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ESHNR 2026 BUDAPEST | Abstracts

Scientific Oral Presentation Session 1: Skull base and temporal bone

Thursday, September 10, 2026 | 11:05-12:35 local time | Room 2

Cone-Beam CT of the Temporal Bone: Normative Linear Biometry of Inner Ear Structures

A.V. Genovese¹, E. Massullo¹, S. Casale¹, F.M. Lo Russo¹, E. Scola¹, E. Schifano², G. Conte¹

¹Milan/IT, ²Palermo/IT

Purpose/Objectives

Normative linear measurements of inner ear structures may enhance diagnostic accuracy in detecting subtle congenital abnormalities. This study aimed to establish Cone-Beam Computed Tomography (CBCT)-based normative reference values for temporal bone anatomy.

Methods and materials

We retrospectively reviewed consecutive CBCT scans of normal temporal bones acquired between June 2022 and June 2024. Scans were classified as normal based on the absence of pathological findings and no history of otologic disorders. Eleven linear measurements of inner ear structures were independently performed by two radiologists, and interobserver agreement was assessed. Reference centiles were generated for each parameter.

Result

A total of 319 patients (135 men, 184 women; mean age, 50.03 years; range, 3 months–91 years) were included. Interobserver reliability was high across all measurements. Age and sex showed a small effect on any measurement. Normative centile distributions for all eleven structures were established.

Conclusion

This study provides robust CBCT-derived normative linear measurements of inner ear structures. These reference values may improve radiologic assessment of congenital hearing loss, particularly in patients with normal-appearing CT examinations.

Enhanced Otosclerosis Assessment with Photon-Counting Computed Tomography

E. Burian

Zurich/CH

Purpose/Objectives

To compare photon-counting CT (PCCT) and cone-beam CT (CBCT) for the evaluation of otosclerosis and to assess inter-reader agreement including additional readings by two otologic surgeons.

Methods and materials

In this retrospective study, 56 patients with suspected otosclerosis (28 PCCT, 28 CBCT) were analyzed. All datasets were independently evaluated by two radiologists and two otologic surgeons, blinded to clinical data. Image quality was assessed using a 5-point Likert scale. Lesion detectability, axial lesion diameter, round window involvement, and classification according to Symons/Fanning and Veillon were recorded. A consensus reading served as reference. Inter-reader agreement was assessed using weighted kappa and intraclass correlation coefficients (ICC). Group comparisons were performed using Mann–Whitney U and Fisher's exact tests.

Result

PCCT showed significantly higher image quality compared to CBCT (median Likert 5 vs. 3, $p < 0.001$). Lesion detectability was higher in PCCT (100%) than in CBCT (82%, $p = 0.004$). Measurement agreement for lesion size was excellent in PCCT (ICC = 0.91) and good in CBCT (ICC = 0.78). Inter-reader agreement for round window involvement was higher in PCCT ($\kappa = 0.82$) than in CBCT ($\kappa = 0.68$). Classification agreement was also higher in PCCT (weighted $\kappa = 0.74$ and 0.69) compared to CBCT ($\kappa = 0.61$ and 0.57). Additional readings by otologic surgeons showed similar trends with slightly increased variability in CBCT. Diagnostic performance was higher for PCCT (AUC ≈ 0.97) than for CBCT (AUC ≈ 0.79).

Conclusion

PCCT provides superior image quality, lesion detectability, and inter-reader agreement compared to CBCT in otosclerosis. These findings support PCCT as a more reliable imaging modality for detailed evaluation of otosclerotic changes.

Visualization of the vestibular aqueduct across MRI sequences – illustrating the advantage of blackbone imaging

H.S. Leung^{1,2}, B. Al-Dulaimy¹, I. Pai¹, S. Connor¹

¹London/GB, ²Hong Kong/HK

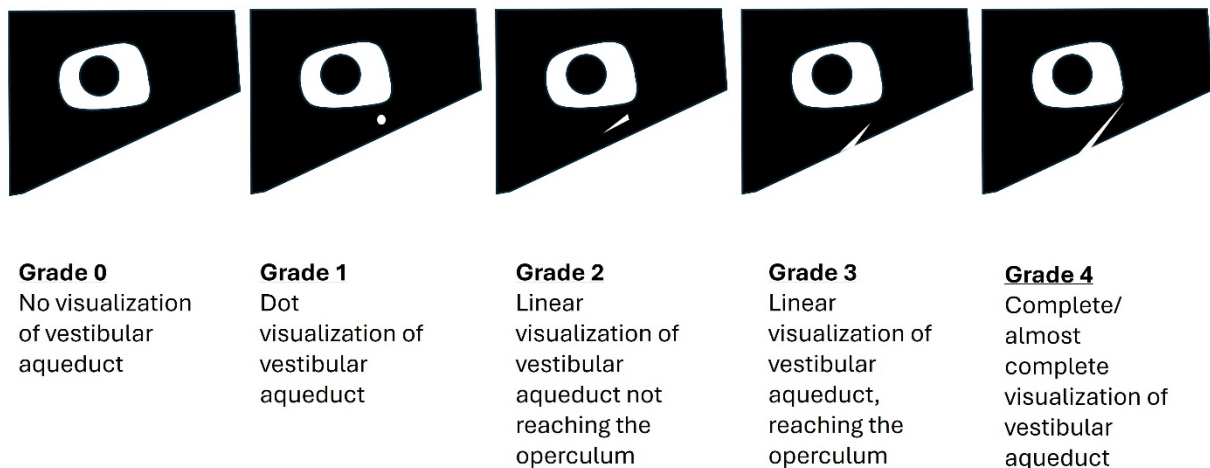
Purpose/Objectives

The angular trajectory of vestibular aqueduct (VA) has emerged as an important factor for the subtyping of Meniere's disease (MD) phenotypes and should form part of the imaging assessment[1]. This relies heavily on its visualization, which has not been systematically evaluated on different MRI sequences. It was hypothesized that a dedicated (blackbone, BB) sequence would be advantageous in depicting the vestibular aqueduct.

Methods and materials

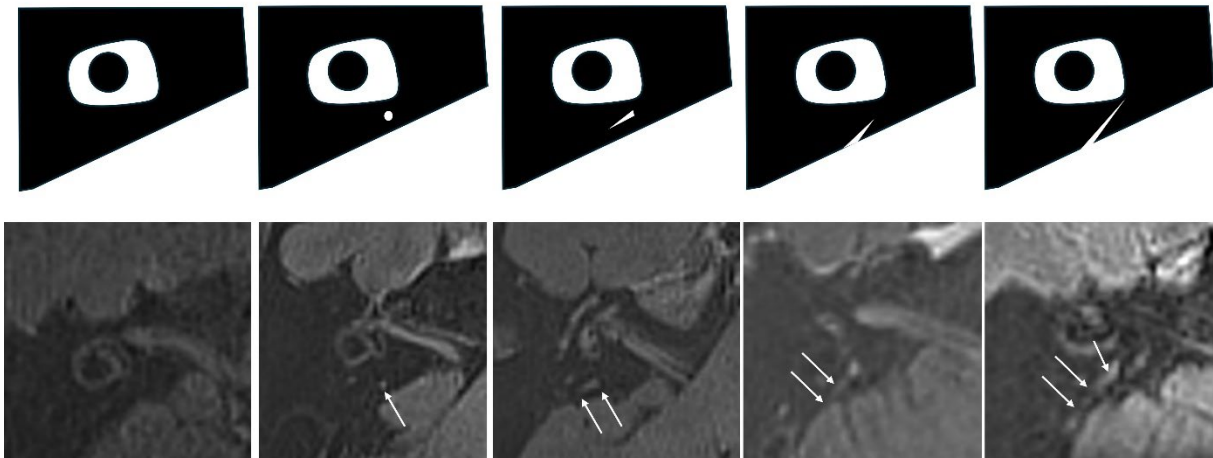
A retrospective diagnostic study included patients who had undergone CT and MD protocol MRI with T2-weighted (T2W) as well as two delayed post-gadolinium inversion recovery (IR) sequences (Zero point endolymph [ZPE-IR] and negative signal endolymph [NSE-IR]). A further cohort of patients was included who had been imaged with CT and a 3D-gradient echo proton density (BB) sequence for cochlear implant planning. Grading of the vestibular aqueduct visualization was performed with a five point scale by two independent observers. Comparisons of VA visualization between patients with/ without established primary MD (by clinical criteria supported by endolymphatic hydrops on imaging) were performed by Mann-Whitney U test. Inter-observer correlation represented in weighted kappa.

Grading of visualization



Vestibular Aqueduct Visualization Grading

Grading of visualization - Examples



Vestibular Aqueduct Visualization Grading - Examples

Result

VA was better visualized on CT than on T2W/ZPE-IR/NSE-IR ($n=109$, $p<0.01$) or BB ($n=31$, $p<0.01$). Primary MD patients ($n=17$) showed worse VA visualization on ZPE-MRI ($p=0.02$) but not on CT or other MR sequences. Satisfactory VA visualization was achieved in 96.7% of ears utilizing blackbone sequences. BB-MRI achieved better VA visualization than ZPE-IR or NSE-IR in non-MD patients ($p<0.01$). Interobserver correlation of VA grading were 0.797 (T2W), 0.696 (ZPE-IR), 0.825 (NSE-IR), 0.813 (BB) and 0.901 (CT) respectively.

Conclusion

VA visualization is worse on MRI than CT and particularly in patients with imaging evidence of MD. Blackbone shows better visualization of VA compared to post-gadolinium inversion recovery sequences and might be a useful additional tool for depiction of VA morphology in MD imaging protocols.

References:

[1] Bächinger D, Luu NN, Kempfle JS, Barber S, Zürrer D, Lee DJ, Curtin HD, Rauch SD, Nadol JB Jr, Adams JC, Eckhard AH. , (2019), Vestibular Aqueduct Morphology Correlates With Endolymphatic Sac Pathologies in Meniere's Disease—A Correlative Histology and Computed Tomography Study, *Otol Neurotol*, e548-e555, 40(5), doi: 10.1097/MAO.0000000000002198

Endolymphatic hydrops and intracranial hypertension: a quantitative MRI analysis

A. Péporté¹, J. Kostova¹, J. Berberat², G. Andreisek^{3,4}, F. Schön³, F. Wagner^{2,5}

¹Frauenfeld/CH, ²Aarau/CH, ³Münsterlingen/CH, ⁴Zurich/CH, ⁵Bern/CH

Purpose/Objectives

This study investigated the prevalence and association of magnetic resonance imaging (MRI) imaging markers indicative of idiopathic intracranial hypertension (IIH) in patients diagnosed with endolymphatic hydrops (EH). The objective was to elucidate potential pathophysiological links between inner ear fluid dysregulation and alterations in intracranial pressure.

Methods and materials

A total of 108 adult patients with dedicated MRI and delayed post-contrast (hydrops) sequences obtained for assessment of auditory/vestibular symptoms between 01/2020 and 06/2025 were retrospectively reviewed. EH grading, nerve volumes of the cochlear nerve, common vestibular trunk and facial nerve, IIH imaging features (e.g., Meckel's cave dilatation, optic nerve findings, venous sinus stenosis), and clinical symptoms were recorded. The prevalence and co-occurrence of EH and IIH features were statistically analyzed.

Result

Vestibular EH (grade 2) was noted in 71.3% (right) and 60.2% (left) of patients and cochlear EH (grade 2) in 42.6% (left) and 34.3% (right) of patients. IIH-related imaging markers were common: bilateral Meckel's cave dilatation (60.2%), partially empty sella turcica (50.9%), bilateral optic nerve sheath dilation (57.4%), optic nerve head enhancement on delayed FLAIR sequences (67.6%), and intrinsic bilateral transverse sinus stenosis (26.9%). Statistically significant associations were identified between vestibular EH severity and optic nerve sheath dilation ($p = 0.0368$), optic nerve tortuosity ($p = 0.0309$), slit-like lateral ventricles ($p = 0.0023$), and increased subcutaneous fat thickness in the scalp and neck ($p = 0.003$). Conversely, intrinsic bilateral transverse sinus stenosis was negatively correlated with EH severity ($p = -0.228$, $p = 0.017$). Overlap analyses demonstrated that many patients with moderate to severe EH exhibited multiple IIH imaging features concomitantly.

Conclusion

MRI findings demonstrate a frequent coexistence of EH and radiological biomarkers of IIH. This observation supports a potential pathophysiological association between inner ear fluid dysregulation and elevated intracranial pressure, underscoring the need for prospective studies integrating clinical outcomes with advanced MRI-based assessments of fluid dynamics.

A quantitative comparison of single dose delayed post gad 1.5T REAL IR and 3T IR MRI sequences for the imaging of endolymphatic hydrops in Meniere's Disease

S. Connor, I. Pai, P. Touska, A. Price, J. Hajnal
London/GB

Purpose/Objectives

Negative signal endolymph (NSE) 3D REAL-IR (inversion recovery) sequences have demonstrated greater diagnostic accuracy and reliability for most Meniere's Disease (MD) MRI descriptors than zero-point endolymph (ZPE) 3D-FLAIR sequences [1], but post intravenous NSE 3D REAL-IR has only been evaluated at 3T. 1.5T MRI scanners are more common worldwide. It was hypothesized that 1.5T NSE-IR could achieve non-inferior perilymphatic SNR (SNR^p) and perilymph–endolymph contrast to noise ($CNR^{p/e}$) to 3T SPACE NSE-IR (long TR/TE) or 3T FSE ZPE-IR (shorter TR/TE) sequences. Secondary aims were to compare endolymphatic volume evaluation and differences in diagnostic accuracy across qualitative MRI descriptors.

Methods and materials

12 patients with Barany 2015 unilateral definite MD criteria (8f/4m; mean age 59.6 range age 31-83) were prospectively enrolled to undergo 1.5T NSE-IR, 3T NSE-IR and 3T ZPE IR sequences at 3.5-4.5 hours after intravenous gadobutrol (0.1 mmol per kg). Two observers independently evaluated images whilst blinded to other sequences, diagnosis and the contralateral ear appearances. The cochlear (SNR^{pc}) and vestibular (SNR^{pv}) perilymphatic SNR, vestibular perilymph-endolymph CNR ($CNR^{p/e}$) were evaluated whilst whole endolymphatic space uncorrected and corrected endolymphatic volume (uV^e and cV^e) were contoured before and after registration to 3D T2w. MD descriptors (n=14) were scored for each ear. Paired t-tests for non-inferiority (-20%) were applied to the resampled mean SNR^p , $CNR^{p/e}$ and the difference between uV^e and cV^e . The cV^e was compared for equivalence ($\pm 20\%$) between sequences. The qualitative MR descriptor agreement between sequences (McNemar exact) and diagnostic accuracy for MD ear diagnosis were calculated.

Result

The 1.5T NSE-IR SNR^{pc} , SNR^{pv} and $CNR^{p/e}$ were inferior to 3T NSE-IR ($p = 1.00$) but non-inferior to 3T FSE ZPE-IR ($p = 1.00$). $CNR^{p/e}$ was significantly higher for 1.5T NSE-IR than 3T FSE ZPE-IR ($p < 0.001$). Mean cV^e was equivalent across all three sequences. The 1.5T NSE-IR mean difference between uV^e and cV^e was less than for the 3T IR sequences ($p < 0.001$). MRI descriptor scores did not differ significantly between sequences and 1.5T NSE-IR achieved the same sensitivity and specificity for identifying MD ears as 3T NSE-IR.

Conclusion

1.5T NSE-IR may provide comparable SNR^p to a shorter TR/TE 3T ZPE sequence and with superior $CNR^{p/e}$. Although SNR^p and $CNR^{p/e}$ are inferior to an optimised 3T SPACE NSE-IR sequence, the qualitative MD descriptor evaluation is of similar diagnostic accuracy, and it accurately measures V^e without the need for registration to 3D T2w sequences.

