

Radiology in Focus

Unusual anterior course of the sigmoid sinus: report of a case and review of the literature

K. GANGOPADHYAY, M.S., D.N.B., F.R.C.S.*, P. D. McARTHUR, F.R.C.S.(C), F.A.C.S.*, S. G. LARSSON, M.D.†

Abstract

The position and dimensions of the jugular bulb and the venous dural sinuses vary considerably. While the anatomical variations of the jugular bulb have been extensively reported in the literature, that of the sigmoid sinus have been reported only rarely. We report a case of unusual anterior course of the vertical segment of the sigmoid sinus which was encountered during an attempted myringoplasty. Anomalies of the jugular bulb in general are also described.

Key words: Cranial sinuses, anatomy; Ear, middle, surgery

Introduction

As in other venous systems, there is considerable variation in the drainage of the dural sinuses. This variation is reflected in changes in the size and position of the jugular bulb and the sigmoid sinus. The discovery of a 'high jugular bulb' was first reported by Page (1914). Injury to the bulb occurred during a myringotomy. Injury to the sigmoid sinus is a possibility during mastoidectomy, especially if it is unusually anteriorly placed or if the so-called sinus plate is eroded by disease. We report an unusual case where the sigmoid sinus was encountered just underneath the skin of the posterior wall of the deep, external auditory canal during an attempted myringoplasty.

Case report

A 35-year-old North African man presented in our Otolaryngology-Head and Neck Clinic with a history of recurrent purulent discharge from the right ear over the previous six months. He also complained of diminished hearing and occasional tinnitus on that side. There was no history of any previous surgical intervention. Two accessory auricles on the right side, just anterior to the tragus, were noted. The external ear canal was normal. There was a large central perforation of the tympanic membrane. The rest of the otolaryngological examination was normal. The audiogram demonstrated moderate conductive hearing loss on the right side; hearing on the left side was normal. A myringoplasty was planned for the right side. At the beginning of the procedure, the middle ear was visualized through the perforation. The handle of the malleus was partly missing. The ossicles were intact and mobile. There was no abnormal vascular structure seen in the middle ear. An incision was made on the deep-canal wall skin in order to raise a tympanomeatal flap and profuse venous bleeding

was encountered from the posterior canal wall. The knife did not encounter any bony resistance at all on the posterior canal wall and seemed to dip straight into a soft structure. The bleeding was controlled with ribbon gauze packing. The procedure was abandoned and the packing was removed after 72 hours. A computed tomography (CT) scan was done on that day which showed an unusual

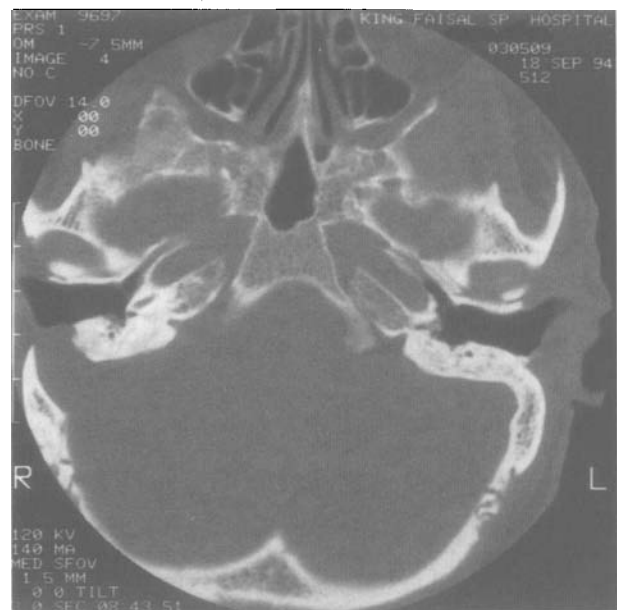


FIG. 1

Axial CT scan showing abnormal, anterior course of the sigmoid sinus on the right side. The sigmoid sinus is without any bony covering and just underneath the skin of the posterior wall of the deep, external auditory canal. The posterior wall of the middle ear is intact.

From the Section of Otolaryngology-Head and Neck Surgery, Department of Surgery* and Department of Radiology†, King Faisal Specialist Hospital and Research Centre, Riyadh, Saudi Arabia.
Accepted for publication: 11 July 1996.



