Long-Term Outcomes of Macrovascular Decompression Using the Pexy Transposition Technique for the Management of Cranial Nerve and Brainstem Compression Syndromes

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INTRODUCTION

Microvascular decompression has been found to relieve symptoms of cranial nerve compression by posterior circulation arteries in several groups of patients, including patients with hemifacial spasm (Barker 1995, Thirumala 2011) and trigeminal neuralgia (Mclaughlin 1999). The most common offending vessel is PICA in hemifacial spasm and SCA in trigeminal neuralgia. Less commonly, the vertebral artery can cause compression of the brainstem, spinal cord, or cranial nerves, often due to a tortuous course with or without dolichoectasia (Li 2019, Sabet 2021). One of the most common methods of microvascular decompression is interposition of teflon or other non-absorbable sponge between the nerve and offending vessel to cushion the nerve from pulsations of the artery (Owashi 2024). In cases of vertebral artery compression, this method is often less suitable due to the size of the artery, which would require a piece of sponge large enough to cause mass effect on its own, and in many cases of vertebral artery compression, the tortuosity that causes the vessel to compress the nerves also complicates the strategy for repositioning.

METHODS

Patient information was obtained from chart review. Our series included patients treated by the senior author (LNS) at Harborview Medical Center from 2005-2025.

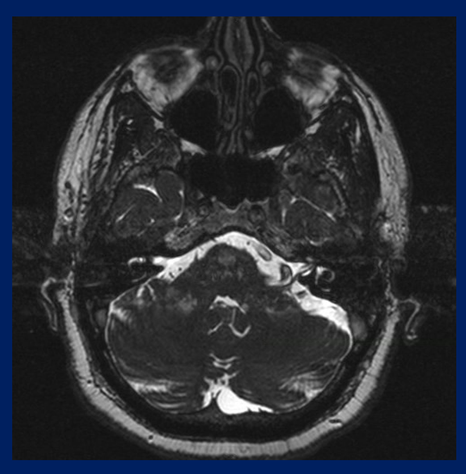
OUTCOMES

The follow-up period ranged from 36 to 1345 days (5 to 192 weeks), with a mean follow-up of 28 weeks and a median of 20 weeks. At the last follow-up, 15 patients (83%) reported being symptom-free, while 2 patients had a significant reduction in symptoms. One patient required reoperation due to the lack of symptom resolution at 6 months postop, which did lead to resolution of preoperative hemifacial spasm. Another patient experienced a delayed return of symptoms of vertigo two years postoperatively and was not found to have any changes on imaging, so was referred for medical management. Another patient had return of symptoms 3 years post op and underwent another microvascular decompression 14 years after her initial surgery.

COMPLICATIONS

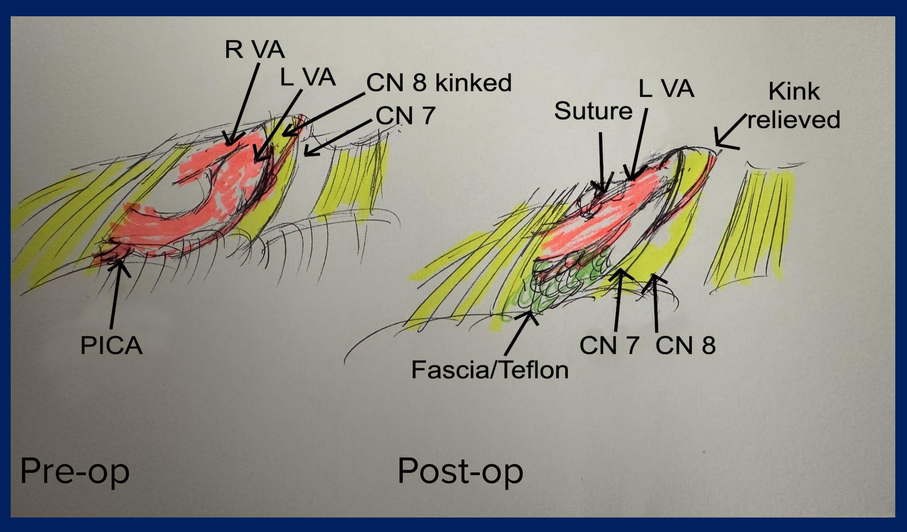
New post-operative symptoms occurred in 12 patients, with 7 of these having full resolution and 5 having some lasting symptoms at last clinical follow up. This included hearing loss in 5 patients, facial weakness in 5 patients, changes in taste in 2 patients, swallowing difficulties in 3 patients, and decreased facial sensation in 2 patients. Transient abducens nerve palsy occurred in one patient. Of note, none of these cranial nerve deficits were severe enough to require additional procedures such as tarsorrhaphy or G-tube placement. Four patients developed pseudomeningocele, with two requiring ventriculoperitoneal shunts (VPS), one successfully treated with a temporary lumbar drain (LD), and one undergoing cranioplasty revision and lumbar drainage due to bone flap fracture.