References:

[1] Connor S, Pai I, Touska P, Price D, Ourselin S, Hajnal JV., (2025), The impact of

3D real-IR delayed post gadolinium MRI parameterisation on the diagnostic performance and optimal descriptor selection in Ménière's disease., Eur Radiol, 1290-1302

Diagnostic Yield and Reliability of Imaging in Otalgia: A Multicentre Retrospective Review

L. Robertson, C. McArthur, A. King, F. Askham
Glasgow/GB

Purpose/Objectives

Otalgia is a common presenting clinical symptom and imaging can assist in identifying primary and secondary causes. Given the complex innervation of the ear, a wide variety of head and neck pathologies may produce referred otalgia and this should be considered in scan protocol selection and image interpretation.

This study aims to evaluate imaging type utilised and the diagnostic yield of imaging in patients presenting with otalgia and the incidence of clinically significant pathology detected on any subsequent scans after initially negative imaging.

Methods and materials

A retrospective multicentre review of imaging performed for otalgia. Cases were identified using keyword searches (e.g. “otalgia”, “earache”, “ear pain”) in the provided clinical history on the local RIS (Radiology Information System) between 1st January 2019 and 31st December 2023.

Data collected included demographics, smoking history, scan type, referring speciality, laterality of otalgia and associated symptoms. Imaging reports were reviewed to determine if a potential cause for otalgia was identified. Indeterminate/incidental findings were also recorded.

In cases with no cause identified for otalgia on initial scan, follow-up imaging reports were assessed for subsequent clinically significant pathology.

Result

In 105 included patients, 36 male, 69 female, mean age 54 years (range 11-93 years), otalgia was unilateral in 95%. Associated symptoms were present in 73%, most commonly throat pain (30%), hearing loss (16%), neck pain (14%), and facial pain (14%). The majority of referrals originated from ENT (82%).

There was marked heterogeneity in scan type with CT performed in 66% and MRI in 34%.

A definitive cause for otalgia was identified on initial imaging in 27%. This comprised 65% with referred source of otalgia and 35% arising from primary otologic pathology, and included a variety of inflammatory, degenerative and neoplastic processes. Incidental or indeterminate findings were reported in 37%.

Follow-up imaging for otalgia was performed in 16% of initially negative cases. Only one case (1%) demonstrated clinically significant pathology on follow-up with no clearly missed diagnoses on initial scan.

Conclusion

In this cohort, imaging for otalgia demonstrated a moderate diagnostic yield. However, there was marked variation in imaging modality and technique suggesting a lack of a standardised imaging pathway but also reflecting a heterogeneous patient

group. When imaging was positive, the majority of cases were due to referred otalgia. Reassuringly, clinically significant pathology was rarely missed on initial imaging.

Ultra–High-Resolution Volume-Mode CT of the Temporal Bone: Indication-Based Radiation Dose Reduction with Deep Learning Reconstruction—A Cadaveric Study

L. Brockstedt, S. Altmann, S. Kim, A. Sanner, A. Kronfeld, M. Beshr, F. Pavlas, M. Schmeißer, M. Brockmann, A. Othman
Mainz/DE

Purpose/Objectives

To systematically evaluate radiation dose reduction in ultra–high-resolution (UHR) volume-mode computed tomography (CT) of the temporal bone using vendor-specific deep learning reconstruction (DLR) compared with hybrid iterative reconstruction (HIR), and to define indication-based dose levels for clinical application.

Methods and materials

In this single-center cadaveric study (June 1 – September 30, 2023), 20 temporal bones from 10 body donors without pathological findings were scanned at 11 dose levels (CTDIvol: 5.1–30.7 mGy). Images were reconstructed using HIR at standard resolution (0.5 mm, 512² matrix) and UHR (0.25 mm, 1024² and 2048² matrices), as well as with the vendor-specific DLR (AiCE Inner Ear) at UHR (0.25 mm, 1024² matrix). Three radiologists independently rated nine anatomical structures on a 5-point Likert scale. Signal-to-noise ratio (SNR) was evaluated in predefined regions.

Result

DLR significantly improved visualization of osseous structures compared with HIR ($p < 0.001$): For routine clinical indications, diagnostically excellent image quality was achieved with DLR at a CTDIvol of 13.3 mGy (DLP 53.2 mGy*cm), corresponding to a 48% dose reduction compared with the HIR (CTDIvol 25.6 mGy, DLP 102.4 mGy*cm). For detailed assessment of delicate microanatomical structures such as the stapes and cochlea, a CTDIvol of 17.4 mGy (DLP 69.6 mGy*cm) was required with DLR, representing a 43% reduction compared with HIR (CTDIvol 30.7 mGy, DLP 122.8 mGy*cm).

Conclusion

DLR enables substantial radiation dose reduction in UHR temporal bone volume CT while maintaining diagnostically excellent image quality. Two indication-adapted dose levels can be defined: a standard protocol (CTDIvol 13.3 mGy) for routine indications and a microanatomy-optimized protocol (CTDIvol 17.4 mGy) for specific high-detail diagnostic tasks.

Menière's Disease: Correlating In Vivo MRI Visualization of the Membranous Labyrinth with Objective Audio-Vestibular Tests

E. Massullo, A.V. Genovese, S. Casale, F.M. Lo Russo, E. Scola, G. Conte
Milan, Italy

Purpose/Objectives

Menière's disease (MD) is a chronic inner ear disorder characterized by episodic vertigo, hearing loss, and tinnitus, strongly linked to endolymphatic hydrops (EH). This study evaluates the relationship between in vivo magnetic resonance imaging (MRI) visualization of EH, using a 4-hour delayed 3D-FLAIR protocol, and objective audio-vestibular outcomes, aiming to better elucidate the morpho-functional relationship in MD.

Methods and materials

This retrospective cohort study included 137 patients with unilateral or bilateral MD diagnosed according to the Bárány Society criteria. All patients underwent 3.0T MRI with delayed post-contrast 3D-FLAIR imaging to grade the status of the membranous labyrinth. Concurrent audio-vestibular evaluations, including pure-tone average (PTA4) thresholds and Vestibular Evoked Myogenic Potentials (oVEMPs and cVEMPs) amplitudes, were performed. Mixed-effects models were utilized to examine the correlations between MRI hydrops grading and functional parameters.

Result

Increasing severity of both cochlear and vestibular hydrops was significantly associated with a predominantly monotonic worsening of PTA4 thresholds. Regarding vestibular function, higher hydrops grades significantly correlated with increased oVEMPs amplitude categories, suggesting altered utricular biomechanics. Conversely, no significant linear correlation was found between hydrops severity and cervical cVEMPs amplitude.

Conclusion

The severity of EH visualized on delayed 3D-FLAIR MRI correlates robustly with specific functional impairments. The significant linear association with PTA4 and oVEMPs amplitudes highlights the sensitivity of advanced MRI in reflecting cochlear and utricular mechanical alterations, positioning it as a cornerstone diagnostic tool for staging and monitoring MD.

Incudo-stapedial angle in patients with otosclerosis: an HRCT study

D. Bracanovic, A. Jotic, B. Markovic Vasiljkovic, A. Janovic, S. Antic
Belgrade/RS

Purpose/Objectives

This study aimed to assess the incudo-stapedial angle (ISA) in patients with otosclerosis using high-resolution computed tomography (HRCT), as its value may impact surgical approach and outcome.

Methods and materials

This prospective study included 68 patients with radiologically detectable foci of otosclerosis and 53 patients diagnosed with noise-induced hearing loss. HRCT scans were analyzed by two experienced radiologists, demonstrating good to excellent interobserver agreement. In both groups, ISA values were measured and classified according to previously proposed criteria as obtuse, right, or acute

Result

The otosclerotic and control groups did not differ significantly in terms of age, sex, or side distribution. The total number of ears with otosclerosis was 143, including 7 bilateral cases. In the total sample and in both groups, there was no significant difference in ISA values between sexes ($p = 0.241$). In the control group, ISA did not differ between sides ($p = 0.322$). Compared to the control group, ISA values in the otosclerotic group were significantly higher ($p = 0.046$), with a higher frequency of obtuse angles. In patients with unilateral otosclerosis, ISA values were higher in the affected ear compared to the contralateral ear, although this difference was not statistically significant. However, the frequency of obtuse angles in the affected ear was significantly higher ($p = 0.023$). ISA values in ears with retrofenestral otosclerosis were higher than in those with the fenestral type, but without statistical significance ($p = 0.657$).

Conclusion

ISA is primarily determined by temporal bone pneumatization. However, our results suggest that it may be altered in patients with otosclerosis, shifting toward more obtuse angles. Changes in the oval window may cause torsion of the stapes, with consequent incus displacement and an increase in ISA values.

Can angular trajectory of vestibular aqueduct be reliably measured on delayed post-gadolinium Real-IR and blackbone MRI sequences?

H.S. Leung^{1,2}, B. Al-Dulaimy¹, I. Pai¹, S. Connor¹

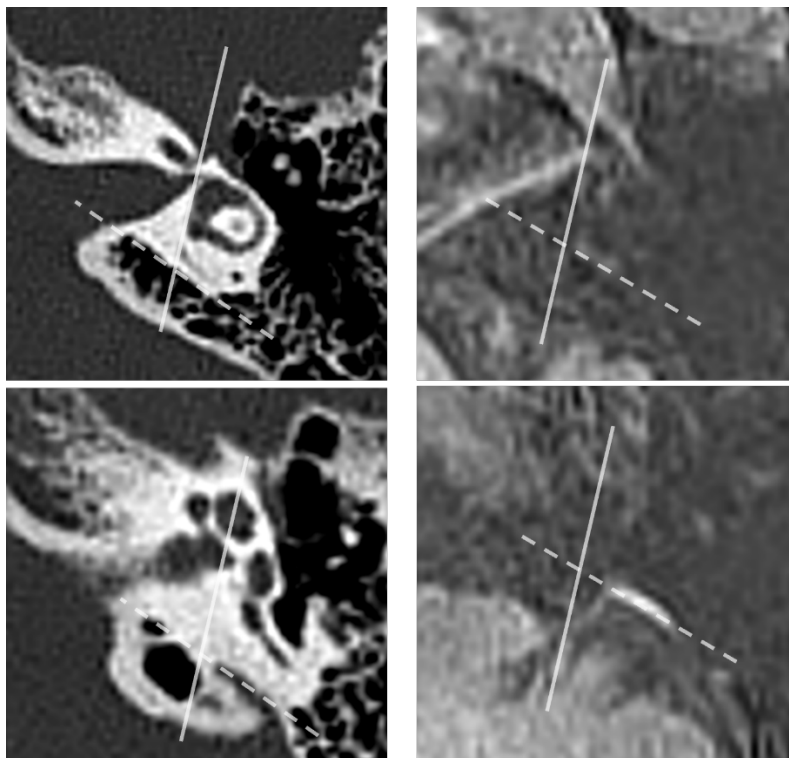
¹London/GB, ²Hong Kong/HK

Purpose/Objectives

The angular trajectory of vestibular aqueduct (ATVA) has emerged as an important factor for the subtyping of Meniere's disease (MD) phenotypes[1][2] and should form part of the MR imaging assessment. The reliability of ATVA measurement across different MR sequences has not been previously evaluated. It was hypothesized that a dedicated (blackbone, BB) sequence would be advantageous in evaluation of ATVA.

Methods and materials

A retrospective diagnostic study included patients who had undergone CT and MRI with T2-weighted (T2W) as well as two delayed post-gadolinium inversion recovery (IR) sequences (Zero point endolymph [ZPE-IR] and negative signal endolymph [NSE-IR]) for suspected MD. A further cohort of patients were included who had been imaged with CT and a 3D-gradient echo proton density (BB) sequence for cochlear implant planning. ATVA were measured in the oblique plane parallel to ipsilateral semicircular canal, between the medial border of the vestibule and the trajectory of VA at/ closest to the operculum on each CT/MRI sequence independently and by two radiologists. Using CT as the gold standard, reliability analyses were performed on MRI by Intraclass correlation coefficient (ICC) and 95% confidence intervals (CI) and Bland-Altman plot analyses. They are stratified by the degree of visualization of vestibular aqueduct, and the presence of clinical or imaging evidence of MD. Inter-rater reliability also calculated by ICC.



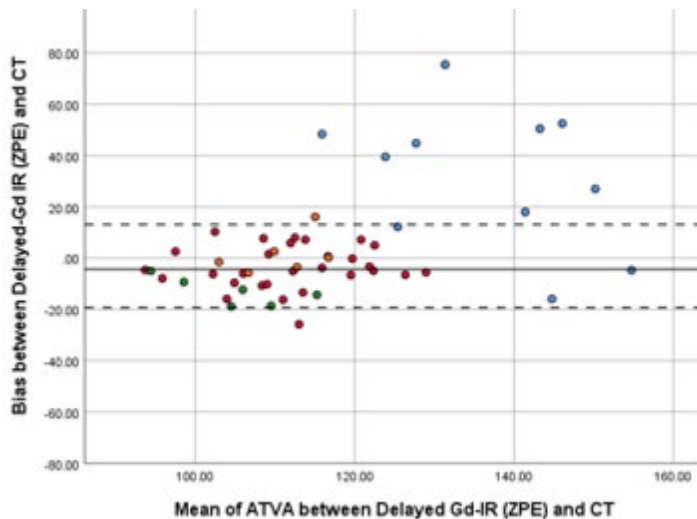
Measurement of Angular Trajectory of vestibular aqueduct on CT and ZPE-MRI, as the angle between medial border of vestibule (solid lines) and opercular segment of VA (dotted lines)

Result

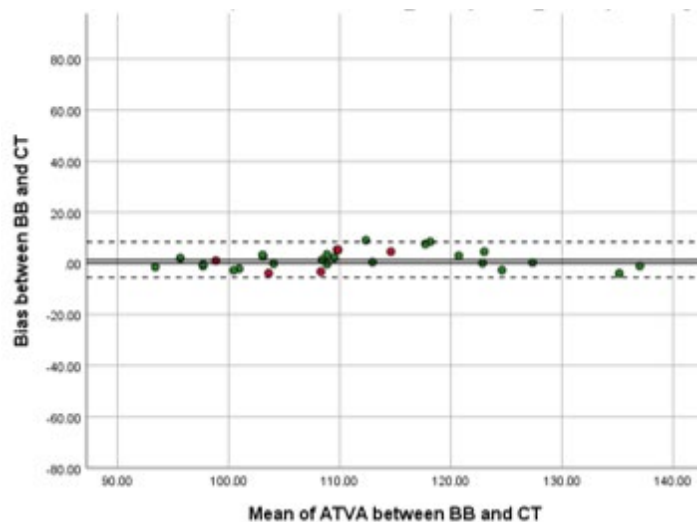
In the delayed post-gadolinium IR group (n=109), ATVA measurements had poor to moderate ICC with CT of 0.14 (95% CI -0.56 – 0.52) for T2W, 0.46 (0.06 – 0.70) for ZPE-IR and 0.36 (-0.17 – 0.65) for NSE-IR. After exclusion of cases with poor VA visualization (i.e. only dot visualization of VA on axial slices), ICC has improved to 0.66 (95% CI 0.30 – 0.84) for T2W, 0.73 (0.06 – 0.93) for ZPE-IR and 0.48 (0.04 – 0.72) for NSE-IR respectively. Bland-Altman plot analyses showed significantly smaller biases after exclusion of poor VA visualization, with standard deviation (S.D.) of biases dropped from 20.9 to 8.04 for T2W, 20.6 to 8.87 on ZPE-IR and 18.5 to 9.13 on NSE-IR. These results were reproducible in the subset analyses in patients without imaging evidence of MD.

In the BB group (n=31), BB-MRI shows excellent ICC with CT of 0.972 (95% CI 0.942 – 0.987), with Bland-Altman plots showing S.D. of bias of 3.55.

Inter-rater reliability between radiologists is excellent on BB and CT, and moderate-good on T2, ZPE and NSE.



