

Analysis of the most medial osteotomy in en bloc subtotal temporal bone resection: anatomical cadaveric study and surgical considerations

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Background

En bloc subtotal temporal bone resection (STBR) is a surgical technique used for the removal of temporal bone malignancies. STBR requires a skull-base team and remains a challenging procedure. Numerous reports describe the classical STBR technique. From a microsurgical anatomical standpoint, en bloc STBR consists of three approaches: the high-cervical, subtemporal–infratemporal fossa, and retromastoid–paracondylar approaches. However, few reports detailing resection of the most medial bone in this procedure have been published, although it is the most technically challenging aspect of en bloc STBR.

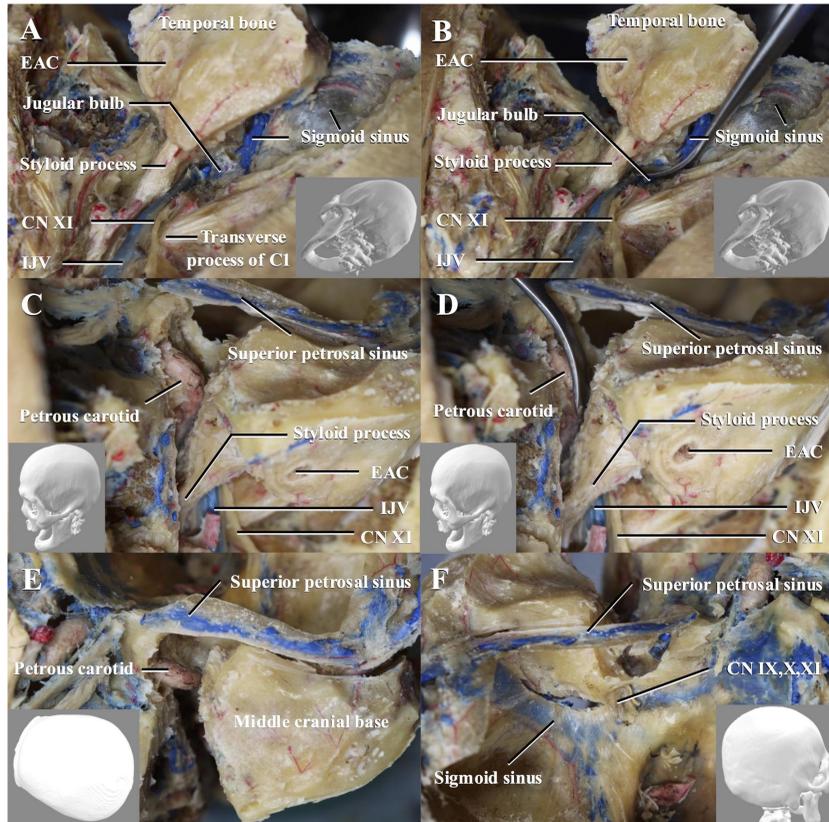
Objective

In this study, we focused on the anatomical details of resection of the most medial bone in en bloc STBR, and we discuss the surgical nuances involved.

Methods and Materials

Dissections were performed on 10 formalin-fixed cadaveric specimens. Following the subtemporal–infratemporal fossa and retromastoid–paracondylar approaches, resection of the medial portion to complete en bloc STBR was examined.

Figure 1. The retromastoid–paracondylar approach and the subtemporal–infratemporal fossa approach for en bloc subtotal temporal bone resection



A. The retromastoid–paracondylar approach exposed the posteroinferior aspect of the jugular foramen. B. The venous wall of the jugular bulb was separated from the jugular fossa. C. The subtemporal–infratemporal fossa approach created an anterior resection line in the temporal bone. D. The petrous segment of the carotid artery was separated from the canal and anteriorly translocated. E. The bone was drilled medial to the petrous segment of the carotid artery. F. The most medial part still connected the temporal bone to the skull. CN, cranial nerve; EAC, external auditory canal; IJV, internal jugular vein

Table 1. Measurement of the triangular region at the most medial osteotomy

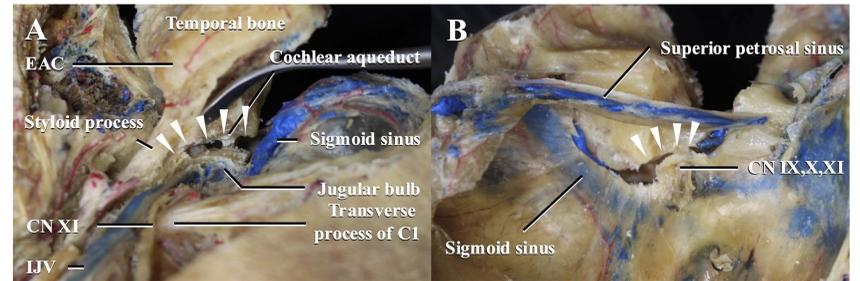
Cadaver	Race	Side	1 (cm)	2 (cm)	3 (cm)	Area (cm ²)
1	Caucasian	Left	1.3	1.2	0.8	0.47
2	Caucasian	Left	2.5	2.5	1.2	1.46
3	Caucasian	Right	1.5	1.3	0.8	0.52
4	Caucasian	Left	1.2	1.3	0.9	0.52
5	Caucasian	Right	1.5	1.5	1	0.71
6	Caucasian	Right	1.2	1.6	1	0.6
7*	Caucasian	Left	1.4	1.8	1.2	0.84
8	Caucasian	Right	2	1.5	1	0.73
9	Caucasian	Left	1.8	2	1	0.9
10	Caucasian	Left	1.5	1.8	1.1	0.82
Average			1.59	1.65	1.00	0.76

The asterisk indicates the cadaver shown in Figure 1-3. The details of the measurement sites are illustrated in Figure 3.

