A transtubercle suprameatal retrosigmoid approach: a nomenclature based on a microsurgical technique of 26 cases

Mauro Alberto Segura-Lozano, MD, PhD[1]; Alvaro Campero, MD, PhD[2]; Mario Alexis Del Real-Gallegos, MD[1]; Alejandro González-Silva MD[1]; Yael Rodrigo Torres-Torres MD[1]; Aarón Giovanni Munguía-Rodríguez, PhD[1]

[1]Neurología Segura Medical Center, Morelia, Mexico.

[2]Department of Anatomy, School of Medicine, University of Tucumán

Introduction

Over the past three decades, numerous studies based on imaging, microsurgical anatomy, and cadaver dissections have been published describing the internal surface of the petrous apex. These investigations highlight its critical role in providing access to Meckel's cave, the posterior cavernous sinus, the petrous tip, the trigeminal porus, and structures within the cerebellopontine angle (CPA). However, despite this extensive research, there is no consensus on the nomenclature for identifying the surgical approach in question. To address this, we conducted a review of our clinical cases alongside a literature analysis to define the anatomical boundaries of this approach and propose a standardized, simplified nomenclature.

Methods and Materials

From January 2020 to June 2024, a total of 626 *de novo* retromastoid approaches were performed at our institution for primary and secondary trigeminal nerve decompression. We describe the findings of cases that required the transtubercular suprameatal retrosigmoid approach and discuss the importance of its nomenclature.

Case	Age (yrs)	Sex	Diagnosis	Years of symptoms	SMT type	Intraoperative findings	Outcome (BNI)
1	65	F	ITN	5	3	Meningioma	I
2	39	M	CTN	1	3	SCA, Vein	I
3	43	F	CTN	2	3	SCA	I
4	52	F	CTN	21	3	SCA	I
5	36	F	CTN	3	3	Vein	I
6	60	M	CTN	17	3	SCA, Vein	I
7	49	F	CTN	2	3	Vein	I
8	45	F	CTN	6	3	SCA, AICA	II
9	66	F	CTN	4	3	AICA, Vein	I
10	43	F	CTN	2	3	SCA, Vein	I
11	54	F	CTN	24	3	SCA	I
12	26	F	CTN	1	3	SCA, AICA, Vein	I
13	45	F	CTN	9	3	AICA, Vein	I
15	53	F	CTN	4	3	SCA, AICA, Vein	I
15	39	F	CTN	2	3	Vein	I
16	53	F	CTN	4	3	SCA, Vein	I
17	53	F	ITN	23	2	Vein	II
18	49	F	CTN	13	3	AICA, Vein	I
19	52	F	CTN	10	3	SCA	I
20	34	F	CTN	3	3	SCA, Vein	I
21	50	M	CTN	20	3	Vein	I
22	43	F	ITN	12	3	UCA, Vein	II
23	33	F	CTN	3	3	Vein	I
24	51	F	CTN	8	3	Vein	II
25	33	M	STN	0.8	2	Epidermoid Cyst	I
26	43	F	CTN	1	3	AICA	I

Table 1. Characteristics of the patients

F: female; M: male; CTN: classical trigeminal neuralgia; STN: secondary trigeminal neuralgia; ITN idiopathic trigeminal neuralgia. SMT: suprameatal tubercle; type I, 0-1 mm; type II, 2-3 mm: type III, >3 mm. SCA: superior cerebellar artery; AICA: anterior inferior cerebellar artery. BNI: Barrow Neurological Institute pain intensity scale; I, (no pain, no medication required); II, (occasional pain, not requiring medication); III, (some pain, adequately controlled with medication); IV, (pain, not adequately controlled with medication); V, (severe pain, not relieved by medication).

Results

Among the 626 patients who underwent retromastoid surgery, 26 cases (4.1%) required the transtubercular suprameatal retrosigmoid approach (Table 1). Of these patients, 22 (84.6%) were women and 4 (15.4%) were men, with ages ranging from 26 to 66 years. The surgical laterality included 3 bilateral procedures, 9 right-sided approaches, and 14 left-sided approaches. The general technique for the transtubercular approach is described in Figure 1.

The suprameatal tubercle is particularly important as it provides a critical surgical corridor for addressing various pathologies within the CPA. However, the degree of obstruction caused by this bony structure is often unpredictable, requiring the skull base surgeon to be prepared to extend the retrosigmoid approach if necessary.