Bland-Altman Plot for the ZPE-MRI ATVA measurements against CT, with mean bias (solid line) and 95% limits of agreement (dotted line) after exclusion of poor VA visualization.



Bland-Altman Plot for the Blackbone-MRI ATVA measurements against CT. The mean bias is indicated by solid line with 95% limits of agreement indicated by dotted lines.

Conclusion

The measurement of ATVA should not be performed when there is only dot visualization of VA, where this measurement is less reproducible. BB MRI sequence gives more reliable ATVA measurements and might be a useful additional tool for depiction of VA morphology in MD imaging protocols.

References:

- [1] Bächinger D, Luu NN, Kempfle JS, Barber S, Zürrer D, Lee DJ, Curtin HD, Rauch SD, Nadol JB Jr, Adams JC, Eckhard AH, (2019), Vestibular Aqueduct Morphology Correlates With Endolymphatic Sac Pathologies in Menière's Disease-A Correlative Histology and Computed Tomography Study., *Otol Neurotol.*, e548-e555, 40(5), doi: 10.1097/MAO.0000000000002198.
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Diagnostic accuracy of ^{18}F -FDG-PET/CT and DWI in suspected head and neck carcinoma of unknown primary

H. Sistonen, A. Markkola, T. Atula, K. Nyman, J. Schildt, E. Castrén, K. Aro
Helsinki/FI

Purpose/Objectives

Cervical lymph node metastasis from head and neck carcinoma of unknown primary (HNCUP) presents a diagnostic challenge, as identification of the primary tumor enables targeted therapy and improves prognosis. ^{18}F -FDG PET/CT has traditionally been recommended as the first-line imaging modality, but recent reports have proposed MRI including diffusion-weighted imaging (DWI), owing to its superior anatomical detail and good ability to detect small tumors[1]. However, prospective comparative evidence remains limited[2][3][4][5].

The purpose of this prospective study was to compare the diagnostic performance of PET/CT and DWI for detecting primary tumors in patients with suspected HNCUP. We hypothesized that DWI is comparable to PET/CT, including in p16-positive metastatic disease. Additionally, we assessed the ability of both modalities to differentiate benign from malignant cervical lymphadenopathy.

Methods and materials

In this prospective study, 120 consecutive patients with a neck mass suspicious for malignancy were enrolled between October 2018 and September 2024. No primary tumor was identified on clinical and fiberoptic examination. All patients underwent ^{18}F -FDG PET/CT and dedicated head and neck MRI including DWI, followed by endoscopy under general anesthesia with biopsies and tonsillectomy.

Image interpretation was blinded to clinical and other imaging data. PET/CT was read independently by a head and neck radiologist and a nuclear medicine physician, and DWI by two head and neck radiologists, with consensus for discrepant cases.

Diagnostic performance for primary tumor detection was assessed per patient.

Subgroup analysis was performed in p16-positive metastases. Histopathology served as the reference standard.

Result

Preliminary analysis showed malignant disease in 96/120 patients, including 93 carcinomas. A primary tumor was identified in 53 patients with PET/CT and 45 with DWI. Sensitivity, specificity, positive predictive value, and negative predictive value were 88%, 45%, 75%, and 68% for PET/CT and 75%, 55%, 63%, and 82% for DWI. PET/CT detected 11 primaries not seen on DWI, most commonly in the oropharynx (n=9). DWI detected three additional oropharyngeal primaries.

In 59 p16-positive cases, sensitivity was 88% for PET/CT and 73% for DWI.

For differentiation of benign and malignant disease, PET/CT showed 85% sensitivity and 88% specificity, and DWI 93% sensitivity and 75% specificity. PET/CT detected distant metastases in three patients.

Conclusion

PET/CT demonstrated higher sensitivity than DWI for detecting primary tumors in suspected HNCUP, including in p16-positive disease. DWI showed high sensitivity for

malignancy, detected a small number of additional primaries, and may provide complementary diagnostic value within the imaging work-up.

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Prevalence and Prognostic Value of Individual T4-defining Radiologic Features in HPV-Positive Oropharyngeal Carcinoma

M.H. Johari^{1,2}, A. Rühle², J. Su², B. O'Sullivan², E. Yu², E. Bartlett², S.H. Huang², J.N. Waldron², A. McPartlin², A. Bayley², S.V. Bratman², E.S. Garcia², A. Spreafico², J. de Almeida², E. Hahn², A. Hosni², J. Kim², N. Malik², W. Xu², A. Hope²

¹Kuala Lumpur/MY, ²Toronto/CA

Purpose/Objectives

To report the prevalence, validity, and relative prognostic value of specific UICC (Union for International Cancer Control) / AJCC (American Joint Committee on Cancer) T4-defining radiologic features in human papillomavirus-positive oropharyngeal squamous cell carcinoma (HPV+ OPSCC).

Methods and materials

We retrospectively reviewed pretreatment computed tomography / magnetic resonance imaging scans of all T4 HPV+ OPSCC patients treated with definitive (chemo)radiation therapy in 2010 to 2021.

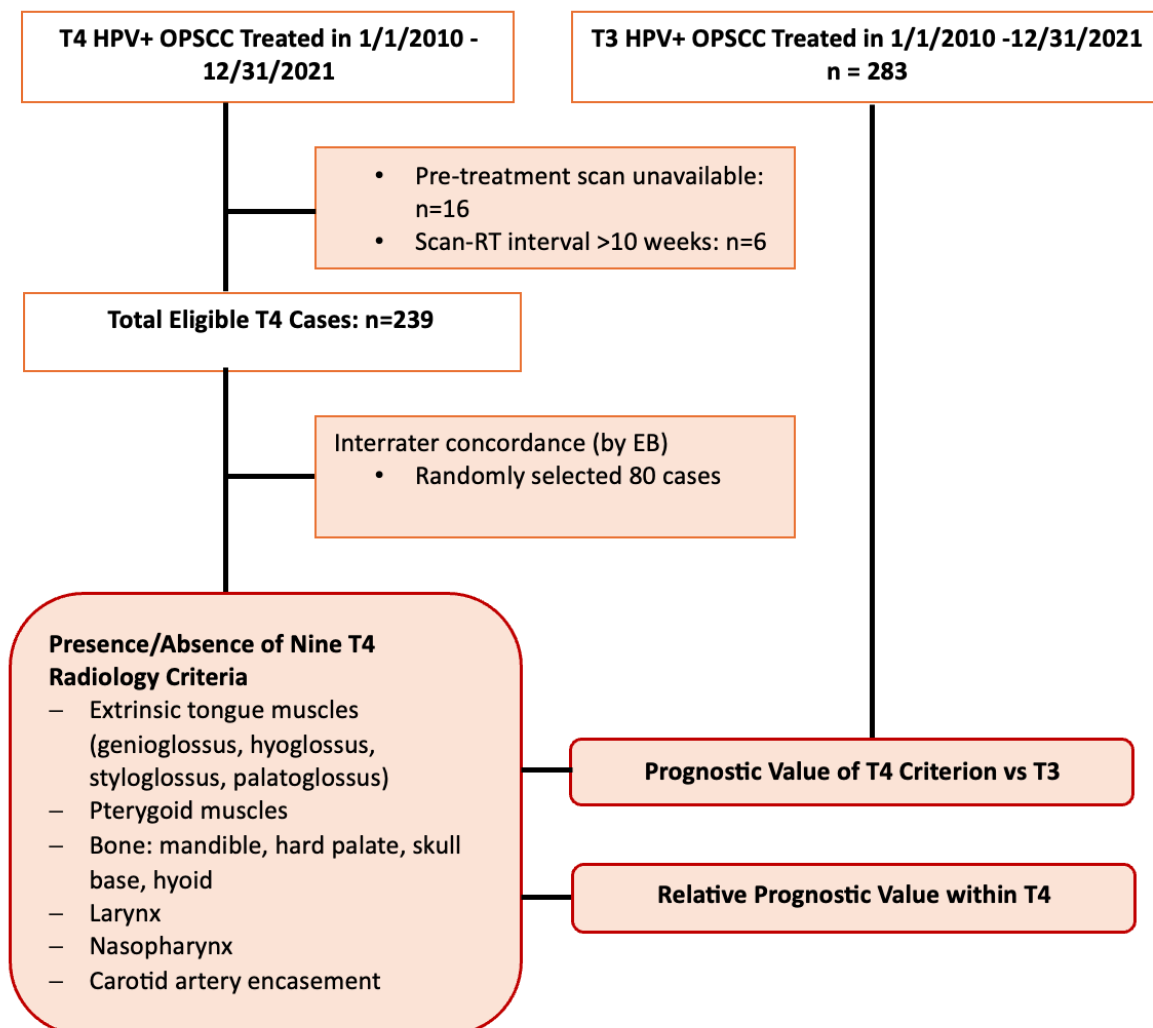
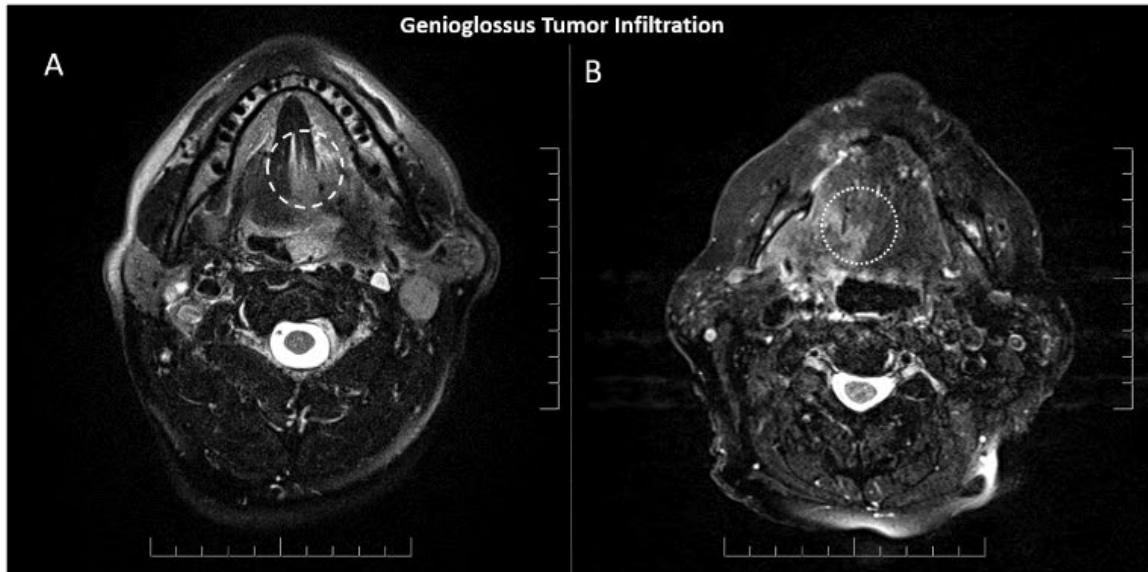


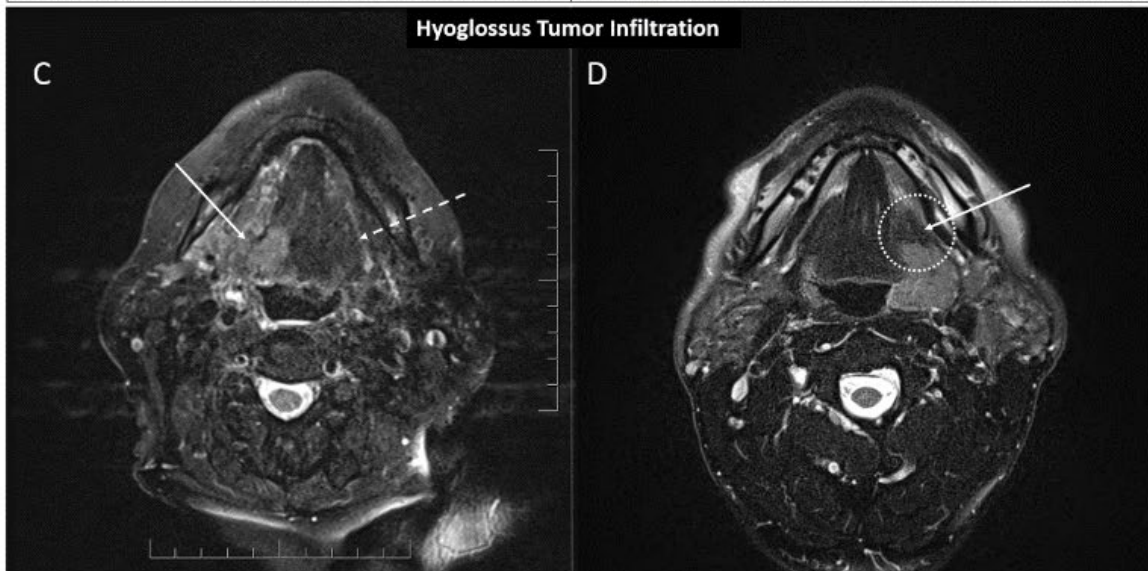
Diagram Depicting Study Population

Nine T4-defining features were assessed: involvement of genioglossus, hyoglossus, palatoglossus, styloglossus, pterygoid muscles (medial and lateral), bone (mandible, hard palate, pterygoid plates, skull base), larynx, nasopharynx, and carotid artery.



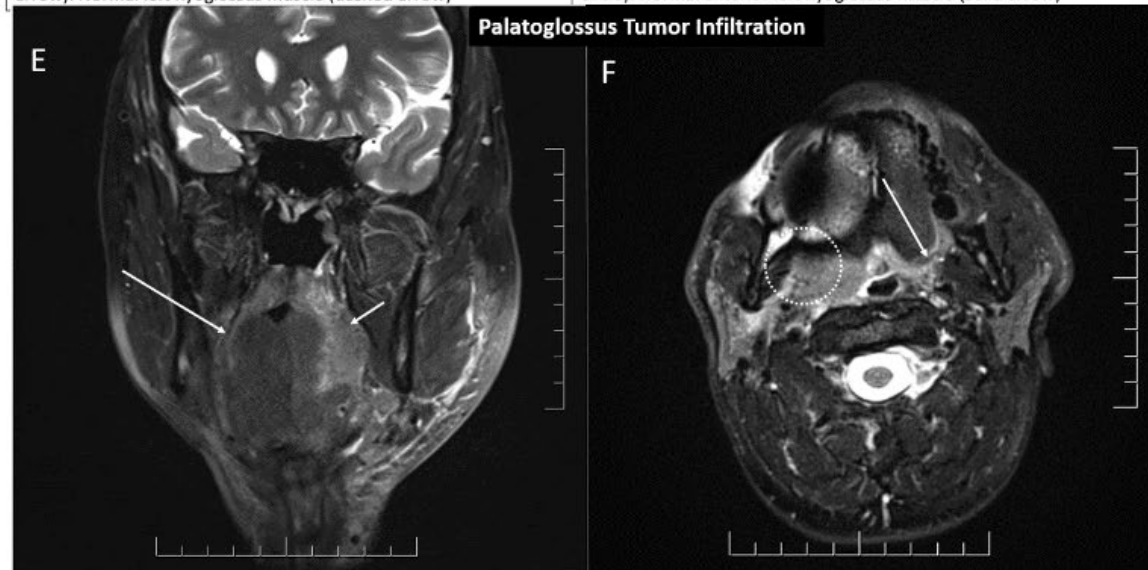
A: Clear tumor infiltration into the left genioglossus (dashed circle)

B: Suspected tumor infiltration of the right genioglossus (dotted circle)



C: Clear tumor infiltration into the right hyoglossus muscle (solid arrow). Normal left hyoglossus muscle (dashed arrow)

D: Suspected tumor infiltration of the left hyoglossus muscle (dashed circle). Normal anterior left hyoglossus muscle (solid arrow)



E: Clear tumor infiltration into the left palatoglossus muscle (short solid arrow). Normal right palatoglossus (long solid arrow)

