.1.	Standardizing imaging protocols and recognizing pitfalls *S. Bisdas, London/UK*	
11:30	SA 3.2.	Present role of quantitative DWI in head and neck oncology *A. King, Hong Kong/HK*	
12:00	SA 3.3.	Present role of quantitative PWI in head and neck oncology *K. Surlan Popovic, Ljubljana/SI*	

11:00-12:30	**SS 8**	**The jaws** *Moderator: C. Karaman, Aydin/TR*	**Room 2**
11:00	SS 8.1.	Radiation and biphosphonates induced bone necrosis *R. Kohler, Sion/CH*	
11:30	SS 8.2.	Dental CT: Implants and beyond – What and how to report *A. Whyte, Perth/AU*	
12:00	SS 8.3.	Odontogenic tumors: Role of imaging in the differential diagnosis *S. Robinson, Vienna/AT*	
12:30-13:10		**Industry sponsored symposium** **Spectral CT in the Head and Neck** *P. Noël, Munich/DE*	**Room 1**
13:10-13:30	*Lunch Break*		
13:30-14:30	**SOPS 3**	**Pot-Pourri of Top best posters!** *Moderator: D. Farina, Brescia/IT*	**Room 1**
13:30	SOPS 3.1.	Evaluation of subcentimeter neck lymph nodes with diffusion weighted MRI in head and neck squamous cell carcinoma (HNSCC) *A. Jovic, Zagreb/HR*	
13:37	SOPS 3.2.	The role of MRI in evaluating neurovascular cross-compression in vestibular paroxysmia *P. Touska, London/UK*	
13:44	SOPS 3.3.	A retrospective review comparing the accuracy of non-EPI diffusion weighted imaging techniques used for the diagnosis of cholesteatoma in clinical practice *A. Ogg, Glasgow/UK*	
13:51	SOPS 3.4.	Correlation between the Histologic and Magnetic Resonance Imaging Results of Optic Nerve and Choroid Involvement in Eyes Enucleated for Retinoblastoma *A. Saleh, Amman/JO*	
13:58	SOPS 3.5.	Detection of Carotid Body Enlargement in Patients with Sympathetically Mediated Diseases with CTA *G. Özer, Ankara/TR*	
14:05	SOPS 3.6.	Osseous Dysplasia: Imaging criteria, diagnosis difficulties for adapted treatment *M. Martin-Duverneuil, Paris/FR*	
14:12		Q&A	

FRIDAY, SEPTEMBER 29, 2017

13:30-14:30	**SOPS 4**	**US applications: Alive and kicking!** *Moderator: K. Bhatia, London/UK*	**Room 2**
13:30	SOPS 4.1.	The role of ultrasound research of soft tissue after face contouring *E. Privalova, Moscow/RU*	
13:37	SOPS 4.2.	The role of Ultrasonography in the diagnosis of foreign bodies into the soft tissues of the maxillofacial region *Y. Shumina, Moscow/RU*	
13:44	SOPS 4.3.	British Thyroid Association's ultrasound scoring of thyroid nodules amongst five observers of various experience: diagnostic performance and inter-observer agreement. *B. Sharif, Harrow/UK*	
13:51	SOPS 4.4.	Inter-observer variability significantly impacts the elasticity values of healthy major salivary glands *J. Vomacka, Olomouc/CZ*	
13:58	SOPS 4.5.	Qualitative and/or semi-quantitative sonoelastography for the diagnosis and differentiation of salivary gland tumors *C.Z. Karaman, Aydin/TR*	
14:05	SOPS 4.6.	US-sialography: method of choice in diagnostics of various forms of chronic sial?adenitis for patients with severe polyvalent allergy *Y. Vasilieva, Moscow/RU*	
14:12	SOPS 4.7.	Efficiency MSCT- and US Sialography in diagnostics of major salivary gland ductal system disorders *Y. Vasilieva, Moscow/RU*	
14:19	SOPS 4.8.	Accuracy of using ultrasound alone in the preoperative localisation of parathyroid adenoma prior to minimally invasive parathyroidectomy *R. Vaidhyanath, Leicester/UK*	
14:26		Q&A	
14:30-16:00	**SS 9**	**Imaging in acute head and neck trauma** *Moderator: J. Olliff, Birmingham/UK*	**Room 1**
14:30	SS 9.1.	Maxillo-facial fractures: What do surgeons need to know? *E. Loney, Darlington/UK*	
15:00	SS 9.2.	Temporal bone trauma *B. Ozgen, Chicago/US*	
15:30	SS 9.3.	Imaging assessment of cranial nerve injuries *J.W. Casselman, Bruges/BE*	

14:30-16:00	**IS 2**	**Interactive session**	**Room 2**
14:30	IS 2.1.	Normal and abnormal imaging findings after reconstructive flaps in the neck *A. Trojanowska, Lublin/PL* *P. Trojanowski, Lublin/PL*	
16:00-16:30	*Coffee Break*		
16:30-17:30	**SS 10**	**The orbit** *Moderator: J. Castelijns, Amsterdam/NL*	**Room 1**
16:30	SS 10.1.	New trends in the classification of orbital inflammation *T. Ferreira, Leiden/NL*	
17:00	SS 10.2.	Role of imaging in the diagnosis and staging of ocular tumors *P. De Graaf, Amsterdam/NL*	
16:30-17:30	**SS 11**	**Salivary glands** *Moderator: L. Fernandes, Lisbon/PT*	**Room 2**
16:30	SS 11.1.	Sialolithiasis: Imaging implications on patient's management *T. Beale, London/UK*	
17:00	SS 11.2.	Parotid tumors beyond salivary origin: A diagnostic challenge *M. Horta, Lisbon/PT*	

SS – Scientific Session | SOPS – Short Oral Presentation Session | NH – New Horizon Session
IS – Interactive Session | SA – State of the Art Session | RC – Refresher Course

PROGRAMME SATURDAY, SEPTEMBER 30, 2017

08:30-10:00	**IS 3**	**Interactive session**	**Room 1**
08:30	IS 3.1.	Mistakes in Head and Neck radiology: You the judge *S. Golding, Oxford/UK*	
08:30-10:00	**RC 1**	**Refresher course** *Moderator: P. Mundada, Singapore/SG*	**Room 2**
08:30	RC 1.1.	Imaging of the temporal bone: Anatomy and inflammatory lesions *S. Kösling, Halle/DE*	
09:00	RC 1.2.	Imaging of the temporal bone: Congenital and neoplastic lesions *F. Dubrulle, Lille/FR*	
09:30	RC 1.3.	Paranasal sinuses: Anatomy and inflammatory lesions *H. Eggesbø, Oslo/NO*	
10:00-10:30	*Coffee Break*		
10:30-12:00	**SS 12**	**Skull base** *Moderator: H. Eggesbø, Oslo/NO*	**Room 1**
10:30	SS 12.1.	Anatomic variants and developmental disorders *V. Chong, Singapore/SG*	
11:00	SS 12.2.	Skull base meningiomas: "Benign" but aggressive tumors! *B. Schuknecht, Zurich/CH*	
11:30	SS 12.3.	New imaging challenges in endoscopic skull base surgery planning *D. Farina, Brescia/IT*	
10:30-12:00	**RC 2**	**Refresher course** *Moderator: S. Petrovic, Nis/RS*	**Room 2**
10:30	RC 2.1.	Paranasal sinuses: Neoplastic lesions *P. Mundada, Singapore/SG*	
11:00	RC 2.2.	Imaging nodal neck masses *S. Qureshi, Manchester/UK*	
11:30	RC 2.3.	Imaging non-nodal neck masses *B. Purohit, Singapore/SG*	
12:00-13:00	**SA 4**	**Head and neck cancer** *Moderator: A. Borges, Lisbon/PT*	**Room 1**
12:00	SA 4.1.	Impact of multimodality data on radiotherapy planning *V. Vandercaveye, Leuven/BE*	
13:00-13:10		**Closing Ceremony**	**Room 1**

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ORAL PRESENTATION ABSTRACTS

SS 1.1.
The many faces of extranodal lymphoma

F. Pameijer, Utrecht/NL

Short Summary: Lymphomas are neoplasms of the lymphoreticular system. Lymphomas may be nodal or extranodal. This presentation is about (imaging aspects of) extranodal lymphoma of the head and neck (H&N). The H&N region is the second most frequent anatomical site of extranodal lymphomas (after the gastrointestinal tract). Most are non-Hodgkin's lymphomas of B-cell lineage, and overall diffuse large B-cell lymphoma is the most common type. Hodgkin's lymphoma rarely occurs in extranodal sites. Patients present with symptoms related to the primary lymphoma site, sometimes in combination with constitutional symptoms (B-symptoms, such as fever, night sweats, and weight loss). In many instances, imaging findings in extranodal H&N lymphoma are non-specific and tissue sampling remains the mainstay of making the diagnosis. However, in some cases the imaging pattern can strongly suggest a diagnosis of lymphoma. The H&N sites where lymphoma is most frequently encountered include: Waldeyer's ring, ocular adnexal structures, upper respiratory tract, salivary glands, thyroid and bone (rare). These sites will be reviewed using examples from daily practice. In this way, 'the many faces' of this disease will be presented and possible characteristic features will be discussed. Both conventional CT, as well as MRI can provide excellent anatomical mapping of these lesions. More advanced techniques such as PET-CT and Diffusion Weighted Imaging (DWI) MR will also be shown.

Take Home Points:

1. Any infiltrative mass in the head and neck may represent malignant lymphoma
2. Waldeyer's ring is the most common site of extranodal head and neck lymphoma
3. If extranodal head and neck lymphoma is associated with neck nodes, these nodes usually are non-necrotic.

SS 1.2.
Nodal involvement: Role of imaging in the diagnosis and follow-up

T. Beale, London/UK

Short Summary: The lecture will highlight the common presenting symptoms and signs and the diagnostic pathway used for assessing this group of patients.

The differential diagnoses and pitfalls encountered in the diagnosis and staging of nodal lymphoproliferative disorders in the head and neck how to report the imaging studies will be discussed.

The role of different imaging modalities US, CT, MRI & DWI, WB MRI and PET-CT/MR and how they complement each other in both the initial staging and the response to treatment will be covered including the current clinical role, if any, of newer imaging techniques.

An imaging algorithm for the follow-up assessment of this group will be demonstrated.

Take Home Points: To understand the role of the different imaging modalities in making the diagnosis and assessing the response to treatment in this group of patients

SS 1.3.
Involvement by multiple myeloma

A. Borges, Lisbon/PT

Short Summary: Multiple myeloma is responsible for 1% of all cancers and for 10% of hematological malignancies. In the head and neck, the spectrum of radiological appearances includes solitary plasmacytoma of bone (single bone lesion), non-osseous extramedullary plasmacytoma (single soft tissue lesion) and multiple myeloma (multiple, systemic involvement). In the head and neck, bone involvement most commonly affects the jaws and skull base, whereas extramedullary involvement is more frequent in the sinonasal region and larynx. Less common sites include the oral cavity and pharynx, orbit, temporal bone, thyroid gland and cervical lymph nodes. Radiologically, bone lesions are osteolytic, often punched out lesions, with no surrounding sclerosis and plasmacytomas are homogeneous soft tissue lesions slightly hyperdense to muscle on CT and slightly hypointense on T2W MR images showing restricted diffusion, imaging features of round small cell tumors. Due to lack of new bone formation, bone scintigraphy is typically negative. PET-CT and whole-body diffusion (DWIBS) are ideal to show lesion distribution as well as in the assessment of treatment response and patients follow-up. Isolated head and neck involvement is rare but a head and neck lesion may be the presenting feature of this condition. Therefore, it is important that radiologists are aware of the main imaging features and consider multiple myeloma and/or plasmacytoma in the differential diagnosis of other more common head and neck lesions. This presentation will review the main imaging appearances in different modalities and discuss the value of imaging in the diagnosis and follow up, showing illustrative cases.

Take Home Points:

- A head and neck lesion may be the presenting feature of multiple myeloma
- Most common locations of solitary bone plasmacytoma are the skull base and jaws whereas those of extra-osseous plasmacytomas are the sinonasal region and larynx
- Typical imaging features of multiple myeloma include lytic punched out bone lesions with no surrounding sclerosis
- Bone and extramedullary plasmacytomas are featured by homogenous soft tissue lesions, hyperdense to muscle on CT and T2 hypoinyense with restricted diffusion on MR

ORAL PRESENTATION ABSTRACTS

SS 2.1.
Cone beam vs conventional CT: Advantages and disadvantages
H. Curtin, Boston/US

Short Summary: Both cone beam CT and multidetector CT (MDCT) systems have advantages and disadvantages. Cone beam CT has a slightly higher resolution than MDCT and, in our opinion, gives very good detail when imaging very small bone structures such as the ossicles, facial nerve canal, and the bony margin of the superior semicircular canal. Cone beam is less expensive than MDCT and can be placed in smaller areas. In the head and neck cone beam is used for maxillofacial imaging, sinus evaluation and more recently temporal bone imaging. Cone beam CT has poorer density separation and cannot currently be used for soft tissue evaluation. Some radiologists are concerned that subtle density differences in bone as in otosclerosis might be difficult to appreciate. This is under evaluation. Most current cone beam systems place the patient in a sitting position and take 15 to 30 seconds to perform. Patient motion can be a major problem and imaging of young children may be impossible. MDCT has slightly lower resolution but is easier to perform and gives excellent bone and soft tissue information. The computer systems automate more of the functions that must be done by the technologists.

Take Home Points:

1. Cone beam gives very high detail bone definition but does not give soft tissue information and can be prone to motion artifact.
2. Standard multidetector computed tomography gives excellent soft tissue and bone information.

SS 2.2.
Imaging otosclerosis: Pearls and pitfalls
B. Verbist, Leiden/NL

Short Summary: Otosclerosis or otospongiosis is a bone dysptrophy unique to the otic capsule. Patients generally present with conductive or mixed hearing loss. Only rarely sensorineural loss will be the dominant presenting symptom. Otosclerosis is often diagnosed by characteristic clinical findings, but imaging may become necessary in case of doubt about the diagnosis, to evaluate the extent of disease or in case of complications after surgical treatment. The disease most frequently begins in the region of the fissula ante fenestram (fenestral otosclerosis) but gradually extends to involve the entire otic capsule (retrofenestral otosclerosis). (Fig 1) It proceeds in a stage-like fashion with foci of varying activity due to bone resorption and replacement by immature, spongy bone and at a later stage densely sclerotic bone. This results in a variable imaging appearance. CT is the imaging modality of choice. (Fig 2). This lecture will focus on the range of appearances on CT and MRI and the relevance of imaging for surgical treatment planning. The clinical and radiologic differential diagnoses will be discussed.

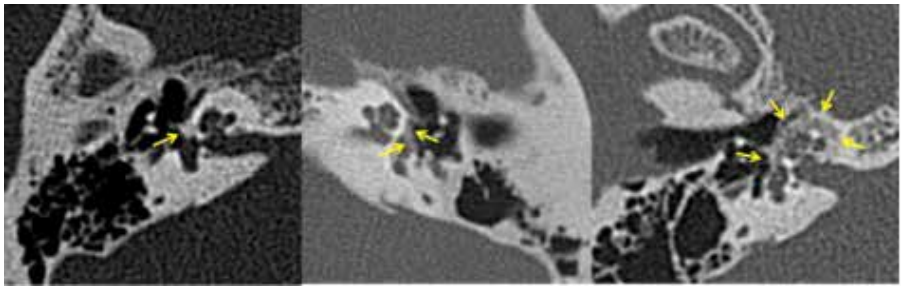

Fig 1: from left to rigth: a) fenestral otosclerosis: otospongiotic focus at the fissula antefenestram, b) otospongiotic focus at the fissula antefenestram and enveloping the oval window, c) otospongiotic foci encroaching the oval window and surrounding the cochlea (fenestral and retrofenestral otosclerosis)

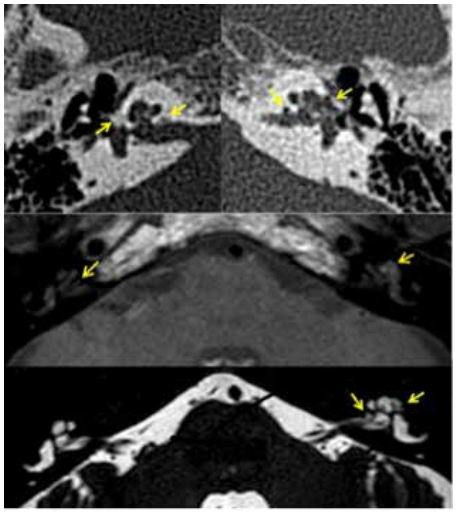

Fig 2: CT of a patient with fenestral and retrofenestral otosclerosis reveals otospongiotic foci on the right and mixed otospongiotic and lytic lesions on the left. On MR imaging the predominantly lytic lesions show an enhancing mass on T1 after contrast and T2 high signal intensity, whereas the small otospongiotic foci on the right are hardly seen.

Take Home Points:

1. CT is an excellent means to confirm the clinical diagnosis of otosclerosis
2. Otosclerosis may appear as lytic areas, foci of demineralization (otospongiosis) or sclerotic changes.
3. The differential diagnosis of otosclerosis is limited.

SS 2.3.
Imaging ossicular chain prosthesis and its complications

B. De Foer, A. Bernaerts, J. Van Dinther, E. Offeciers, J.W. Casselman, Antwerp/BE

Short Summary: "Imaging ossicular chain prosthesis and its complications" Reconstruction of the ossicular chain is required in case of an ossicular chain disruption/dysfunction. Ossicular chain disruption/dysfunction can be caused by either ossicular chain discontinuity or by ossicular chain fixation. Ossicular chain dysfunction/disruption is most frequently caused by otosclerosis, trauma or by erosion by chronic otitis media and/or cholesteatoma, in which the incus, stapes -including footplate- and the incudostapedial joint are most frequently affected. Ossicular chain fixation can be caused by –amongst others- chronic otitis media and tympanosclerosis more specifically. As these types of pathology invariably cause conductive hearing loss, CT is considered the imaging tool of preference in these cases. CBCT of the temporal bone is to be preferred over CT due to its higher spatial resolution, its lower radiation dose and its almost complete absence of metal artifacts. The various types of otospongiosis, the Austin classification regarding the encountered ossicular defects, the Wullstein classification of tympanoplasty and the various types of grafts (auto/allo), cementoplasties and types of ossicular reconstrutions –PORP/TORP will be discussed and illustrated. The most frequent complication of an ossicular chain reconstruction is the persistence and/or recurrence of the pre-operative conductive hearing loss due to malposition and/or post-operative displacement of the used reconstructive prosthesis/material. The success ratio and the degree of post-operative restoration of hearing loss and eventual numbers of post-operative failure and/or displacement depend on the used type of reconstruction and the used prosthetic material. Numerous studies have been published regarding post-operative results, hearing restoration and/or failure of prosthetic surgery mainly in clinical and/or ENT literature. This topic is however beyond the scope of this lecture. Examples of displacement and/or malposition of ossicular chain prosthesis explaining a post-operative failure will be highlighted and demonstrated. Another –albeit- rare complication of prosthetic surgery is the protrusion of the prosthesis into the vestibule. Post-operative vertigo is considered to be a reliable sign of irritation of the macula utriculi. In those cases, both CT/CBCT and MRI are required. It should be noted that CT always overestimates the piston protrusion. MRI is required to demonstrate a peri-prosthetic intravestibular granuloma.

Take Home Points:

- CBCT is to be required over CT in the evaluation of post-operative ossicular chain prosthesis placement
- Radiologists should be familiar with the various types of ossicular chain reconstructions
- Complications are mainly caused by ossicular reconstruction displacement

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ORAL PRESENTATION ABSTRACTS

SS 3.1.
Contributes of imaging in the management of patients with obstructive sleep apnea

A. Whyte, Perth/AU

Resources

Review of the literature evaluating imaging of obstructive sleep apnoea (OSA) in the sleep, respiratory, physiological, ENT, dental and imaging literature since 2000. The majority does not involve radiologists. Imaging has been integral to understanding the anatomical basis of OSA.

200 dedicated MDCT scans of the Sinuses and Upper Airway for SDB at Perth Radiological Clinic: evaluated and reported using a dedicated proforma by one radiologist (AW)

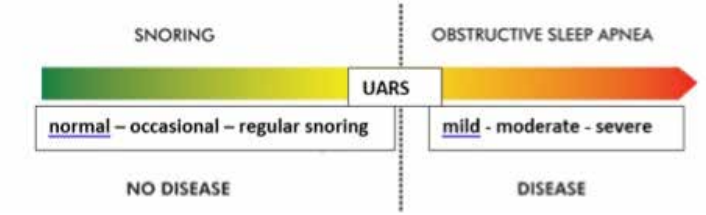
Ongoing research using MRI as part of a nationwide study to evaluate the efficacy of surgery in treating OSA.

Normal Sleep

The stages, cycles and functions of sleep will be briefly discussed

Sleep Disordered Breathing (SDB)

SDB represents a spectrum of disorders ranging in severity from:
snoring – upper airway resistance syndrome – obstructive sleep apnoea (OSA)



Regular snoring occurs in 40% of the adult population. The upper airway resistance syndrome (UARS) represents a transition condition between habitual snoring and OSA

Virtually all sufferers of OSA snore but not all snorers have OSA.

Obstructive Sleep Apnoea (OSA) in Children

Untreated OSA in children is associated with adverse cardiovascular, neurocognitive and somatic growth consequences.

The principal factors predisposing to airway collapse and obstruction during sleep are adeno-tonsillar hypertrophy and obesity. Adenoid hypertrophy is the most important factor in young children (4-10 years) and can be accurately assessed by lateral radiographs which have an accuracy equivalent to endoscopy and correlate closely with the presence and severity of OSA. After the age of 10 years, the combination of decrease in adenoidal size and rapid facial growth decreases airway narrowing at this level.

Hypertrophy of the palatine tonsils is important throughout childhood as an aetiological factor for OSA. Obesity is an independent risk factor for OSA in children and is more significant in adolescence. It leads to deposition of fat in soft tissues surrounding the upper airway with narrowing and predisposition to airway collapse.

Children with a small mandible and maxilla tend to have narrower upper airways and are more prone to OSA.

The standard treatment for paediatric OSA is adentonsillectomy and if indicated, weight loss.

Obstructive Sleep Apnoea (OSA) in Adults

Diagnosis: The diagnosis can be strongly suggested by the clinical setting, questionnaires and imaging. 95% of adults with OSA snore and 75% are obese.

Overnight polysomnography (PSG) is required for the definitive diagnosis and staging of OSA. The Apnoea – Hypnoea - Index (AHI) is used to categorize the disease as mild, moderate or severe according to the number of respiratory events per hour.

Definition and prevalence: OSA is characterized by obstruction of the upper airway during sleep causing repeated airflow cessation (hypopnea and/or apnoea), oxygen desaturation + sleep disruption. In adults, it is defined as an AHI of > 5 per hour and in children and AHI of >1 per hour.

Current estimates are that 27% of adult males and 13% of females are affected by moderate to severe OSA in the USA; this is also known to be a significant underestimate.

Morbidity and mortality: OSA causes daytime sleepiness resulting in risks for the individual and community if this occurs at work or during driving.

In addition, there is a 4 times increase in all-cause mortality including intractable hypertension, thrombo-embolic events (especially stroke), cognitive decline and cancer. Hypoxia and hypercapnia from apnoeic episodes and sympathetic overactivity from arousals leads to endothelial dysfunction, increased coaguability and inflammation in multiple organs.

Patients with undiagnosed (and untreated) OSA are at increased risk of anaesthetic, peri-operative and post-operative complications as compared with patients without sleep apnoea. Treatment with continuous positive airway pressure (CPAP) can significantly reduce the risk of complications.

Pathogenesis: The upper airway can be thought of as a pliable tube (pharynx) with a rigid opening formed by the nasal cavity and rigid continuation as the trachea. Multiple soft-tissues structures border or surround the pharynx and these are further encased by a “bony box” consisting of the mandible, maxilla and cervical spine posteriorly. Increase in bulk of the soft-tissues (predominantly due to enlargement of lymphoid tissue or fat deposition) or decrease in size of the maxillofacial skeleton cause constriction of the upper airway.