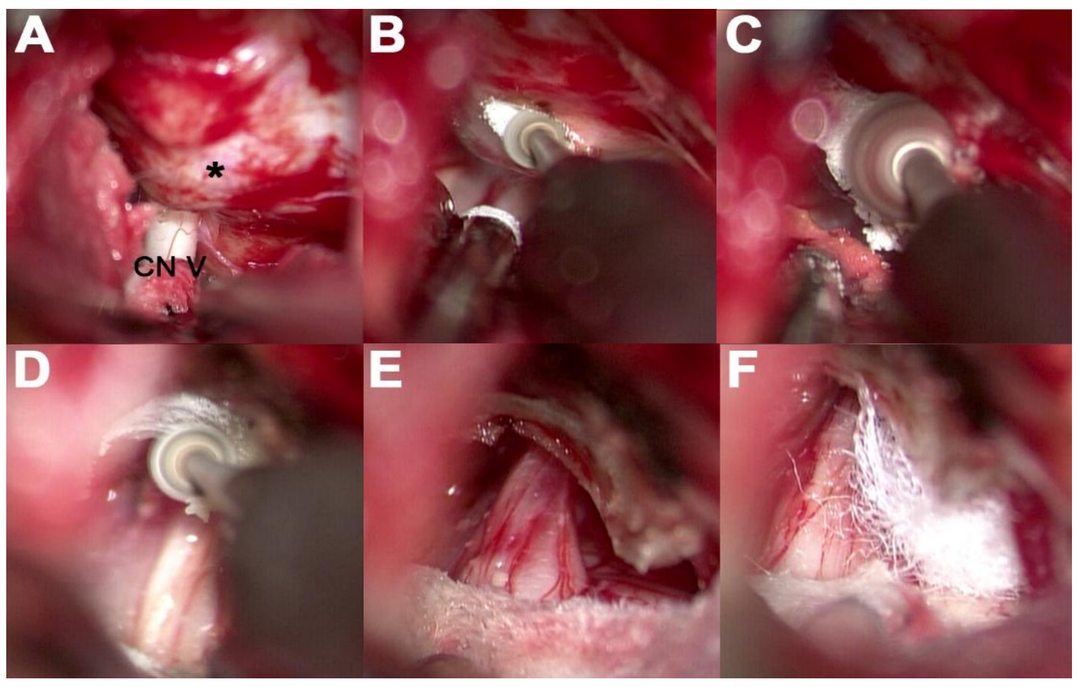

Fig. 1 Transtubercular suprameatal retrosigmoid approach.

(A) Suprameatal tubercle obstructing visualization of the CN V. (B) A 2 mm diamond burr drilling the cortical bone. (C) The 4 mm burr is used when reaching the spongy bone. (D) The 2 mm burr is used again to drill the opposite cortical bone. (E) Exposition of the surgical corridor and exploration on the CN V. (E) Teflon felt is positioned.

Discussion

Based on our experience, the appropriate nomenclature for this technique should be the “transtubercular suprameatal retrosigmoid approach.” This terminology reflects the precise spatial extent of the approach, distinguishing it from an undefined spatial extension. The prefix "trans" is particularly significant, as it indicates that the approach traverses the suprameatal tubercle, rather than merely passing over it. This distinction is especially relevant when comparing this technique to endoscopic visualization, which passes over the tubercle with the lens directed towards the trigeminal porus.

The transtubercular suprameatal retrosigmoid approach involves navigating an anatomically and microsurgically complex region, requiring detailed anatomical knowledge and thorough cadaveric training as essential components of the skill set for all skull base surgeons.

Conclusion

A skull base surgeon must have access to a comprehensive set of microsurgical tools to make appropriate intraoperative decisions in specific clinical scenarios, whether addressing primary trigeminal neuralgia or trigeminal neuralgia secondary to a petrous apex tumor.

Contact

Neurología Segura
Av Montaña Monarca 331, 607-B
Desarrollo Montaña Monarca, 58350
Morelia, Michocán, México.
info@neurologiasegura.net
+52 443 6881327

References

1.-Moreira-Holguin JC, *et al.* (2015). Suprameatal extension of retrosigmoid approach for microvascular decompression of trigeminal nerve: Case report. Int J Surg Case Rep. 15:13-6. doi: 10.1016/j.ijscr.2015.08.010

2.-Peris-Celda M, *et al.* (2019). Intraoperative Management of an Enlarged Suprameatal Tubercle During Microvascular Decompression of the Trigeminal Nerve, Surgical and Anatomical Description: 2-Dimensional Operative Video. *Oper Neurosurg*. 17(6):E247. doi:10.1093/ons/opz027

3.-Rennert RC, *et al.* (2021). Surgical Relevance of the Suprameatal Tubercle During Superior Petrosal Vein-Sparing Trigeminal Nerve Microvascular Decompression. *Oper Neurosurg*. 20(6):E410-E416. doi:10.1093/ons/opab046

4.-Reyna-Mendez H, *et al.* (2021). Suprameatal tubercle classification; its implementation on clinical cases. *Archives of Neurosurgery*: Vol. 1: Iss. 1, Article 6. doi: 10.71119/2992-8478.1001