Trigeminal Neuralgia Caused by A Transfixed Arterial Loop: Illustrative Case

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Introduction

Trigeminal neuralgia (TN) is typically caused by vascular compression, often at the root entry zone (REZ) of the trigeminal nerve. While most cases involve extraneural compression, rare instances of intraneural transfixion exist, posing unique surgical challenges.

Observations

We report a 77-year-old male with TN caused by intraneural vascular compression type II, where a loop of the superior cerebellar artery (SCA) transfixed the portio major of the trigeminal nerve. MRI and intraoperative findings confirmed the SCA coursing through the nerve. He underwent microvascular decompression (MVD), during which, internal neurolysis and Teflon pledget placement near the REZ were performed. Complete pain relief was achieved immediately postoperatively and sustained at 7-month follow-up, with no associated postoperative numbness. Review of the literature reveals common themes of surgical intervention, including longitudinal dissection of the nerve, mobilization of penetrating artery outside of the REZ, and Teflon insertion.

Table 1. Reported Cases of Trigeminal Neuralgia with Intraneural Arteries

Author	Age (Year)	Sex	Division	Intraneural Artery	Helbig's classification	Procedure	Follow Up (months)	Pain Relief	Complications
Present case	77	M	V2, V3	SCA	II	Internal neurolysis and Teflon placement	7	Complete	None
Jito, 2016[1]	82	F	V2, V3	TCA	I	Longitudinal dissection of epineurium	60	Complete	None
Zheng, 2012[2]	70	F	V1, V2	SCA	I	Arachnoid dissection and Teflon wrapping	14	Complete	None
Zheng, 2012[2]	60	F	V1, V2	SCA	I	Arachnoid dissection and Teflon wrapping	26	Complete	Slight numbness
Zheng, 2012[2]	65	M	V2	SCA	I	Arachnoid dissection and Teflon wrapping	16	Complete	None
Tashiro, 1991[5]	50	F	V2, V3	AICA	II	Partial horizontal dissection, lateral mobilization of artery, and prosthesis placement	36	Complete	Loss of nociception in V1 and V2; tactile hypesthesia in V3
Tashiro, 1991[5]	55	M	V2, V3	AICA	I	Partial horizontal dissection, medial mobilization of artery, and prosthesis placement	30	Complete	Mild tactile hypesthesia in V2
Tashiro, 1991[5]	67	F	V2, V3	SCA	II	Partial longitudinal dissection, distal mobilization of artery beyond REZ	30	Complete	None
Zhang, 2022[6]	34	M	V1	AICA	II	Separation of nerve and artery, repositioning of the artery perpendicular to nerve, and Teflon placement	8	Complete	None
Goto, 2021[7]	89	F	No mention	TCA	I	Longitudinal dissection between portio major and minor, mobilization and attachment of the motor root and artery to the tentorium with Teflon sling and fibrin glue	No mention	No mention	None
Patrick, 2005[8]	48	F	V1, V2	AICA	II	Longitudinal dissection allowing free movement	24	Good, reoccurrence	No mention
Watanabe, 2009[9]	71	F	V1, V2, V3	SCA	I	Longitudinal dissection of epineurium and mobilization of artery	No mention	Complete	None
Furuse, 1999[10]	67	F	V2, V3	SCA	II	Longitudinal dissection, anchoring to tentorium, and prosthesis placement	No mention	Complete	None
Nakipuria, 2023[11]	Unknown	Unknown	Unknown	TCA	Unknown	Transposition of artery and Teflon placement	Unknown	Complete	None

AICA, anterior inferior cerebellar artery; F, female; M, male; REZ, root entry zone; SCA, superior cerebellar artery; TCA, trigeminocerebellar artery