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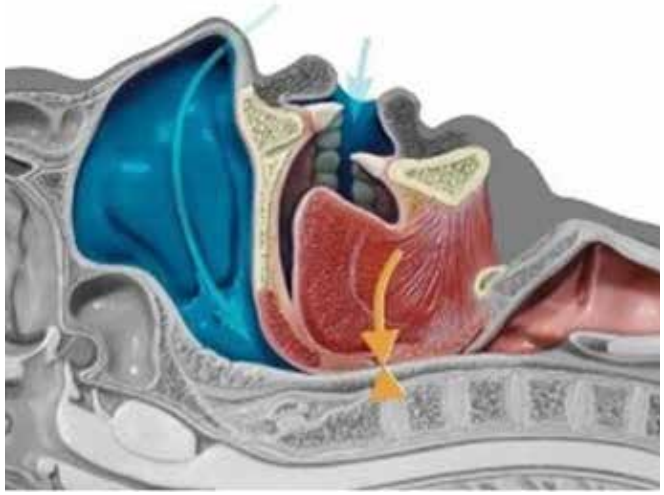
ORAL PRESENTATION ABSTRACTS

During sleep, muscle tone falls, critically to the extrinsic tongue muscles and the tongue falls back occluding the already narrow pharynx leading to apnoea.



Imaging: Either MDCT or MRI can assess the dimensions of the airway in the supine position. Both techniques allow evaluation of the enlarged soft-tissues (lymphoid tissue, pharyngeal wall, parapharyngeal space, tongue) with MDCT providing more optimal evaluation of the nasal cavity, maxilla, mandible and the position of the hyoid bone which is a key indicator of the length of the oropharynx and tongue. Elongation is strongly correlated with OSA.

The lateral cephalogram has been used extensively for research into the anatomical basis of OSA, especially in children. However, it is performed erect and does not allow cross-sectional evaluation of the airway. Cone beam CT does provide full evaluation of the nose and maxillofacial skeleton as well as the airway dimensions; however, it cannot evaluate the nature of the soft-tissue narrowing the pharynx and is performed erect, apart from a single supine scanner. Airway dimensions reduce by 33-66% when changing from the erect to supine position.

Imaging will be discussed in two contexts:

A. Evaluation of patients where SDB/ OSA are strongly suspected or who have failed CPAP for known OSA: MDCT is the first-line investigation and can provide a comprehensive evaluation of all bony and soft-tissue structures that could contribute to OSA. Single or multiple sites of narrowing and the severity at each site can be determined. *Imaging findings strongly suggesting SDB/OSA in imaging performed for other reasons:*

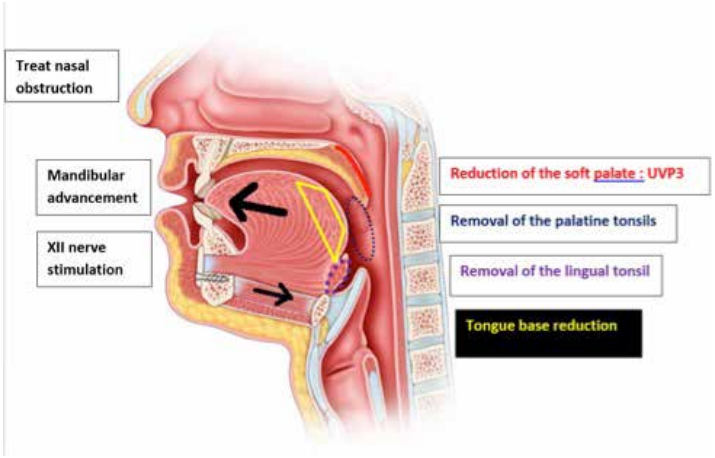
B. Imaging findings strongly suggesting SDB/OSA in imaging performed for other reasons: Several cases are shown where the subsequent confirmed diagnosis of moderate – severe OSA is likely much more significant (for the patient) than the primary indication for imaging.

Treatment: The first-line treatment of OSA, especially moderate to severe disease, is continuous positive airway pressure (CPAP) which acts as a pneumatic splint for the airway. Long-term tolerance of CPAP is variable and of the order of 30-70%.

Other options for treatment depend, to a degree, on which type of specialist the OSA sufferer is referred to. A mandibular advancement device (MAD) is often the best option for mild to moderate disease and is much better tolerated than CPAP. Both this technique and mandibular advancement surgery act, in simplified terms, to increase the size of the "bony box".

Rhinitis is common and should always be treated. Surgical correction of septal deviation and other structural causes of nasal obstruction can lead to resolution of snoring and decrease the requirement for CPAP but rarely cure OSA.

Other surgical techniques decrease the amount of soft tissue compressing the airway and include reduction in size of the soft palate and uvula: uvulopalatopharyngoplasty (UP3), palatine tonsillectomy, removal of the lingual tonsil and reduction in tongue size (trans-oral robotic surgery: TORS). Hypoglossal (XII) nerve stimulation is a minimally invasive technique used to increase the activity of extrinsic tongue muscles, primarily genioglossus; it shows promise as an alternative treatment for OSA.



References:

On request, including CT protocols

Take Home Points:

- SDB varies from snoring to OSA. 40-50% of adults snore as do 95% of OSA sufferers
- Paediatric OSA is due to adenoidal hypertrophy in the 4-10 year age-group. Enlargement of the palatine tonsils and obesity are more important in adolescence
- Adult OSA requires a PSG for definitive diagnosis and grading of the disease.
- The incidence of OSA is underestimated; 75% of affected adults are obese.
- 4 x increase in all causes of adult mortality + morbidity with moderate-severe OSA
- Narrowing of the upper airway in awake, supine adults correlates strongly with the tendency for airway collapse during sleep and OSA.
- Reduction in the maxillofacial skeleton (bony box) or increased soft-tissue within the box can cause upper airway narrowing. Imaging provides optimal assessment.
- Patients with OSA can be comprehensively evaluated with low dose MDCT, especially those who have failed medical treatment.
- OSA can be suggested in patients undergoing imaging for other indications.
- Loss of weight (if obese), treatment of rhinitis and CPAP are the first line treatment for adult OSA. CPAP has a variable long term adherence rate of 30-70% and acts as a pneumatic splint, increasing airway dimensions.
- Mandibular advancement devices (MAD) are an alternative to CPAP and preferred for mild – moderate OSA.
- Multiple surgical and less invasive procedures are being increasingly used to treat OSA either by a) increasing the size of the bony box b) reducing soft-tissue around the upper airway.

SS 3.3.
Cross sectional imaging for functional swallowing disorders: When, how and what to expect

M. Becker, Geneva/CH

Short Summary: Functional swallowing disorders (FSD) are typically diagnosed at videofluoroscopy. They can be isolated and idiopathic or they can occur in association with other symptoms. Common organic causes of FSD include neurologic conditions (stroke, multiple sclerosis, Parkinson's disease, amyotrophic lateral sclerosis, diseases affecting the lower cranial nerves and neuromuscular diseases), autoimmune diseases, gastro-esophageal reflux, radiation therapy and conditions impairing oropharyngeal swallowing due to mass effect on the pharynx and esophagus or due to involvement of adjacent neck spaces. When FSDs are the first manifestation of an underlying disease, tailored cross-sectional imaging, depending on the type of diagnosed FSD is warranted. The purpose of this lecture is to provide an understanding of when and how to use cross-sectional imaging to complement

the work-up of FSD. Common FSD diagnosed at videofluoroscopy, such as dysfunction of the cricopharyngeus muscle, delayed swallowing reflex, pharyngeal hypomotility and aspiration are presented and what to expect from cross-sectional imaging. The indications for CT and MRI are reviewed and their respective role in the detection and precise description of the underlying cause. Major emphasis will be put on how to report the findings in a comprehensive way and how to tailor the examination.

Take Home Points:

- To recognize the most common causes of FSD in patients with a normal pharynx at clinical examination.
- To review the role of different imaging techniques in the diagnosis and treatment of FSD
- To review the key imaging features of the most common causes of FSD as seen on the respective imaging techniques

SS 4.1.
Normal US anatomy and anatomical variants

A. Germano, Amadora/PT

Learning objectives:

1. to present the normal ultrasound anatomy of the thyroid gland and adjacent structures.
2. to recognize common anatomical variants.
3. to give some tips and tricks on ultrasound technique and how to avoid diagnostic pitfalls.

Background: High-resolution ultrasound is considered the best imaging technique for evaluating the thyroid gland, as it is accessible, non-invasive, and highly sensitive concerning the detection and characterization of thyroid nodules. However, a background knowledge of the normal ultrasound anatomy of the thyroid gland, surrounding neck structures, and its anatomical variants, is crucial to avoid misdiagnosis in daily practice.

Findings and procedure details: Images of the gland in the transverse and longitudinal planes are presented, with identification of adjacent strap muscles, trachea, oesophagus, and surrounding vessels. Some common artifacts are shown (muscle aponeurosis, septum, osteophytes, and oesophagus movement with neck rotation). Anatomical variants of shape and size are displayed, including hemi-agenesis, and all variations of accessory thyroid gland parenchyma: external, superior (pyramidal lobe, thyroglossal duct cyst, lingual thyroid), posterior (Zuckerkandle lobe), and inferior (mediastinal). Intra and inter-individual variations of the gland's normal echogenicity and vascularization are discussed. The typical position of the recurrent laryngeal nerves is shown, and the clinical relevance of describing a possible anomalous course (non-recurrent nerve) is highlighted. Finally, ultrasound features of normal neck lymph nodes are defined. Kuttner, Delphian, and Virchow nodes are outlined.

Conclusions: The awareness of normal neck sonographic anatomy and anatomical variants of the thyroid gland is crucial to correctly perform a thyroid gland ultrasound examination and to avoid diagnostic pitfalls.

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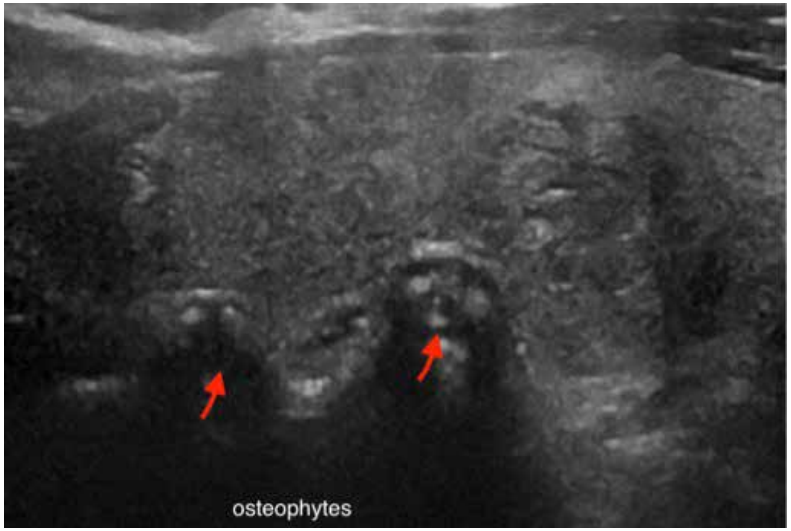

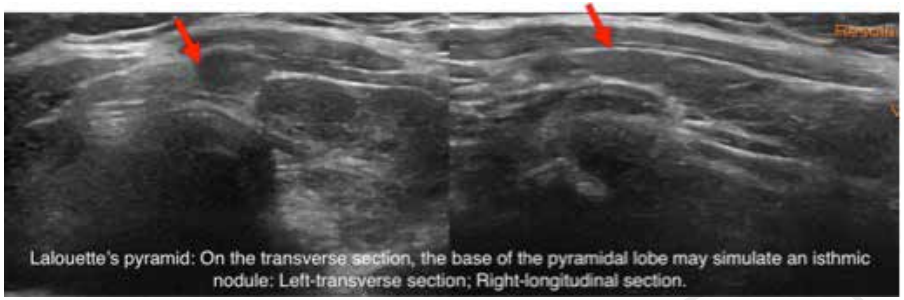
Lalouette's pyramid: On the transverse section, the base of the pyramidal lobe may simulate an isthmic nodule: Left-transverse section; Right-longitudinal section.

Take Home Points:

1. Normal neck sonographic anatomy knowledge is crucial for avoiding diagnostic pitfalls.
2. Recognition of anatomical variants has strong clinical relevance.

SS 4.2.

Doppler, contrast-enhanced US and elastography: Is there a real added value in thyroid nodules characterization?

K.S.S. Bhatia, London/UK

Short Summary: Ultrasound evaluation of thyroid nodules is becoming increasingly standardised as the result of recently published guidelines from different international societies, which propose using malignant risk stratification systems. Although these classifications vary in precise detail, they predominantly utilize combinations of gray scale US features. Over the years, vascular patterns on Doppler US and quantitative indices have been investigated and used by individuals routinely for characterizing thyroid nodules. On Doppler US, perinodular and predominant central vascularity are commonly regarded as being predictors of benignity and malignancy respectively. However, published accuracy data for these parameters is mixed and recent reviews are disappointing. Consequently, nodule vascular patterns and indices are excluded from all but one of the current classification systems. Contrast enhanced ultrasound visualises both nodule macro and microvascularity. CEUS enhancement has been under investigation for nearly two decades with just over a dozen small reports published, which have identified different nodule enhancement patterns according to tissue type including inhomogeneous enhancement in malignant nodules. Moreover, emerging data suggests CEUS may complement current risk classifications. Nevertheless, there is variability in results such that thyroid CEUS remains a research tool and is presently not recommended for clinical use. In the last decade, over 100 reports of elasticity imaging (EI) or elastography have been published. EI is varied broadly subdivided into strain and shear wave techniques. The evidence indicates papillary thyroid cancers are stiffer than benign nodules but diagnostic performance data are highly varied including relatively large studies with disappointing results. In addition, issues pertaining to operator dependence, reproducibility and nodule suitability for elastography are not completely resolved. Recently, expert panel guidelines have been published with the aim to promote high quality and optimised thyroid EI examinations, and several experts are already endorsing thyroid elastography. However, in this speaker's opinion, thyroid EI is highly controversial and its reliability as well as definitive indications still needs to be established. Thyroid EI for focal nodules should now be clarified with larger multicenter studies using current EI technologies. This talk will present the evidence for vascular patterns and quantitative indices, CEUS and elastography for distinguishing between benign and malignant thyroid nodules. This talk will highlight potential indications for some of these parameters in routine clinical practice.

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Take Home Points:

1. Most evidence suggests thyroid nodule vascular patterns on Power Doppler US are suboptimal for predicting benignity or malignancy.
2. Thyroid CEUS is presently a research tool although some evidence suggests that it has potential to complement conventional US including malignant risk classifications such as TIRADS.
3. Despite numerous reports evaluating thyroid elastography for malignancy in nodules in the last decade, the evidence is inconsistent in terms of it diagnostic performance, optimal technology and nodule suitability. Given the plethora of small reports with mixed results, larger multicenter systematic studies using the latest technologies are required to validate any potential indications.

SS 4.3.

Implications of the new ATA guidelines on pre-operative thyroid imaging

L. Fernandes, Lisbon/PT

Short Summary: Thyroid nodules are extremely frequent, and although thyroid cancer is still relatively uncommon the diagnosis of differentiated thyroid cancer is becoming more prevalent. The management of adult thyroid nodules and differentiated thyroid cancer is thus a major challenge for modern Radiology. Ultrasound, with its high resolution, should be used appropriately to characterize and select which nodules should be biopsied. American Thyroid Association's (ATA's) guidelines were revised in 2009 and more recently in 2015, with some pertinent changes to highlight. The aim is to define evidence-based recommendations representing contemporary optimal care regarding initial evaluation, clinical and ultrasound criteria for fine-needle aspiration (FNA) biopsy, interpretation of FNA results, use of molecular markers, and decision-making in the management of thyroid nodules. ATA recommendations are graded as strong, weak, no recommendation and insufficient. There are many questions to try to answer: what about screening and staging? What are the implications of the new ATA guidelines on pre-operative thyroid imaging? What surgical, radioiodine or other therapy to choose? Witch is the best surveillance and management strategy for recurrent and metastatic disease? Many other groups have also developed clinical practice guidelines, as we all know very well. Controversies and differences related for instance to geographic regions and physician specialties highlight the need to clarifying evidence droughts with future research. Are we ever going to agree in how to best deal with these patients? We also may ask if clinically occult cancers incidentally detected on imaging, that are rising recently, are that meaningful? In the end, we might agree that there is still no replacement of individual decision-making in limited centers with clinical specific expertise.

Take Home Points:

The management of adult thyroid nodules and differentiated thyroid cancer is a major challenge for modern Radiology American Thyroid Association's guidelines concerning those nodules were revised in 2015 Ultrasound data including ATA nodule sonographic patterns and risk of malignancy are reviewed What are the implications of the new ATA guidelines on pre-operative thyroid imaging? Many other groups have also developed clinical practice guidelines for thyroid nodules In the end, are we ever going to agree in how to best deal with these patients?

SOPS 1.1.

Peritumoral bone change in oral squamous cell carcinoma: a prospective study through radiologic-pathologic correlation

G. Jo, K. Huh, H. Yeom, Seoul/KR

Short Summary: When oral squamous cell carcinoma (OSCC) invades the jaw bone, abnormal CT attenuation or MR signal intensity (SI) are frequently observed in remaining margin, which makes it difficult to determine the extent of tumor invasion.

Purpose/Objectives: The aim of this study is to assess peritumoral bone changes on pre-operative CT, MR, PET-CT images and post-operative cone beam CT images of resected specimen, then to compare the radiologic findings with histopathologic findings.

Methods and Materials: Between November 2015 and December 2016, we enrolled twenty subjects who were diagnosed with OSCC and waiting for mandibulectomy. This study was approved by our institute review board. The degree of sclerosis (absence, mild, moderate) on pre-operative CT image and SI of underlying bone marrow (low, intermediate, high) on pre-operative MR image were analyzed. On pre-operative PET-CT images, the degree of fluorodeoxyglucose(FDG) uptake was assessed. Post-operative cone beam CT of resected specimens was taken to improve the accuracy in determining the region of interest for radiologic-pathologic correlation. After decalcification of the specimens, histopathologic slides were prepared for three regions of the specimens, including the deepest region of bone invasion, and 3-5 mm anterior and posterior to it. Histopathologic findings, such as the presence of malignant cell nest (presence, absence), the density of peritumoral inflammation (absence, mild, moderate), the pattern of trabecular bone alteration (thickness, number), peritumoral stroma reaction (fibromyxoid, desmoplastic) were evaluated. The relationships between radiologic and histopathologic findings were evaluated using Pearson's Chi-square test.

Results: On CT images, sclerosis was observed in 15/20 cases. On MR images, pathologic SI of underlying bone marrow was observed in 13/20 cases. Peritumoral bone change commonly presented high SI on T2-weighted image and enhancement on postcontrast T1-weighted image. However, SI of peritumoral change on MR image was different from that of a main mass. On PET-CT images, hyperuptake was observed in 2/20 cases, which was very rare. According to histopathologic findings, no malignant cell nest but mild inflammation was observed in peritumoral bone change area. Sclerosis on CT images tended to show a higher level of trabecular thickness and a normal trabecular number. Abnormal SI of bone marrow on MR images showed desmoplastic stromal reaction rather than fibromyxoid one.

Conclusion: Peritumoral bone changes are often accompanied by OSCC as sclerosis or pathologic signal change of bone marrow. Those changes should not be considered as bone invasion by OSCC and unnecessary wide resection of the mandible should be avoided.

SOPS 1.2.

Utility of routine cranial acquisition in staging 18F-FDG PET/CT scans in Head & Neck cancer

H. Shiwani, S. Karthik, S. Vaidyanathan, Leeds/UK

Short Summary: Assessing the utility of routine cranial acquisition in staging 18F-FDG PET/CT scans in Head & Neck cancer

Purpose/Objectives: To assess the utility of routine cranial acquisition in staging 18F-FDG PET/CT scans in head & neck cancer

Methods and Materials: A retrospective single-group cohort study included all consecutive patients who had a PET/CT scan for the assessment of possible head and neck cancers between the 1st January 2015 and 31st December 2016 at Leeds Teaching Hospitals. Presence of an intracranial finding was the primary outcome measure.

Results: A total of 216 patients were identified who had undergone a staging 18F-FDG PET/CT scan with cranial acquisition for the assessment of head and neck cancer. 147 had an Oropharhynx primary, 27 had an Oral Cavity primary, 6 had a Nasophaynx primary, 6 had a Laryngeal primary, 19 had a Hypopharynx primary, 11 had a Supraglottic primary. None of the patients had evidence of intracranial malignancy.

Conclusion: Guidance from the RCR UK details the application 18F-FDG PET/CT scans in head and neck cancer and is a modality used when staging is difficult clinically or previous imaging has been uncertain or unequivocal. Although lung cancer, melanoma and breast cancer commonly metastasize to the brain, this is relatively uncommon in head and neck cancers calling into question the need of cranial acquisition. The benefits of excluding cranial acquisition in staging scans for head and neck cancer is the time saved performing a scan and reduction in the dose received from the CT scanner. Our study highlights the low incidence of intracranial findings in PET/CT scans for head and neck cancers and provides evidence for the exclusion of routine cranial acquisition.

SOPS 1.3.

Detection of residual head and neck cancer after (chemo)radiotherapy: Value of DWI to characterize residual 18F-FDG uptake on PET-CT at the primary tumor site

D. Noij[1], V. Jagesar[1], P. De Graaf[1], M. De Jong[1], O. Hoekstra[1], R. De Bree[2], J. Castelijns[1], [1]Amsterdam/NL, [2]Utrecht/NL

Short Summary: Diffusion-weighted imaging adds specificity to characterize residual 18F-FDG uptake at the primary tumor site 3 months after (chemo)radiotherapy in patients with head and neck squamous cell carcinoma.

Purpose/Objectives: Diagnosing residual malignancy after (chemo)radiotherapy presents a diagnostic challenge due to overlapping symptoms and imaging characteristics. We assessed the added diagnostic and prognostic value of diffusion-weighted imaging (DWI) to positron emission tomography combined with computed tomography (PET-CT) in head and neck squamous cell carcinoma (HNSCC) patients with residual fluorodeoxyglucose (18F-FDG) uptake at the primary tumor site 3 months after (chemo)radiotherapy.

Methods and Materials: For this retrospective study from January 2010 to June 2012, twenty-two patients (median age: 61 years, range: 41-77 years) with residual 18F-FDG-uptake at the primary tumor site at 3 months after (chemo)radiotherapy were included for analysis. Both PET-CT and MRI including DWI were performed as a part of the institutional protocol and were qualitatively assessed for the presence of residual malignancy at the primary tumor site. We used ROC analysis to determine the optimal cut-off with a high weight on sensitivity in order not to miss any residual malignancy. Further we used the log-rank test for survival analysis. The reference standard consisted of histopathological confirmation.

Results: Sensitivity and specificity of PET-CT were 100% and 47%, respectively. For DWI, sensitivity and specificity were 80% and 82%, respectively. When DWI was added to PET-CT with residual 18F-FDG uptake and only a positive read on both PET-CT and DWI was considered to be overall positive, sensitivity remained 80% (95%CI: 28-99%), and specificity was 88% (95%CI: 64-99%). Local progression-free survival was significantly shorter in patients with a positive read on both PET-CT and DWI (P =0.017).

Conclusion: In this pilot study of selected patients with residual 18F-FDG -uptake at the primary tumor site 3 months after (chemo)radiotherapy, we demonstrated that the addition of DWI to PET-CT has the potential to increase the specificity of the response evaluation with limited decrease of sensitivity.

SOPS 1.4.

Simultaneous PET/MRI assessment of response to chemo/radiotherapy in patients with locally advanced head-neck squamocellular carcinoma: Preliminary results

V. Romeo, B. Iorio, M. Mesolella, M. Covello, Naples/IT

Short Summary: 5 patients with locally advanced head-neck SCC underwent simultaneous PET/MRI of the head-neck region before and after chemotherapy (CT) and/or radiotharapy (RT). Morpho-structural tumor features were assessed and metabolic, diffusion and perfusion (Ktrans, Ve, kep, iAUC) data were obtained by positioning regions of interest (ROIs); a comparison between pre- and post-treatment PET/MRI examinations was assessed. In 3 patients classified as Partial Response there was a consensual reduction of post-treatment morphological, metabolic and perfusion parameters with a significant increase of ADC values; the remaining 2 patients were classified as Complete Response with no detectable tumor lesions on post-treatment PET/MR images. Multiparametric evaluation with simultaneous PET/MRI could be a useful tool to assess the response to CT and/or RT in patients with head-neck SCC.