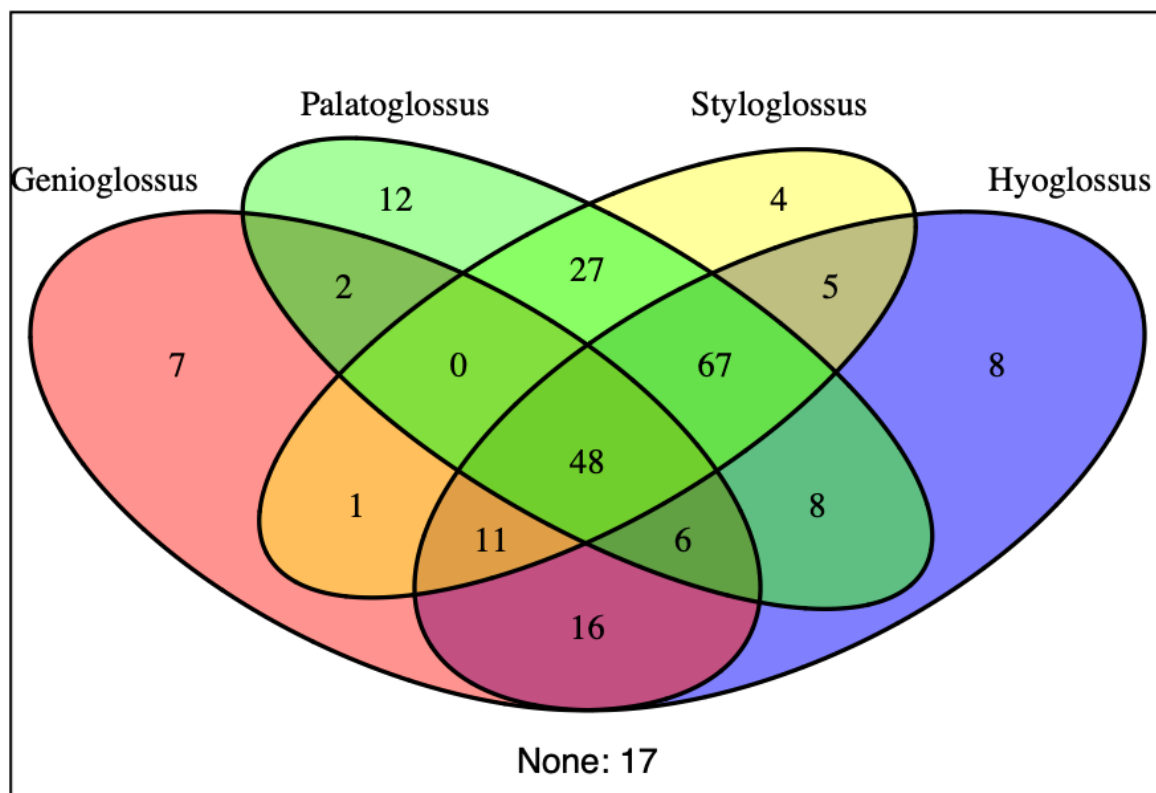
F: Suspected right palatoglossus infiltration (dotted circle); extension to tongue base obscured by artifact. Normal left muscle (solid arrow)

Examples Illustrating Different Level of Certainty Regarding Extrinsic Tongue Muscle Invasion

The prognostic validity of each T4-defining feature was evaluated by comparing the risk of disease progression with that of T3 disease using univariable analysis. Multivariable analysis, stratified by treatment and adjusted for gross tumor volume of the primary lesion (GTVp), estimated the adjusted hazard ratio (aHR) for risk of disease progression associated with each of the 9 features within T4 disease.

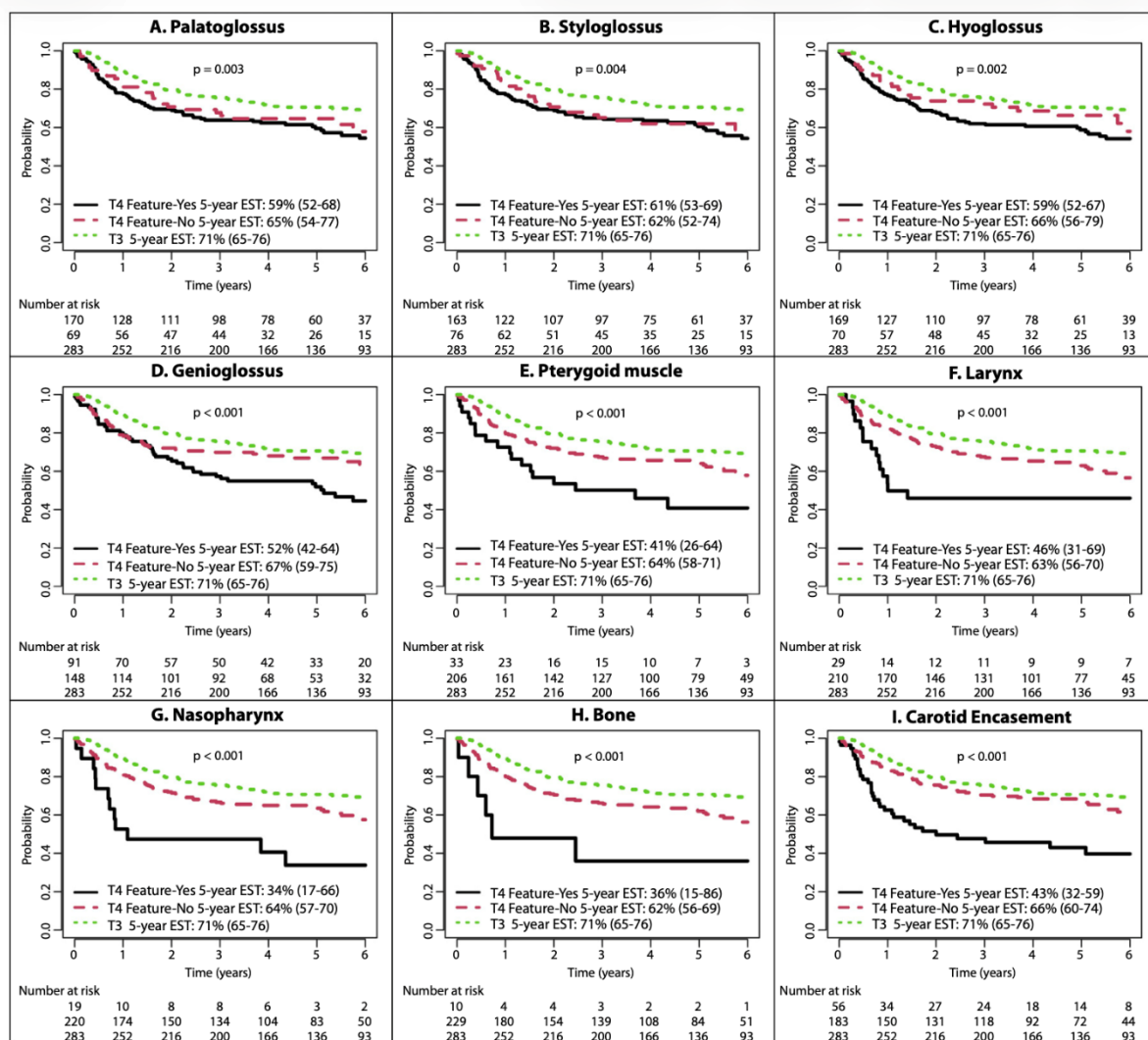
Result

A total of 522 cases were included (T4 [239], T3 [283]). The frequencies of individual T4-defining features were as follows: hyoglossus (71%), palatoglossus (71%), styloglossus (68%), genioglossus (38%), carotid encasement (23%), pterygoid muscle (14%), larynx (12%), nasopharynx (8%), and bone (4%).



Overlap of Extrinsic Tongue Muscle Involvement in HPV-positive Oropharyngeal Squamous Cell Carcinoma

All 9 T4-defining features were associated with higher risk of cancer progression versus T3 (all $P < .01$).



Disease-free survival, stratified by the presence versus absence of specific individual T4-defining features, compared to T3 disease.

Among T4 cases, invasion of nasopharynx (aHR, 2.42; 95% CI, 1.20-4.90; $P = .014$) and genioglossus (aHR, 1.99; 95% CI, 1.26-3.14; $P = .003$) conferred greater risk of disease progression versus other T4-defining features.

Conclusion

All radiologic UICC/AJCC T4-defining features have worse outcomes compared to T3 disease, supporting their retention within the T4 category. Among T4 cases, worse outcomes were observed in cases with deep tongue muscle invasion (genioglossus) and nasopharyngeal extension.

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Utility of PET-derived metrics as a complement to NIRADS for predicting recurrence or residual disease in head and neck squamous cell carcinoma

P. Salomon, V. Dunet, M. Jreige, K. Lambercy, J. Di Vincenzo
Lausanne/CH

Purpose/Objectives

The aim of this study was to assess the impact of ^{18}F -FDG PET–derived metrics as a complement to NIRADS at 3 months post-treatment to improve the prediction of local and/or nodal recurrence or residual diseases with a special focus on the NIRADS 2 category.

Methods and materials

In this retrospective single-center study, 267 patients (73 women; mean age: 66 years) with oral cavity or oropharyngeal squamous cell carcinoma treated with radiochemotherapy with or without surgery between 2017 and 2025 were included. Patients with prior radiotherapy to the same anatomical region were excluded. All patients underwent ^{18}F -FDG PET/CT with or without neck MRI at baseline and at 3-month follow-up after treatment. Quantitative PET parameters of the primary tumor and lymph nodes were recorded at baseline and at 3 months. The reference standard consisted of histopathology, clinical examination, and follow-up imaging. A final NIRADS category (f-NIRADS) was assigned to each patient after complete diagnostic work-up, which was performed within a median interval of 90 days.

Stepwise multivariable logistic regression analysis with computation of odds ratio (OR) and 95% confidence intervals [95%CI] was performed including age, sex, p16 status, tumor location, initial TNM stage, treatment type and NIRADS at 3 months (3m-NIRADS) to predict f-NIRADS category. A second analysis was performed including the PET-derived metrics.

Result

Multivariable logistic regression without PET metrics identified 3m-NIRADS category (OR 8.52 [4.61-15.76], $p < 0.001$), p16-negative status (OR 6.52 [2.17-19.61], $p = 0.001$), and higher initial N stage (OR 1.81 [1.07-3.06], $p = 0.027$) as independent predictors of recurrence or residual disease. After including the PET parameters, p16-negative status (OR 15.9 [4.92-51.32], $p < 0.001$), pre-treatment lymph node SUVmax (OR 1.08 [1.01-1.15], $p = 0.028$), and post-treatment tumor SUVmean (OR 22.6 [2.84-180.34], $p = 0.003$) were independent predictors.

In the subgroup with 3m-NIRADS 2, p16-negative status (OR 64.4 [3.70-1122.0], $p = 0.004$) and higher pre-treatment lymph node SUVmax (OR 1.15 [1.03-1.30], $p = 0.015$) predicted recurrence or residual disease.

Conclusion

A higher NIRADS category at 3 months, p16-negative status, and advanced initial N stage were independent predictors of recurrence or residual disease.

Among NIRADS 2 patients, p16-negative status and higher initial lymph node SUVmax identified a subgroup at increased risk that may benefit from closer diagnostic evaluation. Overall, quantitative PET metrics provided limited incremental predictive value compared with the NIRADS classification.

Clues Before the Biopsy: Can CT Distinguish HPV-Positive from HPV-Negative Oropharyngeal Carcinoma?

R. Birla-Coroiu, R.M. Manea, D.A. Iuga
Brasov/RO

Purpose/Objectives

Human papillomavirus (HPV) positive oropharyngeal squamous cell carcinoma (OPSCC) is associated with a more favorable prognosis compared to the HPV negative malignancies. Although the histopathological test remains the gold standard for diagnosis, CT imaging could provide clues before the biopsy. The aim of this review is to evaluate whether CT findings can help differentiate HPV positive from HPV negative OPSCC.

Methods and materials

A systematic literature research was performed using the open database from PubMed, with the following key words: „oropharyngeal carcinoma“, „HPV“, „lymph node“, „texture analysis“. Studies investigating CT characteristics of HPV positive and negative carcinomas were reviewed. Parameters including tumor morphology, location, lymph node characteristics and CT texture analysis were evaluated. After applying the selection criteria a number of 21 studies were included, comprising observational studies and retrospective series. This systematic review was conducted in accordance with the PRISMA guidelines.

Result

Studies demonstrated a consistent imaging difference between HPV positive and negative OPSCC. HPV positive carcinomas are most typically smaller, with well defined borders or an exophytic growth pattern that has limited local infiltration. The most common location is in the palatine tonsils or at the base of the tongue. One of the most characteristic findings is the presence of cystic metastatic lymph nodes, which are significantly bigger than the metastatic lymph nodes in HPV negative tumors. In contrast, HPV negative carcinomas are often larger, with irregular borders and with more extensive local invasion, especially in the adjacent muscles. Lymph nodes tend to be more solid, rather than cystic. Ulceration and necrosis is less common in the HPV positive tumors compared to the HPV negative ones (10% vs 20% for ulceration and 9% vs 19% for necrosis). However, when the patient is a smoker and has HPV positive OPSCC the distinction becomes less clear as the cystic appearance is less pronounced, ulceration being present in 13% of smokers, compared to 5% of never smokers. Furthermore, advanced CT texture analysis suggest that HPV positive tumors have a higher intrinsic homogeneity, whereas HPV negative have higher intratumoral heterogeneity.

Conclusion

Imaging findings cannot replace the histopathologic confirmation, but several CT characteristic can raise the suspicion for HPV positive OPSCC prior to biopsy. Well defined primary tumor, cystic nodal metastases and specific texture analysis may help radiologists differentiate between the two entities. However, smoking history is essential to be taken in consideration as it can modify the imaging patterns.

Detection of Parathyroid Adenoma in Single-Phase Photon-Counting-CT in a Clinically Challenging Cohort: A Multimodal Comparison Study With [¹⁸F]Fluoroethylcholine-PET/CT and Ultrasound

S. Rau, C. Goertz, J. Jahn, A. Fink, M. Russe, A. Rau, P. Meyer, F. Bamberg, J. Weiss, F. Kind
Freiburg im Breisgau/DE

Purpose/Objectives

To assess whether routine single-phase contrast-enhanced photon-counting detector CT (PCD-CT) can localize hyperfunctioning parathyroid glands in second-line primary hyperparathyroidism (pHPT), using surgery as the reference standard and [¹⁸F]fluoroethylcholine (FECh) PET/CT as benchmark.

Methods and materials

In this prospective single-center study, consecutive patients with biochemically confirmed pHPT and inconclusive or discordant first-line imaging underwent paired non-contrast FECh PET/CT and additional contrast-enhanced single-phase portal-venous PCD-CT. Two blinded radiologists independently evaluated PCD-CT. FECh PET/CT was read in consensus by two nuclear medicine physicians. The primary endpoint was patient-level sensitivity under a strict all-lesions-found criterion, requiring correct localization of all hyperfunctioning glands without false-positive findings. Secondary analysis used an at-least-one-lesion-found criterion. Effective dose was estimated for both modalities.

Result

Thirty-seven surgical patients (31/37 women; mean age, 64.3 +/- 8.4 years) with 40 hyperfunctioning parathyroid glands were included. Under the primary all-lesions-found criterion, sensitivity was 91.9% (34/37) for FECh PET/CT versus 70.3% (26/37) and 59.5% (22/37) for PCD-CT readers 1 and 2. FECh PET/CT significantly outperformed both readers (p=0.04 and p<0.01). Under the at-least-one-lesion-found criterion, sensitivity was 91.9% (34/37) for FECh PET/CT, 75.7% (28/37) for PCD-CT reader 1, and 67.6% (25/37) for reader 2. Effective dose was 7.78 +/- 1.11 mSv for FECh PET/CT and 0.61 +/- 0.18 mSv for PCD-CT.