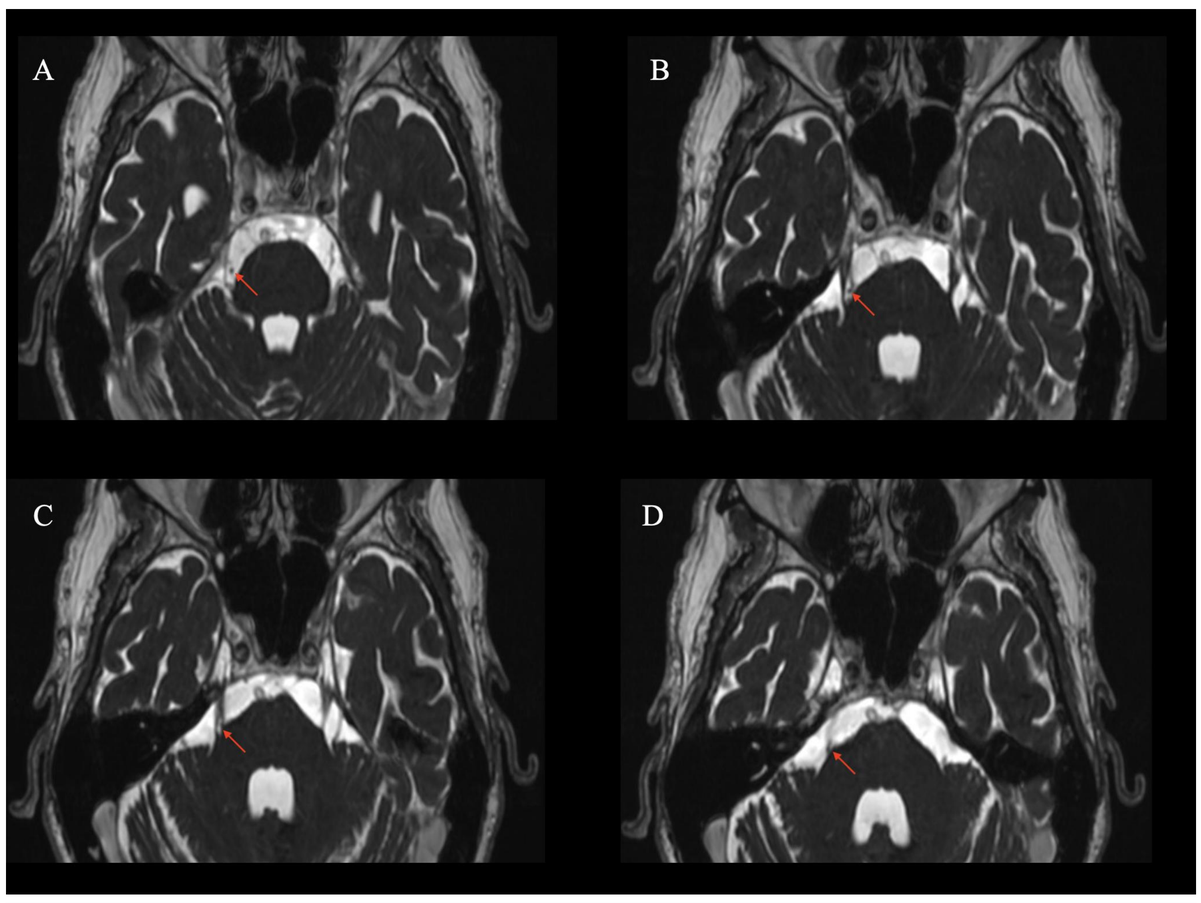

Figure 1. CISS axial MRI (cranial to caudal) of the brain at the level of the trigeminal nerve exit demonstrating a right SCA loop bisecting the trigeminal nerve. A: a single artery is shown here with penetration of the trigeminal nerve. B-C: more caudal view showing the loop with two arteries bisecting the trigeminal nerve. D: A further caudal view, under the trigeminal nerve illustrating the arterial penetration. The SCA is indicated by the red arrow.

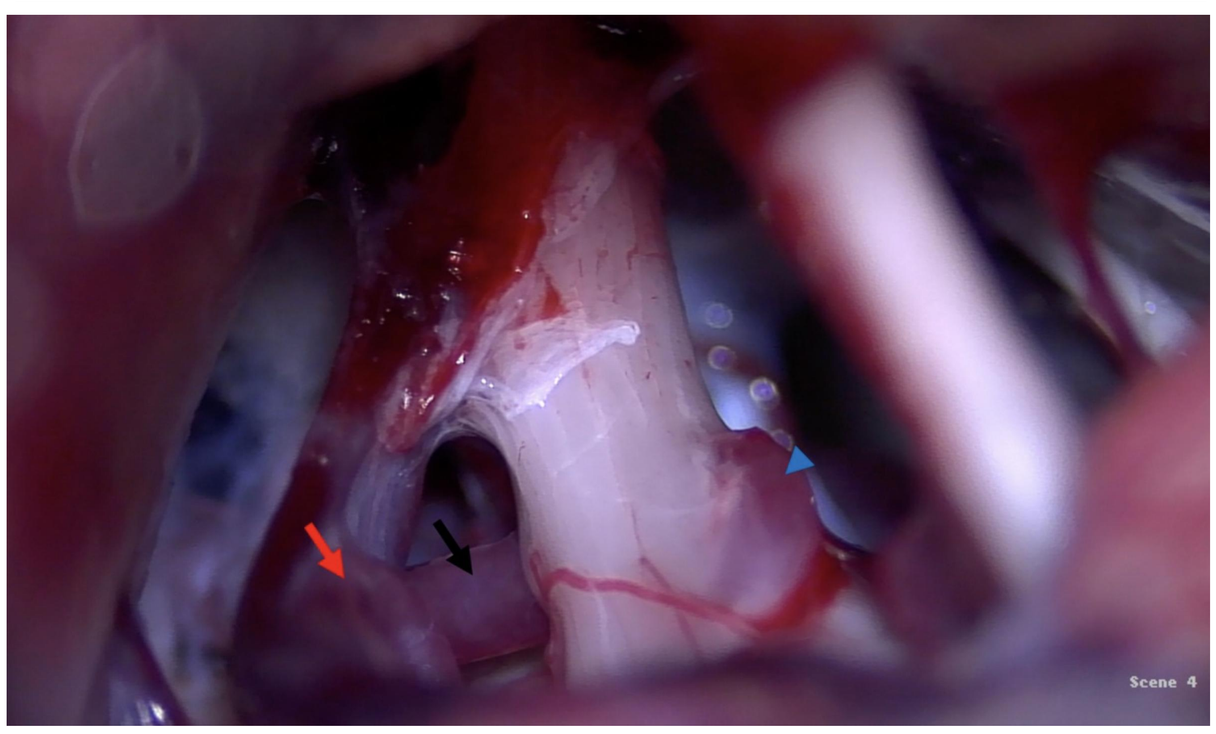

Figure 2. Intraoperative photograph demonstrating the proximal SCA (black arrow), portion of the SCA where it begins to transfix the nerve (blue arrowhead), and the distal segment of the SCA (red arrow).

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Surgical video: Internal neurolysis between the fascicles of the trigeminal nerve at the level of the intraneural loop.

Conclusion

For type I penetrations, we suggest separating the motor and sensory roots, then mobilizing the motor root and artery. For type II, we recommend either internal neurolysis with distal movement of the artery, or horizontal transection to free the artery from the nerve. Patient-centered planning that balances risk of sensory loss against symptom recurrence is essential.

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References