Results

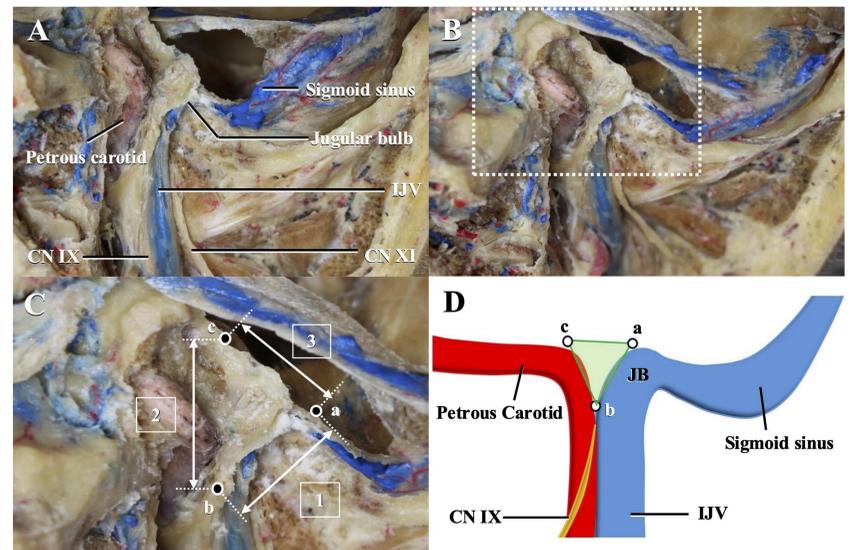
To achieve en bloc STBR, we had to safely remove the bone within a triangular area anterior to the jugular fossa, posterior to the posterior genu of the petrous segment of the internal carotid artery, and directly above the carotid ridge on the medial side of the styloid process base. The region to be resected had mean (range) dimensions of 1.59 (1.2–2.5) cm anteriorly, 1.65 (1.2–2.5) cm posteriorly, and 1.0 (0.8–1.2) cm medially, with a total area of 0.76 (0.47–1.46) cm².

Figure 2. Medial resection of the temporal bone



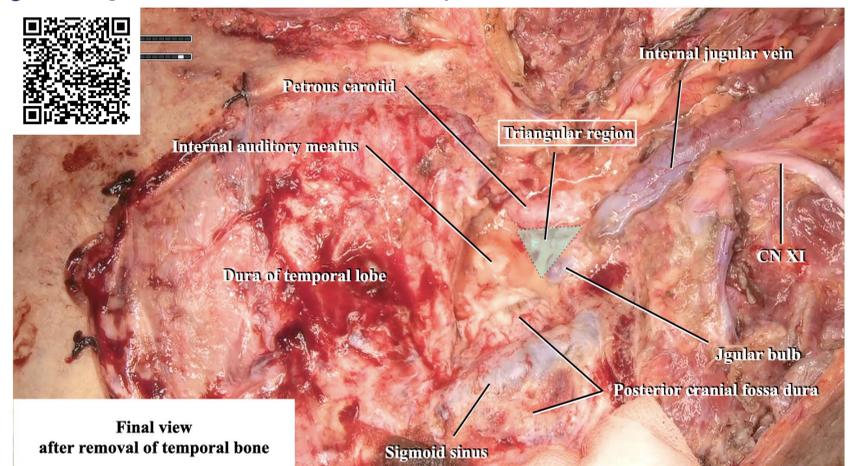
A. The bone was drilled just above and lateral to the jugular fossa (arrowheads). B. The medial resection is completed just above the jugular foramen (arrowheads). CN, cranial nerve; EAC, external auditory canal; IJV, internal jugular vein

Figure 3. Location of the required medial resection and its measurements



A. The location of the medial resection. B and C. Measurements in three directions of the medial portion to be resected. Panel C is an enlargement of the area in the block in panel B. The most medial bony area to be drilled was defined as the region enclosed by three anatomical landmarks: (a) directly superior to the jugular bulb, (b) the lateral edge of the carotid ridge, and (c) just anterosuperior to the pars nervosa of the jugular foramen. Measurement 1 (a-b) is in the posterior direction. Measurement 2 (b-c) is in the anterior direction. Measurement 3 (c-a) is in the medial direction. D. Illustration of the triangular bony area located at the most medial aspect, representing the final osteotomy site. CN, cranial nerve; IJV, internal jugular vein; JB, jugular bulb

Figure 4. Surgical view after the most medial osteotomy



A blue triangular area indicate the region of the most medial osteotomy. The surgical video is accessible via the QR code.

Conclusions

En bloc STBR is a complex and technically demanding procedure, with the medial bone being the most challenging component to resect. This study emphasizes the importance of understanding the anatomical features of the medial bone for en bloc resection. It is crucial to drill this narrow triangular area safely and precisely. These quantitative values in this study are intended primarily as educational reference ranges for surgeons, rather than as operative metrics or decision-making thresholds. Our study aims to contribute to the refinement of surgical techniques for temporal bone resection.

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