Conclusion

In this diagnostically challenging second-line pHPT cohort, FECh PET/CT provided the highest localization performance. Single-phase PCD-CT showed moderate sensitivity at very low radiation dose and may serve as a scalable opportunistic anatomic imaging option when PET/CT is unavailable or when contrast-enhanced neck CT is otherwise being performed.

Radiological features of recurrent adenoid cystic carcinoma (ACC) of the head and neck following carbon ion radiotherapy.

L. Levante¹, C. Fichera², G. Fontana¹, V. Dolcetti¹, J. Fragomene¹, B. Vischioni¹, M. Bonora¹, E. Orlandi¹, L. Preda¹, M.R. Fiore¹, S. Imparato¹

¹Pavia/IT, ²Lodi/IT

Purpose/Objectives

To identify effective radiological features of recurrent adenoid cystic carcinoma (ACC) of the head and neck after carbon ion radiotherapy (CIRT).

Methods and materials

Radiological features (shape, margins, mass effect, contrast enhancement, DWI, mean ADC on ROI, necrosis, side relative to treated area, location relative to initial tumor volume, growth trend, T2 and T1 signal) were retrospectively analyzed in 51 patients with recurrent ACC treated with CIRT between 2013 and 2022 at CNAO. The same variables were assessed in 51 patients without recurrence (control group). In recurrent cases, imaging was evaluated at three time points (t.p.): 6 months after treatment (t.p.0), 6 months before recurrence (t.p.1), and at recurrence (t.p.2). For controls, t.p.2 corresponded to the mean recurrence time of the other group (34 months). Δ ADC values across time points were also calculated in both groups.

Result

Compared with controls, at t.p. 2 recurrent ACC exhibited a significant radiological pattern ($p < 0.001$), including rounded or lobulated shape, mass effect, homogeneous enhancement, mean ADC of 1098 mm²/s, Δ ADC of -460 mm²/s, progressive growth, peripheral localization, and intermediate T2 signal. At t.p.1, these features were partially already comparable to those observed at t.p.2, except for mean ADC, which showed a progressive reduction, and Δ ADC, which had already decreased compared with t.p.0 (1306 and -250 mm²/s, respectively). A reproducible radiological pattern of recurrent ACC after CIRT was identified, with some features being objectively quantifiable, particularly Δ ADC, a parameter scarcely investigated to date.

Conclusion

This preliminary study outlines the main radiological features of ACC recurrence after CIRT and provides a basis for developing response criteria related to salivary gland tumors of the head and neck treated with particle therapy.

A Novel Role for Quantitative Contrast-Enhanced Ultrasound Perfusion Imaging in Focal Salivary gland lesions: Preliminary Comparison with MRI

S. Telli Erdogan¹, L. Flygare¹, S. Strandberg¹, M. Nilsson²

¹Umeå/SE, ²Lund/SE

Purpose/Objectives

Dynamic contrast-enhanced MRI is widely used for the differentiation of salivary gland tumours and can provide valuable perfusion information. However, MRI has several limitations, including contraindications such as claustrophobia, metallic implants, and pacemakers, long examination time, and limited availability in some centers. Contrast-enhanced ultrasound (CEUS) is a cost-effective and widely available imaging modality that allows real-time assessment of microvascular perfusion and lesion characterization.

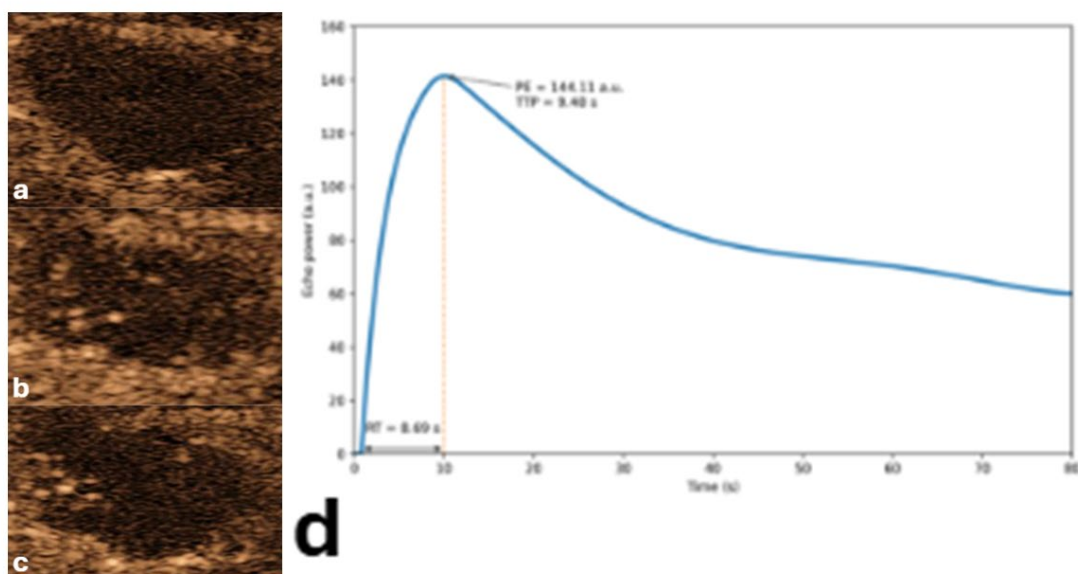
This study aims to explore CEUS as an alternative imaging method for differentiating benign and malignant salivary gland tumours and to evaluate the diagnostic performance of quantitative CEUS perfusion analysis.

Methods and materials

In this prospective clinical study, eight patients with salivary gland tumours underwent both dynamic contrast-enhanced MRI and contrast-enhanced ultrasound. Qualitative CEUS features were assessed by visual evaluation of enhancement pattern, intensity, and temporal behavior. DICOM images were exported to a dedicated software for quantitative perfusion analysis (VueBox™, Bracco, Italy). Time–intensity curve (TIC) patterns obtained from CEUS were morphologically compared with TICs derived from MRI.

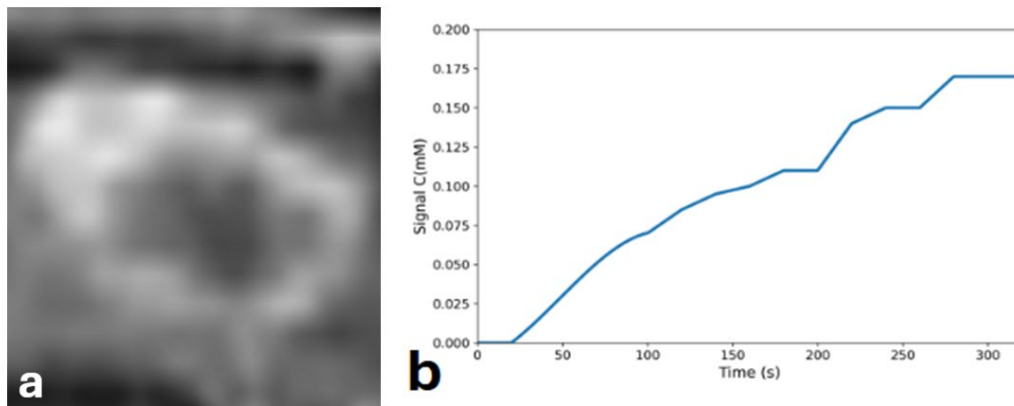
Result

Contrast-enhanced ultrasound demonstrated tumour enhancement in all patients, with varying qualitative enhancement patterns. No morphological correlation was observed between TIC patterns obtained from CEUS and those derived from MRI .



Contrast-enhanced ultrasound (CEUS) of a pleomorphic adenoma in the parotid gland showing enhancement at (a) 5 s, (b) 15 s, and (c) 25 s post-contrast. (d) Time–intensity curve (TIC) demonstrating peak enhancement (PE), time to peak (TTP), and

rise time (RT), reflecting wash-in perfusion.



Dynamic contrast-enhanced MRI (DCE-MRI) of the same lesion. (a) Contrast-enhanced T1-weighted MRI image of the lesion. (b) Corresponding time–intensity curve illustrating progressive signal enhancement dynamics over time.

Conclusion

Quantitative contrast-enhanced ultrasound perfusion analysis is feasible in the evaluation of focal salivary gland tumours and provides information regarding tumour perfusion characteristics. CEUS TIC patterns do not morphologically correlate with those derived from dynamic contrast-enhanced MRI; this discrepancy likely reflects fundamental differences in contrast agent pharmacokinetics and microvascular behavior.

Nevertheless, our preliminary findings indicate that CEUS-derived TIC parameters may contain clinically meaningful diagnostic information. The diagnostic performance and potential complementary value of CEUS-TIC analysis will be further investigated in the continuation of this research project.

These early results suggest that CEUS may represent a viable alternative imaging modality to MRI in the differentiation of salivary gland tumours.

Diagnostic performance of optimized 4D PCD-CT for the detection of parathyroid adenoma: a prospective multi-reader study

S. Rau, A. Rau, P. Argawal, C.P. Simon, F. Kind, C. Goertz, J. Jahn, A. Fink, M. Reiser, T. Stein, P. Meyer, F. Bamberg, M. Russe, J. Weiss
Freiburg im Breisgau/DE

Purpose/Objectives

To investigate the diagnostic performance of an optimized 4D photon-counting detector CT (PCD-CT) protocol for the detection of parathyroid adenomas in patients with primary hyperparathyroidism (pHPT) and inconclusive first-line imaging, and to assess quantitative imaging metrics for differentiation from thyroid tissue and lymph nodes.

Methods and materials

In this single-center study, consecutive patients with inconclusive first-line imaging underwent [18F]fluoroethylcholine PET/CT ([18F]FECh-PET/CT) and dedicated 4D PCD-CT with arterial and portal venous acquisitions, 40- and 70-keV reconstructions, and virtual non-contrast images. The reference standard was histopathology or [18F]FECh-PET/CT with biochemical follow-up in non-surgical cases. Lesion-level sensitivity and positive predictive value were assessed based on annotations by three independent radiologists. Normalized attenuation and wash-in/wash-out metrics were calculated as quantitative discriminators between adenomas, thyroid tissue, and lymph nodes.

Result

Forty-nine patients (mean age, 64.2 ± 10.9 years; 42/49 women) were included. Lesion-level sensitivity and positive predictive value ranged from 67.3% to 83.7% and from 67.3% to 90.0%, respectively. In quantitative analyses, wash-out was the best discriminator, significantly differentiating parathyroid adenomas (27.2%) from thyroid tissue (20.2%, $p < 0.001$) and lymph nodes (-3.1%, $p < 0.001$), whereas this was not observed for the other metrics.

Conclusion

In a challenging pHPT cohort, optimized 4D PCD-CT achieved moderate-to-high lesion localization sensitivity. Quantitative wash-out assessment differentiated parathyroid adenomas from both thyroid tissue and lymph nodes and may support diagnostic decision-making.

The Styloid Map: A Radiology-Based Tool for Surgical Planning of Parapharyngeal Space Masses

F. Cicchetti¹, F. Ruju¹, S. Zorzi¹, G. Pietrobon¹, E. Errico², M.V. Veneroni², L. Preda², G. Petralia¹

¹Milan/IT, ²Pavia/IT

Purpose/Objectives

To evaluate the reproducibility and clinical usefulness of a radiologic styloid map for parapharyngeal space (PPS) masses and to assess whether map-based topographic patterns are associated with surgical strategy and postoperative outcomes.

Methods and materials

This bicentre retrospective study included 111 surgically treated PPS masses from June 1998 to May 2025 at the European Institute of Oncology (IEO), Milan, and at the Foundation IRCCS Policlinico San Matteo, Pavia. Inclusion criteria were preoperative imaging within 8 weeks before surgery, definitive histology, and at least one follow-up. On the axial slice with the largest lesion cross-section, the styloid map divided the PPS into medial prestyloid (Area 1), lateral prestyloid (Area 2), and poststyloid/carotid (Area 3) compartments. Two radiologists independently assessed lesion extent, area of maximum extension, epicentre, carotid displacement, and parotid contact; disagreements were resolved by consensus. Interobserver agreement was calculated for single variables and for a composite core map. Associations with surgical approach, major postoperative complications, and non-R0 margins were analysed. An exploratory 3-tier rule-based algorithm was also tested.

Result

Median age was 52.4 years, median maximum radiologic diameter 44 mm, and median follow-up 18.3 months. Twenty-six lesions (23.4%) were malignant. Pleomorphic adenoma was the most frequent histology (44/111, 39.6%), followed by schwannoma (13/111, 11.7%). Agreement for single map variables ranged from $\kappa=0.69$ to 0.93. Exact agreement for the composite core map was 86.0%, with overall $\kappa=0.83$. The map was associated with surgical strategy: a transoral component was used in 79.5% of Area 1 lesions, 51.1% of Area 2 lesions, and 25.0% of Area 3 lesions. Compared with Area 1, Areas 2 and 3 showed lower odds of a transoral component (OR 0.29, $p=0.016$; OR 0.13, $p=0.015$). Carotid displacement reduced the odds of a transoral component (OR 0.10, $p=0.002$), while parotid contact increased the odds of a combined approach (OR 4.62, $p=0.039$). No significant association was found with major postoperative complications or non-R0 resection. The exploratory 3-tier algorithm showed 57.6% exact agreement with the actual surgical approach ($\kappa=0.33$).

Conclusion

The styloid map is a reproducible radiologic classification with surgical relevance. Although it did not predict major complications or margin status, it stratified the likelihood of transoral and combined approaches, supporting its role as an imaging-based tool for PPS surgical planning. The exploratory algorithm showed only fair agreement, suggesting that the map may support surgical judgment rather than replace it.

Probing deeper into Extranodal Extension - a local comparison of Ultrasound versus Cross-sectional imaging in assessing imaging Extranodal Extension (iENE)

R. Price-Davies, S. Sadiq, L. Guthrie, S. Kazmi
Swansea/GB

Purpose/Objectives

Imaging-derived extranodal extension (iENE) has emerged as an independent prognostic factor, influencing both cancer staging and treatment decisions. Its importance is particularly evident in the selection of patients for non-surgical treatment options and has now been included in the revised American Joint Committee on Cancer (AJCC) and International Union Against Cancer (UICC) staging guidelines. There are also international consensus guidelines for diagnosing iENE with computed tomography (CT) and magnetic resonance imaging (MRI), yet there is limited evidence about how ultrasound (US) compares directly with CT and MRI.

Methods and materials

The AOSNHNR-ASHNR-ESHNR Joint Task Force provides a comprehensive framework for radiologists to identify and report iENE using CT, MRI, and US. Three head and neck radiologists from Swansea Bay University Health Board utilised this together with the accompanying self-tests across all three imaging modalities (CT, MRI, and US) as online training. Following this, a local training pack was developed to facilitate an additional round of iENE training. This local pack was derived from the patients listed in the local 2025 and 2026 tumour boards and enabled a blinded direct comparison of ultrasound grading against cross-sectional imaging.

Result

Initial findings from the local training pack revealed that first round studies using ultrasound to grade iENE achieved a concordance approaching 70% among the three radiologists according to the Joint Task Force criteria, without any further discussion, consolidation and subsequent restaging. The data also indicated that grading improved over the course of the process, and concordance is optimal in cases graded as 0 (no evidence of iENE) and 3 (advanced iENE).

Conclusion

Ultrasound is a diagnostic tool heavily used in head and neck UK radiology and workshops are expanding, the last ESHNR included a one-day special focus on this very subject. Early data from this pilot small-scale study within our health board after only first read independent iENE staging was encouraging, and further rounds following consolidation and consensus are now ongoing as per the development of the consensus guidelines. We propose US should at least be considered within the assessment of iENE as an adjunct to CT and MRI to further improve the positive predictive value and sensitivity of iENE, particularly for lower grades which is the pivotal grade deciding on treatment and prognosis. Direct comparison with pENE is also ongoing to further test how robust US can be in evaluating iENE.