Purpose/Objectives: To assess by simultaneous PET/MRI the response to chemo and/or radiotherapy in 5 patients with locally advanced head and neck squamocellular carcinoma (SCC)

Methods and Materials: 5 patients with locally advanced head and neck SCC underwent simultaneous contrast-enhanced PET/MRI of the head and neck region using a 3 T Biograph mMR before and after chemo and/or radiotherapy. In particular, 4 patients (2 hypopharyngolaryngeal carcinoma, 1 nasopharyngeal carcinoma and 1 retromolar trigone carcinoma) were treated with concurrent chemo/radiotherapy (CT-RT), while the last patient with a nasopharyngeal carcinoma was treated with RT alone, according to the clinical indications. Morpho-structural tumor features and size were assessed; area value, metabolic (SUV and MTV) and functional diffusion (ADC) and perfusion (Ktrans, Ve, kep, iAUC) data were obtained by positioning regions of interest (ROIs). A comparison between pre- and post-treatment PET/MRI examinations was assessed for each patient and integrated with clinical evaluation.

Results: 3 patients treated with CT-RT (2 hypopharyngolaryngeal carcinoma and 1 retromolar trigone carcinoma) were classified as partial response (PR), showing a reduction of post-treatment morphological, metabolic and perfusion parameters with a significant increase of ADC values; the remaining 2 patients with nasopharyngeal carcinoma, treated respectively with CT-RT and RT alone, showed a complete response (CR) with no detectable tumor lesions on post-treatment PET/MR images. Interestingly, the 2 patients classified as CR showed lower pre-treatment ADC values as compared to the 3 patients classified as PR.

Conclusion: Simultaneous PET/MRI could be a useful tool to assess the response to CT and/or RT in patients with head and neck SCC. Future studies in a larger cohort of patients are necessary to confirm our results and also to identify metabolic and/or functional biomarkers that could be predictive of patient's response to therapy.

SOPS 1.5.

The prognostic value of the combination of 18-F-FDG-PET and diffusion-weighted imaging in head and neck cancer.

R. Martens, D. Noij, T. Koopman, B. Zwezerijnen, O. Hoekstra, P. De Graaf, R. Boellaard, J. Castelijns, Amsterdam/NL

Short Summary: The prognostic value of 18F-FDG-PET/CT and diffusion-weighted MRI in locoregional recurrence and overall survival are mainly based on volume and metabolic activity related parameters. The ADC and PET/CT parameters will be combined in a multiparametric model to measure predictivity.

Purpose/Objectives: In resectable head and neck squamous cell carcinoma (HNSCC) (chemo)radiotherapy is increasingly being used to preserve tissue functionality. There is emerging evidence combining functional imaging techniques like diffusion-weighted imaging (DWI) and 18F-FDG-PET/CT may be used to predict response to treatment. Moreover, because both techniques are based on different physiologically properties, combining both modalities may provide complementary information. The purpose of this study will be to assess the prognostic value of pre-treatment DWI and 18F-FDG-PET/CT in HNSCC.patients treated with (chemo)radiotherapy. Preliminary results are presented below.

Methods and Materials: For this retrospective cohort study patients we included 130 patients wich histologically proven HNSCC, treated with chemo-radiotherapy. Of these patients 60 who underwent both a DWI scan and 18F-FDG-PET/CT (PET/CT), 43 PET/CT and 27 a DWI before the start of treatment. DWI and 18F-FDG-PET/CT were semi-automatically quantitatively analyzed by manually delineating primary tumor (PT) and nodal location. The predictive value of both modalities will be assessed with the non-parametric Mann-Whitney U test and a multivariate cox proportional hazard model.

Results: Mean follow-up time was 20.5 months. Volume of VOI (p=0.047), total activity in VOI(p=0.040), Peak injection dose (ID) in VOI (p=0.02), total injection dose in VOI (p=0.021) and Total lesion glycolysis (p=0.044) were significant different on primary tumor recurrence. Significant predictors of locoregional recurrence were the VolumeofVOIcc p=0.004, total activity in VOI (p=0,000103), peakIDmlVOI (p=0.018), totalIDinVOI (p=0.001), TLG (p=0.001). Regarding the overall survival larger VolumeofVOIcc (p=<0.001), higher total activity in VOI(p=<0.001), a higher PeakIDmlinVOIml (p=0.001), higher TotalIDinVOI (p=<0.001), SUVmin (p=0.006), SUVpeak (p=0.01), SUVmean (p=0.017), TLG (p=<0.001), SD ADC (p=0.004), Max ADC (p=0.005) were significant predictors.

Conclusion: Pre-treatment volume and activity related PET/CT parameters were significant predictors of locoregional recurrence of PT in HNSCC and in locoregional recurrence-free survival. The metabolic activity of a tumor measured by standard uptake and glycolysis as well as ADCmax were predictors of overall survival. A multiparametric model will be created to determine the optimal combination of functional parameters.

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ORAL PRESENTATION ABSTRACTS

SOPS 1.6.

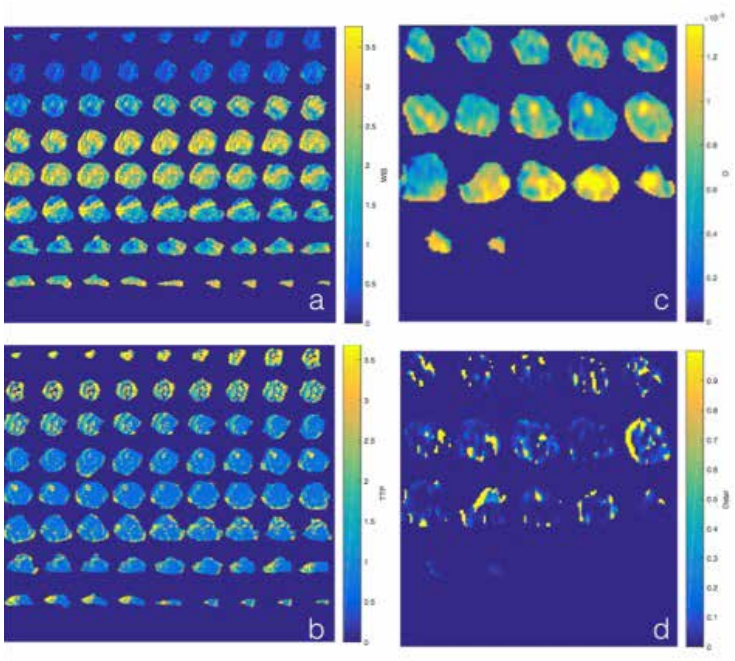
A multivariate analysis combining DCE-MRI and IVIM derived parameters to improve differential diagnosis of parotid tumors: A proposal for new indexes

F. Patella[1], M. Petrillo[1], M. Sansone[2], R. Fusco[2], G. Pompili[1], G. Franceschelli[1], G. Carrafiello[1], [1]Milan/IT, [2]Naples/IT

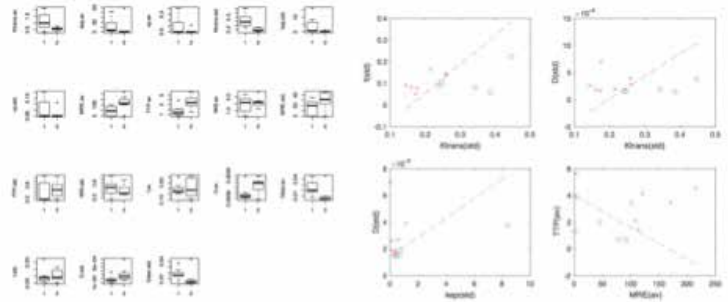
Short Summary: In this preliminary study we used an advanced multivariate analysis of IVIM and DCE parameters to propose new indexes potentially able to separate Warthin tumors by Pleomorphic Adenomas in a new way never used in literature before.

Purpose/Objectives: The purpose of our study was to evaluate the diagnostic value of new indexes combining different DCE-MRI and IVIM derived parameters to adequately separate Warthin tumors and Pleomorphic Adenomas.

Methods and Materials: A total of 14 histopathological proven parotid tumors (7 Warthin's tumors and 7 pleomorphic adenomas) in 11 consecutive enrolled patients were included in this study. For both DCE-MRI and IVIM model free and model based parameters were computed pixel by pixel on manually segmented regions of interest (ROIs) drawn on entire lesion's volume. Median values and the standard deviation on segmented ROIs (extracted volumes) were calculated for each lesion under a Matlab environment. Extracted parameters were: Ktrans_av, kep_av, vp_av, Ktrans_std, kep_std, vp_std, MRE_av, TTP_av, WIS_av, MRE_std, TTP_std, WIS_std, f_av, D_av, D*_av, f_std, D_std, D*_std. Statistical procedures to evaluate data included both univariate and multivariate analysis using conventional linear analysis and more advanced techniques to separate Pleomorphic Adenomas by Warthin Tumors. Furthermore, for each couple of parameters (153 couples) ROC curve analysis were performed and specificity, sensitivity, positive predictive value (PPV) and negative predictive value (NPV) were calculated.



Results: Our findings showed that no single variable was able to differentiate Warthin tumors by Pleomorphic adenomas. Furthermore, only 4 couples presented AUC = 1:
1) Ktrans(std) and f(std); 2) Ktrans(std) and D(std)'; 3) Kep(std) and D(std); 4) MRE(av) and TTP(av). The linear combination of these coupled variables provided 4 new parameters:
*Y1 = 46.0 * Ktrans(std) + 34.7 * f(std)*
*Y2 = 34.8 * Ktrans(std) + 8368 * D(std)*
*Y3 = 0.525 * kep(std) + 7223 * D(std)*
*Y4 = 0.0361 * MRE(av) + 1.5 * TTP(av)* whose cut-off values were respectively: *1) 7.2973 2) 6.8202 3) 1.0210 4) 6.0205*
In all cases sensitivity, specificity, PPV e NPV were 100% (misclassification error rate = 0%).



Conclusion: New coupled variables provided by a linear combination of DCE-MRI and IVIM derived parameters potentially could help in differential diagnosis between Warthin Tumors and Pleomorphic Adenomas being more accurate of both single variable based analysis and coupled parameters commonly used in literature until now.

SOPS 1.7.
Ultrahigh-field (9.4T and 17.6T) magnetic resonance imaging of retinoblastoma

M. De Jong[1], P. De Graaf[1], P. Pouwels[1], J. Beenakker[2], R. Jansen[1], J. Geurts[1], A. Moll[1], J. Castelijns[1], P. Van Der Valk[1], L. Van Der Weerd[2], [1]Amsterdam/NL, [2]Leiden/NL

Short Summary: Retinoblastoma is the most common pediatric eye cancer. Imaging of retinoblastomain vivo is nowadays performed at 1.5T or 3.0T and ideally allows for images with pixel sizes <0.5x0.5 mm2 and slice thicknesses of <2 mm3. Ex vivo ultrahigh-resolution MRI at 9.4T and 17.6T of enucleated retinoblastoma eyes was performed resulting in ultrahigh-resolution images with voxel sizes of 59x59x59 to 100x100x100 µm3. This allowed us to show detailed aspects of retinoblastoma in terms of retinoblastoma staging and small anatomical details

Purpose/Objectives: Detailed information about tumor morphology and extent in retinoblastoma is important for treatment decision making. Therefore, the purpose of our study was to show the potential of ultrahigh-field magnetic resonance imaging (MRI) for depicting tumor morphology and detecting tumor extent in retinoblastoma in more detail by correlating in vivo and ex vivo images with histopathology.

Methods and Materials: Six retinoblastoma patients (median age 5.5 months, range 2–14) were prospectively included in this study.Median time between retinoblastoma diagnosis and enucleation was 8 days (range 7–19). In vivo pre-enucleation MRI ta 1.5 T was performed with a circular surface coil covering the eye. Ex vivo imaging was performed on two vertical 89-mm-bore magnets with field strengths of 9.4 T and/or 17.6 T. After ex vivo imaging the eyes were histopathologically analyzed and matched with MRI findings.

Results: We were able to correlate ultrahigh-field MR images of various aspects of intraocular retinoblastoma (growth type, viable tumor versus necrosis) and disease staging (tumor position relative to optic nerve or choroid, tumor seeding, figure 1) with histology. Retinoblastoma with vital tumor cells surrounding a central vessel interspersed with necrotic areas presented as an 'geographical pattern' on both MR and histopathology images (figure 2).

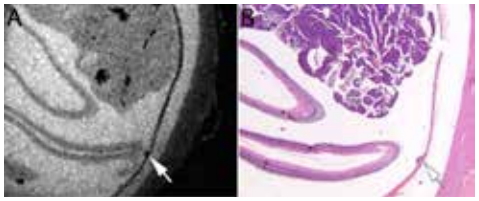


Figure 1. Ex vivo MR image (A;FLASH image with a small FOV at 17.6T) and a matching histopathologic image (B) showing a tumor mass and a detached retina. The arrow shows a subretinal tumor seed on the choroid.

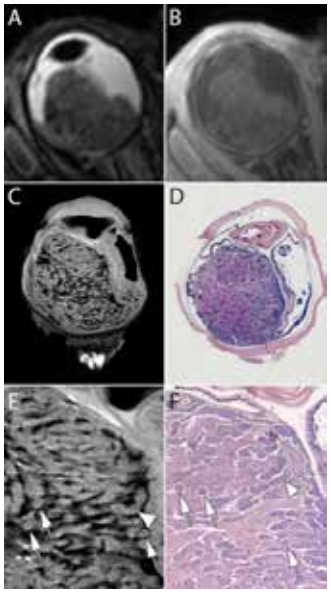


Figure 2. In vivo MR images (A:T2-weighted at 1.5 T and B:T1-weighted contrast enhanced at 1.5T) showing a reasonably homogenous tumor. Ex vivo MR image (C and E:RARE at 17.6T) versus histopathologic slides (D and F).

Conclusion: In this study we presented ultrahigh-resolution MR images of retinoblastoma showing various aspects of disease staging in high detail. Insight in small anatomical details might help guide and reduce sampling error of histopathology. Improved disease staging (in and ex vivo) with more detailed imaging can potentially improve treatment decisions.

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ORAL PRESENTATION ABSTRACTS

SOPS 2.1.

Ex vivo delineation of temporal bone substructures in ultra-high resolution using industrial computed tomography

J.-M. Hempel, G. Bier, M. Bongers, Tübingen/DE

Short Summary: Industrial CT is feasible for ultra-high resolution ex vivo studies of the temporal bone and demonstrates the limitations of recent CT technology in clinical setting.

Purpose/Objectives: Delineation of subtle substructures in computed tomography (CT) of the temporal bone is essential for detection of potential middle and inner ear disease as well as for planning a surgical approach for cochlear implantation. However, the spatial resolution of recent CT systems is limited due to detector architecture and issues of radiation protection.

Methods and Materials: In this prospective field study we evaluated the feasibility of industrial computed tomography (Zeiss Metrotom, Zeiss, Oberkochen, Germany) for ex vivo studies on cadaveric temporal bone.

Results: Industrial CT allows for delineation of microscopic temporal bone substructures with a resolution up to 0.3 µm. Small structures such as the basilar membrane of the cochlea, the cochlear cleft, or the stapes suprastructure can be clearly identified.

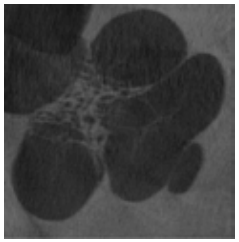

Fig. 1: Ultra-high resoultion computed tomography of the cochlea revealing smallest substructure of the modiolus and depict basilar membrane.

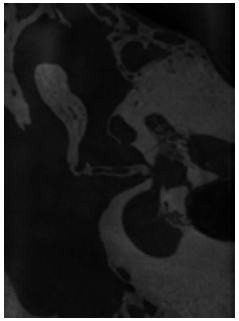

Fig. 2: Delineation of the middle ear ossicle chain

Conclusion: Industrial CT is feasible for ultra-high resolution ex vivo studies of the temporal bone and demonstrates the limitations of recent CT technology in clinical setting.

SOPS 2.2.

The diagnostic accuracy of 1,5 T versus 3 T Non-Echo-Planar Diffusion-Weighted Imaging in the detection of middle ear and mastoid cholesteatoma.

L. Lips, F. Theunissen, P. Nelemans, E. Roele, J. Van Tongeren, A.a. Postma, Maastricht/NL

Short Summary: The purpose of this study was to retrospectively compare diagnostic performance of 1,5T versus 3T non-echo planar diffusion-weighted imaging in the detection of primary, residual and/or recurrent cholesteatoma. Primary, residual and recurrent cholesteatoma can be accurately detected using DWI signal intensity. Standard sequences are still valuable to maintain high specificity. 1,5T scanners yield better results than 3T scanners.

Purpose/Objectives: The purpose of this study was to retrospectively compare diagnostic performance of 1,5T versus 3T non-echo planar diffusion-weighted imaging in the detection of primary, residual and/or recurrent cholesteatoma. Keeping up with new insights on optimizing imaging techniques is important to decrease the need for second-look surgery, and its associated morbidity and surgical costs.

Methods and Materials: Patients with either clinically suspected cholesteatoma or postoperative routine survey MR who subsequently underwent surgical procedure were included (155 patients, 190 MR scans) from a large MR database. Patients underwent 1,5T (n=148) or 3T MRI (n=42), with non-echo planar DWI, T1 and T2 standard acquisitions. Two radiologists independently reassessed the images. MR findings were correlated with surgical findings in all cases. This study was approved by the institutional review boards. The need for signed consent was waived for this retrospective study. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and diagnostic odds ratio were calculated.

Results: Using both non-epi DWI and standard sequences, reviewer 1 identified 148 lesions in middle ear and mastoid showing high DW signal, of which 138 were deemed most likely cholesteatomatous. Reviewer 2 identified 143 lesions with high DW signal, of which 125 were interpreted as probably cholesteatoma. All patients subsequently underwent surgery, confirming the presence of 143 cholesteatomas in 125 patients, 19 primary and 124 residual/recurrent. Diagnostic odds ratios were higher if patients were scanned on 1,5T (14,7 for reviewer 1, 16,7 for reviewer 2) compared to 3T (2,0 for reviewer 1, 3,5 for reviewer 2). If only high DWI signal was used to detect cholesteatoma, sensitivity was high for both readers (90% resp. 82%) but specificity was low (57% resp 64 %). Adding standard T1 and T2 sequences to the process lead to a higher specificity (62% resp. 75%) but lower sensitivity (84% resp. 79%).

Conclusion: Primary, residual and recurrent cholesteatoma can be accurately detected using DWI signal intensity. Standard sequences are still valuable to maintain high specificity. 1,5T scanners yield better results than 3T scanners.

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SOPS 2.3.

Preliminary study of electrical distribution within the human inner ear based on computed tomography of vestibular implanted patients

A. Hedjoudje, K. Hageman, R. Hayden, C. Dai, C. Della Santina, Baltimore/US

Short Summary: Multichannel vestibular prostheses are intended to restore sensation to individuals with bilateral loss of vestibular hair cell function. We built a human anatomy finite element model based on computed tomography (CT) of vestibular implanted patients to understand the inner ear electrical current spread during electrode stimlation. This model can facilitate optimal design of electrode arrays intended for human vestibular implantation.

Purpose/Objectives: Multichannel vestibular prostheses are intended to restore sensation to individuals with bilateral loss of vestibular hair cell function. Our previous research has demonstrated the ability of a finite element model to accurately predict responses to electrical stimulation in chinchillas and rhesus monkeys. We extended this approach to human anatomy based on computed tomography (CT) of vestibular implanted patients.

Methods and Materials: CT scans were collected for 3 patients implanted with a multichannel vestibular prosthesis. Model geometry was developed from a 3-dimensional reconstruction of a human specimen serially sectioned at 50 um. Virtual electrodes were positioned within the model volume based on their actual CT scan locations. Finite element analysis computed the extracellular potential field time course during current pulses from any constellation of electrodes.

Results: Current spread and degree of spurious activation of non-target afferents depends on the stimulating electrode positions. The highest voltage values were near the target vestibular nerves for the 3 electrodes in each patient. Ideal stimulations were obtained with electrode placed in target ampullas.

Conclusion: CT scans of vestibular implanted patients can facilitate optimal design of electrode arrays intended for human implantation and give important indications about optimal electrode insertion sites.

SOPS 2.4.

Computed Tomography and Magnetic Resonance Imaging-based Finite Element Analysis Predicts Current Flow in Labyrinths Implanted with a Multi-Channel Vestibular Prosthesis

A. Hedjoudje, M. Rahman, S. Mori, C. Dai, C. Della Santina, Baltimore/US

Short Summary: Our goal was to construct a robust, anatomically precise finite element model of current flow in the implanted labyrinth and better understand the biophysics of ampullary, utricular, saccular, cochlear and facial nerves stimulation. From CT and MRI high resolution images we built a 3D geometry before we computed the extracellular potential field elicited by virtual electrodes using the finite element model. VOR eye rotation 3D axes were then predicted from the relative proportion of model axons excited within each of the ampullary nerves and compared to actual 3D angular vestibulo-ocular reflex axes elicited by prosthetic stimuli. The model's predicted axis aligned well with the actual axis of eye rotation which facilitates optimal design of electrode arrays for clinical application.

Purpose/Objectives: As is true for cochlear implants, current spread beyond the intended target of a given electrode is a key factor determining the pattern of nerve stimulation elicited by a multi-channel vestibular prosthesis. Our goal was to construct a robust, anatomically precise finite element model of current flow in the implanted labyrinth and better understand the biophysics of ampullary, utricular, saccular, cochlear and facial nerves stimulation.

Methods and Materials: Model geometry was generated through 3-dimensional (3D) reconstructions of a normal rhesus temporal bone imaged using microMRI data obained with a 11.7 Tesla Magnet (48 µm isotropic voxels) and microCT (70 µm isotropic voxels). The extracellular potential field during a biphasic current pulse was computed using finite element methods.

Potential field values then served as inputs to stochastic, nonlinear dynamic models for each of 2,415 vestibular afferent axons with spiking dynamics based on a modified Smith and Goldberg model. A well-validated model of myelinated fibers implemented action potential propagation. Eye rotation 3D axes were predicted from the relative proportion of model axons excited within each of the ampullary nerves and compared to actual 3D angular vestibulo-ocular reflex axes elicited by prosthetic stimuli.

Results: The model's predicted axis aligned well with the actual axis of eye rotation, with misalignment of 18 ± 6.1 degrees (mean ± SD) for the 234 stimulation conditions examined.

Conclusion: Extension of the model to human anatomy should facilitate optimal design of electrode arrays for clinical application.

SOPS 2.5.
CT or MRI: Which is the best imaging modality to diagnose a large vestibular aqueduct or endolymphatic sac?

M. Gkagkanasiou[1], S. Connor[2], C. Dudau[2], [1]Athens/GR, [2]London/UK

Short Summary: We reviewed cases with large vestibular aqueduct (LVAS) and determined that the difference observed between measurements, obtained within the vestibular aqueduct (CT) or intraosseous endolymphatic sac/duct (MRI), did not influence diagnosis on the basis of Valvassori and Cincinnati criteria. In only one case there was extraosseous endolymphatic sac dilated on MRI while the intraosseous component was within normal limits. There was good interobserver reproducibility for CT and MRI.

Purpose/Objectives: We explored whether there 1) was a difference between measurements obtained within the vestibular aqueduct (CT) or intraosseous endolymphatic sac/duct (MRI) and whether this influenced diagnosis on the basis of previously published threshold values (Valvassori and Cincinatti) 2) were cases where the extraosseous endolymphatic sac was clearly dilated on MRI yet the intraosseous component was within normal limits and hence would appear normal on CT. Secondary objectives were to compare interobserver reproducibility for the CT and MRI based measurements, and to investigate any mismatch between the diagnosis using Valvassori versus Cincinatti criteria.

