

THE PIVOTAL ROLE OF CRANIAL NERVE DECOMPRESSION

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ABSTRACT

Reported are a total of 81 microsurgical operations for cranial nerve root decompression comprising of 66 trigeminal, 10 facial, one vestibular, one vagus and three accessory nerve dysfunction syndromes from 1983 to 1990.

Almost all cases of trigeminal neuralgia (TNG) secondary to vascular (59 cases) and minute mass (10 cases) compression, and those with hemifacial spasm (HFS) (nine out of 10 cases) recovered with microsurgical decompression of these nerves. A comparison of results of different treatment modalities of TNG are discussed. Some recently reported series in the literature indicate the superiority of microvascular decompression (MVD) of the 5th nerve for the treatment of TNG. MVD of the 7th nerve has currently been accepted as a procedure of choice, albeit with reservations, in managing HFS.

Despite our effective surgical outcome and satisfactory results obtained by others with MVD of the 8th, 10th and 11th nerves, long-term follow up of selected cases may further clarify the role of MVD on caudal cranial nerves.

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INTRODUCTION

Although the anatomico-physiological basis of microvascular decompression of the cranial nerve is a subject of controversy,¹ this approach is still widely used and despite its effective results, more long-term follow up on large series is needed to assess its efficacy.⁵ Some authorities advocate this approach because of its nondestructive nature.^{14,18,28,30}

The anatomy of facial sensation was first explained by Charles Bell in 1829.³⁷ Dandy in 1932 pointed out vascular compression of 5th nerve root in 40-50% of his patients at posterior fossa surgery.⁶ Gandner in 1959 proposed demyelination of the trigeminal nerve as a

possible cause of trigeminal neuralgia. Rand in 1966 performed decompression of the cranial nerve for the first time at UCLA.²⁸ Jannetta advocated vascular compression of the fifth nerve as an etiological factor for trigeminal neuralgia in 1967.¹⁴ Compression of the root entry zone of the cranial nerves by vascular loop is being reported.^{5-7,11,14-20,28,30,32,37} Vascular compression may induce hypo or hyperfunctioning syndromes of the cranial nerves, such as trigeminal neuralgia,¹⁷ hemifacial spasm,³⁰ tinnitus and vertigo,¹⁵ neurogenic hypertension,^{7,19} and torticollis.²⁰

The eventual outcome of the cases who underwent MVD during the past few years was an incentive for us to continue our work on cranial rhizopathies.

MATERIAL & METHODS

Eighty-one cases of cranial rhizopathies operated by the author from March 1983 up till September 1990 at the Imam Khomeini hospital comprised of 66 cases of TNG, 10 cases of HFS, three cases of spasmodic torticollis, one case of arterial hypertension and one case of vertigo, are analytically reported (Table I).

MVD of the relevant nerve is performed by retro-mastoid craniectomy (RMC), using an artificial material of Teflon-felt under the microscope.

Our criteria for patient selection was as follows:

- No response to medical treatment,
- Failure of prior medicaments,
- Suitable candidate selection to sustain general anesthesia and who could tolerate RMC for MVD with a life expectancy of more than five years.
- Suspected vascular compression on the patient with normal CT scan and routine x-rays.

RESULTS

The majority of patients (41 out of 81 cases, 50.6%) were in their sixth decade of life, the youngest being 22 years old and the oldest 82.

Out of 66 cases of TNG, 56 had vascular loop and 10 had minute mass (not obvious on CT) compressing the 5th nerve at CPA (Table II). Decompression of the 5th nerve in either vascular loop or tumor patients resulted in complete pain relief in all of these cases postoperatively. Complications of this procedure responded to treatment with reoperation (Table III). Postoperative result for pain relief was excellent in 95.4% (63 cases). The remaining three cases with persisting pain also were relieved on reoperation with adequate vascular decompression.

Out of 10 cases of HFS which were decompressed from AICA or PICA loop, nine cases (90%) had satisfactory results (Table IV).

In spite of the fact that in all three cases of spastic torticollis, there was some vascular compression of spinal accessory nerve bilaterally, only one of them failed to achieve good results with complete decompression, but the other two cases achieved acceptable recovery with unilateral spinal rootlet section.

The case of vertigo achieved an excellent result with MVD of the 8th nerve.

The patient with hypertension who also had left-sided TNG responded well to decompression of the medulla and the vagus nerve from basilar artery. The blood pressure remained normal postoperatively without antihypertensive drugs.

Table I

Total cases of rhizopathies operated on between 1983-1990	81
Trigeminal neuralgia	66
Hemifacial spasm	10
Torticollis	3
Hypertension	1
Vertigo	1

Table II. Microsurgical pathologic finding in 66 cases of TNG

Vascular compression	56
Arterial loop	49
Venous compression	7
mass compressing the 5th root	10

Table III. Side effect of MVD on 66 cases of TNG

Pain recurrence	3	4.54%
Transient cranial n. deficit	2	3.03%
Hydrocephalus (shunted)	1	1.51%

Table IV. Results of MVD on 10 cases of HFS

Excellent (HFS absent)	6	60%
Good (spasm diminished)	3	30%
Poor (No change)	1	10%

Illustrative cases:

Case I: A 51-year-old male with a history of arterial hypertension and left TNG of four years' duration was admitted to the hospital. Superior cerebellar artery (SCA) compressing the 5th root and ectatic basilar artery (BA) compressing the left vagus nerve and the medulla were both decompressed with Teflon under the microscope (Fig. 1). Postoperatively the patient did well without facial pain and the blood pressure had dropped slightly below the original preoperative value. After one month, the patient did not require anti-hypertensive drugs because the blood pressure had reached the normal level for that age.