Automated Detection of Neck Abscesses from Multi-Parametric MRI Using Deep Learning

V. Viertonen, A. Sirén, J.-P. Vierula, T. Happonen, M. Nyman, J. Nurminen, H. Huhtanen, O. Rainio, J. Hirvonen
Turku/FI

Purpose/Objectives

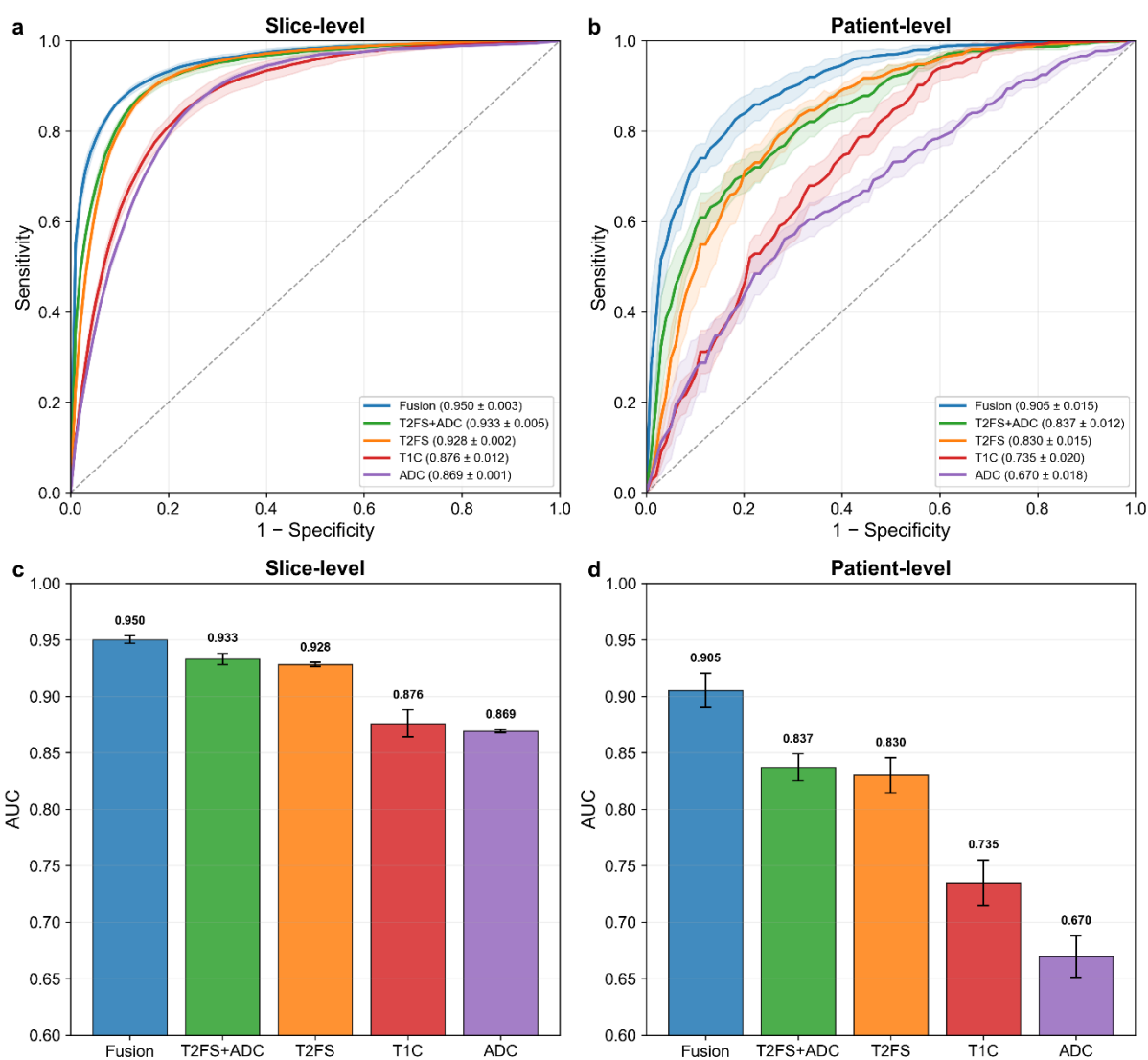
To evaluate deep learning detection of neck abscesses using five single- and multi-parametric MRI input configurations, and to determine whether multi-sequence fusion improves detection performance over individual sequences.

Methods and materials

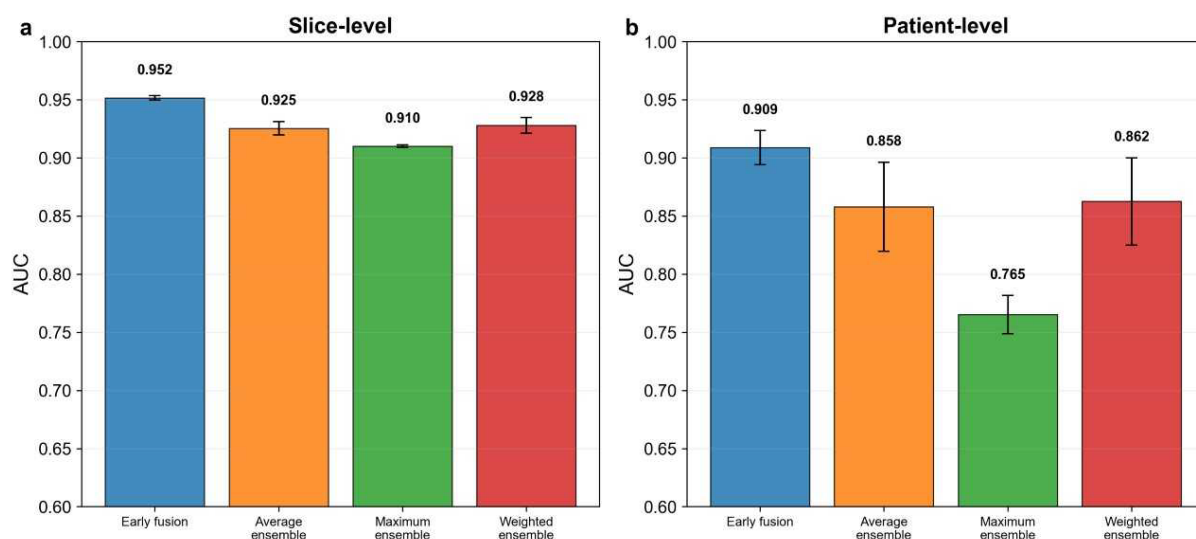
A total of 316 patients (226 abscess-positive, 90 negative) from a single-center emergency MRI database were included. A convolutional neural network (CNN) was trained on axial MRI slices using five input configurations: post-contrast T1 (T1C), T2 fat-saturated (T2FS), apparent diffusion coefficient (ADC), contrast-free T2FS+ADC, and three-channel fusion (T1C, T2FS, ADC). All sequences were co-registered using rigid registration. Performance was evaluated using five-fold cross-validation with six independent repeats (150 models total). Slice-level predictions were aggregated to patient-level probability scores using a previously validated algorithm. Pairwise AUC comparisons were performed using DeLong's test with Bonferroni correction.

Result

At patient level, three-channel fusion achieved the highest AUC of 0.905 (SD 0.015), significantly outperforming all individual sequences (all $p < 0.05$, Bonferroni-corrected). Among contrast-free configurations, T2+ADC achieved AUC 0.837 (SD 0.012) and T2 FS alone 0.819 (SD 0.020), both substantially outperforming post-contrast T1+C (AUC 0.729, SD 0.022). ADC alone performed lowest (AUC 0.643, SD 0.029). At the optimal threshold, fusion achieved 81% sensitivity, 80% specificity, and 92% positive predictive value. Early fusion (three-channel input) outperformed all late-fusion ensemble strategies (best ensemble AUC 0.873), indicating that the network learns beneficial cross-sequence features. Slice-level AUC was 0.950 for fusion and 0.933 for T2+ADC.

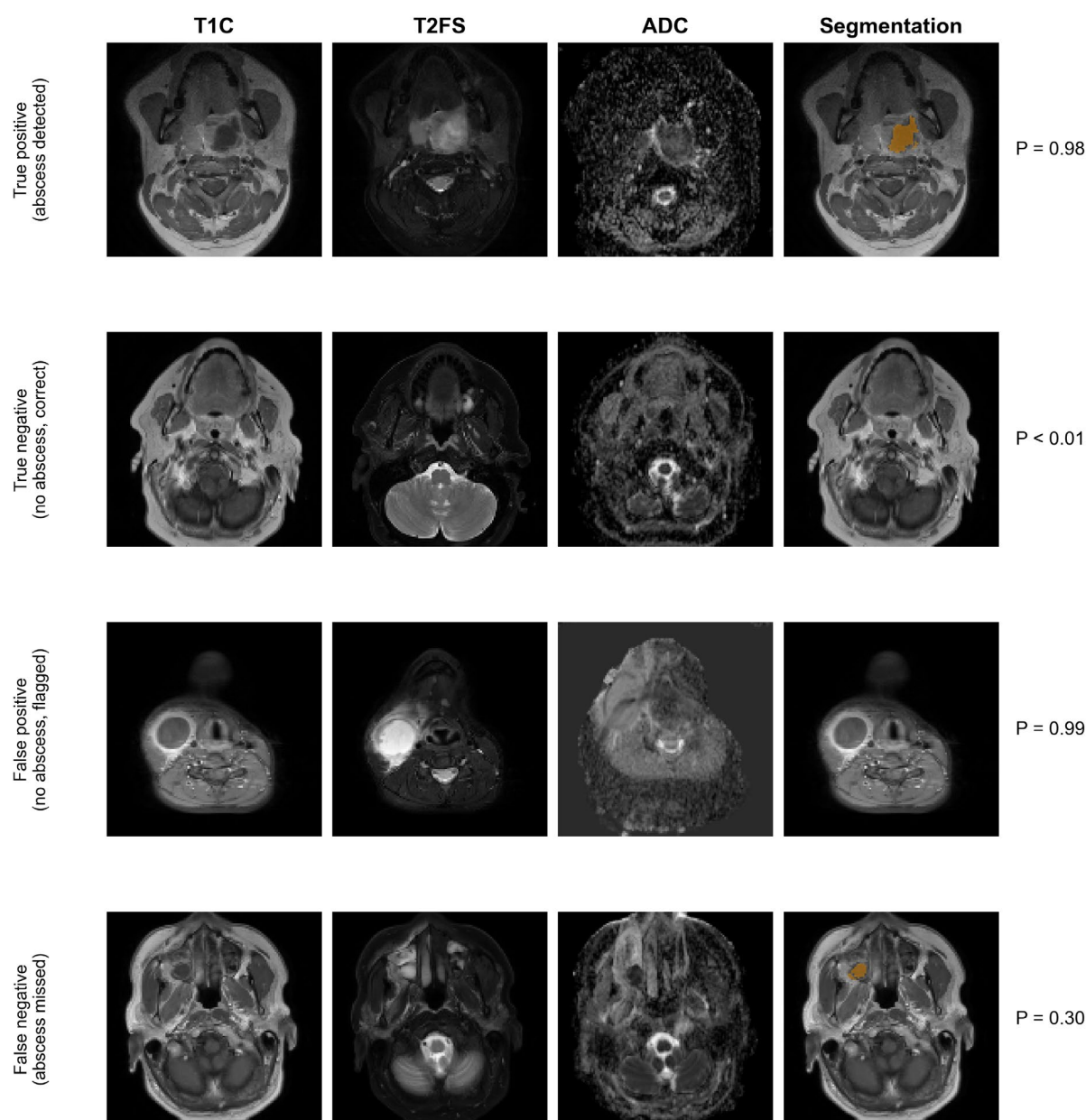


Diagnostic performance of five input configurations for deep learning detection of neck abscesses. (a) Slice-level ROC. (b) Patient-level ROC (c) Slice-level AUC with error bars indicating standard deviation across six training repeats. (d) Patient-level AUC.



(a) Slice-level AUC. (b) Patient-level AUC. Early fusion denotes a single model

trained with three-channel input (T1C, T2FS, ADC). Late fusion strategies combine predictions from three independently trained single-sequence models using average, maximum, or optimized weighted ensembles.



Representative classification examples across the four outcome categories. Each row shows axial T1C, T2FS, ADC images, and a T1C image with the segmentation mask overlay (orange) for the same slice. The predicted probability (P) is the patient-level output of the fusion model.

Conclusion

In conclusion, deep learning applied to multi-parametric MRI can detect deep neck abscesses with a patient-level AUC of 0.905. The multi-sequence fusion model significantly outperformed all individual sequences, and notably, even unenhanced sequences demonstrated substantial diagnostic accuracy. Automated multi-parametric detection is feasible in emergency neck MRI, and our proposed model could serve as an automated triage tool to flag positive cases for priority review.

Reliability and accuracy of high-resolution dental MRI for periapical lesion detection – An in vivo head to head comparative study with CBCT

L. Schulte, K. Schulte, M. Appel, A. Rößler, J. Mente, A. Lauer, S. Heiland, M. Bendszus, T. Hilgenfeld
Heidelberg/DE

Purpose/Objectives

To evaluate the reliability and accuracy of dental MRI (dMRI) compared to the clinical gold standard CBCT for detection and quantification of periapical lesions in a prospective clinical study.

Methods and materials

A prospective study was conducted with 20 patients who underwent both CBCT and dental MRI at 3T using a T1-weighted contrast-enhanced sequences (T1KM-MRI) with 0.7 mm isotropic resolution. Analysis was done twice by one reader on tooth-level qualitatively (lesion present/absent) as well as quantitatively. The latter included linear measurements in three planes followed by classifying results into the CBCT-PAI score to assess clinical impact of MRI based over- or underestimation. Reliability assessment was done via weighted kappa statistic (κ_w) and the intraclass correlation coefficient (ICC). Diagnostic performance was evaluated descriptively and with the McNemar test with post-hoc Tukey and with Shapiro-Wilk and Mann-Whitney-U-test.

Result

Analysis of 483 teeth revealed 46 apical lesions in 38 teeth. Reliability was excellent in CBCT/dMRI for both lesion detection (κ_w [95%CI] = 0,981[0,94-1]/0,910[0,89-0,99]) and linear measurements (ICC [95%CI]: 0,940[0,90-0,96]/0,950[0,92-0,97]). All lesions were identified in dMRI (sensitivity 100 %) and no statistical difference were noted compared to CBCT ($p = 0,500$). In addition, MRI identified 6 additional apical lesions invisible in CBCT (Figure 1).