FIG. 2

Coronal CT scan demonstrating intact floor of the middle ear bilaterally.

anterior course of the vertical segment of the sigmoid sinus reaching up to the posterior wall of the external auditory canal. The medial part of the posterior wall of the bony external auditory canal was dehiscence with the sigmoid sinus lying just underneath the canal wall skin. The posterior wall of the middle ear was intact (Figure 1). Coronal CT revealed that the floor of the middle ear was intact (Figure 2).

Discussion

The sigmoid sinuses are continuations of the transverse sinuses, beginning where these leave the tentorium cerebelli. The internal jugular vein, the right being larger in 75 per cent of cases (Gejrot, 1964), begins at the jugular foramen as a continuation of the sigmoid sinus. Its first part is enlarged to form the superior bulb which projects into the floor of the tympanum: this is the jugular bulb.

The sigmoid sinus is approximately 3.75–5.0 cm long. It is S-shaped and may be roughly divided into a vertical portion and a horizontal portion. The vertical limb of the sigmoid sinus is most commonly involved in sinus thrombosis as it is in close relation to the mastoid antrum. The horizontal limb is very short, runs upwards and forwards, and terminates in the jugular bulb (Graham, 1977).

The jugular bulb lies under the floor of the middle ear and when small it is separated from the floor of the middle ear by a comparatively thick bone. This layer may consist of compact bone but it is frequently pneumatized by the hypotympanic air cells. The tympanic nerve, vein and artery pass through this layer of bone and it is thought that infection may travel along these canals from the middle ear to the jugular bulb. When the bulb is large it may push its way upward into the middle ear (Graham, 1977). Infection may alter the size and bony covering of the jugular bulb in the hypotympanum (Kennedy *et al.*, 1986) as well as previous surgery (Gejrot, 1964). Spontaneous progressive enlargement into the middle ear has been noted (Graham, 1977).

Hasso and Broadwell (1991) divided the anomalies of the jugular vein as high jugular bulb, protruding jugular bulb, jugular diverticulum and agenesis. A high jugular

bulb is a jugular bulb located above the level of the bony annulus of the temporal bone (Overton and Ritter, 1973; Jahrsdoerfer *et al.*, 1981). In three different studies this anatomical variant was found to be present in seven per cent, six per cent and 3.5 per cent of temporal bones examined histologically, making it the most common vascular anomaly of the petrous bone (Jahrsdoerfer *et al.*, 1981).

The protruding jugular bulb has two components, a dehiscence of the floor of the middle ear and a protrusion of a portion of the jugular bulb through the dehiscence. A bony dehiscence overlying the jugular bulb was found in one cadaveric study to have a seven per cent incidence of occurrence (Glasscock *et al.*, 1980). Stern and Goldenberg (1980) used the terms 'lateral jugular diverticulum' to describe similar anomalies.

A jugular diverticulum is an irregular outpouching of the jugular bulb that rises superiorly and medially in the petrous pyramid (Jahrsdoerfer, 1981). Stern and Goldenberg (1980) used the terms 'medial diverticulum in medial petrous bone' to describe similar anomalies.

Unlike the variations of the position of the jugular bulb, unusual anterior course of the sigmoid sinus has been reported very rarely. We were unable to find any case report where the sigmoid sinus was encountered just beneath the skin of the deep external auditory canal. CT showed the posterior wall and the floor of the middle ear intact thus showing that it was not a case of abnormality of the jugular bulb.

The vertical segment of the sigmoid sinus occasionally follows an unusual anterior course and reaches the posterior wall of the external auditory canal (Valvassori, 1993). This variation is not unusual in contracted mastoids with little or no pneumatization. Usually the sinus is covered with a thin bony shell. Complete absence of bony covering is quite rare.

In our case the patient had accessory auricles on the same side which possibly is co-incidental rather than an association.

Bleeding was readily controlled with pressure—an experience shared with other authors (Graham, 1977; Moore, 1994) who encountered bleeding from anomalous jugular bulb during middle ear surgery.

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Address for correspondence:

Dr P. D. McArthur, F.R.C.S.(C), F.A.C.S.,
Section of Otolaryngology–Head and Neck Surgery,
Department of Surgery, M.B.C. #40,
King Faisal Specialist Hospital and Research Centre,
P. O. Box 3354, Riyadh 11211,
Saudi Arabia.

Fax: +966 1 442 7772