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HEAD AND NECK

The imaging of the dizzy patient: computed tomography versus magnetic resonance imaging

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Abbreviations

CT Computed tomography
MD Meniere's disease
MRI Magnetic resonance imaging

Dizziness is one of the most common presenting symptoms in both primary and tertiary settings, accounting for up to 10 % of primary-care presentations [1, 2] and approximately 4 % of the presentations at the emergency department [2]. Depending on its aetiology, it is usually classified as peripheral/vestibular or central; this classification is important not only for diagnostic purposes but also and mainly for targeted treatment. Meniere's disease (MD), typically presenting as recurrent episodes of vertigo associated with fluctuating sensorineural hearing loss, tinnitus and aural pressure, is believed to be among the most common causes of peripheral dizziness [3]. Endolymphatic hydrops was histologically described nearly 80 years after the first clinical description of the disease and since then it has been considered the hallmark of MD [3]. Following the evolution of magnetic resonance imaging (MRI), endolymphatic hydrops was demonstrated in imaging studies in patients with MD [4, 5], radiologically supporting the relation between hydrops and MD.

Interestingly, Attye et al. demonstrated saccular hydrops in patients with at least moderate sensorineural hearing loss, not necessarily suffering from MD, indicating a relation of endolymphatic hydrops to sensorineural deafness rather than MD. This study questions first the 'traditionally' believed correlation of MD and hydrops and second the importance of imaging in assessing the dizzy patient.

Regarding saccular hydrops, it is not the first study questioning the pathogenetic correlation of hydrops and MD. Previous radiological study demonstrated hydrops on MRI in patients without MD [6], while a recent systematic review indicated a higher incidence of autoimmune arthritis among the MD population suggesting a possible autoimmune background of MD [7]. Given the current lack of evidence, further studies will enlighten this field and enhance our understanding of MD.

Concerning the significance of imaging studies in dizziness, it is commonly believed that in most patients presenting with such symptoms, the diagnosis is based on the medical history and findings of the clinical examination. For the more challenging cases as well as acutely presenting patients, imaging studies can be of benefit; the question is what type of imaging is the best for investigating dizziness?

Recent study assessing the impact of computed tomography (CT) and MRI in investigating the dizzy patient in emergency settings concluded a low predictive yield of CT but also the lack of practicality and usefulness of MRI [8, 9]. However, MRI requested for certain dizzy patients, predominantly those with neurological symptoms, seemed to be of benefit, at least for the patients presenting in emergency settings [8, 9]. While agreeing on the low predictive value of CT in evaluating acute dizziness, Lawn-Heath et al. also demonstrated an important role of MRI in appropriately selected cases [8]. The answer to the question should we scan the dizzy patient or not is hidden in the words: *in appropriately selected cases*.

Despite the repeatedly shown lower predictive yield on emergency settings than MRI [2, 8, 9], CT can still be of great help. Indeed, CT can demonstrate posterior fossa haemorrhage and large infarcts [2]. Additionally, given the diagnostic advantages of CT in assessing osseous structures, CT is still the scan of choice in cases of skull base fracture, a suspected 'third window' effect, such as superior semi-circular canal dehiscence or even chronic otitis media with or without cholesteatoma and erosion of the labyrinth, assessing the

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operated ear (displaced middle ear/stapes prosthesis) and looking for inner ear malformations [2, 10].

On the other hand, MRI and its constant developments offer a powerful diagnostic tool for assessing the cerebellopontine angle and the internal auditory meatus with its neural structures (vestibular schwannomas, meningiomas and further cerebellopontine lesions) and the brain. Additionally, diffusion-weighted imaging demonstrates 83 % sensitivity for acute ischaemic stroke [9] while non-echo planar diffusion is highly sensitive and specific in detecting primary, residual or recurrent cholesteatoma [10]. MRI has been shown superior to CT by many studies in assessing the selected dizzy patients on acute settings [2, 8, 9]; such repeatable findings cannot be ignored.

Still, the costs associated with MRI, the limited accessibility to MRI scanners in some places, the time required for the acquisition of appropriate imaging compared with CT, the contraindications to MRI (pacemakers, metallic implants, etc.) and possible claustrophobia are factors that need to be taken into account when MRI is considered.

Although the medical history and clinical findings are very important, in selected cases, particularly in emergency settings, where the underlying cause can be life-threatening, imaging studies can be crucial. Patients presenting acutely with headache, underlying thrombotic and vascular risk factors, and previous vascular events warrant scanning [2, 9]. Additionally, in patients reviewed electively for dizziness, imaging can be utilised to enlighten diagnostic challenges, facilitate the diagnosis and confirm the clinical suspicion in certain cases *but not in every patient*. Over-utilising imaging studies in assessing dizziness can result not only in a waste of resources and tremendous costs but also in unnecessary anxiety and frustration for the patients themselves.

With the additional recent research focus on MRI development, the efficacy of CT in assessing dizziness might be further questioned. However, currently both MRI and CT can be of great help when assessing the dizzy patient *within the appropriate clinical context*. Provided the indication is valid, these imaging modalities are valuable tools. Before rushing into answering the question whether MRI or CT is better in helping us with the diagnosis, we should first ask ourselves what we are looking for in every clinical scenario. Then, we should be able to make the most out of the available imaging techniques.

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