Methods and Materials: Subjects diagnosed with LVAS/LESA were prospectively identified. This was on the basis of either Valvassori and Cincinnati criteria assessed on CT or MRI (or the presence of an enlarged extraosseous sac on MRI). Subjects with both CT and MRI available (n=58) were evaluated by two independent observers and midpoint and operculum widths were measured. Subjects with MRI (+/- CT) available (n=76) were also evaluated and midpoint, operculum and extrosseous sac widths were measured.

Results: There was a significant difference between measurements obtained with CT versus MRI ($p<0.05$). CT diagnosed LVAS in 2/58 cases (Valvassori) and 4/58 cases (Cincinnati) where MRI measurements were normal, whilst MRI diagnosed LESA in 2/58 cases (Valvassori) where CT measurements were normal . There was 93,1% CT/MRI diagnostic agreement using both criteria. There were 6/58 CT cases and 4/76 MRI cases in which intraosseous measurements would have indicated a LVAS/LESA diagnosis using the Cincinnati but not the Valvassori criterion . In only one case was the extraosseous endolymphatic sac clearly dilated on MRI while the intraosseous component was within normal limits. The interobserver reproducibility (ICC) was good to excellent for all CT/MRI based measures.

Conclusion: There is a significant difference between CT and MRI based midpoint and operculum measurements with a 93,1% agreement in terms of LVAS/LESA diagnosis for both criteria. CT measurements resulted in an increased number of LVAS/LESA diagnoses compared with MRI, when using Cincinnati criteria . The MRI based LVAS/LESA diagnosis was less dependent on which criteria were used.

SOPS 2.6.
Fast and accurate diagnosis of an oval or round window perilymphatic fistula on CT and MRI without gadolinium injection

A. Venkatasamy, Z. Al Oraini, S. Riehm Cahen, A. Charpiot, F. Veillon, Strasbourg/FR

Short Summary: Our study focuses on the value of CT and MRI for the diagnosis of a perilymphatic fistula of the RW or OW after a barotrauma in the absence of a fracture. Until now, the only proven method for the diagnosis of perilymphatic fistula is exploratory surgery. We were able to properly diagnose a perilymphatic fistula without contrast injection, with excellent sensitivity (>90%) and specificity (100%) for CT and MR combined.

Purpose/Objectives: Evaluate the reliability of a non-contrast CT of the temporal bone and high resolution T2-weighted gradient-echo steady-state free precession sequence (SSFP) for the diagnosis of perilymphatic fistula (PLF) of the round window (RW) or oval window (OW) after a barotrauma.

Methods and Materials: 101 patients with a suspicion of PLF after barotrauma, imaged by either a temporal bone non-contrast CT and/or an MRI exploration a high-resolution T2-weighted gradient-echo SSFP sequence were included. The direct sign of a perilymphatic fistula is the visualization of fluid filling the OW or RW spaces. Indirect sign (on non-contrast CT) was a malposition of the footplate . All patients underwent exploratory surgery and surgical findings served as gold standard.

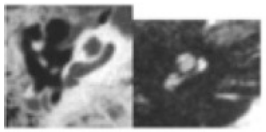

Fig 1: 1) Non-enhanced CT showing a hypodense complete fluid-filling of the RW. 2) Same patient, MRI, axial T2-weighted image showing fluid-filling of the RW.

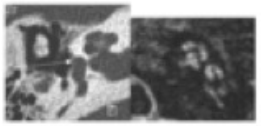

Fig 2: 1) Non enhanced CT showing an eversion of the footplate (arrow). 2) Axial T2-weighted MR image showing fluid in the OW The CT correctly diagnosed OW PFL with a sensitivity of 85.7% and a specificity of 97.9%. MRI correctly diagnosed PFL of the OW with a high sensitivity (92.3%) and specificity (96.3%). CT and MR combined correctly diagnosed PFL of the RW with excellent sensitivity (95.6%) and specificity (100%).The combination of CT and MR correctly diagnosed PFL of the OW with excellent sensitivity (90%) and specificity (100%).

Results: The non-contrast CT diagnosed the PLF of the round window with a high sensitivity (93.6%) and specificity (93.3%). MRI correctly diagnosed PFL of the round window with a high sensitivity (94.4%) and specificity (95.5%).

Conclusion: Non-injected CT or MRI are highly reliable for the diagnosis of PLF of the round or the oval windows, enalbling a fast and accurate diagnosis with a high sensitivity and specificity, which increase when techniques are combined (Se>90% and Sp 100%). We recommend starting the explorations with the CT, as it is easily accessible and fast, followed by a non-injected high resolution T2 sequence on MRI.

NH 1.1.
Image texture analysis and its biologic correlates - A new challenge for radiologists?

M. Ravanelli, Brescia/IT

Short Summary: Radiomics is a new field based on two concepts: 1) diagnostic digital images contain information that can be captured and quantified by mathematical algorithms; 2) these information are potentially relevant. As consequence, aims of radiomics are: 1) to extract robust quantitative parameters from images and 2) to correlate these parameters with clinical data. Image descriptors of a neoplastic lesion regard its size/volume, its shape/margins and its inner structure (texture). These parameters may be theoretically extracted from all diagnostic images but the more frequently used techniques are CT and MR. Parametersshould be robust, that is sufficiently insensitive to acquisition technical parameters, type of scanners, artefacts, segmentation variability, tumor size: this will be the first point we will touch in our talk.

When a group of robust parameters has been extracted, they can be used mainly for two purposes: i) noninvasive signature of genomic and phenotypic tumor characteristics (for example, HPV status in oropharyngeal cancer, EGFR mutation, PDL-1 overexpression in head and neck cancer etc.); ii) prediction of response to therapy (for example, chemoradiation in naso-oro-pharyngeal cancer, neoadjuvant chemotherapy in paranasal sinus cancer, response to tyrosinkinase inhibitors or immunotherapy etc.). Here comes the second point: how to manage large sets of data (often redundant) from relatively small numbers of patients in order to obtain useful and honest (that is generalizable) results? How to exploit the potential of this big amount of data avoiding overfitting (false discoveris)? This seems to be the more critical point and it cannot be addressed without an help from biostatistics.

Third point: which are the very initial results of radiomics in the field of head and neck oncology? Which are the ongoing studies we are informed of?

Fourth point is composed by a pure question and a question-purpose: there will be a space for radiomics in precision medicine of head and neck cancer? Is there a space in our Society for a “radiomic group” with an interdisciplinary vocation

NH 1.2.
Impact of spectral CT on head and neck oncology

H. Curtin, Boston/US

Short Summary: Spectral CT (most commonly dual energy CT) relies on different photon attenuation by different materials and tissues dependent upon the energy of the incident photon. There are several strategies used by different vendors but all take advantage of the same basic physical principles. Several papers have explored the usefulness of spectral CT in head and neck oncology. Most emphasize the differences in spectral behavior of iodine compared to various soft tissues taking advantage of the k-edge absorption characteristics of iodine. Some machines simply blend the energy levels weighting high and low energies differently. Virtual monochromatic images calculate and provide a virtual image at various different energies. Material decomposition maps compare the various spectra to known materials. The iodine map is an example Low energy scans emphasize iodine and can help separate enhancing tumor from normal tissue such as muscle. This is an advantage as tumor and muscle often have the same appearance at standard single energy CT scanning. Images are noisier but can be paired with 65 to 70 kVp virtual images that approximate the images that most radiologists are comfortable with from the single energy scanning systems. One major advantage, in our opinion, is the ability to differentiate cancer from non-ossified thyroid cartilage. Both are dense on contrast enhanced CT but their spectral properties and patterns are very different. Non-ossified cartilage is relatively denser at high energy; enhancing tumor is relatively denser at low energy. Thus they can be separated. Metal artifact reduction will also be discussed and brief mention will be of other approaches to achieving useful information from the very large data sets available.

Take Home Points:

1. Low energy virtual monoenergetic images or low energy weighted images emphasize iodine content and accentuate the margin of an enhancing tumor.
2. Non-ossified thyroid cartilage has no significant blood supply and its density is due to protein rather than iodine. The cartilage can be differentiated from enhancing tumor by varying emphasis of high and low energy spectral information.

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NH 1.3.
Potential impact of new PET tracers

D.C. Costa, Lisbon/PT

Short Summary: FDG (18F-fluoro-2-deoxy-D-glucose) continues to be the most widely available radiopharmaceutical for Positron Emission Tomography (PET) imaging. Its diagnostic performance is well established in Head & Neck oncology, in particular when staging, re-staging and assessing response to therapy of patients with head and neck squamous cell carcinomas (HNSCC). Clinical outcome is improved when SUVmax decreases 50% or more between pre and post-therapy assessments. More recently other radiopharmaceuticals have been proposed. R&D has been driven by tumour cell biology, wider availability and personalized medicine. Some biomarkers serve as diagnostic (with prognostic value) tools and treat diseases (THERANOSTICS). Radioactive iodine (131I- sodium iodide) is a long standing exaample of this. It helps the diagnosis and treatment of patients with hyperthyroidism and differentiated thyroid carcinoma (DTC). The choice of radionuclide to label imaging biomarkers is crucial. The short half-life (T1/2) of CARBON-11 (20 minutes) and OXYGEN-15 (2 minutes) detracts from their use in facilities without “on-site” cyclotron. The longer the labelling process and pharmacokinetics, the higher the need for longer hal-life radionuclides, such as FLUOR-18 (110 minutes), COPPER-64 (12 hours), ZIRCONIUM-89 (3 days) and IODINE-124 (4 days). With all this in mind a wide variety of biomarkers are nowadays available for research. Some of them are clinically useful under strict regulations according to local Ethics Committees, Medicinal regulators and Radiation Protection National and International Boards. Below some examples of new radiopharmaceuticals for PET imaging with apparent clinical potential for Head & Neck oncology are presented. The exceptional sensitivity and specificity of somatostatin receptors overexpression in Neuroendocrine Tumours (NET) led to the development of radiolabeled somatostatin analogues, such as 68Ga-DOTA-NOC, 68Ga-DOTA-TOC and 68Ga-DOTA-TATE. The latter labelled with LUTETIUM-177 (Lutathera®) is used for PRRT (Peptide Receptor Radionuclide Therapy). Several reports demonstrate its benefits. However many NET, e.g., pheochromocytomas and paragangliomas reveal adrenergic abnormalities and therefore 18F-DOPA, a marker of the catecholaminergic metabolism (dopa decarboxylase activity) should be preferable. Monoclonal antibodies (MAbs), key molecules involved in proliferation, differentiation, cell death and apoptosis, angiogenesis, invasion, and metastases biology, labelled with radionuclides are the basis for ImmunoPET. 89Zr-Trastuzumab and others labelled with 64Cu have been described. Recently, antibodies anti-“Programmed cell death protein 1” (PD-1) and anti-“Progammed Death-Ligand 1” (PD-L1) were introduced for scrutinity. Hypoxic head and neck tumors have high risk of local recurrences and distant metastases. Exmples of hypoxia radiotracers are: 18F-FMISO - [18F]Fluoromisonidazole; 18F-FAZA - 18F-Fluoroazomycin arabinoside; 64Cu-ATSM (diacetyl-bis(N4-methylthiosemicarbazone). Other biomarkes, nucleosides linked to cell proliferation have not made significant impact on management of Head & Neck tumours.18FLT (3’-deoxy-3’-[18F]-fluorothymidine) a marker of cellular proliferation shows very high uptake in bone marrow. Identification of other foci is quite difficult whenever routine qualitative imaging is desired. Amongst the labelled amino acids there is continuing interest in the evaluation of the following: L-[Methyl-11C]-methionine (MET); L-1-[11C]-Tyrosine (TYR); L-3-[18F]-Fluoro-alpha-methyltyrosine (FMT); O-(2-[18F] Fluorethyl)-L-tyrosine (FET) Methionine (MET) is preferred in facilities with “in house” cyclotron and radiochemical production units. Otherwise FET (fluoroethylthyrosine) is a good option for everyone else. Both are excellent performers to search for intracerebral primary tumours, metastatic disease and identification of post-therapy (surgery and radiation) intracerebral recurrences. Finally PET/MR, in addition, to quantitative measures of radiotracer tumour uptake together with several other related features (RADIOMICS), will further increase the expected positive impact of newly developed radiopharmaceuticals as imaging biomarkers in Head & Neck oncology.

Take Home Points:

FDG (18F-fluoro-2-deoxy-D-glucose) continues to be the most widely available radiopharmaceutical for Positron Emission Tomography (PET) imaging. Clinical outcome of patients with Head & Neck tumours is improved when SUVmax decreases 50% or more between pre and post-therapy assessments. Tumour cell biology, wider availability (including facilities without “on-site” cyclotron) and personalized medicine approach with THERANOSTICS in mind are the most frequent R&D drivers. Neuroendocrine Tumours (NET) overexpressing somatostatin receptors benefit from PET with 68Ga-DOTA-NOC, 68Ga-DOTA-TOC and 68Ga-DOTA-TATE. The latter labelled with LUTETIUM-177 (Lutathera®) is used for metabolic systemic radiotherapy or PRRT (Peptide Receptor Radionuclide Therapy).However many of these tumours, e.g., pheochromocytomas and paragangliomas reveal adrenergic abnormalities and therefore 18F-DOPA, as a marker of catecholaminergic metabolism (dopa decarboxylase activity) should be preferable. Monoclonal antibodies (MAbs), key molecules involved in proliferation, differentiation, cell death and apoptosis, angiogenesis, invasion, and metastases biology labelled with radionuclides are the basis for ImmunoPET. Antibodies anti-“Programmed cell death protein 1” (PD-1) and anti-“Progammed Death-Ligand 1” (PD-L1) are highly promising examples. Hypoxic head and neck tumors have a high risk of local recurrences and distant metastases. 18F-FMISO - [18F]Fluoromisonidazole; 18F-FAZA - 18F-Fluoroazomycin arabinoside and 64Cu-ATSM (diacetyl-bis(N4-methylthiosemicarbazone) are examples of hypoxia imaging biomarkers. Methionine (MET) and FET (fluoroethylthyrosine) are helpful to search for intracerebral primary tumours, metastatic disease and distinguish between post-therapy (surgery and radiation) and intracerebral recurrences. PET/MR, in addition, to quantitative measures of radiotracer tumour uptake together with several other related features (RADIOMICS), will increase the expected positive impact of newly developed radiopharmaceuticals as imaging biomarkers in Head & Neck oncology.

IS 1.1.
Tumor boards alive!
A. Borges, H. Estibeiro, Lisbon/PT

Short Summary: This interactive presentation is aimed to simulate a routine multidisciplinary treatment planning conference where a ENT surgeon and a diagnostic radiologist will discuss the most relevant issues behind patient's management decision making. Based on real MCDT conferences held weekly at our institution we have chosen a few representative oncology cases from different areas in the head and neck featuring problems in diagnosis, evaluation of treatment response and need for further intervention, recurrent cancer and second primaries. Major goals of MCDT's at our institution include gathering of all relevant material to assign definitive tumor staging, propose recommended management based on NCCN guidelines and offer reasonable alternatives, speed up the decision process by gathering several specialists together with dedicated time in an interactive environment, create a forum for second opinions and develop a detailed database for further review and assessment. Moreover, these conferences provide a privileged teaching environment for medical students, residents and less experienced physicians dealing with head and neck cancer. These meetings are attended by ENT head and neck surgeons, radiation oncologists, medical oncologists, radiologists, pathologists, nuclear medicine physicians and a dedicated ENT nurse. MCDTs have been shown to shorten the time between diagnosis and treatment and between surgery and adjuvant treatment. Incorporation of NCCN guidelines in decision making, provides the highest level of evidence although management should always be individualized.

Take Home Points:
Multidisciplinary treatment planning conferences (MCDT's) gather a core of physicians involved in the diagnosis, treatment and follow-up of head and neck cancers Multidisciplinary decision making based on NCCN guidelines incorporate the highest level of evidence Tumor boards offer a privileged teaching environment for medical students, residents and younger physicians involved in the management of head and neck cancer patients MCDT's have been shown to decrease the time between diagnosis and treatment as well as between surgery and adjuvant treatment

SS 5.2.
Future: Radiomics and computational imaging
N. Papanikolaou, Lisbon/PT

Short Summary: Medical imaging is a proven technology for the clinical assessment of cancer. It represents an important tool for several decades. Consequently, imaging is often viewed as an old technique, a misperception that, unfortunately, has limited its potential and perceived effect on precision medicine. It is well known that tumors exhibit strong phenotypic differences in patients that can be visualized by imaging. A great advantage of medical imaging is its ability to noninvasively visualize cancer's appearance, such as intratumoral heterogeneity, on a macroscopic level, at baseline and follow-up, from the primary tumor to potential metastasis. In current clinical practice, tumors are also monitored by invasive biopsy and molecular profiling, but their spatial and temporal pathologic heterogeneity limits the ability of invasive biopsy techniques to fully capture their state. Furthermore, the necessity of repeated, invasive sampling and the molecular assay may be burdensome to the patient, is expensive, and limits the practical number of opportunities to monitor disease progression and treatment response. Conversely, the imaging phenotype may encompass a wealth of information, including the effects of the genotype, the environment of the tumor, and its potential treatments. Currently, a hypothesis-driven research is the mainstream methodology incorporating a single or limited number of imaging biomarkers approach either to aid in differential diagnosis, to provide with prognostic information regarding treatment response or to monitor and guide therapy. Apparently, this strategy suffers from selection bias, and therefore there is a shift in cancer imaging biomarkers to a more "holistic" approach by quantifying and extracting myriads of imaging patterns including texture and shape features on a pixel by pixel basis otherwise invisible to the human eye. The latter methodology is summarized under the term Radiomics, and it's the process were an intelligent algorithm is undergoing training with labeled data, then validation and testing are performed to determine the clinical performance answering a specific clinical question. Radiomics refers to the process of extracting mineable, high-dimensional data from the routine, standard of care computed tomography (CT), magnetic resonance imaging (MRI), and positron-emission tomography (PET) images, using automatic or semiautomatic extracted data-characterization algorithms. Imaging provides an opportunity to extract important information regarding tumor characteristics in a non-invasive way. It provides with 3D tumor assessment multiple times during the course of the disease (before, during and after treatment). However, currently imaging evaluation is mostly based on the subjective opinion of Radiologists, it's time-consuming, varies significantly protocol-wise and therefore it provides with low reproducibility. These are the main driving forces of development of Radiomics where there is an effort to infer from macroscopic based imaging features tumour histological subtypes and proteogenomic patterns. Machine learning methods are used to build, train and validate models that can aid in the prediction and early stratification of patients that is the heart of precision medicine concept. A typical workflow of Radiomics comprises image acquisition, lesion segmentation, features extraction, features selection, development and validation of the predictive model. In all phases, there are unsolved problems and challenges. In the image acquisition part, we need to make sure that the raw information as provided on our images adds value to answer the clinical question. One of the bottlenecks in Radiology when it comes to quantification of imaging biomarkers is the lesion segmentation. Usually, the radiologist must trace the lesions in multiple images manually, which is time-consuming and results in low reproducibility. Modern algorithms based on machine learning techniques can be used to provide automatic or semi-automatic segmentation with minimal human interaction. The following step is feature computation/extraction, where texture and shape features will be calculated along with clinical biomarkers. Feature selection will be done to avoid redundant features and improve the quality of data, by reducing their dimensionality. Following to that multiple machine learning algorithms will be evaluated to find the optimal that can provide with the best prognostic power. In addition, non-imaging layers of information will be engaged in the form of genomics, proteomics or metabolomics to further explore correlations and

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interactions in a molecular level. Apart from conventional anatomical imaging in the form of T1 and T2-weighted imaging, functional methods like DW-MRI or DCE-MRI could be used to assess specific components of the disease including angiogenesis, abnormal metabolism, hypoxia, and hypercellularity. A critical phase in a Radiomics project is the clear identification of the clinical question. This can be prognosis regarding treatment response, accurate subtype classification in a histopathological or molecular level, patient stratification regarding i) toxicity of specific treatments (i.e. radiation therapy), ii) tumor aggressiveness, iii) tumor resistance to treatment, and iv) metastatic propensity.

Take Home Points:

1. Precision Medicine offers more effective treatments with less toxicity
2. Imaging Phenotype correlates with histology and clinical outcomes
3. Radiomics may provide prognostic information (treatment response, histological subtype, metastatic propensity)
4. New biomarkers (texture related) are currently being under clinical evaluation

SA 1.1.
New concepts, genetic testing and implications for imaging

V. Leite, Lisbon/PT

Short Summary: Pheochromocytomas (PCC) and paragangliomas (PGL) are rare neuroendocrine tumours (2–5 patients per million per year) that arise in the chromaffin cells in adrenal medulla (PCC) or in extra-adrenal sites (PGL) such as head&neck (HNPGL), thoracic, abdominal, or pelvic. PGL can be sympathetic or parasympathetic. PCC and most thoraco-abdomino-pelvic PGL are sympathetic and produce one or more catecholamines whereas parasympathetic PGL are found in the head or neck and are usually non-functional. Most HNPGL are benign and detected by mass effects and frequently arise from the carotid body, less commonly from jugulotympanic and vagal paraganglia, and rarely, from the laryngeal paraganglia. Germline mutations in these tumours occur in up to 40% of cases and more than 15 susceptibility genes have been discovered, some with maternal imprinting. Next-generation sequencing of targeted gene panels is now the recommended form of genetic screening. Several imaging tests can be used to localize these tumours, but positron-emitting radiolabeled somatostatin analogs seem to be the preferable agents to screen for metastatic disease. A judicious use of different treatment modalities in advanced PPGL may improve patients´ outcome. Illustrative cases of some HNPGL patients will be presented and discussed in this session.

Take Home Points:

Pheochromocytomas and paragangliomas require a multimodal approach and should be treated by a MDT in specialized centres.

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SS 6.1.
Fetal and post-natal imaging of congenital head and neck anomalies

C. Czerny, Vienna/AT

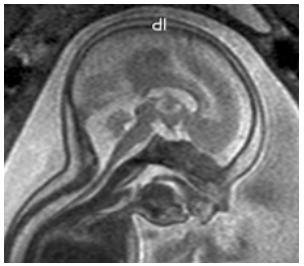
Short Summary: Facial malformations include a broad spectrum of abnormalities. Some of these malformations occur as sporadic malformations and others as syndromic malformations. The sporadic malformations can be seen e.g. as facial clefts and the syndromic ones in combination with other malformations of the face or the brain or of other organs or parts of the body.

Prenatal imaging consists of fetal ultrasound and fetal MRI. Fetal MRI has the advantage over fetal ultrasound, that in some cases the pathology is better delineated and comes out more clearly. Also, syndromic malformations and the complexicity are better visualized. Fetal MRI requires special imaging techniques. This includes sequences with high contrast and solution in combination with very fast imaging. The fast imaging is necessary as the fetus may move at any time and then the images cannot be properly analyzed for potential malformations.

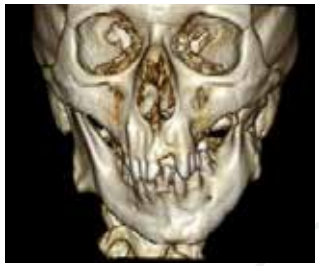
Postnatal imaging is either performed with MRI or with CT and then in those cases in which facial malformations e.g. such as clefts are suspected and to visualize preoperatively the bony structures which is mandatory for the planning of reconstructions. MRI is performed with conventional sequences depending on the region of interest.

CT is usually performed without the application of contrast material and is documented in a soft-tissue and bone-window-level setting.

Fetal MRI Pierre-Robin



Treacher-Collins Syndrom



Take Home Points:

In this lecture, the imaging techniques prenatal and postnatal will be explained and various malformations will be shown prenatally and postnatally.