52M presented with intermittent severe vertigo

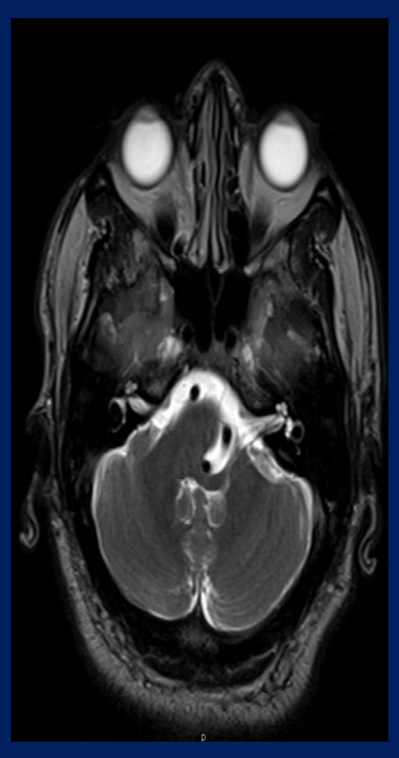


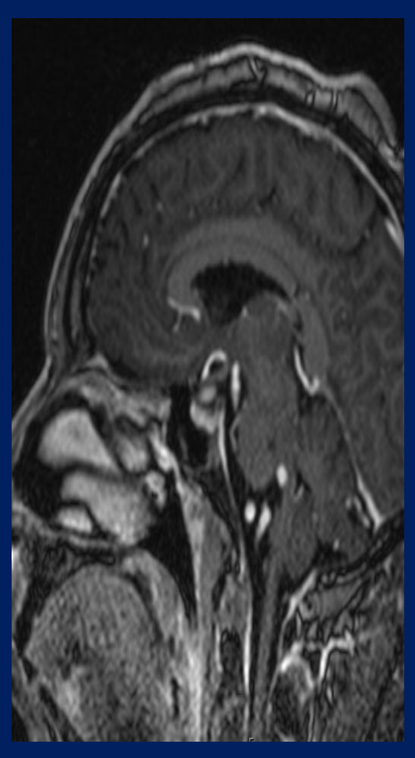
Far lateral craniotomy, vertebral artery pexy to clival dura and decompression of CN 7 & 8
Reconstruction with split thickness calvarial graft

Intra-op findings: L VA and PICA compressing the CN7/8 complex



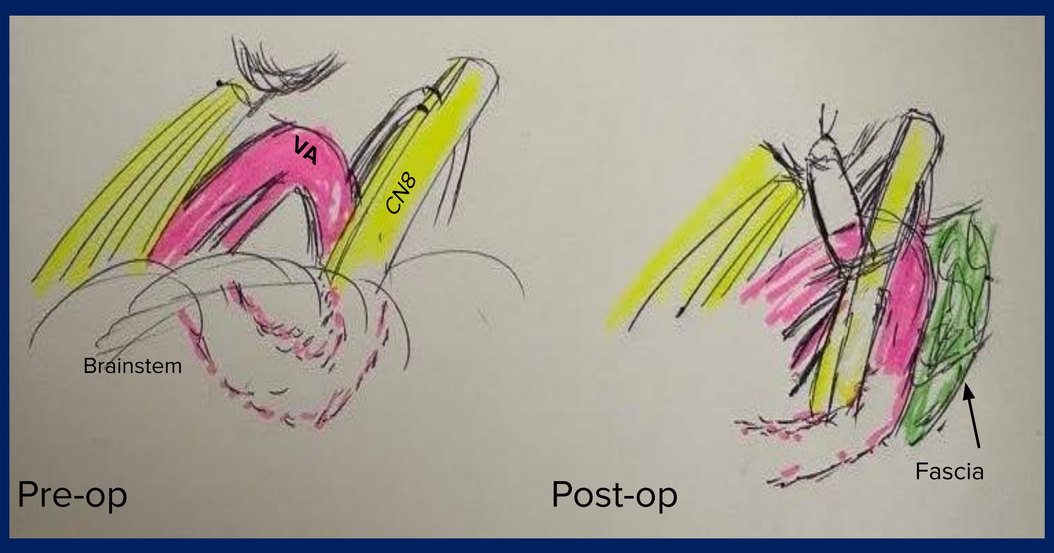
39M with 18 mo of R body allodynia, weakness, and discoordination





L retrosigmoid and temporal craniotomy, mastoidectomy, far lateral approach with exposure of V3 segment of VA, macrovascular decompression of brainstem, vertebral artery pexy

Intra-op findings: aneurysmal, dilated L VA indenting brainstem



Patient characteristics

		n	%
Gender	Male	13	72.22%
	Female	7	38.89%
Age	30-49	5	27.78%
	50-69	13	72.22%
	70+	2	11.11%
Presenting sx	Hemifacial spasm	11	61.11%
	Trigeminal neuralgia	5	27.78%
	Vertigo	3	16.67%
	Headaches	5	27.78%
	Other		
Laterality	R	3	16.67%
	L	15	83.33%
Artery causing compression	VA	17	94.44%
	Basilar	3	16.67%
	PICA	9	50.00%
	AICA	9	50.00%
	SCA	3	16.67%
	Vein	3	16.67%
Area of compression	Brainstem	8	44.44%
	CN	16	88.89%
	REZ of CN	9	50.00%

CONCLUSION

Vertebral artery pexy is an effective treatment for patients suffering from macrovascular compression of the brainstem and cranial nerves, with the majority of patients experiencing symptom resolution or significant improvement. This initial series of patients emphasizes some of the risks involved in these surgeries and highlights areas of future refinement in surgical technique to provide the best outcomes for patients with vertebral artery compression syndrome.

Scan for video

https://drive.google.com/file/d/1rdVDkjaZ-LHhd5EqPDlPuGu7yDbPyRCE/view?usp=sharing