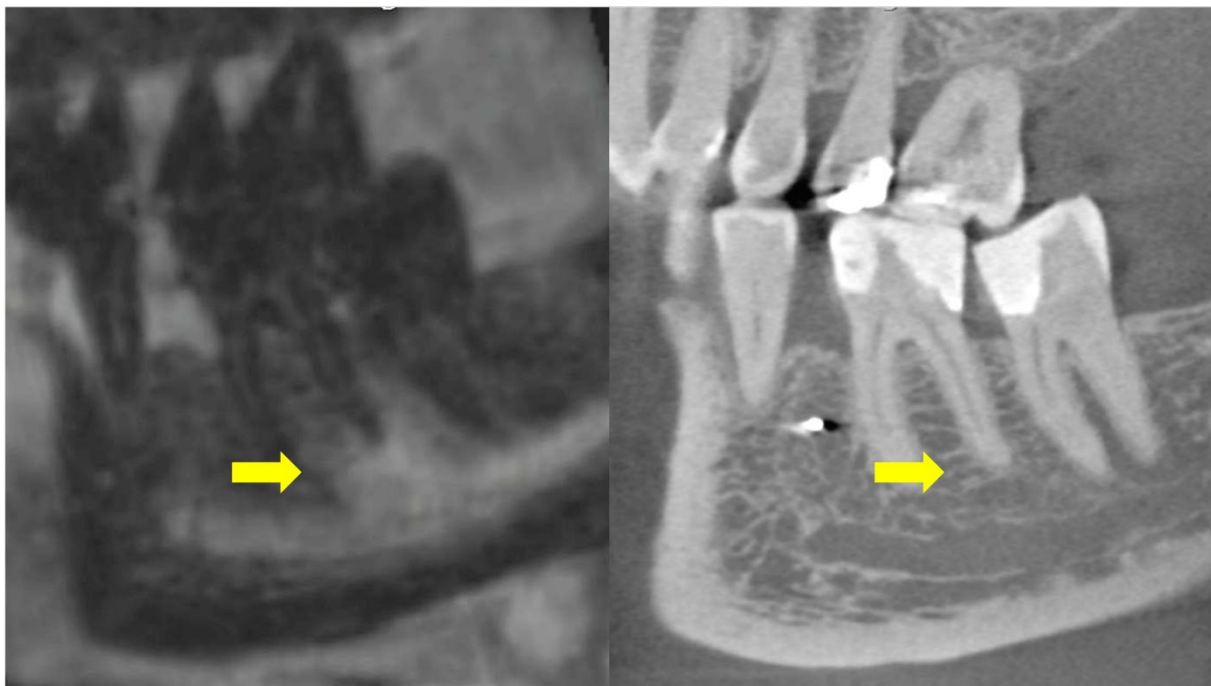


Figure 1: Periapical lesion detected in T1KM (a) and absent in CBCT (b)

Mean difference $\pm$ standard deviation of difference of dental MRI – CBCT based measurements were $1,25 \text{ mm} \pm 1,37$ ($p = 0,001$) larger for dMRI resulting in a lesion upgrading on dMRI in the CBCT-PAI classification in 14 out of 46 lesions (30%), all by one grade. Overestimation was most frequent for early disease grades and reduced with increase in progression grades (Figure 2).

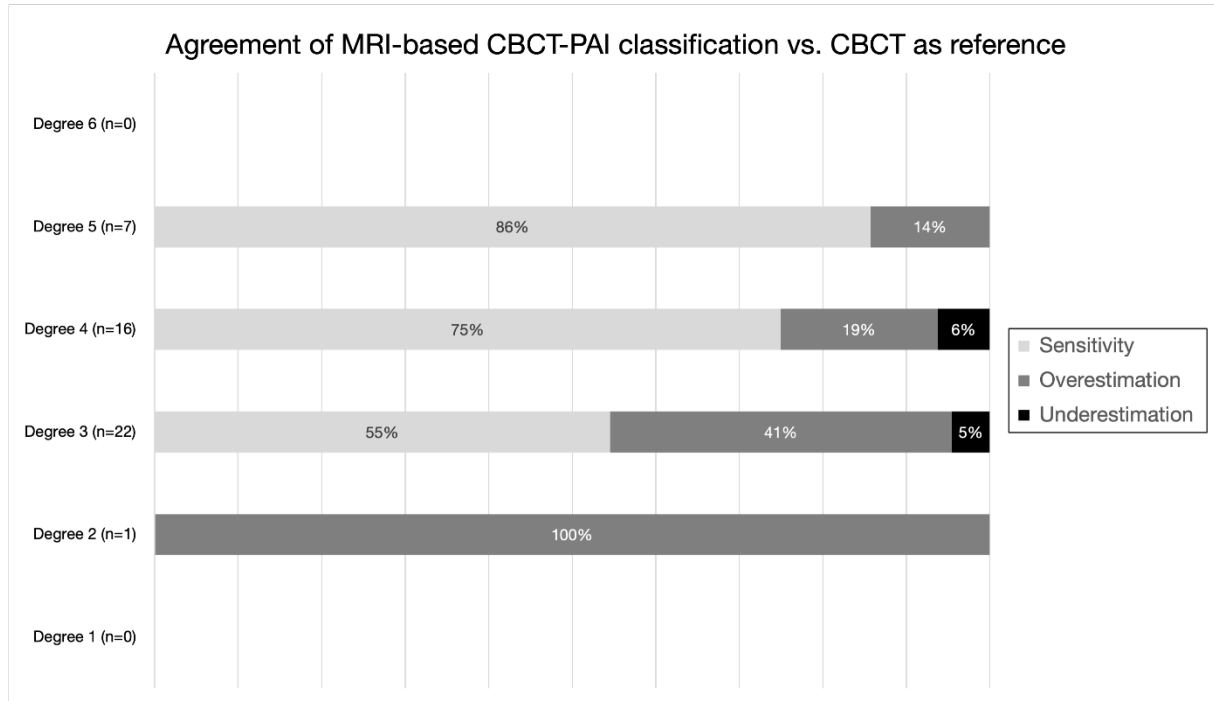


Figure 2: Sensitivity of dMRI T1KM for correct classification of CBCT-PAI degree. Incorrect classifications are subdivided in over- and underestimation

Conclusion

Dental MRI using a high-resolution T1KM reliably and accurately identified all periapical lesions detected in CBCT and, moreover, offers the potential for earlier disease identification by detecting additional lesions not detected on CBCT. Lesions size may be overestimated compared to CBCT, which must be taken into consideration for modifying therapy planning.

Oral Cavity Lesion Mimicker: How prevalent is the Mylohyoid Boutonnière on MRI?

A. Péporté¹, J. Kostova¹, F. Schön², G. Andreisek^{2,3}, L. Diem⁴, F. Wagner^{5,6}

¹Frauenfeld/CH, ²Münsterlingen/CH, ³Zurich/CH, ⁴Lucerne/CH, ⁵Aarau/CH, ⁶Bern/CH

Purpose/Objectives

The mylohyoid muscle is considered a continuous muscular sling, but it is often discontinuous, forming mylohyoid boutonnières that can contain salivary tissue, fat, blood vessels, or lymph nodes. While several studies have explored mylohyoid boutonnières in cadavers and through CT imaging, the prevalence of them on MRI remains largely unexplored. This study aims to assess the prevalence, age-dependence, anatomical distribution, and content of mylohyoid boutonnières on MRI.

Methods and materials

A retrospective review of MRI scans of the head and neck from 294 patients between 2016 and 2020 was carried out. MR images were analyzed for the presence, location, and contents of mylohyoid boutonnières. Inter-rater agreement from the three independent readers with different levels of experience and statistical analysis were performed to assess consistency across readers.

Result

Mylohyoid boutonnières were observed in 50.7% of individuals, with bilateral defects present in 45.6% of cases. The majority of these deficiencies were located in the anterior (45.6%) and middle (51.0%) thirds of the mylohyoid muscle. The herniated content primarily consisted of salivary tissue (69.3%), followed by fat (15.9%) and blood vessels (14.2%). No significant association was identified between the presence of mylohyoid boutonnières and age. Inter-rater agreement among the three reviewers was high for all assessed parameters—including presence, laterality, location, and content—with no statistically significant discrepancies detected.

Conclusion

The mylohyoid boutonnière represents a true and relatively common anatomical variant, identified in 50.7% of individuals in this study, with most defects occurring bilaterally. MRI offers excellent soft tissue contrast, making it well suited for assessing oral cavity anatomy, whereas CT provides superior spatial resolution and may be more sensitive in detecting small bony or soft tissue defects. Awareness of this variant is important to avoid diagnostic pitfalls in the evaluation of oral cavity lesions and to reduce unnecessary invasive procedures.

Impact of Sequence Selection on Postoperative MRI Interpretability and Artifact Reduction in Simulated Mandibular Trauma

E. Burian

Zurich/CH

Purpose/Objectives

This ex vivo study evaluated the diagnostic performance of different MRI sequences for postoperative imaging of simulated mandibular fractures stabilized with titanium and bioresorbable osteosynthesis materials.

Methods and materials

Six porcine mandibles with standardized fractures of the mandibular angle, body, and parasymphysis were stabilized using titanium microplates, titanium reconstruction plates, or bioresorbable systems. All specimens underwent photon-counting computed tomography (CT) as reference and 3 Tesla MRI including five sequences: T1-weighted turbo spin echo (T1-TSE), Dixon-based imaging (DIXON), T1-TSE with wideband artifact reduction (WARP), ultrashort echo time (UTE), and slice encoding for metal artifact correction (SEMAC). Three blinded observers rated general image interpretability, fracture visibility, artifact extent, and soft- and hard-tissue interpretability using five-point Likert scales. Quantitative analysis included signal-to-noise ratio (SNR), contrast-to-noise ratio (CNR), and two-dimensional artifact measurements.

Result

Advanced artifact-reduction sequences outperformed conventional T1-TSE and DIXON ($p < 0.001$). SEMAC, UTE and WARP achieved the highest general image interpretability (median 5) and excellent fracture line visibility. WARP provided the best soft-tissue interpretability (median 5), highest muscle SNR (median 207.9 vs. 74.4 for SEMAC and 51.9 for UTE; $p \leq 0.004$) and highest CNR (median 184.8 vs. 59.6 for SEMAC and 23.5 for UTE; $p \leq 0.014$), while UTE demonstrated superior hard-tissue SNR (median 30.0 vs. 13.2 for SEMAC; $p < 0.001$). SEMAC showed the greatest reduction in artifact extent (135% relative to CT vs. 209% for WARP and 220% for UTE; $p \leq 0.004$). There was a good inter-reader agreement ($\alpha \approx 0.76$).

Conclusion

In this ex vivo model, advanced MRI like SEMAC, UTE and WARP sequences substantially improved postoperative image interpretability and reduced implant-related artifacts. A tailored multimodal MRI protocol may complement CT in selected postoperative scenarios.

Comparative analysis of masseter and sternocleidomastoid muscle myosteatosi: which muscle is a more reliable imaging biomarker for age-related sarcopenia

A. Janović¹, K. Rajković², B. Miličić¹, Đ. Bracanović¹, S. Antić¹,
B. Marković Vasiljković¹

¹Belgrade/RS, ²Kruševac/CS

Purpose/Objectives

Loss of muscle mass and strength in age-related sarcopenia occurs in both skeletal and masticatory muscles. Recent studies suggested skeletal muscle myosteatosi as a promising imaging biomarker for sarcopenia. This study aimed to assess myosteatosi in the masseter (MM) and sternocleidomastoid muscles (SCMM) in sarcopenia using non-contrast-enhanced CT.

Methods and materials

One hundred and nineteen patients with head and neck CT scans were retrospectively included (59.6% female, 59.4±15.2 years). Age, gender, body mass index (BMI), and the number of functional tooth units (FTU) were recorded. CT-assessed skeletal muscle index (SMI) was used to classify patients into sarcopenic or non-sarcopenic groups. Myosteatosi of MM and SCMM was assessed by quantifying the percentage of intramuscular fat bilaterally. Two-dimensional CT images were imported into ImageJ software, and the area of low-density pixels within the muscle was quantified. This parameter is divided by the muscle cross-sectional area to calculate the degree of myosteatosi. Statistical analysis included the Mann-Whitney U test, Pearson correlation analysis, and univariate and multivariate logistic regression models.

Result

Sarcopenia was diagnosed in 65% of patients. There were statistically significant differences in SCMM myosteatosi between sarcopenia and non-sarcopenia groups (19.9±8.1 vs. 14.9±6.5; p<0.001). By contrast, MM myosteatosi did not show significant intergroup differences when analysing the entire sample (10.5 ± 9.3 vs. 8.7 ± 8.1; p = 0.06). After selecting patients with normal BMI, significant intergroup differences were obtained for both MM and SCMM myosteatosi. The SCMM myosteatosi correlated positively with age (R = 0.385, p<0.001) and negatively with SMI (R = -0.356, p<0.001). The MM myosteatosi correlated positively with age (R = 0.388, p<0.001) and BMI (R = 0.280, p = 0.002), whereas it negatively correlated with FTU (R = 0.288, p = 0.002). Univariate and multivariate regression models identified only SCMM myosteatosi as a significant independent predictor of sarcopenia regardless of the BMI.

Conclusion

CT-assessed SCMM myosteatosi is a reliable imaging biomarker for age-related sarcopenia. CT-assessed MM myosteatosi could not be used for sarcopenia prediction since it is affected by BMI.

Relevance of SPECT/CT Multimodality in the Surgical Management of MRONJ

T. Riedling, Z. Ritter, D. Dezső, A. Mühl
Pécs/HU

Purpose/Objectives

Precise delineation of medication-related osteonecrosis of the jaw (MRONJ) is essential for surgical planning, yet conventional CT alone may show limited sensitivity and specificity in defining the true extent and biological activity of the lesion. As hybrid SPECT/CT provides both anatomical and functional information, preliminary reports have suggested that it may improve preoperative assessment. On this basis, we initiated a small case series to explore its potential clinical relevance in MRONJ surgery.

Objective: to assess the added value of SPECT/CT in determining the extent of MRONJ and in supporting surgical treatment planning.

Methods and materials

After intravenous administration of Tc-99m MDP, SPECT/CT imaging was performed in patients with clinically suspected MRONJ at the Institute of Nuclear Medicine, University of Pécs, using a Mediso system. Functional SPECT and low-dose CT datasets were fused and evaluated with InterView™ FUSION software. Imaging findings were compared with conventional radiographic assessment, and their impact on surgical planning was analyzed in three cases.

Result

In all three cases, fused SPECT/CT imaging delineated the extent of suspected osteonecrosis more precisely than conventional imaging. The combined functional and anatomical information facilitated identification of viable versus involved bone, supported selection of the surgical approach, and helped define resection margins and wound closure on presumed vital bone surfaces.

Conclusion

Accurate assessment of lesion extent is critical in MRONJ surgery. In this small case series, SPECT/CT provided clinically relevant additional information beyond conventional imaging and appeared useful for planning surgical management. Larger studies are warranted to further define its role in routine practice.

Segmentation-Based Morphometric Analysis of Neck Abscesses on MRI: Associations with Disease Severity

V. Viertonen, A. Sirén, J.-P. Vierula, T. Happonen, M. Nyman, J. Nurminen, J. Hirvonen
Turku/FI

Purpose/Objectives

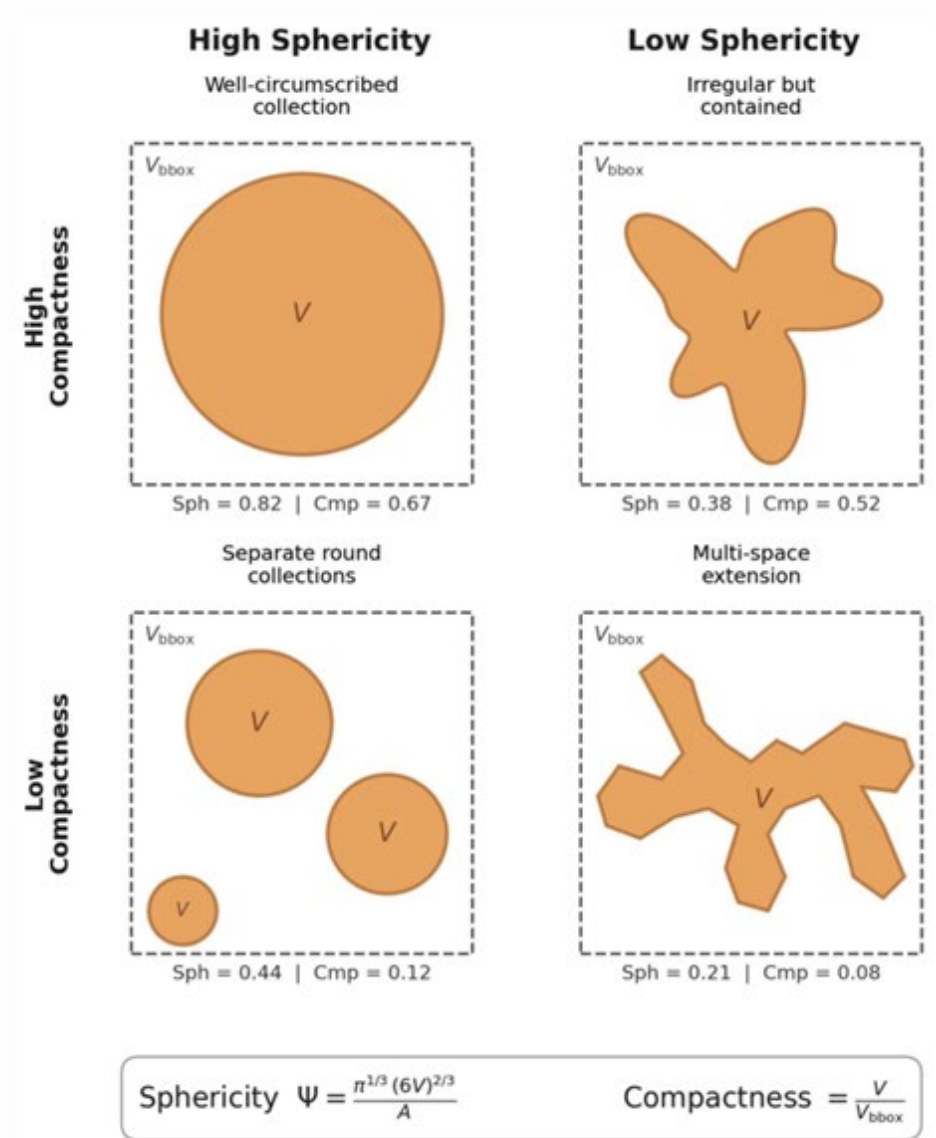
Abscess diameter on MRI is an established predictor of clinical severity in neck infections, but this single measurement does not characterize three-dimensional morphology. The aim of this study was to evaluate whether MRI-based, segmentation-derived volume, sphericity, and compactness improve upon conventional manual diameter measurement in predicting clinical severity of neck abscesses, defined as ICU admission and prolonged hospital stay.