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SS 6.2.
CT and MRI at the emergency department: When US is not enough
J. Lopes Dias, Lisbon/PT

Pediatric neck emergencies are common and comprise a wide range of diseases. The diagnostic imaging modality should be primarily chosen according to the patient's clinical status. Ultrasonography (US) is a readily available instrument for assessment of superficial structures and remains the first-line modality for the evaluation of pediatric neck diseases in the emergency setting. However, computed tomography (CT) has particular indications that should be promptly recognized by radiologists. The use of CT in the pediatric population causes some discomfort in both clinicians and radiologists due to ionizing radiation exposure, intravenous administration of iodinated contrast, and eventual need of sedation. However, it better assesses deep cervical spaces and evaluates disease extension, which may be critical for decision-making purposes. The identification of drainable abscesses and the accurate assessment of fractures, airway permeability, retropharyngeal space and mediastinum are the most important features. Magnetic resonance imaging (MRI) is seldom used at the emergency department, but is strictly indicated when osteomyelitis, spondylodiskitis, septic arthritis, and spinal cord lesion are suspected.

SS 6.3.
Rhabdomyosarcoma and its mimics
M.M.I. de Win, Amsterdam/NL

Short Summary: In this lecture the demographics and imaging characteristics of RMS and is most important mimickers will be discussed and demonstrated with casus from our institution. Introduction Rhabdomyosarcoma (RMS) is a high-grade, malignant mesenchymal tumour and is the most common paediatric soft-tissue sarcoma, representing 3-5% of all malignancies in children. 40% of the RMS occur in the head and neck region and after malignant lymphoma, RMS is the second most common primary malignancy in this area in children. About 75% of the children are younger than 10 years old at time of presentation. Three histological groups are recognized: embryonal type (70%, younger patients and better prognosis), alveolar (15%, older children, worse prognosis) and pleomorphic (adults). The craniofacial RMS are also classified in three groups according to the primary sites of the tumour: parameningeal, non-parameningeal and orbital, of which the parameningeal location has the worst prognosis. Clinical symptoms vary according to their specific location, but a fast growing solid head and neck lesion in a child should raise the suspicion of a RMS. Imaging modalities in RMS US is probably the most common imaging modality used in children and often used as the first step in children presenting with a swelling in the head and neck region. In superficial lesions, it is valuable in distinguishing cystic, vascular and solid lesions. US is also valuable to address the lymph nodes and guide fine needle aspiration cytology. When a solid lesion is suspected MRI is imaging modality of first choice for defining the exact location and extension of the tumour. For recommendations on the MRI protocol see the table from Freling et al 2010. For young children up to 6 or 7 years old general anaesthesia is necessary to become good quality images. CT is often additional when erosions of the bony structures are suspected on the base of the MRI. Whole body PET-CT can be useful in detecting occult lymph node metastases, bone metastasis and other distant metastasis, but has the disadvantage of radiation exposure and less accurate performance of the primary tumour. Therefore, in our institution low dose PET-CT is only used in children with increased risk of distant metastasis. The patient will be classified in 3 risk groups on the base of the information from imaging (TNM) together with clinical information (including resectability). Imaging characteristics Most RMS in the head and neck are solitary bulky lesions, showing good contrast between the tumour and the adjacent fat planes and skull base on T1-weigthed images. They can be either well described or more infiltrative. On T2 the RMS show a large variety of signal intensities and also the enhancement pattern after IV contrast admission is variable. The variability makes that there is no pathognomic MRI appearance of craniofacial RMS. The radiological report The radiological report of a head and neck tumour should include the site of origin of the lesion, the size of the lesion in 3 dimensions, the imaging characteristics, the extension in all directions and adjacent compartments. Special attention should be paid to intracranial and intraorbital extension, involvement of the bony skull base, cranial nerves and perineural spread, the carotid and vertebral arteries, the pterygopalatine fossa and cavernous sinus. Moreover, suspected lymph nodes and distant metastases should be reported. Differential diagnosis Because imaging characteristics of RMS are variable and malignant lesions in the HN region in children are rare, one should consider both benign and malignant lesions in the differential diagnosis. See the table from Freling at el for differential diagnostic considerations. When a malignant lesion is suspected a biopsy is needed to determine the histological diagnosis. Literature Imaging findings in craniofacial childhood rhabdomyosarcoma. Freling NJ, Merks JH, Saeed P, Balm AJ, Bras J, Pieters BR, Adam JA, van Rijn RR. Pediatr Radiol. 2010;40:1723-38. Imaging of head and neck neoplasms in children. Robson CD. Pediatr Radiol. 2010;40:499-509. Rhabdomyosarcoma of the head and neck in children: review and update. Reilly BK, Kim A, Peña MT, Dong TA, Rossi C, Murnick JG, Choi SS. Int J. Pediatr Otorhinolaryngol. 2015;79:1477-83. Table 1 MRI protocol for HNRMS, from Freling et al 2010

ORAL PRESENTATION ABSTRACTS

Head-neck coil
Axial SE T1-W, SE T2-W
Coronal SE T1-W; optional: sagittal SE T1-W
After IV gadolinium: coronal without fat saturation
axial, coronal, sagittal with fat saturation
Slice thickness: ≤3 mm
Field of view 180–200
DWI-echo planar imaging or non-EPI
Optional:
T1- and/or T2-W fat-saturated sequences (STIR, SPIR)
Contrast-enhanced GRE sequences (VIBE)
General anaesthesia in young children: <7 years
For orbital RMS it is recommended to add fat saturation in all contrast-enhanced series and to incline the sagittal series parallel to the optic nerve

Benign	Malignant
PM	**PM**
Haemangioma/lymphangioma	Malignant lymphoma
Juvenile angiofibroma	Nasopharyngeal carcinoma
Schwannoma	Hemangioendothelioma
Plexiform neurofibroma	Ewing sarcoma
Aneurysmal bone cyst	PNET
Giant cell granuloma	Osteosarcoma
Neurinoma	Metastasis
Parotid tumour	
Non-PM head and neck	**Non-PM head and neck**
Reactive lymph nodes	Metastasis (neuroblastoma)
Mucocele	Other:
Nasal polyp	Extra-skeletal mesenchymal
Ossifying fibroma	Chondrosarcoma
Lateral neck cyst	Fibrosarcoma
Medial neck cyst	Synoviosarcoma
Teratoma	
Ectopic thyroid tissue	
Orbit	**Orbit**
Haemangioma	PNET
Vascular malformation	Ewing sarcoma
Schwannoma	Metastasis (neuroblastoma)
Optic nerve glioma	Optic nerve glioma
Plexiform neurofibroma	LCH
Teratoma	
Lacrimal gland tumour	
Dermoid cyst	
Fibrous dysplasia	

Table 2 Differential diagnostic considerations, from Freling et al 2010

Take Home Points:

- A fast growing solid head and neck lesion in a child should raise the suspicion of a rhabdomyosarcoma
- Imaging characteristics of rhabdomyosarcomas are variable, so there will be a broad differential diagnosis
- MRI plays a major role in determining local extent of the head and neck rhabdomyosarcoma and an accurate review is essential at diagnosis

SS 7.1.
US: Indications and limitations

G. Riegler, Vienna/AT

Short Summary: High Resolution Ultrasound (HRUS) works with frequencies up to 20 MHz offering brilliant spatial resolution of the musculoskeletal system. This makes HRUS an ideal tool for the assessment of any superficial structure which includes the major part of the human body`s peripheral nerves including the brachial plexus. The near field resolution has now the potential for assessing small nerves with a diameter of down to 1mm. Additionally, HRUS is currently the only imaging modality for direct visualisation of the nerve during flexion or extension of a limb, allowing to visualize normal nerve gliding or demonstrate impairment. Tumors arising from the nerve sheets or compressing nerve structure are easily accessible for US investigation. Inflammatory or immune-related nerve swelling affecting the brachial plexus show typical features on HRUS. HRUS allows assessing the level of traumatic injury along any section of the brachial plexus except the ganglionic segment. Limitations include investigator dependence and poor knowledge of anatomical skills. HRUS should only be performed on high quality equipment with probes running up to 20 MHz.

Take Home Points:

High-resolution ultrasound (HRUS) allows assessing pathologies along any section of the brachial plexus except the ganglionic segment

SS 7.3.
MRI: What and how to report?

M. Mack, Munich/DE

Short Summary: The brachial plexus provides sensory and motor innervation to the ipsilateral shoulder, chest, arm, and hand. Arising from the C5-T1 of the spinal cord, the brachial plexus is divided anatomically into roots, trunks, divisions and cords. Therefore, the goal of MR imaging should be a complete visualization of the entire course from the cervical spine to the terminal branches. We can differentiate traumatic and non-traumatic lesions

In traumatic injury, the most significant question is to differentiate pre-and postganglionic injury, as this has relevant impact for the therapeutic management. Non-traumatic lesions include infection (extension of spinal osteomyelitis, empyema/pulmonary parenchymal infections, glenohumeral septic arthritis, overlying soft tissue infection, or iatrogenic introduction of pathogens), inflammatory brachial neuritis/neuropathy (e.g. Parsonage Turner Syndrome), benign (fibromatosis, proliferative fasciitis, lipoma, hemangioma, brachial cleft cyst, lymphangioma, and benign neural and nerve sheath neoplasms) or malignant neoplasms (e,g, metastatic disease and rare primary tumors like sarcoma), radiation-induced plexopathy (occurs between 5 and 30 months post radiation therapy), vascular abnormalities, and compression of the plexus (e.g. thoracic outlet syndrome)

Take Home Points:

1. To learn the imaging technique
2. To understand the different pathologies of the brachial plexus and the key facts for the report

NH 2.1.
Moving on to structured imaging reports

A. King, Hong Kong/HK

Short Summary: Rapid advances have been made in image techniques and image interpretation, but communication of the imaging findings via the image report has advanced more slowly. Structured reporting is therefore now under the global spotlight, but the term structured reporting means different things to different radiologists. There are three main forms of structured reporting, the basic structured report using a limited number of headings followed by free text (used for decades by most radiologists); standardised templates/ itemised reports using standardised texts +/- free text; point and click using standardised text under organised headings and subheadings (+/- drop down lists). Many studies show referring clinicians prefer our reports to have greater structure than that provided by the basic report and there are important advantages to a more structured approach: 1. Reduction in perceptual errors (by guiding search pattern and preventing lapses in concentration) and reduction in errors of spelling and grammar. 2. Assessment of all key features tailored to a disease or condition (important as radiology and medicine become more complex). 3. More consistent, concise & clear reports which avoid ambiguous terms and reduce variability between radiologists, as well as allowing easier and quicker extraction of pertinent information. 4. Automatic functions that speed up reporting. 5. Data mining. On the other hand, a more structured approach to reporting has some disadvantages: 1. Templates are not perfect and many are too simplistic or rigid to provide a complete report, especially for those complex cases with a wide scope of anatomy, pathology and management issues. 2. Difficulty in reaching a consensus on structure and content. 3. Some structured reports are difficult to digest (point and click reports). 4. Process causes distractions that interfere with the image interpretation. 5. Complex abnormal reports can be time consuming. 6. Strong personal views also contribute to poor compliance. Many radiologists worry about a loss of professional autonomy and freedom to express opinions; potential replacement by other health care professionals or artificial intelligence; time involved in learning to use a new system; and data mining can be perceived to be of benefit only to outside groups (referring clinicians, academic radiologists and healthcare providers). Despite these disadvantages it is inevitable that radiology reports will become more structured and standardised, and globally prepared reports will be downloaded and adapted to local use especially by the younger generation of radiologists. In 2008 the Radiological Society of North America initiated a project to create and share templates on the web site which now has a library of more than 200 radiology report templates using a standard lexicon (RadLex). A joint project with the European Society of Radiology allows members of both societies to access the library and contribute to the development of multilingual sets of structured report templates. Many other societies and individual departments have also developed their own structured reports, and recognised grading systems are being incorporated into the reports. Currently the most well-established templates are those from breast screening, cardiovascular imaging, gastroenterology and oncology. In contrast, structured reports for the head and neck are less developed although there are many areas of head and neck radiology that would benefit from a more structured approach. These include structured reports for the petrous temporal bone, paranasal sinuses, thyroid nodules, cervical lymph nodes, head and neck cancer staging and post-treatment assessment. In the future, grading systems such as those for thyroid nodules and cervical nodes could be added to the structured report and it may be possible to access key references to pertinent anatomy, pathology and management issues during compilation of the report. Report structure, content, grading systems and references could then be updated periodically by a panel of experts, in much the same way as for the UICC/AJCC classification for cancer staging. In addition, ongoing developments in structured reporting will provide closer integration and automatic links between the written report and key images, and use of natural language processing for data tracking and analysis.

Take Home Points:

1. Radiology reports will become more structured.
2. Head and neck radiologists should have an active role in developing structured reports.
3. The best structured reports will probably be translated into multiple languages, downloaded globally and adapted for local use, especially by the younger generation of radiologists.

SA 2.1.
Spectrum of imaging finding in the head and neck

M. Becker, Geneva/CH

Short Summary: Autoimmune and granulomatous diseases often have head and neck (HN) manifestations. Sjögren's sydrome, rheumatoid arthritis, IgG4 related disease and polychondritis are the most common autoimmune diseases affecting the HN, whereas granulomatosis with polyangiitis, sarcoidosis, Churg-Strauss disease and infectious diseases (tuberculosis, actinomycosis, cat-scratch disease and syphilis) are the most common granulomatous diseases with HN involvement. The HN organs most often involved include the larynx and the trachea, the paranasal sinuses, the salivary glands and the lacrimal glands, the orbits, the thyroid gland, the lymph nodes, the vascular structures and, occasionally, the neck muscles. This lecture aims to provide a comprehensive approach to imaging of patients with HN manifestations of autoimmune and granulomatous diseases. Characteristic CT, MRI and PET CT features are reviewed with emphasis on clinical- radiologic correlation and typical manifestations. The complementarity of different imaging modalities is illustrated and overlapping features with malignant tumors are demonstrated. The recognition of the typical pattern of organ changes and the multifocal or bilateral presentations are reviewed. Pitfalls of image interpretation and how to avoid them are discussed.

Take Home Points:

- To become familiar with the imaging characteristics of the most common HN manifestations of autoimmune and granulomatous diseases.
- To recognize characteristic patterns of disease and how to use multimodality/ multiparametric imaging for the work-up of these lesions

- To understand when to include autoimmune and granulomatous diseases in the differential diagnosis of HN lesions
- The major challenge with high field MRI is the non-uniformity of the transmitted magnetic field.
- Applications in which spatial resolution is critical are most suitable for ultra high field MRI.
- New high permittivity materials can be used to focus the MRI signal to regions of specific interest.

SA 3.1.
Standardizing imaging protocols and recognizing pitfalls

S. Bisdas, London/UK

Short Summary: Standardisation of imaging protocols is essential to increase acceptance of quantitative imaging biomarkers by the imaging community, clinical trial industry, and regulatory agencies as proof of biological, proof of changes in pathophysiology, and surrogate endpoints for changes in the health status of patients. Any standardisation process should be open to public comments and evolve within a rigorous framework comprising of technical confirmation, realistic implementation, consensus approval by the clinical and research stakeholders, and immediate support and dissemination within the radiological community. Recognising the pitfalls of the existing, applied imaging protocols is a prerequisite facilitated by in-depth knowledge of the physical principles of conventional and advanced imaging modalities. Any groups that may embrace the challenge to standardise and reduce ambiguity regarding the terms and imaging methodology should address carefully any sources of pitfalls and shortcomings, suggest feasible workarounds, put pressure on the vendors to provide commercially available solutions, encourage open-source image post-processing software, and discourage the clinicians and researchers from applying any technique in an erroneous way by setting quality prerequisites in publications and clinical trials. Continuous educational seminars and clear guidelines issued by the professional bodies will help to establish correct imaging standards.

Take Home Points:

There is need to standardise and reduce ambiguity regarding the terms and methodology used for measuring, describing and comparing various components of imaging tests.
Panels of experts in academia and professional bodies should provide advice on the vision, propose scientific goals, and implementation of these actions. Continued work by appointed committees, academia, and industry is essential for developing a truly robust and least burdensome standardisation to improve clinical decision making.

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ORAL PRESENTATION ABSTRACTS

SA 3.2.
Present role of quantitative DWI in head and neck oncology

A. King, Hong Kong/HK

Short Summary: DWI has been under intensive evaluation in head and neck oncology for well over a decade, but there are still hurdles to overcome before internationally accepted diffusion parameters and thresholds are established. Currently, the apparent diffusion coefficient (ADC) is the most widely reported parameter for assessment of water molecule diffusion in head and neck tumours, but ADC thresholds are influenced by many factors. Malignant tumours tend to cause greater restriction of diffusion (lower ADCs) than benign conditions (higher ADCs), but the head and neck is a complex region with a wide range of normal tissues and pathologies, and even within a tumour different pathological processes compete to influence the ADC. Furthermore, ADC thresholds are influenced by image acquisition notably the choice of b values; definition of the “optimal” threshold; endpoints used to assess cancer outcome and treatment response. To further complicate the task of setting DWI thresholds, new DWI parameters beyond ADC are under evaluation using intravoxel incoherent motion (IVIM) and diffusion kurtosis imaging (DKI). These include D* and f measuring pseudo-diffusion related to the microcirculation (b-values ~0- 200 sec/mm2), D measuring pure diffusion (b-values ~400-1000 sec/mm2) and K measuring kurtosis which reflects tumour heterogeneity and cell complexity (b-values > 1000 sec/mm2). All these DWI parameters can be quantified not only as a mean value but also as measures that better reflect tumour heterogeneity such as the ADC min/max, skewness, kurtosis and percentiles. Although international DWI thresholds have yet to be established results are emerging that show that DWI provides valuable additional information to the anatomical based images in the following scenarios in head and neck radiology practice: 1) Malignant vs. benign nodes. Studies show significantly lower ADCs in malignant squamous cell carcinoma (SCC) nodes compared to benign nodes (ADCs of malignant nodes ~ ≤ 1.0 x10-3 mm2/s) and DWI can be performed even on small sub-centimeter malignant nodes (reported range of ~0.92-1.02 x10-3 mm2/s). However, DWI is technically challenging, especially in the sub-centimeter nodes, and not all studies are able to demonstrate significant DWI differences between malignant and benign nodes. 2) Malignant vs. benign tumours. There are significant differences in diffusion parameters between pleomorphic adenoma, Warthin’s tumours and malignant salivary gland tumours. IVIM increases the accuracy of DWI thresholds by combining a high D to identify pleomorphic adenoma (myxomatous content) and high D* to identify Warthin’s tumour (vascular tumour). Other benign tumours with a high ADC mean include schwannoma, venous vascular malformation, vascular tumours such as juvenile angiofibroma and ameloblastoma. 3) Cancer vs. benign processes such as post-treatment change, infection and inflammation. ADC and D are significantly lower in residual/recurrent SCC compared to post-treatment change. Most reported post-treatment ADC mean thresholds for cancer are in the range of ≤ 1.2-1.5 x10-3 mm2/s, but one should be mindful of the fact that fibrosis and organisation of resolving necrosis in a sterile node may also cause low ADCs. Similarly, the ADC of SCC is lower than that of most infections/inflammatory processes, although a notable exception is nodal necrosis in lymphadenitis which has lower ADCs (pus) compared to a malignant tumour

necrosis. 4) SCC vs. lymphoma. ADC mean of SCC is consistently reported to be higher for SCC (~0.8-1.3 x10-3 mm2/s) than non-Hodgkin's lymphoma (~0.5-0.8 x10-3 mm2/s), but overlap in thresholds may occur between poorly differentiated SCC and Hodgkin's lymphoma. 5) SCC predictive markers for treatment response. A wide range of DWI parameters/measures have been evaluated against a wide range of differing outcomes, and although a high ADC mean, ADC min and D mean are associated with poor outcome no clear DWI threshold has emerged. Thresholds for early intra-treatment changes are more encouraging and show those SCCs with a smaller than expected % rise in ADC mean (range of 12-24%) are more likely to have a poor clinical outcome.

Take Home Points:

1. DWI parameters are influenced by many factors and the number of potentially useful DWI parameters and measures to quantify these parameters are growing.
2. The body of literature suggests that at present DWI has a role in distinguishing malignancy from benign pathology such as reactive nodes, benign tumours, post-treatment change and infection; distinguishing SCC from lymphoma; and possibly predicting SCC response based on early intra-treatment % change in DWI parameters. 3. DWI thresholds have yet to be established and internationally recognised.

SA 3.3.
Present role of quantitative PWI in head and neck oncology

K. Surlan Popovic, Ljubljana/SI

Short Summary: The purpose of this lecture is to describe the role of dynamic contrast-enhanced MR imaging in the evaluation of head and neck carcinoma. Conventional contrast-enhanced CT and/or MR imaging are still the current standard techniques for the diagnosis and treatment evaluation of the head and neck carcinomas. However they fail to predict and monitor tumour response to the chemoradiotherapy,treatment becoming an important mainstay among treatment strategies. Angiogenesis is one of the hallmarks of cancer response to the applied therapy and can be assessed by dynamic contrast-enhanced MR imaging. Many studies have been published in the recent years proving that dynamic contrast-enhanced MR imaging clinical use is still developing. Dynamic contrast-enhanced MR imaging provides a rapid evaluation of tissue perfusion and can be easily implemented in every head and neck MR protocol. However different quantification methods and parameter choice can affect the reliability of results of the studies. More multicentre clinical studies and standardization of the imaging protocols and analysis will set dynamic contrast-enhanced MR imaging in every day clinical practice.

Take Home Points:

- to understand the principles of dynamic contrast-enhanced MR imaging in head and neck region
- to become familiar with applications and clinical feasibility of dynamic contrast-enhanced MR imaging in head and neck carcinoma

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ORAL PRESENTATION ABSTRACTS

SS 8.1.
Radiation and biphosphonates induced bone necrosis

R. Kohler, Sion/CH

Short Summary: In this presentation, we will discuss two distinct types of osteonecrosis of the jaws affecting mainly the mandible: radiation-induced and bisphosphonate-induced. The first one develops either within two years after completion of the radiation therapy ("early-onset") or after two years ("late-onset). The risk factors are of course the dose, field and type of radiation therapy but also concomitant chemotherapy, poor dentition status and oral hygiene, acute or chronic trauma, nutritional status and alcohol/tobacco use. The exact pathogenesis is still debated with several coexisting theories. Clinically, patients develop an area of exposed bone through an opening of the overlying skin or mucosa persisting as a non-healing region for a period of at least 3 months. Pain, swelling, malocclusion, dysphagia, fistula, trismus or facial disfiguration are accompanying symptoms. Conventional radiography, CT and CBCT show loss of osseous trabeculae, cortical erosions, osteolysis, sequestrum, bone fragmentation, gas bubbles and fracture. MRI reveals signal alteration of the bone marrow with T1-weighted hypointensity, T2-weighted and STIR hyperintensity and intense post-contrast enhancement. MRI is furthermore the best imaging technique for the depiction of the involvement of the soft parts. The main differential diagnosis is tumour recurrence. MRI including diffusion-weighted imaging with its excellent soft tissue resolution plays a major role as well as FDG PET-CT. Alternative diagnoses are bone metastasis, osteomyelitis and medication-induced osteonecrosis. Bisphosphonate-induced osteonecrosis is a more recently described pathological, whose classical definition is: current or previous treatment with a bisphosphonate, exposed bone in the maxillofacial region that has persisted more than 8 weeks and no radiation therapy to the jaws. However this restrictive definition does not include cases of necrosis without bone exposition. Bisphosphonates decrease the bone turnover by inhibiting osteoclast-mediated bone resorption and are used in the treatment, among others, of osteoporosis and lytic bone metastasis. As for osteoradionecrosis, its pathology is complex and subject to discussion. Risk factors are duration of treatment, intravenous administration, cancer and anti-cancer therapy, dentoalveolar procedures, dental or periodontal disease, glucocorticoids and alcohol/tobacco abuse. CT shows a mix of sclerosis and osteolysis starting from the alveolar ridge and lamina dura, occasional periosteal reaction and rarely sequestrum. At MRI, there is T1-weighted hypointensity, T2-weighted hypo- or hyperintensity and STIR hyperintensity of the bone marrow. Inflammation of soft parts with contrast enhancement may also be observed. The differential diagnosis is the same as for osteoradionecrosis. In both conditions, imaging plays a role not only for the diagnosis but also for the follow-up by evaluating the efficacy of treatments. For both pathologies, treatment and prevention will also briefly be discussed.

