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Mastoid emissary vein: Anatomy and clinical relevance in plastic & reconstructive surgery

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Summary The mastoid emissary vein (MEV) is an anatomical structure with limited description in the literature and its importance is even less recognized in the plastic surgical field. Investigations in its anatomy and physiology have described its anthropological significance in transition to bipedalism and preferential intracranial venous flow into the vertebral plexus in the upright man.

Inadvertant injury of vessels of this size pose a significant problem due not only to difficulty with haemostasis but also from their bidirectional flow and close proximity to the sigmoid sinus where cases of thromboembolism have been described. Recognition of this common anatomical structure and how to manage bleeding from the vessel it is important for the surgeon operating in this area and even more so for the craniofacial surgeon who operates on complex craniosynostotic patients where the MEV may be the sole dominant drainage pathway of the brain.

We conducted a study on 106 cadaveric dry skull specimens looking at the incidence, position and caliber of mastoid emissary foramina. 83.7% of skulls were found to have at least one foramen with a mean diameter of 1.64 mm and the largest specimen measuring 7 mm.

Introduction

The mastoid emissary vein (MEV) is an anatomical structure with limited description in the literature and its importance is even less recognized in the plastic surgical field. Since its first description by Gruber in 1875 of a tortuous mastoid canal, there have been anatomical studies and anthropological investigations in neurosurgical and neuroradiology fields of medicine, however for most surgeons, the MEV appears to show its relevance in untimely encounters on the operating table leading to unexpected bleeding and in a few reported cases, death of the patient.

Our interest in the MEV arose through a similar incident during which we were operating on a 73-year old male

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patient with a large fungating SCC in the right post-auricular region. During excision, the lesion was found to be involving the periosteum and subsequently the resection resulted in a bed of bare cortex. Coverage of the defect was planned with a posterior transposition flap from neck skin in the upper region of the posterior triangle. During elevation of this flap, dissection in the region of the posterior border of the mastoid resulted in injury to a large caliber vessel, which appeared to exit the posterior mastoid with substantial resultant venous bleeding. Despite immediate application of pressure, the estimated blood loss within 5 min was greater than 200 mls. The degree of flow made further identification or dissection of the vessel difficult and temporizing haemostasis with bone wax, head elevation and pressure. The defect was closed with the designed local flap with pressure bandage. Neurosurgical opinion was sought and it was suggested that the structure was most likely an atypically large mastoid emissary vein. CT and MRI findings confirmed a tortuous mastoid canal with an opening of 4 mm.

Our experience with this patient led to an investigation into the anatomy of the mastoid emissary vein. Its functional and physiologic significance, and its applications in operative planning for the plastic and reconstructive surgeon were of particular interest (Figures 1 and 2).

Method

A direct observation and measurement of cadaveric dry skull specimens was performed for this study. The mastoid emissary vein was deemed present if an external opening in the described area on the posterior aspect of the mastoid was found together with a corresponding internal opening. Due to the tortuosity of the MEV, a probe could not necessarily be passed completely through, however if the foramen was deep enough for a probe to enter then the

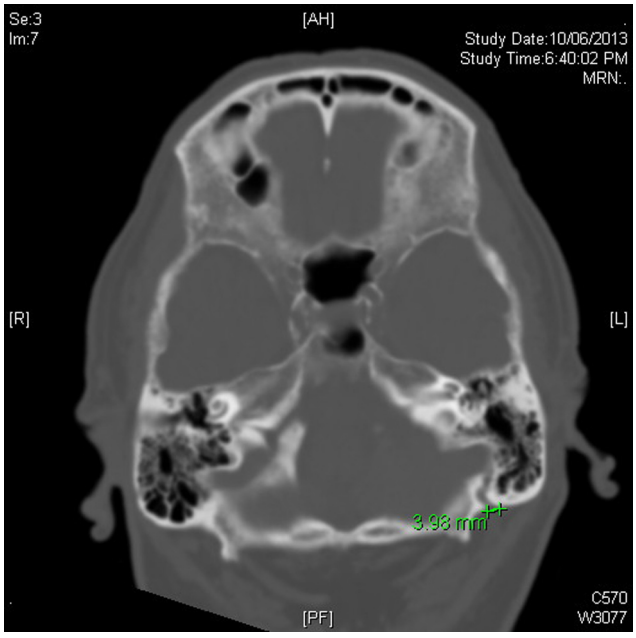
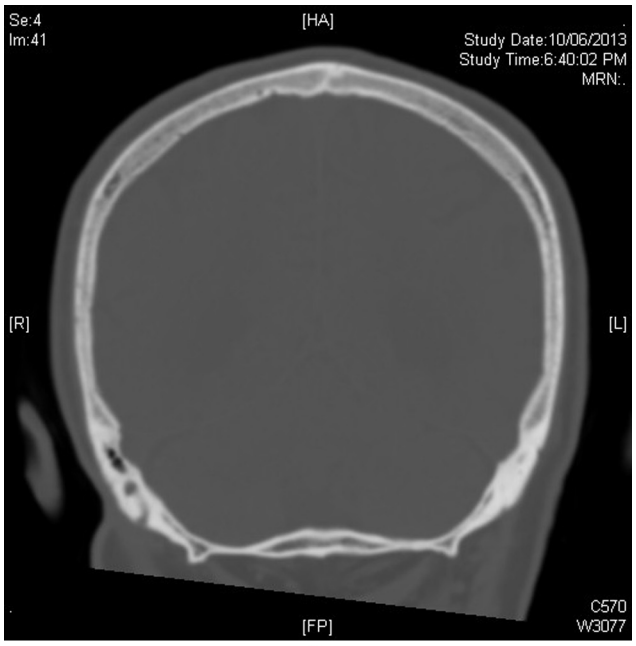


Figure 1 CT showing tortuous mastoid canal with external foramen measuring 3.98 mm.



a

b

Figure 2 a) Coronal and b) sagittal CT views showing position of mastoid canal and foramen for emissary vein.

MEV was recorded as being present. Data collection included position of MEV from the mastoid tip and diameter of the external foramen when present.

Statistical analysis included two sample *t*-test for comparison of percentages and confidence intervals for mean diameters. Significance was calculated at $p < 0.05$.

Results

A total of 80 whole skull specimens were examined for the study. An additional 26 hemi-skulls (12 left, 14 right) were also included for size and position analysis.

In the 80 whole skull specimens, there were a total of 67 (83.4%) skulls found to have at least one opening that corresponded to a mastoid emissary foramen. These were