Methods and materials

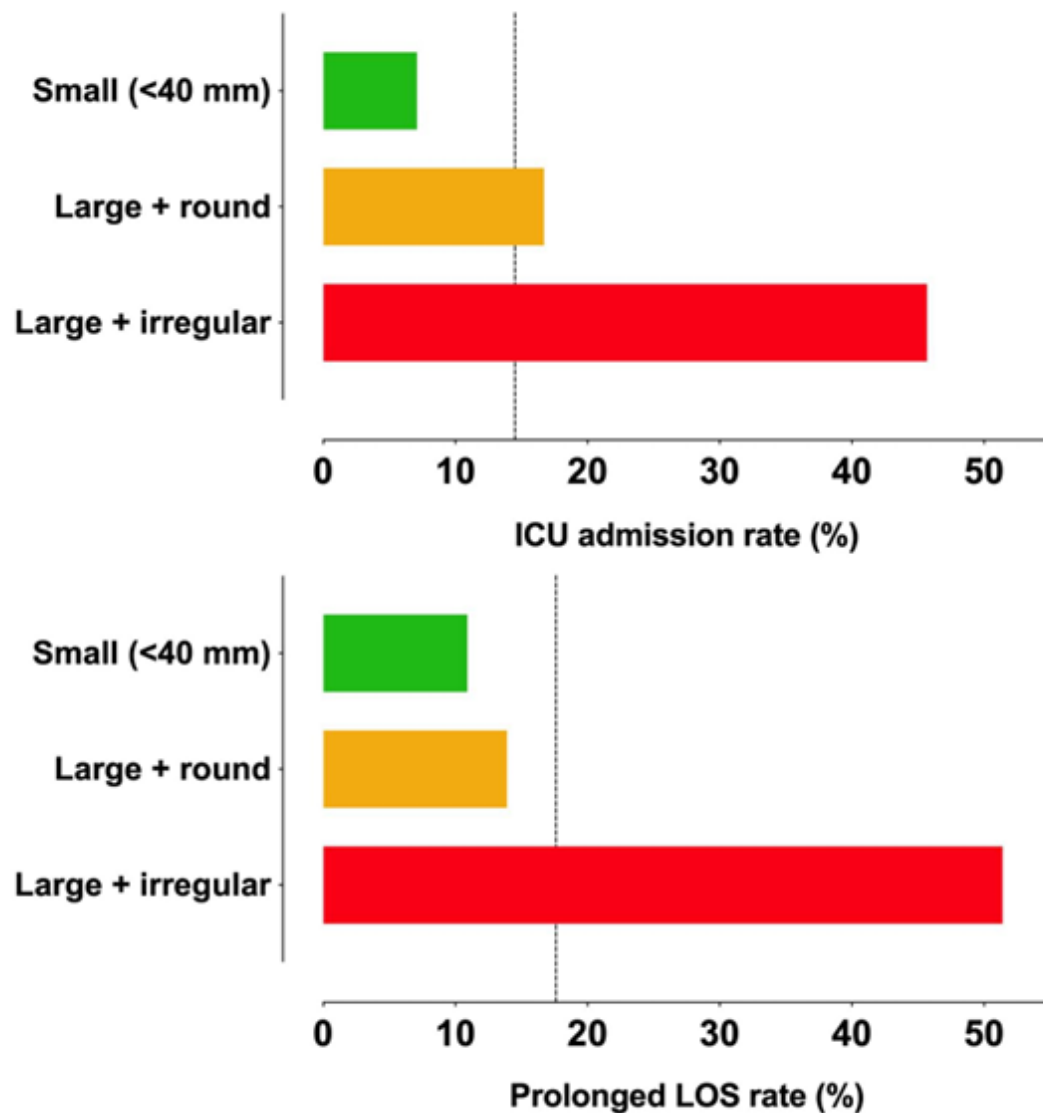
In 227 consecutive patients with surgically confirmed neck abscesses, abscess masks were segmented on post-contrast T1-weighted MRI. Associations with intensive care unit (ICU) admission and prolonged hospital stay (length of stay exceeding 5 days) were evaluated using multivariable models replicating an established prognostic framework. Inter-rater reproducibility was assessed in 30 re-segmented cases.

Result

Of 227 patients (mean age 40 ± 20 years, 57% male), 33 (14%) required ICU admission and 40 (17%) had prolonged stay. Sphericity was lower in ICU patients (median 0.35 vs 0.45, $p < 0.001$) and in those with prolonged stay ($p < 0.001$). In multivariable models, volume improved upon manual diameter for ICU prediction (area under the curve 0.841 vs 0.816); adding sphericity improved prolonged stay prediction (R^2 0.246 vs 0.216, $p = 0.005$). Compactness was significantly lower in patients requiring ICU admission (median 0.11 vs 0.15, $p = 0.006$) and in those with prolonged hospital stay (median 0.10 vs 0.15, $p < 0.001$). Inter-rater reproducibility was excellent (intraclass correlation coefficients 0.96–0.99).



Conceptual illustration of sphericity and compactness as applied to abscess morphology. Sphericity quantifies surface regularity relative to a perfect sphere, ranging from 0 (highly irregular) to 1 (perfectly spherical). Compactness is defined as the ratio of abscess volume to its three-dimensional bounding box volume.



ICU admission rate and prolonged hospitalization rate according to a combined size-shape classification. Abscesses were classified as small (maximum diameter < 40 mm, n = 156), large and round (diameter $\geq$ 40 mm with sphericity above the median of 0.38, n = 36), or large and irregular (diameter $\geq$ 40 mm with sphericity below the median, n = 35).

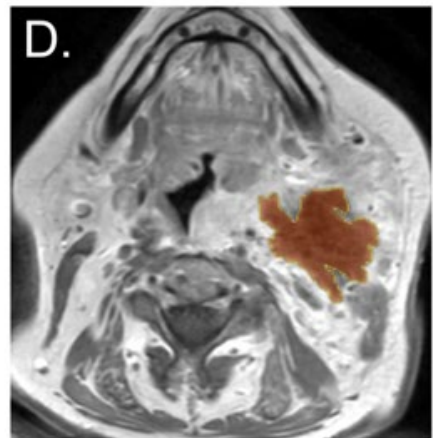
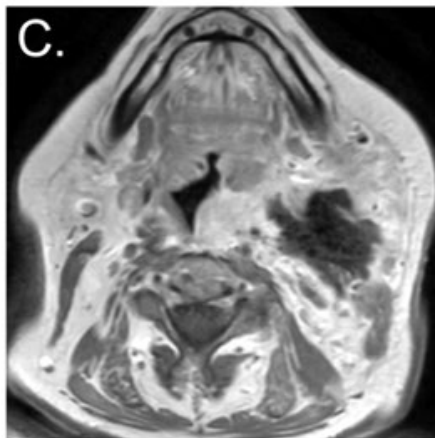
Conclusion

Segmentation of neck abscesses provides three complementary morphometric features that improve upon conventional manual diameter measurement. Volume offers superior size quantification and provides prognostic information beyond manual diameter. Sphericity captures shape complexity that independently predicts prolonged hospitalization beyond volume. Compactness reflects multi-compartment spatial spread associated with ICU admission. Together, these segmentation-derived metrics represent a meaningful advancement over single linear diameter measurements in the imaging assessment of neck abscess severity.

Sphericity = **0.70**
Volume = 28.3 mL
ICU = No
LOS = 5d



Sphericity = **0.37**
Volume = 29.6 mL
ICU = Yes
LOS = 17d



Axial post-contrast T1- weighted MR images of two odontogenic abscesses with similar volume but contrasting sphericity and clinical outcomes.

Should we re-christen Branchial Cleft Cysts?

E. Osborne, D. Forbes, G. O'Neill, C. McArthur
Glasgow/GB

Purpose/Objectives

There is a long-held theory that the lateral cystic neck lesions we refer to as "branchial cleft cysts" arise embryologically from the branchial apparatus. However, there are alternative theories to their origin. It is noted that these lesions often present for the first time in older adults. Furthermore, it is our observation that such lesions, ultimately confirmed as branchial cleft cysts histologically, have an imaging appearance strongly suggestive of the presence of a host lymph node at their periphery which would potentially hint at a more sinister pathology, namely nodal metastasis from squamous cell carcinoma (SCC). Our aims were to determine how frequently lateral cystic neck lesions confirmed to be branchial cleft cysts demonstrate a host lymph node sonographically and contain lymphoid content histologically, to support alternative theory to their origin and alter nomenclature.

Methods and materials

Retrospective identification of adult patients who underwent neck ultrasound in NHS Greater Glasgow and Clyde during 2019-2025 where the term "branchial cleft cyst", or variations of that term, was present in the provided clinical history or ultrasound report. Exclusion criteria were: no sonographic abnormality, a non-cystic neck mass, no images on PACS, no definitive histology available or a clearly intraparotid cyst. Demographics were recorded and histology results examined with particular attention to presence of lymphoid content in confirmed branchial cleft cysts. In confirmed cases on histological examination, any available imaging was reviewed retrospectively to determine if there was potentially host lymph node tissue visible at the periphery of the cystic lesion.

Result

Of 72 included patients, 35 had a histologically confirmed branchial cleft cyst, 21 female, 14 male, with mean age 40 years (range 17-73 years), 30 confirmed on excision and 5 on core biopsy. Other diagnoses included metastatic SCC, warthin's tumour, metastatic papillary thyroid carcinoma and TB. In 33/35 (94%) cases lymphoid content was mentioned in the histology report. On imaging review 30/35 (86%) had the clear impression of an eccentric peripheral rim of nodal tissue, 2/35 were indeterminate and 3 had no convincing nodal content 2 of which had no available cross-sectional imaging to evaluate.

Conclusion

Histological evidence of lymphoid tissue was mentioned in almost all cases of confirmed "branchial cleft cysts" strongly suggesting an alternative origin to the classical embryological theory. If a host node is visible on imaging then a benign squamous cyst remains in the differential diagnosis.

We should consider re-naming branchial cleft cysts. Possible terms include lymphoepithelial cyst or benign squamous cystic node.

A comparative study of multi-contrast dental MRI and CBCT: Clinical correlates of disease status and inflammatory burden in periodontitis

N. Tekiki¹, A. Lauer¹, K. Hartung¹, M. Kirchner¹, L. Schulte¹, H. Li¹, A. Juerchott¹, M. Sohani², S. Heiland¹, M. Bendszus¹, T. Hilgenfeld¹

¹Heidelberg/DE, ²Schwalmtal/DE

Purpose/Objectives

To evaluate the reliability of multi-contrast dental-MRI (dMRI) for periodontal lesion assessment in comparison to cone-beam computed-tomography (CBCT).

Associations between imaging findings and clinical indicators of periodontal inflammation (i.e., bleeding on probing (BOP), periodontal probing depth (PPD) and periodontal inflamed surface area (PISA)), were analyzed to explore the potential of dMRI to reflect disease status and inflammatory burden.

Methods and materials

In this prospective study, patients with severe periodontitis underwent clinical examination, CBCT, and 3T-dMRI. Site-level detectability of periodontal osseous defects and/ or marrow signal changes at the six standard clinical probing sites per tooth, as well as tooth-level lesion volumetry were evaluated across CBCT, T1-weighted (T1W), contrast-enhanced T1W, and T2-weighted (T2W) on MRI. Moreover, reliability (κ , ICC) and clinical-imaging associations (Kruskal-Wallis and mixed-effect models) were analyzed.

Result

Nineteen patients with severe periodontitis stages III and IV were included. Reliability of dMRI matched CBCT (site-level κ :0.631-0.771; tooth-level ICC:0.832-0.973). Increasing PPD and BOP raised lesion detectability and volumes across all modalities, with dMRI being consistently more sensitive than CBCT. T1W depicted lesions and bone loss similar to CBCT and unaffected by BOP ($P=0.132$) or PPD ($P=0.252$). T2W identified most lesions regardless of PPD and reflected high correlations with BOP ($P<0.05$), PPD ($P<0.001$), and PISA ($P<0.001$).

Conclusion

Reliability of dMRI for lesion identification and quantification was comparable to CBCT. The presence of T2W marrow edema at sites with a CBCT-normal periodontal ligament space and no radiographically detectable bone loss on CBCT may represent a promising imaging marker for early periodontal disease recognition and assessment of inflammatory burden.

Radiological Predictive Staging of Deep Neck Space Abscesses: Clinical Correlation and Management Implications

S. Lavallo¹, E. Masiello², F.M. Parisi³, A. Maniaci¹

¹Enna/IT, ²Milan/IT, ³Catania/IT

Purpose/Objectives

Deep neck space infections represent potentially life-threatening conditions requiring prompt recognition and appropriate management. Current imaging protocols lack standardized predictive staging systems to guide clinical decision-making between conservative medical management and surgical intervention. The aim is to present a radiological predictive staging system for deep neck abscesses correlating CT findings with clinical outcomes and treatment strategies.

Methods and materials

We conducted a retrospective analysis of 200 consecutive patients presenting with deep neck abscesses over five years. Radiological parameters including abscess size, location, multispace extension, airway compromise, vascular involvement, and mediastinal extension were systematically evaluated on contrast-enhanced CT scans. Clinical outcomes were correlated with imaging findings using chi-square and logistic regression analysis.

Result

Our staging system stratified cases into four risk categories. Stage I (n=68, 34%) responded favorably to medical management. Stage II-III patients (n=102, 51%) required surgical drainage. Stage IV cases (n=30, 15%) presented with life-threatening complications. The system demonstrated 87% sensitivity and 82% specificity in predicting surgical intervention ($p<0.001$). Significant correlations were found between advanced staging and airway obstruction ($p=0.003$), descending mediastinitis ($p<0.001$), prolonged hospitalization ($p=0.002$), and ICU admission ($p<0.001$). Multivariate analysis confirmed radiological stage as an independent predictor of outcomes (OR 4.2, 95% CI 2.1-8.4, $p<0.001$).

Conclusion

Implementation of radiological predictive staging enhanced clinical decision-making and improved patient outcomes, providing otolaryngologists with objective, validated criteria for determining optimal treatment strategies.