Take Home Points:

Clinical history of jaw osteoradionecrosis and bisphosphonate-induced necrosis is clearly different. CT and MRI are complementary imaging techniques. There is some overlap between both pathologies at imaging. Imaging is also useful for the follow-up. For osteoradionecrosis, it is of utmost importance to exclude tumoral recurrence.

SS 8.2.
Dental CT – Implants and beyond – What and how to report

A. Whyte, Perth/AU

Key Points:

- Dental nomenclature + basic dentoalveolar anatomy
- Caries, periodontal disease and pericoronitis are the principal dental diseases
- Periapical infection results from pulpitis secondary to caries or trauma
- Advantages + disadvantages of CBCT with reference to MDCT
- Titanium implants are the method of choice for edentulism; CBCT provide optimal surgical planning for implant placement
- Impacted mandibular third molar teeth that are suspected to have roots that are suspected to be closely related to the IAC or ankylosed should be evaluated by CBCT prior to surgical extraction. CBCT also optimally evaluates impacted maxillary canines.
- Post-contrast MDCT is the gold standard in evaluating suspected complications of dental sepsis; remember: A-B-C-D.
- MDCT of the TMJ is an excellent technique especially in the older age group.
- There are a range of benign lesions involving maxillofacial region with specific imaging features

References:

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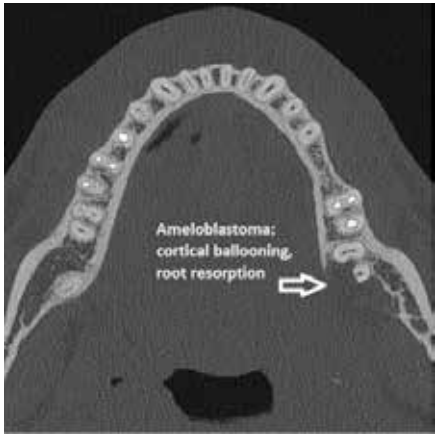
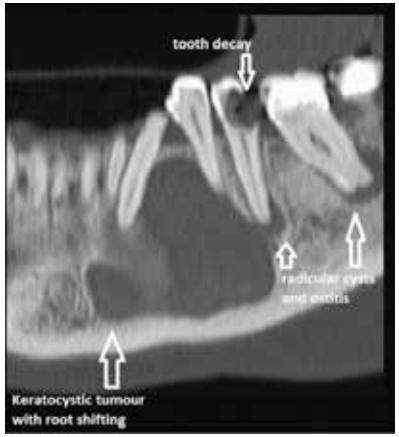
3. Whyte A at al. Magnetic resonance imaging in the evaluation of temporomandibular joint disc displacement – a review of 144 cases. Int J Oral Maxillofac Surg 2006; 696–703

SS 8.3.
Odontogenic tumors: Role of imaging in the differential diagnosis

S. Robinson, Vienna/AT

Short Summary: Odontogenic tumours are closely linked to tooth development, arise from tooth derivatives and may cause bone remodeling and weakening. Odontogenesis involves close interaction of oral epithelium (ectoderm) and neural crest (mesenchyme). Ameloblasts (produce enamel) and odontoblasts (produce dentin) derive from the first, the dental pulp from the second. Abnormal proliferation of tissues and cells may give rise to many different lesions with various histologic forms classified by their stage in tooth development. The more primitive the dental structures from which they derive, the more aggressive the lesion is. The appearance is mixed radiolucent or radiopaque, depending on the predominant tissue: odontogenic epithelium or mesenchyme, mature fibrous stroma, with or without hard tissue formation. The most helpful imaging features in evaluating odontogenic tumors will be addressed in this lecture. Even though the imaging patterns are uncharacteristic, they can help to decide, whether the lesion in question is more likely to be benign and just expansive or rather aggressive and locally invasive. The constellation of clinical findings, the location within the jaw, its borders and internal architecture have to be taken into account. Special emphasis should be laid on the relationship of a lesion to adjacent teeth (crown, apex, cementoenamel junction), the state of dentition (supernumerary/missing/impacted teeth?), the alveolar canal and other landmarks. The information of CT and MRI is basically seen to be complimentary. Odontogenic tumours, such as keratocystic tumours, ameloblastoma, myxoma and odontoma should be separated from those of fibro-osseous origin (cemental lesions, fibrous dysplasia, ossifying fibroma), malignant tumours (type of osteolysis, periosteal reaction, soft tissue component), osteomyelitis, biphosphonate induced ostenecrosis, postsurgical findings after sinuslift and pseuesions (Stafne, Torus)





Take Home Points:

Odontogenic tumours derive from tooth derivatives and comprise a range of different lesions, giving rise to a whole array of mixed radiolucent or radiopaque lesions. Histologically benign variants are more common, grow slowly and are expansive. More aggressive entities grow locally invasive and have a much higher recurrence rate.

SOPS 3.1.
Evaluation of subcentimeter neck lymph nodes with diffusion weighted MRI in head and neck squamous cell carcinoma (HNSCC)

A. Jovic, J. Fila, Zagreb/HR

Short Summary: Aim of our study is to establish whether subcentimeter metastatic and metastatic-free lymph nodes of the neck from the HNSCC can be distinguished with diffusion weighted MRI. In our study we included 17 patients with biopsy proven HNSCC and clinically negative for lymphadenopathy. All patients underwent diffusion weighted MRI of the neck. From MRI images we selected 42 lymph nodes and measured ADC. The patients had neck surgery including neck dissection. Lymph nodes from dissection specimens were marked according to the anatomical neck level and sent to the pathologist. Measurement results from the MRI images were compared with the results of the pathological examination. The optimal cut off value was 0.947 for distinguishing metastatic from metastatic-free lymph nodes. For optimal ADC value sensitivity, specificity, PPV, NPV and accuracy were 88.46% , 93.75%, 51.6%, 99.1%, 92%, respectively. Diffusion weighted MRI can distinguish metastatic from metastatic-free neck lymph nodes smaller than 10 mm.

Purpose/Objectives: To determine whether diffusion weighted MRI can distinguish metastatic from metastatic free lymph nodes smaller than 10 mm in patients with HNSCC and clinical N0 neck.

Methods and Materials: From October 2016 until April 2017 17 patients with biopsy proven HNSCC and clinically negative for lymphadenopathy underwent diffusion weighted MRI of the neck. From DWI images we measured apparent diffusion coefficient (ADC) of 42 lymph nodes. The patients had neck surgery including neck dissection. Lymph nodes from dissection specimens were marked according to the anatomical neck level and sent to the pathologist. We compared measurement results from the MRI images with the results of the pathological examination.

Results: We measured 42 lymph nodes, 16 benign and 26 malignant. For malignant lymph nodes mean ADC value was 0.870 × 10–3 mm2/sec (range: 0.764– 0.992 mm2/sec). In benign lymph nodes, ADC maps showed an average value of 1.182 × 10 -3m 2/sec (range: 0.973–1.375 ×10-3 mm2/sec). Area under the ROC curve, with standard error and 95% confidence interval was 0.958, 0.846 to 0.996 (Z=15.582, P=0.0001). The optimal cut off value was 0.947 for distinguishing metastatic from metastatic-free lymph nodes. For optimal ADC value sensitivity, specificity, PPV, NPV and accuracy were 88.46% , 93.75%, 51.6%, 99.1%, 92%, respectively.

Conclusion: Diffusion weighted MRI can distinguish metastatic from metastatic-free neck lymph nodes smaller than 10 mm. Diffusion weighted MRI should be include in preoperative imaging in patients with HNSCC.

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SOPS 3.2.
The role of MRI in evaluating neurovascular cross-compression in vestibular paroxysmia

N. Sivarasan, P. Touska, L. Murdin, S. Connor, London/UK

Short Summary: Vestibular paroxysmia (VP) is a debilitating disease characterised by episodic vertigo. Neurovascular cross-compression (NVCC) has been implicated in its aetiology. Our study demonstrated neurovascular contact in 100% of patients with VP (compared with 45% of controls) and nerve angulation in 44% of cases (compared with 0% of controls). This adds to the theory that NVCC may underlie the pathogenesis of VP and nerve angulation may represent a more specific feature.

Purpose/Objectives: VP is characterised by recurrent attacks of short-duration vertigo and is defined as 'definite' or 'probable' VP according to the Barany Society diagnostic criteria (BSDC). It is thought to be caused by neurovascular cross-compression (NVCC) of the vestibulocochlear nerve. Our study sought to evaluate the role of NVCC on VP, including neurovascular contact rate, compared with controls and whether additional parameters were related, such as angulation of the nerve and the location of the point of contact.

Methods and Materials: A retrospective study was performed. Patients were diagnosed according to the BSDC. The asymptomatic sides of patients with unilateral tinnitus were used as controls. Controls were age-matched due to the potential impact of age-related vascular calcification. Two independent, blinded reviewers assessed the isovolumetric T2-weighted MRI sequences (3D CISS/3D SPACE) and recorded the presence of nerve contact, site, angulation and vessel involved. The images were reconstructed using software (Syngo.via; Siemens Healthcare, Erlangen, Germany). Final results were achieved by consensus.

Results: A total of 29 patients were included: 9 patients with VP ('probable' = 5, 'definite' = 4) and 20 controls. Neurovascular contact occurred in 100% of patients with VP and 45% of controls. Notably, all patients with lateralising signs had neurovascular contact on the same side as the symptoms. The majority (54%) of neurovascular contact was caused by a branch of the Anterior Inferior Cerebellar Artery (AICA). Angulation (as seen in figure 1) occurred in 4 of the VP patients (44%, p= 0.005), but in none of the controls. In 1 VP case, the angulation was on the contralateral side to the clinical findings. The remaining 3 patients with angulation had no lateralising features. There was no correlation between site of contact and the presence of VP.

Conclusion: Neurovacular contact occurred in all VP patients, compared with 45% of controls. In addition, nerve angulation was found to be significantly associated with VP cases.

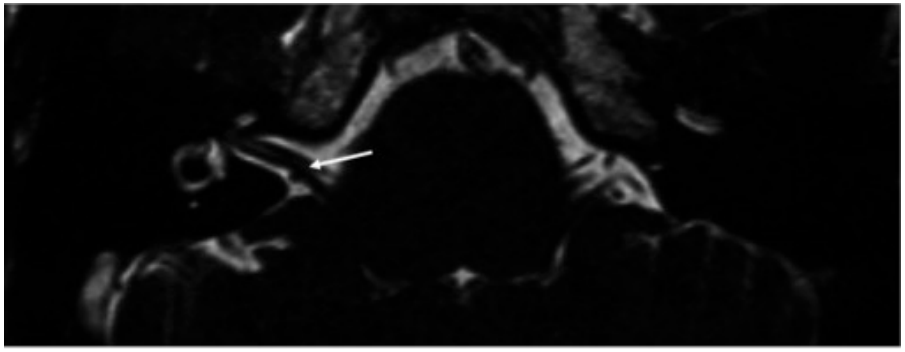

Figure 1. Heavily T2 weighted 3D CISS MRI sequence demonstrating an AICA loop, which contacts and causes angulation of the right vestibulocochlear nerve (arrowed).

Although limited by sample size, our results suggest that nerve angulation may be a specific finding in vestibular paroxysmia.

SOPS 3.3.
A retrospective review comparing the accuracy of non-EPI diffusion weighted imaging techniques used for the diagnosis of cholesteatoma in clinical practice

A. Ogg, G. Kontorinis, S. Allwood-Spiers, I. Mccrea, Glasgow/UK

Short Summary: A retrospective review of accuracy and comparison of non-EPI MRI imaging diagnosis of cholesteatoma in clinical practice in NHS Greater Glasgow and Clyde.

Purpose/Objectives: Magnetic resonance DWI, particularly non-EPI techniques, has become the imaging modality of choice for the reliable diagnosis or exclusion of middle ear cholesteatomata. The accuracy is reported to be >95%. The objective of this review was to evaluate the accuracy of cholesteatoma diagnosis using non-EPI DWI and compare the different acquisition techniques used within hospitals in the Greater Glasgow and Clyde area.

Methods and Materials: A CRIS word search was performed for 'magnetic resonance imaging' and 'cholesteatoma' across the 11 MRI centres within Greater Glasgow and Clyde from July 2015 to December 2016. From this search 130 scans, which had DWI imaging, were identified. Using medical records, 46 patients from this group were found to have had subsequent surgical exploration. For the purpose of this review only the patients who underwent surgical exploration were included. The cohort of 46 patients were a mix of referrals for primary diagnoses (n=13) and suspected recurrent cholesteatoma (n=33). The patients either had multishot TSE DWI (n=9) or HASTE DWI (n=37) imaging. The scans were reported by a range of radiologists with varying experience. The result was classed as positive or negative based on the primary radiology report and this was then correlated with the surgical operative note.

Results: Of the 46 patients in the final cohort there were a total of 5 false negative results and 7 false positive results. 12 discrepancies out of a total of 46 cases give an overall accuracy of 74%. The overall sensitivity in this review was therefore 77% and specificity 58%. Of the different MRI techniques used there was no significantly superior type. The multishot TSE DWI had a sensitivity of 80% and a specificity of 75%. The HASTE DWI sensitivity was 80% and the sensitivity 65%.

Conclusion: In our clinical practice we found a 74% accuracy in the diagnosis of cholesteatoma using non-EPI DWI imaging with little difference between diffusion acquisition techniques. This result is considerably below that expected and documented in other publications. The reasons for this are thought to be multi factorial.

SOPS 3.4.
Correlation between the Histologic and Magnetic Resonance Imaging Results of Optic Nerve and Choroid Involvement in Eyes Enucleated for Retinoblastoma

A. Saleh, J. Hiasat, M. Alhusaini, Y. Yousef, Amman/JO

Short Summary: Prospective, nonrandomized case series. We included 74 eyes from 70 patients with retinoblastoma. Contrast-enhanced MRI was performed to study tumor characteristics and extent of invasion before surgery. Enucleation was performed and histopathologic features noted.

Learning Objectives: To correlate Magnetic Resonance Imaging (MRI) Results with histopathology findings in retinoblastoma and to determine the diagnostic accuracy of (MRI) in detecting tumor invasion.

Background: Contrast-enhanced MRI was performed using head coil to study tumor characteristics and extent of invasion before surgery. Enucleation was performed and histopathologic features noted.

Imaging Findings or Procedure Details: Optic nerve invasion was seen in 24 eyes (10 with laminar invasion, 12 with post laminar invasion, and 2 with cut edge invasion) histologically, and in 13 eyes (5 with laminar invasion, 6 with post laminar invasion, and 2 had cut edge invasion) radiologically in MRI. Choroid invasion was seen in 28 eyes (12 with focal invasion, and 16 with massive invasion) histologically, and in 16 eyes (12 with focal invasion, and 4 with massive invasion) in MRI.Extrasceral tumor extension was seen in 3 eyes histologically and radiologically as well. The accuracy of MRI in detecting laminar optic nerve invasion was 83% (sensitivity, 20%; specificity, 95%), post laminar invasion 91% (sensitivity, 21%; specificity, 100%), optic cut edge invasion 100% (sensitivity,100%; specificity 100%). The accuracy of MRI in detecting focal choroid invasion was 78% (sensitivity, 42%, specificity, 88%), and for massive choroid invasion was 78% (sensitivity, 19%, specificity, 97%), and the accuracy in detecting extrascleralextension was 97% (sensitivity, 67%, specificity, 98%).

Conclusion: In Retinoblastoma, MRI has high sensitivity in detection of extensive optic nerve invasion, and extra scleral tumor extension, but is not sensitive in detecting laminar and

postlaminar optic nerve invasion, and focal as well as massive choroid invasion. And it is has high false positive rate in predicting laminar optic invasion (60%), and focal choroid invasion (58%). Therefore decision of chemotherapy on the basis of suspected postlaminarinvasion and massive choroid invasion on MRI is not justified in the absence of histopathologic evidence of disease.

SOPS 3.5.
Detection of Carotid Body Enlargement in Patients with Sympathetically Mediated Diseases with CTA

G. Özer, L. Pasaoglu, Ankara/TR

Short Summary: The purpose of study was to compare patients with sympathetically mediated diseases such as hypertension, heart failure and diabetes mellitus and control group in terms of carotid body (CB) size by using computed tomography angiography (CTA). Axial CB diameter measurements performed on 158 patients, with 33 controls, 21 smokers, 26 hypertensive patients and 78 patients who had at least two comorbid diseases. There was a statistically significant increase in CB diameter of hypertensive patients (2.77 mm, p=0.02) and patients with comorbid diseases (2.76 mm, p<0.01) in relation to the control group (2.22 mm). This study found a larger CB size for patients who had sympathetically mediated diseases, especially hypertension, and this enlargement could be detected on CTA.

Purpose/Objectives: The CB is dominant peripheric chemoreseptor in the body, responds primarly to acute hypoxemia. CB has previously been found to be enlarged and hyperactive in patients with sympathetically mediated diseases such as hypertension, heart failure (HF) and diabetes mellitus (DM). The purpose of study was to compare patients with the diseases mentioned and control group in terms of CB size by using CTA.

Methods and Materials: Neck CTAs that were performed in our clinic between February and September 2015 were reviewed. Patients histories were examined in terms of hypertension, HF, DM, chronic kidney failure, chronic lung diseases and smoking. In total, 180 patients' CTAs were evaluated retrospectively. The patients were classified as control group (n=33), only smokers (group 1, n=21), only hypertensive patients (group 2, n=26) and patients who had at least two of diseases mentioned before (group 3, n=78). The widest axial diameter of the CBs was measured and statistical analysis was performed. To evaluate intraobserver reproducibility, 30 patients were selected randomly and measurements were taken at different times.

Results: There was a statistically significant increase in CB diameter of group 2 (2.77 mm, p=0.02) and group 3 (2.76 mm, p<0.01) in relation to the control group (2.22 mm). There was no significant difference between group 1 (2.47 mm, p=0.123) and the control group. Repeated measurments showed that high intraobserver correlation for both sides (ICC: 0.91/0.94).

Conclusion: This study found a larger CB size for patients who had sympathetically mediated diseases, especially hypertension, and this enlargement could be detected on CTA. With better understanding of the relation between CB and the mentioned diseases, CTA can be used as guide for future investigations and therapies.

SOPS 3.6.
Osseous Dysplasia: Imaging criteria, diagnosis difficulties for adapted treatment

N. Martin-Duverneuil, B. Ruhin, Paris/FR

Introduction: Osseous dysplasias are rare benign pseudotumoral lesions caracterised by the presence of abnormal cemento-osseous material involving maxillary and mandibular alveolar bone.

Objectives: For inexperimented clinicians, clinical and radiological diagnosis remains difficult. Therefore, diagnoses are often erratic, potentially erroneous and late, inducting inadapted treatment and following procedure.

Material and Methods: We report here a retrospective epidemiological, clinical, radiological and surgical analysis of 61 osseous dysplasias cases diagnosed and treated in our institution from 2010 to 2017.

Results: Osseous dysplasias can display four clinical and radiological patterns appearing as focalized, periapical, florid or gigantiform findings. Standard views and CBCT are today the most adapted imaging to precisely evaluate these lesions. Physiopathological hypothesis, epidemiology, clinical, radiological and histopathological criteria are discussed. Intrication with other bone pathologies and particularly infectious complications can modify their classical appearance. Differential diagnosis with other bone pathologies such as fibrous dysplasia and Pagets' disease are here underlined.

Conclusion: Diagnosis of osseous dysplasias are too frequently erroneous. Accurate knowledge of clinical and radiological criteria is then essential to optimize the medical and surgical management, for the best survey and prognosis of these patients.

SOPS 4.1.
The role of ultrasound research of soft tissue after face contouring

E. Privalova, A. Vasilyev, E. Gubanova, D. Davydov, Moscow/RU

Short Summary: The aim of this research was to evaluate the possibilities of soft tissue ultrasound after face contouring. In the research, there were examined 170 patients from 19 to 65 years of age after face contouring with filler introduction in the soft tissues of the face. In the result of this research complications were observed in 29%, in 71% - no pathological changes were detected. As a result of ultrasound studies, the following complications were identified: inflammatory of soft tissue, inflammatory granulomas (foreign body granuloma), edema of soft tissue, vacuolization of foreign body, soft tissue fibrosis, filler migration, excess filler administration, deep introduction of a filler based on hyaluronic acid.

Purpose/Objectives: The aim of this research was to evaluate the possibilities of soft tissue ultrasound after face contouring.

Methods and Materials: In the research, there were examined 170 patients from 19 to 65 years of age after face contouring with filler introduction in the soft tissues of the face. The fillers were both biodegradable (hyaluronic acid) and non-biodegradable (silicone, polyacrylamide, polymethylmethacrylate). Ultrasound studies of soft tissues were performed with linear transducer with a frequency of 7-18 MHz in B-mode, Color Doppler mode and SMI.

Results: In the result of this research complications were observed in 29%, in 71% - no pathological changes were detected. The fillers were localized in nasolabial folds (54%), lips (33%), cheek areas (8%), frontal area (3%), nose region (2%). As a result of ultrasound studies, the following complications were identified: inflammatory of soft tissue ((n=7), inflammatory granulomas (foreign body granuloma) (n = 24), edema of soft tissue (n=5), vacuolization of foreign body (n = 7), soft tissue fibrosis (n = 20), filler migration (n = 5), excess filler administration (n=1), deep introduction of a filler based on hyaluronic acid (n=1). In each case ultrasonography allowed to determine the localization of the filler, the size, the relationship with surrounding soft tissues, the clarity and the smoothness of contours, the echo-structure. Another important part of the study was an assessment of vascularization around the periphery of the filler. There were conducted histologic studies for some patients after the surgery.

Conclusion: In conclusion, ultrasound study allows to estimate a precise localization and depth of the filler, the state of surrounding soft tissues and the process of a biodegradation of the filler. Ultrasonography should be the first stage of the method of evaluation of patients with complications after various filler injections.

SOPS 4.2.
The role of Ultrasonography in the diagnosis of foreign bodies into the soft tissues of the maxillofacial region

Y. Shumina, E. Privalova, M. Smyslenova, Moscow/RU

Short Summary: In this study the role of Ultrasonography in the diagnosis of foreign bodies into the soft tissues of the maxillofacial region was evaluated. And ultrasound signs of foreign bodies of organic and inorganic origin were determined by an experiment which was performed in this study too.

Purpose/Objectives: The aim of this study was to evaluate the role of Ultrasonography in the diagnosis of foreign bodies into the soft tissues of the maxillofacial region and to determine ultrasound signs of foreign bodies of organic and inorganic origin by an experiment.

Methods and Materials: 18 patients aged 18 to 45 with suspicion of foreign bodies in the soft tissues of the maxillofacial region were examined. The study and the experiment were performed on the ultrasound scanner using intraoperative linear sensor with a frequency of 7-15 MHz in B-mode and Color Doppler mode.

Results: During the study the following foreign bodies in the soft tissues of the maxillofacial region were revealed: intubation tube in the tear ducts (n=1), drainage tube in the parotid duct (n=2), mustache shrimp in the floor of the oral cavity (n=1), a fragment of plastic in the main excretory duct of the parotid gland (n=1), husk of sunflower seed in the area of sublingual salivary gland duct (n=1), ear of cereal plants (rye)(n=1), glass splinters in the cheek area (n=2), helminth disease (dirofilariasis) of the upper eyelid (n=1) and parotid-masticatory area (n=1). Also cosmetic fillers after contour plastics were revealed (n=7). Among them: silicone in the lip area (n=3), polyacrylamide gel in nasolabial fold (n=2), hyaluronic acid in nasolabial fold (n=2). During the experiment, the ultrasound signs of various types of foreign bodies of organic and inorganic origin were determined.

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Conclusion: Thus, Ultrasonography allows to visualize the foreign bodies in the maxillofacial region, to determine their precise location, the depth of occurrence, the relation to surrounding structures and even to predict the possible nature of it because of the presence of their own ultrasound signs.

SOPS 4.3.
British Thyroid Association's ultrasound scoring of thyroid nodules amongst five observers of various experience: diagnostic performance and inter-observer agreement.

