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Pictorial Review

Classic signs in head and neck imaging☆

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Radiologists have long relied upon the use of metaphoric imaging signs to attribute meaning to disease or anatomy-specific imaging patterns encountered in clinical imaging. Teachers of radiology often employ the use of such signs to help learners rapidly identify the typical appearance of various pathologies. Head and neck (H&N) imaging is no exception, and as a specialty that deals with uncommon pathologies and complex anatomy, learners and practising radiologists alike may benefit from this simplistic, pattern-based approach. In this review, we present a compendium of classic imaging signs of H&N lesions, including signs related to traumatic, infectious, neoplastic, congenital, and inflammatory aetiologies found throughout the spectrum of H&N sites (temporal bones, orbits, paranasal sinuses, larynx, salivary glands, and neck soft tissues). Additionally, we identify potential pitfalls and detail critical clinical ramifications related to the rapid and accurate diagnosis of these pathologies.
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Introduction

Radiologists have long relied upon the use of metaphoric imaging signs to attribute meaning to disease or anatomy-specific imaging patterns encountered in clinical practice. Dating back to 1918, when Crane first reported the "inverted comma" sign[1] on pulmonary radiographs, radiologists have taken advantage of fortuitous similarities between certain imaging findings and the appearance of common daily objects or patterns to rapidly recall certain diagnoses, thus harnessing man's innate ability to extract pattern information from a visual stimulus and rapidly match it to a specific, finite entity recalled from memory. Such instantaneous processing of pattern-based visual cues to decipher a specific, pathognomonic entity is often referred to in the medical community as the "Aunt Minnie" phenomenon.[2,3] Although its mechanism is not well understood, it may have roots in the Gestalt theory of perception and hold significance for radiology learners.[4,5]

Due to the complex anatomy and uncommon pathologies encountered in clinical practice, head and neck (H&N) imaging has historically been viewed with trepidation by learners, who may benefit from a simplified, pattern-based approach to learning. As such, we propose that both radiology trainees and practising radiologists may be greatly aided by familiarity with several imaging signs that have been attributed to H&N lesions. In this review, we present a compendium of these classic imaging signs, highlight the

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salient imaging findings, identify potential pitfalls, and detail important clinical ramifications. Images were retrospectively obtained through review of the electronic medical records and picture archiving and communication system (PACS), maintaining compliance with the Health Insurance Portability and Accountability Act (HIPAA) and policies of the institutional review boards at the authors' institutions. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. All photos and artwork are courtesy of the authors' personal collections or open-source internet collections.

Temporal bones

"Broken heart" and "Y" signs of incudomalleolar disarticulation

Trauma, typically blunt injury, may result in disarticulation of the incudomalleolar joint, which manifests as subtle joint widening and lateral displacement of the incus.[6,7] Patients present with conductive hearing loss on the affected side. While this can be seen in the axial plane, conspicuity of the finding is increased when viewed in coronal reconstruction (Fig 1), which has previously described as the "Y" sign in the ear–nose–throat (ENT) literature[8] and by the pithy moniker of the "broken heart" sign by neuroradiologists.[9] Incudomalleolar disarticulation has been reported as the one of the most common ossicular chain injuries,[6,7] thus multiplanar imaging is advised to scrutinise for subtle incudomalleolar disarticulation.

"Ice-cream cone" sign of vestibular schwannoma

Schwannomas are a commonly encountered nerve sheath tumour, which grow eccentric to the nerve of origin.[10] On high-resolution magnetic resonance imaging (MRI) of the temporal bones, vestibular schwannomas may resemble an "ice-cream cone" with the bulbous extension of tumour within the cerebellopontine angle (CPA) resembling the ice-cream sitting upon a cone of tumour within the internal auditory canal (IAC; Fig 2). Vestibular schwannomas are the most common mass involving the CPA and IAC,[11] as well as the most common mass accounting for sensorineural hearing loss.[12] The vast majority of vestibular schwannomas are unilateral and sporadic, but the presence of bilateral vestibular schwannomas is essentially pathognomonic for neurofibromatosis type 2 (NF2).[13]

"Corkscrew cochlea" sign of X-linked stapes gusher

X-linked stapes gusher is a rare congenital aetiology for mixed conductive and profound sensorineural hearing loss due to *POU3F4* gene mutation.[14] At temporal bone computed tomography (CT), these patients demonstrate a characteristic "corkscrew" configuration of the cochlea (Fig 3) due to absence of the interscalar septum and modiolus, as well as a bulbous configuration of the lateral internal auditory canal with deficient lamina cribrosa.[15] This allows communication between subarachnoid cerebrospinal fluid (CSF) and cochlear perilymph, which may result in a perilymph–CSF gusher and perilymph fistula if stapedectomy or cochleostomy is attempted.

Orbits

"Tram-track" sign of optic nerve sheath meningioma

Optic nerve sheath meningiomas are the most common tumour of the optic nerve sheath, but only account for around 2% of orbital tumours.[16,17] At MRI, they characteristically demonstrate linear, often parallel enhancement along the periphery of the nerve sheath due to spread of

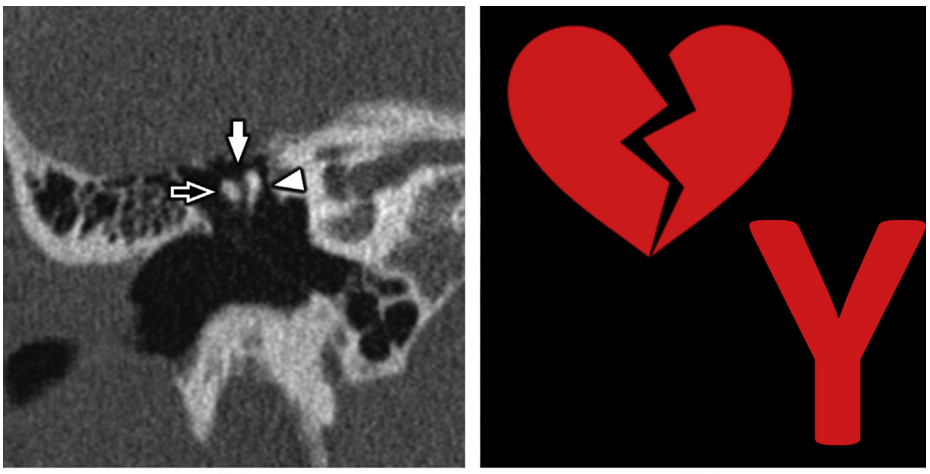

Figure 1 "Broken Heart" and "Y" signs of incudomalleolar disarticulation. (a) Coronal non-contrast enhanced CT shows widening of the incudomalleolar joint (white solid arrow) with lateral displacement of the short process of the incus (white open arrow) relative to the head of the malleus (white arrowhead). (b) This configuration of the ossicles observed on coronal CT has been likened to the appearance of a "broken heart" or "Y".

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