B. Sharif, D. St Leger, H. De Silva, M.H. Qarib, A. Weller, R. Kumar, R. Lingam, Harrow/UK

Short Summary: The British Thyroid Association's ultrasound classification (BTA-U) of thyroid nodules identifies suspicious nodules for fine needle aspiration and cytology (FNAC). We examined the agreement between five observers in classifying nodules according to BTA-U. We also examined the agreement between the radiological and cytological/histological diagnoses. Our results show good inter-observer agreement and a high sensitivity in the selection of malignant nodules for FNAC.

Purpose/Objectives: The British Thyroid Association (BTA) introduced the ultrasound 'U' classification (BTA-U) of thyroid nodules as part of their 2014 guidelines on the management of thyroid cancer. This allows selection of suspicious nodules for FNAC. We examined the inter-observer agreement of five observers at varying levels of expertise in scoring the nodules according to BTA-U. We also investigated the level of agreement between BTA-U and cytological diagnosis (according to the Bethesda System) and BTA-U and the final histological diagnosis.

Methods and Materials: 73 patients (aged 18-88 years) with thyroid nodules with prior ultrasound scans and FNAC in a tertiary centre were included. The observers, blinded to the report, cytological diagnosis and final histological diagnosis, retrospectively reviewed ultrasound images and classified the nodules according to BTA-U. The observers included a head and neck radiology consultant, a general radiology consultant, a senior radiology registrar, a junior radiology registrar and a senior sonographer experienced in thyroid ultrasound. Kappa and ICC analysis were used to assess the level of inter-observer variability. The Kappa statistic was used to assess the agreement between BTA-U and cytological diagnosis. The agreement between radiological diagnosis and the final histological diagnosis was examined by calculating: sensitivity, specificity, positive and negative predictive value.

Results: There were 54 benign nodules and 17 malignant nodules in this sample. Two patients were lost to follow up, thus no final cytological or histological diagnosis could be made. There was good inter-observer agreement for U scoring [short Kappa score was 0.73 (95% confidence interval 0.68-0.77); the ICC score was 0.74 (95% CI 0.75-0.86)]. There was moderate agreement with more detailed subcategorical U scoring [ICC score of 0.74 (95% CI 0.66-0.81)]. There was fair agreement between radiological and cytological diagnosis [Kappa 0.33 (95% CI 0.16-0.50). BTA-U had a sensitivity of 100%, specificity of 34%, a positive predictive value of 32% and a negative predictive value of 100% relative to the final histological diagnosis.

Conclusion: Good inter-observer agreement was achievable across different levels of expertise. Adhering to BTA guidelines can achieve a sensitivity of 100% in selecting malignant nodules for FNAC.

SOPS 4.4.
Inter-observer variability significantly impacts the elasticity values of healthy major salivary glands

J. Vomácka, I. Stárek, Z. Sedlácková, K. Langová, Olomouc/CZ

Short Summary: Shear wave elastography (SWE) reveals expanding clinical applications, including thyroid pathology. In the presented study we assess, if the inter-observer variability could affect elasticity/stiffness values of healthy submandibular and parotid gland. Real-time SWE of submandibular and parotid glands showing normal B-mode findings was performed in 12 male and 8 female healthy volunteers, aged from 24 to 70 years. We demonstrated relevant inter-observer differences in the mean elasticity values of both major salivary glands. We believe that it was due to the individually distinct compression of their parenchyma, exerted by the probe operated by particular observers. This effect probably occurs also in the SWE of salivary tumours. However, the stiffness of these pathologic lesions is significantly higher than the inter-observer value deviations, making the latter unable to influence the results.

Purpose/Objectives: Shear wave elastography (SWE) reveals expanding clinical applications, including thyroid pathology. In the differential diagnosis of major salivary glands masses, this method has not gained firm position so far. In the presented study we assess, if the inter-observer variability could affect elasticity/stiffness values of healthy submandibular and parotid gland.

Methods and Materials: Real-time SWE of submandibular and parotid glands showing normal B-mode findings was performed in 12 male and 8 female healthy volunteers, aged from 24 to 70 years. The elasticity was assessed quantitatively in kPa. The study, comprising a total of 160 echotomograms, was performed by two independents ultrasonographists, who exerted only minimal pressure on the investigated area. The elasticity values of both glands were recorded for either investigators, separately for right and left proband´s side. The results were compared using a pair t-test. Moreover, conformity of results obtained by the investigator 1 and 2, respectively, was analyzed with Bland-Altman graphs.

Results: Mean elasticity values of the left and right submandibular/parotid glands in the observer 1 made 13,8/13,2 and 13,5/10,3, in the observer 2 10,7/10,9 and 7,1/7,9 kPa, respectively. The t-test analysis showed in general significantly higher stiffness values in the observer 1. Relevant distinctions of the elasticity between right and left side were present solely for the parotids in the observer 1 only. Bland-Altman graphs showed concordance in elasticity values of both the left and right submandibular glands measured by either observers. However, for the left and right parotids, the inter-observer differences in results tended to and significantly increased, respectively, with the rising values of elasticity.

Conclusion: We demonstrated relevant inter-observer differences in the mean elasticity values of both major salivary glands. We believe that it was due to the individually distinct compression of their parenchyma, exerted by the probe operated by particular observers. This effect probably occurs also in the SWE of salivary tumours. However, the stiffness of these pathologic lesions is significantly higher than the inter-observer value deviations, making the latter inable to influence the results.

SOPS 4.5.
Qualitative and/or semi-quantitative sonoelastography for the diagnosis and differentiation of salivary gland tumors

C.Z. Karaman, Y. Polat, A. Eryılmaz, F. Taskin, A.H. Navaei, Aydin/TR

Short Summary: The aim of this study was to investigate the contribution of qualitative and semi-quantitative strain sonoelastography, separately and in combination, in differential diagnosis of salivary gland tumors. Seventy-three patients were enrolled in this prospective study. All masses were examined by qualitative and semi-quantitative strain elastography. Sensitivity, specificity, PPV and NPV were calculated for both qualitative scoring and strain index ratio. For qualitative assessment these values were 86,7%, 93.1%, 76.5%, 96,4%, respectively. Using the ROC analysis for semi-quantitative technique, sensitivity was 82% and specificity 100% at the cutoff value of 2.44 for strain ratio (p=0.001). In combination, two techniques improved specificity to 98,3% and PPV 92,9%. Qualitative technique showed reasonable success. Semi-quantitative analysis increased the diagnostic capability of qualitative sonoelastography. Qualitative and semi-quantitative sonoelastography may be helpful in deciding the nature of salivary gland masses.

Purpose/Objectives: The aim of this study was to investigate the contribution of qualitative and semi-quantitative strain sonoelastography, separately and in combination, in differential diagnosis of salivary gland tumors.

Methods and Materials: Seventy-three patients (37 men and 36 women) with salivary gland mass, aged between 16 and 85 years (mean age 55,9±16,1) were enrolled in this prospective study. All masses were examined by qualitative and semi-quantitative strain elastography. The most representative images were recorded to be evaluated according to a 4-scale scoring system. Score 1-2 were accepted to be benign and 3-4 malignant. The strain index of the mass in respect to the surrounding parenchyma was measured for semi-quantitative technique.

Results: Sixty-nine (94,5%) masses were located in the parotid gland, the rest in the submandibular gland (5.5%). Fifty-eight (79,5%) masses were benign, and pleomorphic adenomas lesions were in the majority (37.9%). There were 15 malignant lesions (20,5%). Sensitivity, specificity, PPV and NPV were calculated for both qualitative scoring and strain index ratio. For qualitative assessment these values were 86,7%, 93.1%, 76.5%, 96,4%, respectively. Using the ROC analysis, sensitivity and specificity at the cutoff value of 2.44 for strain ratio were 82% and 100%, respectively (p=0.001). All the lesions with strain index above 2.44 were malignant. In combination, two techniques improved specificity to 98,3% and PPV 92,9%.

Conclusion: Qualitative technique showed reasonable success. The method seems to be more sensitive for benign lesions for its high sensitivity and NPV. Semi-quantitative analysis dramatically increased the diagnostic capability of qualitative sonoelastography. Qualitative and semi-quantitative sonoelastography may be helpful in deciding the nature of salivary gland masses.

SOPS 4.6.
US-sialography: Method of choice in diagnostics of various forms of chronic sialoadenitis for patients with severe polyvalent allergy

Y. Vasilieva, I. Vasilev, Moscow/RU

Short Summary: Examination of patients with severe polyvalent allergy, when it is necessary to use contrasting, always has many difficulties. Normal saline solution was used as a universal liquid substance for echographic imaging of the entire ductal system of salivary glands for patients with severe polyvalent allergy. Use US-sialography with up normal saline solution in ductal system was allowed to diagnose structural changes of ductal system.

Purpose/Objectives: Efficiency evaluation of ultrasonography of salivary glands with ductal system contrast (US-sialography) using universal liquid substance for patients with polyvalent allergic reaction.

Methods and Materials: Were examined 132 patients with major salivary glands disorders of them 69 subjects were diagnosed with chronic form of sialoadenitis, 34 of whom had contraindications for MSCT-sialography.

Results: Changes of the affected salivary gland that were revealed during the initial ultrasound, as well as clinical and laboratory data, did not allow to identify the exact form of chronic sialoadenitis. Subjects without known allergic reactions (n = 50) had MSCT-sialography performed, its results being considered verificative. Patients with confirmed polyvalent allergy (n = 48) were examined using US-sialography with normal saline solution as a medical contrast medium for ductal system on the side of the lesion. Three forms of chronic sialoadenitis were identified: parenchymal (n = 25), ductal (n = 23), interstitial (n = 21). US-sialography allowed to assess ductal system of the glands, accurately evaluate distal duct segments condition, define the connection between parenchymal changes and ductal system. Acquired sonographic signs of duct and salivary gland parenchyma damage were specific for each form of chronic sialoadenitis, which was also confirmed by the results of MSCT-sialography in the control group.

Conclusion: US-sialography is a highly informative examination technique in diagnostics of chronic salivary glands disorders. The method allowed to determine the exact form of chronic sialoadenitis and to further develop the tactics of treatment for patients with polyvalent allergic reaction.

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SOPS 4.7.
Efficiency MSCT- and US-Sialography in diagnostics of major salivary gland ductal system disorders

Y. Vasilieva, I. Vasilev, Moscow/RU

Short Summary: The text compares the diagnostic possibilities of the duct system in the pathology of the salivary glands. The study was conducted with the help of the native ultrasound and with additional artificial extension of ducts with liquid substance. The results were confirmed by X-ray examinations.

Purpose/Objectives: efficiency evaluation of salivary ultrasonography with ductal system contrast (US-sialography) using universal liquid substance.

Methods and Materials: Echographic examination was performed on a total number of 80 patients (age 18 to 82) with confirmed chronic major salivary glands disorders as well as allergic reaction to iodine. Considering inability to perform an MSCT-sialography, all patients were examined using US-sialography with up to 4 ml of normal saline solution in ductal system. Normal saline solution was used as a universal liquid substance for echographic imaging of the entire ductal system. For the purpose of keeping the solution inside the ductal system for its continuous tight filling, after contrast infusion the catheter was blocked by a plug without being removed from the opening of the duct. Examination was carried out using the iU-22 ultrasound system (Philips, Netherlands) and the dedicated compact pen-transducer with 7 to 15 MHz operating frequency range. Primary diagnostics and dynamic case observation (in 70% of cases) were performed.

Results: in 100% of cases US-sialography allowed not only to evaluate gland parenchyma, but also to visualize up to distal duct segments, give its full anatomic characteristics, define its pathological changes. All results had clinical confirmation.

Conclusion: US-sialography can be a method of choice in diagnostics of salivary glands ductal system disorders for patients with contraindications to MSCT-sialography and to avoid radiation exposure.

SS 9.1.
Maxillo-facial fractures: What do surgeons need to know?

E. Loney, Darlington/UK

Short Summary: Maxillofacial trauma accounts for around 2% of hospital admissions, over 80% of which is related to assault or motor vehicle collisions. Injuries are often complex and may appear initially daunting to the reporting Radiologist. It is important to accurately and concisely communicate ones findings to those treating the patient in a manner in which all parties can understand. Also to think ‘outside the box’ and consider other injuries commonly associated with facial trauma. This presentation aims to simplify the reporting such examinations by using a series of logical questions to allow one to group injuries into categories directly related to mortality and morbidity. The principle of facial buttresses will be

explored and how the restoration of these not only affects cosmetic outcomes but also the function of orbital and dental structures. Commonly used classification systems such a Le Fort and Manson will be described. Potential fracture complications will be covered. Overall, this presentation aims to provide the building blocks to producing reports that are compact, relevant and clearly communicate important findings to others that may affect patient management. In other words....to tell surgeons 'what they need to know'!

Take Home Points:

A. It is possible to simplify reporting of complex maxillofacial trauma by asking 3 questions:

1 Are the pterygoid plates intact?
   a yes; Le Fort fracture. **b** no; move onto question 2
2 Does the patient have NOE or ZMC-type fractures?
   a yes; describe and classify **b** no; move onto question 3
3 Does the patient have any other maxillofacial fractures?
   a yes; describe and classify **b** no; consider other injuries (intracranial, spinal, soft tissue)

B. Restoration of facial buttresses is essential to preserve orbital and dental function, along with improving cosmesis.

C. It requires considerable force to fracture facial bones- what other injuries does the patient have?

SS 9.2.
Temporal bone trauma

B. Ozgen, Chicago/US

Short Summary: Computed tomography plays a fundamental role in the evaluation of patients with temporal bone trauma. Fractures of the temporal bone are traditionally divided into longitudinal and transverse fractures, according to the orientation of the fracture to the long axis of the petrous bone. Although the fractures are often complex and do not exactly fit this classification, the traditional classification is still useful in understanding the mechanisms of injury and predicting the structures likely to be involved. The majority of temporal bone fractures are longitudinally oriented and they can rupture the tympanic membrane or involve the ossicles. These fractures may extend medially to involve the genu of the facial nerve but they do not usually involve the inner ear structures. The tegmen tympani may also be injured and may rarely result in CSF otorrhea.Transverse fractures are less common and typically involve the otic capsule and the IAC and thus have a poorer prognosis. Cranial nerve VII and VIII palsies are more commonly seen. Perilymph fistula is another possible complication. As the traditional classification system does not correlate with clinical findings and prognostic features, a new classification system have been proposed, dividing temporal bone fractures depending on whether the otic capsule is spared (otic capsule–sparing fracture) or violated (otic capsule-violating fracture). The otic capsule–sparing fracture is much more common and has an increased incidence of conductive hearing loss due to ossicular injury. The otic capsule–violating fractures are more commonly associated with complications such facial nerve injury, sensorineural hearing loss and cerebrospinal fluid fistula. The radiologist must be familiar with the possible trauma mechanisms of the temporal bone and should be able to identify acute and chronic injury to critical temporal and skull base structures that are important for guiding management and determining prognosis.

Take Home Points:

There is a traditional classification of temporal bone fractures with the more common longitudinal fractures that can involve the ossicles and less frequent transverse fractures typical involving the otic capsule and more likely to result in CN VII and VIII injury. The newer classification that takes into account whether the otic capsule is spared (otic capsule–sparing fracture) or violated (otic capsule-violating fracture) has a better clinical correlation and has better prognostic utility. Identifying injury to critical temporal and adjacent skull base structures is more important for guiding management and determining prognosis than simply classifying temporal bone fractures into category.

SS 9.3.
Imaging assessment of cranial nerve injuries

J.W. Casselman, B. De Foer, Wilrijk/BE

Short Summary: Traumatic injuries to the cranial nerves are caused by shearing forces, rapid accelertion/deceleration, injury to the skull base, penetrating craniocerebral injuries especially through the skull base and as a sequel to various surgical procedures. The incidence of cranial nerve (CN) injury in craniocerebral trauma varies between 5 and 23%. The most frequently involved nerve is CN1 followed by CN 7, the oculomotor nerves CN3-CN4-CN6 and by CN2. CN5 and the lower CN's 9-12 are only rarely involved. CT is needed when fractures are present and can show the involvement and narrowing of the neuroforamina and can also demonstrate displaced bone fragments which are injurying the nerves. MR is however the preferred technique and can show the damage to the stretched or bruised nerve, even in the absence of fractures. Oedema, haematoma or avulsion of the nerve can be demonstrated by this technique. For the optic nerve even the secondary signs of trauma like oedema, ischaemia, and infarction of the nerve can be demonstrated by MR. But in many cases the cause of the CN palsy will be found at the level of the CN nuclei and the fascicular segment of the nerves in the brainstem or on the olfactory/optic/auditory central pathways and here again MR is the method of choice. These central post-traumatic injuries are best seen on FLAIR, SWI, unenhanced T1 and T2-weighted images. Damage to the cisternal segments of the CN's can best be evaluated on heavily T2-weighted submillimetric TSE images or GE images. The bigger nerves like CN1, CN2, CN3 and CN5 can als be studied on unenhanced and Gd-enhanced T1-weighted images in order to detect hemorrhage or to prove the presence of recent damage with blood-nerve barrier rupture. Olfactory bulb measurements help to

confirm post-traumatic damage and correlate well with the remaining olfactory function. Nevertheless these patients rarely regain normal olfactory ability. Other CN's frequently recover from traumatic injury, even one year after the trauma. Imaging can be used to confirm damage when recovery is less than expected or absent.

Take Home Points:

- Know which cranial nerves are most frequently involved by trauma
- Learn that not only the cisternal segments of the cranial nerves but also their fascicular segments and nuclei must be studied
- Be familiar with the best imaging techniques to study patients with post-traumatic CN deficits
- Recognize the imaging signs in post-traumatic CN lesions

IS 2.1.
Normal and abnormal imaging findings after reconstructive flaps in the neck

A. Trojanowska, P. Trojanowski, Lublin/PL

Short Summary: This interactive presentation delivered by a radiologist and an ENT-surgeon will help you to become acquainted with most frequent surgical procedures in head and neck including flap harvesting and reconstruction techniques. The aim of this interactive course is also to discuss and understand how to evaluate post-surgical patients, in terms of possible recurrence and especially, to learn how to assess microvascular flaps. Different cases will be presented: normal findings after surgery with reconstruction, suspected recurrence, some complications both acute and chronic as well as expected changes in neck tissue and altered neck anatomy.

SS 10.1.
New trends in the classification of orbital inflammation

T. Ferreira, Leiden/NL

Short Summary: Orbital inflammation can present in many ways, such as scleritis or uveitis, dacryoadenitis, optic perineuritis, myositis or cellulitis. It can also present as a focal mass. Sometimes it involves multiple compartments and sometimes it will cross compartments.

Regarding its etiology, it can be idiopathic and then often called a pseudotumor , or it can be in the context of several granulomatous, autoimmune or systemic diseases, such as sarcoidosis, Wegener, IgG4 related disease, Graves, Sjogren and connective tissue disorders. Orbital inflamation is frequently difficult to differentiate from orbital infection or from tumours such as lymphoma.

It is crucial to be sure of the etiology of an orbital lesion due to important therapeutic implications. Imaging features of orbital inflammation due to different etiologies, of orbital infection and of lymphoma overlap and frequently it is the laboratorial results or the characteristics of other organ involvement which will make the diagnosis. Sometimes tissue characterization or a therapheutical test is needed for the definitive diagnosis.

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Take Home Points:

In this presentation the imaging characteristics of orbital inflammation at different locations will be shown. It will specially focus at the clues on image that can help the Radiologist to differentiate orbital inflammation from infection and lymphoma, but also between the different etiologies of orbital inflammation, such as specific findings that can help in distinguishing a Wegener from IgG4 related disease, pseudotumor, Graves, among others.

SS 10.2.
Role of imaging in the diagnosis and staging of ocular tumors

P. De Graaf, Amsterdam/NL

Short Summary: Ocular masses in adults and children represent a spectrum of (rare) benign and malignant lesions that can be challenging to diagnose and treat. Most patients are diagnosed on clinical grounds by means of extensive clinical investigation by the ophthalmologist including fundoscopy, ocular ultrasound, optical coherence tomography (OCT) or retinal fluorescein angiography. Together with these techniques, high-resolution MRI has emerged as an important imaging modality for pretreatment assessment, i.e. confirmation of diagnosis and staging disease extent. The role of CT is limited. Most primary and metastatic ocular masses in adults involve the uveal tract and in particular the choroid. Uveal melanoma is the most common primary intraocular tumor in adults and intraocular metastases most commonly originate from breast, lung and gastrointestinal tract tumors. Most primary ocular masses in children involve the retina, with retinoblastoma being the most common primary pediatric intraocular tumor. The differential diagnosis of these tumors contain several benign lesions, which can show specific signs on imaging.

Take Home Points:

- Ultrasound and MRI are the most appropriate imaging techniques to assess intraocular masses in adults and children
- The aim of imaging is to confirm clinical diagnosis and to describe local tumor invasion and regional extension

SS 11.1.
Sialolithiasis: Imaging implications on patient's management

T. Beale, London/UK

This lecture will highlight the role of imaging in both the diagnosis and treatment of salivary calculi.

Imaging algorithms for both the assessment of patients with salivary colic / obstructive salivary symptoms and the role of radiological intervention in the treatment of salivary calculi will be discussed.

The specific imaging findings that will affect the patient management will be emphasised and tips on which modality to use in different clinical scenarios will be covered.

Techniques on improving visualisation of salivary calculi and avoiding the pitfalls when imaging this group of patients will be highlighted.

Take Home Points:

At the end of the lecture I hope you will understand:

- When to use the different imaging modalities in assessing salivary calculi.
- The role of radiological intervention in the treatment of salivary calculi.
- What particular imaging criteria have implications in the management of sialolithiasis
- How to avoid the pitfalls and improve your imaging in this group of patients.

SS 11.2.
Parotid tumors beyond salivary origin: A diagnostic challenge

M. Horta, Lisbon/PT

Short Summary: The parotid is the salivary gland that is most often involved by secondary tumours. Sometimes, they can occur years after treatment of the primary neoplasm and medical history may not be available at the time of diagnosis. Non-salivary tumours metastatic deposits in the parotid gland may mimic primary salivary gland neoplasms, therefore differential diagnosis is essential to tailor therapeutic management. Metastases to the parotid gland most often arise from head and neck cutaneous squamous cell carcinoma and melanoma. However, Merkel cell carcinomas, metastatic sarcomas, metastatic basal cell carcinoma and secondary deposits from distant primary sites such as breast, lung and kidney can also be encountered. Lymphoproliferative diseases may also involve the parotid gland as part of disseminated disease or, more frequently, as a primary malignant extranodal or nodal lymphoma. Moreover, the radiologist must keep in mind that, although rare, soft tissue tumours such as haemangioma, lipoma and primary sarcomas can also be seen in the parotid gland.

Take Home Points:

The parotid is the salivary gland that is most often involved by secondary tumours. Secondary deposits to the parotid most often arise from head and neck cutaneous squamous cell carcinoma and melanoma. Lymphoproliferative diseases may involve the parotid gland as a primary malignant lymphoma or as part of a disseminated systemic disease. Although rare, soft tissue tumours may also be encountered in the parotid gland.

IS 3.1.
Mistakes in Head and Neck radiology: You the judge

S. Golding, Oxford/UK

Short Summary: Radiology reporting is a process of detection and interpretation of signs, from which a clinical opinion is derived. It is inherent to this process that at times individual radiologists will deliver incorrect reports resulting from failed detection or erroneous interpretation. It is also established that radiologists may disagree over findings and interpretations to a significant degree. These disagreements are known as “discrepancies”. It is established that the incidence of discrepancies can be significant. For example, there can be up to 30% disagreement between individual radiologists’ interpretations. A reporting discrepancy does not automatically imply a clinical error or detriment to the care of the patient. Many discrepancies are justifiable differences in opinion without clinical implication. Others, however, may extend to impact on the patient’s care. These latter may be regarded as reporting errors. Errors may also give rise to medicolegal claims against the radiologist or the institution. When this occurs a specialist radiologist – the “expert witness” – may be asked to advise on whether an error was justifiable or negligent. The questions to be addressed in these circumstances fall into the following catagories: A. Is there an abnormality? B. Was there an error? C. Was this error negligent? D. Did the error cause a real problem for the patient? In this interactive session the audience will be asked to give their opinion as “expert witnesses” on these questions in cases which have arisen in examples of alleged negligence. This will be assisted by presentations on the grading of discrepancies, on how negligence is defined, on the issue of medical causation, and on what the radiologist should do if they find they have been sued for negligence.

Take Home Points:

There are differences between discrepances and errors in radiology reporting. Not all discrepancies are the source of detriment to the patient’s care. Only discrepances which extend to potential or definite clinical harm represernt errors in reporting. Successful medical negligence claims have to prove firstly that there was an error, and secondly that the error caused a problem for the patient.

RC 1.1.
Imaging of the temporal bone: Anatomy and inflammatory lesions

S. Kösling, Halle/DE

Short Summary: Optimal radiological reports require profound knowledge of normal morphology. Therefore, this lecture starts with a short overview about anatomical structures of the external, middle and inner ear, which are relevant to know for the interpretation of cross sectional images. The structures will be demonstrated on CT, Cone-Beam CT and MR images. The second part is concerned with inflammations. They are the most common diseases of the temporal bone. Compared to the commonness, imaging is rather seldom needed. In many acute and less severe chronic inflammations (e.g. many kinds of external otitis, glue ear, acute otitis media, otitis media chronica mesotympanalis), clinical methods provide the necessesary therapeutic information. Indications for imaging are given in chronic aggressive inflammations as otitis externa necroticans, cholesteatoma, cholesterol granuloma, and florid granulations, in complications and clinical unclear cases. Thereby, CT delivers excellent information about the individual middle ear anatomy and the extension of the inflammation including bony erosions and destructions. However, it is not possible to differentiate different middle ear inflammations with safety by CT. Cholesteatomas, cholesterol granulomas and granulations may be indistinguishable on CT. MRI can differentiate these entities. However, it is nearly never requested in non-operated patients. For differential reasons, CT-signs of otitis media chronica mesotympanalis should be known. Contrast-enhanced CT depicts easily extracranial inflammatory complications as well as a

venous and sinus thrombosis. Due to higher sensitivity, MRI should be preferred for other intracranial complications. In certain cases, imaging is requested in inflammations of the inner ear. Only MRI is able to visualise a labyrinthitis in the acute phase. It its course, complete healing, labyrinthine fibrosis and or labyrinthine ossification may occur. MRI is needed to detect fibrosis. CT has to be performed to identify ossifications.

Take Home Points:

- Optimal radiological reports require profound knowledge of normal anatomy and thin-sliced imaging with high spatial resolution
- Imaging is rather seldom needed in inflammations of the temporal bone: extension of aggressive inflammation, detection of complications, unclear cases
- CT: surgical planning in inflammations of the external and middle ear, extracranial complications, labyrinthine ossifications
- MRI: inner ear lesions, intracranial complications, DD inflammatory lesions of the middle ear

RC 1.2.
Imaging of the temporal bone: Congenital and neoplastic lesions

F. Dubrulle, Lille/FR

Short Summary: The most common congenital lesions of the temporal bone are malformations : EAC atresia, malformations of the ossicular chain like stapes dysplasia, the malformations of the inner ear are now classified by the Sennaroglu classification with a particular analysis of the cochlea (Incomplete partition IP I and II). Any congenital hearing loss should be analysed and classified while keeping the cochlear nerve and the cochlear implantation in mind. The most classical malformations and the most important syndromes will be described, like Mondini, large vestibule aqueduct syndrome, cochlear nerve hypo or aplasia, SCC malformations, Gusher Syndrome The assessment of any temporal bone tumor should follow a tissue based and space related approach. The most frequent lesions that affect the different parts of the temporal bone will be reviewed: external ear, middle ear (excluded acquired cholesteatomas), inner ear, petrous apex and jugular foramen region. Benign lesions and pseudotumors must be recognized and distinguished from malignant lesions. Many of the above mentioned lesions will be illustrated and their imaging characteristics will be discussed. However, even if the above mentioned lesions are frequent and normally easy to recognize, some of temporal bone lesions can have an atypical presentation and are sometimes more difficult to recognize. CT and MRI have a complementary role in the evaluation of these lesions. This review will focus on the advances in imaging technique and on the imaging features of the most common lesions affecting the temporal bone, with particular attention to the specific points that should not be overlooked and should be described to the ENT surgeon.

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Take Home Points:

- know the imaging characteristics of the most frequent temporal bone malformations.
- know the new Sennaroglu classification of the inner ear malformations.
- be familiar with the state of the art CT and MR imaging to detect and diagnose tumoral lesions of the temporal bone.
- know the most frequent congenital, benign and malignant lesions of the temporal bone

RC 1.3.
Paranasal sinuses: Anatomy and inflammatory lesions

H.B. Eggesbø, Oslo/NO

Short Summary: The paranasal sinus anatomy is unique for each individual. Knowing the basic anatomy and the most common variants are fundamental in order to interpret the correct diagnosis in case of paranasal sinus opacification. Computed tomography (CT) is still the “gold standard” and the “workhorse” in paranasal sinus imaging.

Magnetic resonance imaging (MRI) should be supplementary if needed, and in cooperation with the ENT surgeon. A close cooperation with the performing radiographer is very important since a correct interpretation requires an optimal CT examination.
A basic CT protocol should include the following:

1. Axial plane scanning in order to avoid artifacts from dental fillings into the sinuses.
2. The scanning must include the maxillary alveolar process and the whole teeth in the upper jaw, in order to reveal odontogenic disease as the cause for maxillary sinus opacification.
3. Reconstruction should be with bone algorithm with slice thickness ≤1 mm in axial, coronal, and sagittal planes. If an odontogenic condition is suspected, also oblique reconstructions must be considered.
4. In case of opacification other than mucosal thickening, additional reconstruction with soft tissue algorithm, using 2.5 mm slice thickness, is mandatory. Soft tissue algorithm may:

1. Differentiate the mucosal lining, serous mucous and mucocele from pyocele, allergic fungal sinusitis or blood that are recognized by higher attenuation.
2. Easily detect scattered calcifications typical for a fungus ball (mycetoma).
3. Reveal pathology outside the sinus wall, as seen in invasive fungal sinusitis and bacterial infection extending outside the sinus walls. Cone beam CT do not allow reconstruction with soft tissue algorithm, however in this case, changing the window width (WW) and window level (WL) may be useful.

Take Home Points:

1. To be familiar with the paranasal sinus anatomy
2. To be familiar with the CT protocol for paranasal sinus imaging
3. To recognize the hallmarks of chronic rhinosinusitis patterns, and distinguish these patterns from mimicking conditions, e.g. antrochoanal polyp, mucocele, pyocele, fungal rhinosinusitis, odontogenic rhinosinusitis, ANCA-vasculitis, and benign and malignant tumours

SS 12.1.
Anatomic variants and developmental disorders

V. Chong, Singapore/SG

Short Summary: There are various anatomic variants and pseudolesions in the skull base. It is important to recognise them as further investigations will bring no benefits. Furthermore, if additional invasive diagnostic procedures are used, actual harm may be done. On the other hand, the accurate diagnosis of developmental lesions may facilitate appropriate management. This presentation will focus on the more commonly encountered anatomic variants and developmental anomalies. They include size asymmetry of foramen ("normal large" versus pathologic large); differentiation of pseudolesions (flow induced artefacts) from genuine lesions; and recognition of normal structures in abnormal positions (such as aberrant internal carotid artery or dehiscent jugular bulb). In addition, herniation of intracranial contents (arachnoid granulations, meningocoeles or meningomyeolcoeles) presents varying degrees of bone erosion or extensions through the skull base into the paranasal sinuses, nasal cavity of suprahyoid neck. There are several skull base developmental lesions that are accurately diagnosed on imaging studies (without the need for histologic confirmation). These lesions include arachnoid cysts, epidermoid cysts and lipomas. Arachnoid cysts do not enhance and have features similar to CSF. Separation from epidermoid cysts can be made as epidermoid cysts have slightly higher signal intensity than CSF, lobulated borders and heterogeneous internal architecture. On DWI arachnoid cysts are lower in signal whereas epidermoid cysts are higher in signal intensity. On steady-state free-precession MRI, arachnoid cysts remain homogeneous, whereas epidermoid cysts signal heterogeneity is accentuated. Lipomas are easy to recognise as they exhibit typical fat density on CT and MRI. Neurofibromatosis and fibrous dysplasia are commonly seen developmental lesions. Neurofibromatosis is a mesenchymal disorder which may have large plexiform neurofibromata which may be confused with tumours. The clue to diagnosis may reside in associated neurogenic tumours or bony lesions. Fibrous dysplasia shows characteristic findings on plain radiographs and on CT. However, on MRI, the findings are more complex and they may be confused with tumours as the mass-like fibrous component may enhance vividly. Fibrous dysplasia shows a spectrum of features depending on the amount of fibrous tissues and mineralized matrix constituting the lesions.

Take Home Points:

1. Jugular foramen flow-induced pseudolesions and anatomic variants presenting as middle ear mass have typical findings and should not be mistaken as genuine lesions
2. The attending surgeons should be alerted for the presence of meningomyelocoeles and meningocoeles to prevent unnecessary biopsy
3. Arachnoid cysts, epidermoid cysts and liopmas can be readily distinguised on MRI
4. The diagnosis of fibrous dysplasia requires a high index of suspicion

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SS 12.2.
Skull base meningiomas: "Benign" but aggressive tumors!

B. Schuknecht, Zurich/CH

Short Summary: Meningioma is the most common adult intracranial tumor (f : m ratio 1.5-3 : 1) with an autopsy incidence of 1 – 1.5%. An increased incidence is found in patients with neurofibromatosis type 2 or prior radiotherapy to the skull commonly after a delay of 10-20 years. Skull base meningiomas are subdivided according to the following locations: · anterior skull base : (olfactory groove, tuberculum sellae, sphenoid wing (medial-clinoidal, lateral spheno-orbital) · central skull base: petroclival , pericavernous · posterior skull base: lower clival , foramen magnum, · lateral posterior fossa: cerebellopontine angle, and foramen jugulare Imaging is required to depict location and extension of meningiomas. At the skull base extracranial extension may affect the olfactory rim, the orbit, infratemporal / pterygopalatine fossa, the temporal bone and jugular foramen. Blistering, hyper- ostosis and transosseous growth are commonly encountered osseous reactions. Limitations for endoscopic and craniofacial resection are lateral and retrosellar extension, brain invasion/ cerebral edema, involvement of basal cerebral arteries and cranial nerves, firm tumor consistency and previous surgery/radiotherapy. Histologiy distinguishes 15 subtypes of meningioma. Nine of these subtypes are allotted to WHO grade I, and three each to grade II (atypical 5-15%) and grade III (malignant 1-2%). However, recently DNA methylation-based meningioma classification was found to harbor a higher power for predicting tumour recurrence and prognosis than the WHO classification (Sahm F et al. Lancet Oncol 2017;18:682-94). The incidence of Grade II and III tumors is significantly higher in non skull base tumours (12.1%) than in the skull base (3.5%) (Sade B et al. Neurosurgery 2007; 61:1194–1198). Skull base meningiomas showed growth on f-up in 39.5% (15/38) with a relative growth rate of 6.84 (2–24) %/year, in comparison to 74.7% (56/75) of non–skull base meningiomas ($p = 0.0004$) which enlarged at a rate of 13.78 (2–74)% $p< 0.009$. Hashimoto N et al. J neurosurg 2012;112: 574-580. The median MIB-1 labeling index of Grade I skull base tumors (1.35%; $p = 0.016$) was significantly lower than that of Grade I non–skull base meningiomas (2.60%) McGovern S et al J Neurosurg 2010;112: 925-933. Furthermore skull base meningiomas harbor a significantly lower percentage of cells with 1p loss (20.31%) compared with non–skull base tumors (37.87%). Imaging correlates of these histologic and molecular findings that distinguish skull base from non skull base meningiomas have not yet been identified.

Take Home Points:

1. Skull base meningiomas are categorized into those that affect the anterior, central and lateral skull base
2. Skull base meningiomas are characterized by a slower growth rate, longer tumour doubling time and lower rate of grade II and III tumours in comparison to non skull base locations
3. Skull base meningiomas when related to cranial nerves, basal cerebral artereis and cavernous /dural sinuses are prone to a higher rate of subtotal resection by endoscopic and transcranial aproaches

SS 12.3.
New imaging challenges in endoscopic skull base surgery planning

D. Farina, Brescia/IT

Short Summary: Surgical resection of skull base lesions may be accomplished with open and endonasal approaches, or a combination of the two. In recent years, endonasal microsurgery has significantly expanded its potential, as the number of approaches multiplied, offering corridors that can be used to reach lesions as deeply located as the craniocervical junction or the jugular foramen. Similarly, the spectrum of indications for this kind of surgery has widened, including –in selected cases- malignant tumors, which can be managed with combined or even purely endoscopic approach. Traditionally, endonasal approaches are classified as sagittal or coronal; each class can be further subdivided according to the related skull base segment. Sagittal corridors are mainly used to treat median skull base lesion and includetransfrontal and transcribriform (anteriorcranial fossa); transplanum, transsellar (middle cranial fossa); transclival, transodontoid (craniocervical junction). Coronal corridors may be applied for paramedian lesions and are classified according to the depth of the resection; transorbital approach may be used for anterior skull base lesions; transpterygoid, infratemporal, transcavernous and transpetrous for middle cranial fossa lesions; transjugular and transcondylar for posterior cranial fossa lesions. Each of the abovementioned corridors has indications and contraindications, related to the involvement of specific anatomic structures. Additionally, anatomic variants (sinus cavities, vascular structures) may hinder the corridor or modify the strategy for reconstructive time of the procedure, therefore require careful attention. Not surprisingly, cross-sectional imaging is essential part of the preoperative work-up. CT provides high resolution information on bone structures and bone variants. Recently, the introduction of CBCT scanners has pushed the spatial resolution down to 0,1mm, thus offering unsurpassed definition of even the subtlest bone structures, though at the price of losing information about soft tissues. MRI must be acquired exploiting its spatial and contrast resolution; therefore, besides conventional SE sequences, a combination of heavily T2 weighted (CISS, SPACE) and T1 weighted 3d sequences is mandatory to obtain the highest detail on critical anatomic regions like the cavernous sinus and skull base foramina; 3d angio sequences may complete the protocol when specific issues, triggered by the contiguity between lesion and vascular structures, need to be solved.

Take Home Points:

1. To be aware of the different endonasal approaches that can be used to remove anterior, middle and posterior skull base lesions, and of their classification
2. To understand the most relevant anatomic landmarks for each approach
3. To learn about indications and contraindications of the procedure and, consequently, of the key information to be provided in the radiologic report
4. To emphasize the anatomic variants that may have relevant impact on the surgical procedure.

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RC 2.1.
Paranasal sinuses: Neoplastic lesions

P. Mundada, Geneva/CH

Short Summary: Sinonasal cancers constitute about 5% of all head and neck cancers. Sinonasal cancers include a broad range of histological characteristics with squamous cell carcinoma accounting for more than 80%, and adenocarcinoma and adenoid cystic carcinoma accounting for 10% of these cancers. Maxillary sinus squamous cell carcinoma is the most common type amongst these tumours. Goals of the imaging include characterization of tumours and delineating tumour extensions to various compartments; assessment of osseous changes, a depiction of normal variants and planning the biopsy and surgical approach. The imaging armamentarium for the evaluation of sinonasal tumours includes CT, MRI, FDG PET-CT/MRI. Each modality offers some advantage over other and also have some drawbacks. This talk aims to provide a comprehensive imaging review of common benign and malignant tumours of the paranasal sinuses in adults and provide an imaging algorithm for tumour evaluation. Emphasis is placed on key imaging questions the radiologist has to answer to facilitate treatment planning as well as on recent advances in imaging of paranasal sinuses including FDG PET-CT / MRI and perfusion imaging. We will also discuss common peri-neural pathways of tumour spread and will highlight the impact of HPV infection on imaging and treatment of benign and malignant tumours of the paranasal sinuses

Take Home Points:

1. Benign and malignant tumours of paranasal sinuses may have an aggressive clinical course or may get detected incidentally.
2. Squamous cell carcinoma accounts for 80% of all tumours of paranasal sinuses.
3. CT and MRI complement each other in the initial tumour evaluation, staging and follow-up.
4. Use of diffusion weighted MRI and perfusion MRI has added a new dimension to the imaging of paranasal sinus tumours.
5. FDG PET-CT/MRI plays a crucial role in diagnosis, staging and management of malignant tumours.
6. HPV infection related malignancies of paranasal sinuses form a unique subset

RC 2.2.
Imaging nodal neck masses

S. Qureshi, Manchester/UK

Short Summary: Nodal Neck Masses The presentation will allow an understanding of the anatomical distribution of cervical nodes and assessment of normal morphology on multimoadilty imaging. Pathology will be explored in terms of imaging characterstics in the differing modalities. This will include evaluation of intrinsic charcetristics as well as review of extracapsular spread. Refresher on the anatomical distribution of pathological nodes. Up to date multimodaility imaging review for nodal neck disease. There will also be a review of the 8th AJCC and implication of HPV as well as ECS.

Take Home Points:

1. Anatomical distribution
2. Intrinsic and Extrinsic characteristics of pathological nodes
3. Up to date multi modality review
4. Review of 8th AJCC

RC 2.3.
Imaging non-nodal neck masses
B. Purohit, Singapore/SG

Short Summary: Non-nodal neck masses are common in both children and adults and often present as palpable lumps. A relevant clinical history and examination is crucial in narrowing the differential diagnosis, deciding on the choice of imaging modality and finally establishing the relevance of imaging features.

High-resolution ultrasound (US) with fine needle aspiration cytology (FNAC) is the imaging modality of choice for the assessment of the vast majority of palpable neck lumps. Additional cross-sectional imaging like CT or MR is required to characterise deep-seated disease, extensive inflammatory disease, and to stage malignancy. This talk reviews the clinical and multimodality imaging features of commonly occurring non-nodal, non-salivary, non-thyroid neck masses, namely, cysts, vascular malformations, lipomas, benign and malignant nerve sheath tumours and sarcomas. A systematic imaging flow-chart has been described for the evaluation of these lesions in both adults and children, including the role of complimentary imaging modalities like positron emission tomography-computed tomography (PET/CT) with fluorine-18-fluorodeoxy-D-glucose (FDG). Finally pseudo-lesions of the neck have been reviewed briefly.

Take Home Points:

1. Non-nodal neck masses are routinely encountered in adults and children.
2. Common non-nodal neck masses include cysts, vascular malformations, lipomas, benign and malignant nerve sheath tumours and sarcomas
3. High resolution US with FNAC will help to diagnose most palpable lumps, whereas CT/MRI are required for evaluating deep-seated disease and suspected malignancy.
4. For the reporting radiologist, knowledge of the age and clinical history of the patient, location of the lesion, and imaging features helps to arrive to the most likely diagnosis.

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SA 4.1.
Impact of multimodality data on radiotherapy planning
V. Vandecaveye, Leuven/BE

Short Summary: With the emerging concepts of adaptive radiation treatment strategies, there is increasing interest for multiparametric imaging assessment prior to and/or during the course of therapy, aiming to develop a non-invasive tool to identify patients who could benefit from treatment intensification, select patients for adaptive radiotherapy (especially important in proton radiotherapy) and aiming to identify tumor regions with suspected radioresistance. For the radical treatment of head and neck cancer (HNC), the major challenge for chemoradiotherapy is to attain the highest probability of cure while toxicity to surrounding normal tissues should be as minimal as possible.However, this is heavy reliant on accurate target delineation and better idenfitication of tumour regions at risk of recurrence and normal anatomy prone to toxicity. Computed tomography and cone-beam CT remain the cornerstone for treatment planning, based on their excellent anatomical topographic information for tumour localization. Besides the location, size, and extent of the tumour, there is increasing interest in integrating enhanced knowledge of the tumour biology into the management of HNC. Additional information can be gained from hybrid Positron Emission Tomography/CT (PET/CT), Dynamic contrast enhanced magnetic resonance imaging (DCE-MRI) and diffusion-weighted MRI(DWI). In current clinical routine, PET/CT can be of additional value to reduce interobserver variability in tumour delineation, reduction of size of the Gross tumour Volume (GTV) planning, identification of tumour extent missed by CT or MRI, and identification of small lymph node metastases and thus adapation of the treatment plan. Because of its superior soft tissue contrast, convention al MRI has added value in the treatment planning of nasopharyngeal, oral and oropharyngeal cancers and addition of MRI usually results in reduction of interobserver variability to outline the GTV. The integration of functional information into the treatment planning and treatment adaptation during the course of radiotherapy is largely subject of clinical research or is limited for its clinical application to large volume centers with specific expertise. Emphasize is put on the intergration of metabolical, microvascular and microstructural information to predict eventual complete response or high risk of recurrence pretreatment in order to guide radiotheraplanning to assess respons at an early stage during the course of chemoradiotherapy in order to enable dose boosting to tumour subsites at risk of non-response and thus adapt the treatment plan. The integration of functional information for treatment planning and adaptation, however, require further development before routine clinical application is possible. Major point for development include: accurate identification of the biological correlate for the imaging changes, correcting image distortion and mismatches which is a most pronounced for DWI and improving quantitative delivery of the functional information for adequete treatment

planning. The aim of this presentation is to give an overview of the impact of additional pretreatment PET/CT, DCE-MRI and DWI to the radiotherapy planning and potential use during the course of treatment in order to allow treatment adaptation. Next to improved tracers and functional imaging assessment, it is likely that more advanced quantitative approaches using voxel by voxel distribution of the functional imaging information are necessary to allow risk identification in the individual patients and not solely of statistical patient populations.

Take Home Points:

- To understand the additional clinical role of PET/CT and MRI for target delineation
- To understand the biologiocal rationale for application of different functional imaging modalities for pretreatment radiotherapyplanning and adaptation during radiotherapy
- To understand the requierements and pitfalls to integrate functional imaging data into radiotherapy planning
- To understand new advanced quantitative image analysis approaches using voxel by voxel distribution

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A. Cristina, L. Aminov, M.S.C. Haba, A.E. Petcu, D. Haba; Iasi/RO

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N. Sivarasan, P. Touska, L. Murdin, S. Connor; London/UK

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A. Ogg, G. Kontorinis, S. Allwood-Spiers, I. McCrea; Glasgow/UK

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A. Jovic, J. Fila; Zagreb/HR

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G. Özer, L. Pasaoglu; Ankara/TR

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S. Vaid; Pune/IN

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K.Y. Lai; Singapore/SG

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T. Jindal, C. Yablon; Ann Arbor/US

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K. Orhan[1], U. Seki[1], I. Rozylo-Kalinowska[2]; [1]Ankara/TR, [2]Lublin/PL

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D.-H. Lee; Seoul/KR

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S. Apajalahti[1], S. Robinson[2]; [1]Fi- Hus/FI, [2]Vienna/AT

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N. Fattah, A.R. Soroush, H. Ebrahiminik, A. Jafari, E. Sadeghian; Tehran/IR

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M. Garcia; Belo Horizonte/BR

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N. Yetimoglu Ozdil[1], K. Orhan[2]; [1]Istanbul/TR, [2]Ankara/TR

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M. Cruz[1], M. Oliveira[1], C. Oliveira[2], E. Pinto[1], M.D.L. Cachulo[1]; [1]Coimbra/PT, [2]Vila Real/PT

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A. Koltowska, M. Wolanczyk, M. Sasiadek, A. Zimny; Wroclaw/PL

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S. Dutra[1], D. Torres[2], M. Serrado[3], P. Cordeiro[1], J. Barros[2]; [1]Ponta Delgada/PT, [2]Lisbon/PT, [3]Funchal/PT

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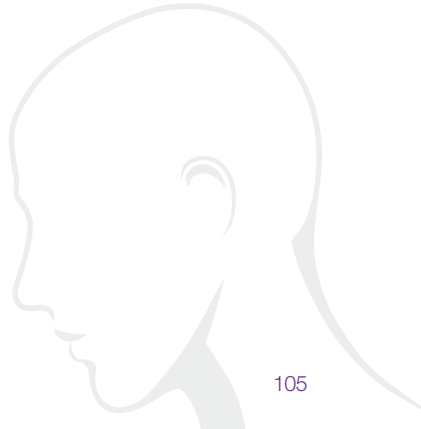

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