Case II: A 42-year-old male who underwent three successive subtemporal retrogasserian rhizotomies during the last 17 years and who did not receive any benefit from these operations was referred to our unit for evaluation. On examination he had lost vision of his right eye because of anesthetic corneal abrasion secondary to V₁ section and also had masseter muscle atrophy. He had severe pain which did not respond to medical therapy with carbamazepine and phenytoin. CT scan showed no obvious or detectable right CPA abnormality. The patient underwent surgery for MVD of 5th nerve. Epidermoid tumor engulfing and compressing the 5th nerve root zone was extirpated completely and the nerve was thus freed altogether (Figure



Fig. 1. Basilar artery compressing the 10th nerve.

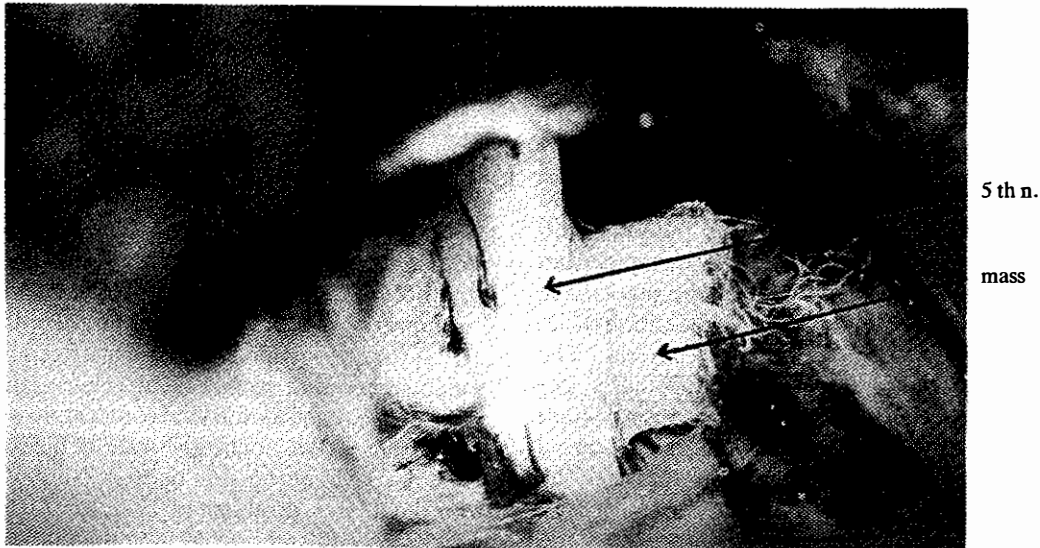


Fig. 2. Mass compressing the 5th nerve.

2). The pain vanished postoperatively which revealed that decompression of the fifth nerve by means of mass removal was effective.

DISCUSSION

After the observations of Dandy and Gardner, Rand proposed MVD^{6,28} and later the original "arterial loop" hypothesis was elaborated and popularized by Jannetta.¹⁴⁻¹⁹

Comparison of results after MVD and that of cutting the nerve fibers, eleven hundred patients treated for medically intractable TNG have been followed for an average of 10 years by Fick. Of the patients operated on with posterior fossa exploration and MVD, 93%

obtained an excellent result whereas only 84% achieved a similar result if no compressing vessel was found and a partial rhizotomy was performed. The incidence of recurrence rate (14%) was similar for both these procedures. Of patients who underwent a percutaneous stereotactic rhizotomy, 91% obtained relief of pain and suffered minimal side effects as a result of sensory loss and motor weakness.⁸

We have found 95.4% (63 out of 66 cases) pain relief in follow up of our cases of MVD procedures for 6.5 years, which is comparable with that of Jannetta's 10 year follow up of 97.8% and Wilkins' 3.5 years follow up of 87.5%.^{15,17} Also our recurrence rate of pain 4.54% (three out of 66) was similar to the result with 4.6% recurrence in 200 cases of Jannetta.¹⁵ We have found that in the majority of cases the compression was

due to arterial loop which corresponds to anatomical portion of root entry zone of the 5th nerve (84.8% = 56 out of 66 cases). Tumor causing compression in our series (15.1% = 10 out of 66 cases) was higher than the other series. We have never seen, nor read in the literature, a case of unilateral V₁ and V₃ involvement, sparing V₂, that is the involvement is contiguous between adjacent divisions. Also masseter muscle spasm is usually accompanied by V₃ involvement. We had three such cases, one a pure form of masseter spasm and two cases of V₃ neuralgia with trismus.

Most of etiopathologies of rhizopathies are located at root entry exit zone (REEZ) nerves, predominantly due to vascular compression.^{5-7,10,11,14,15,17,18,29,31}

Destructive procedures for the treatment of TNG have not had better results in long-term follow up compared to MVD.¹⁰

Thermocoagulation is immediately effective in more than 90% to 100% of patients in several series.^{21,26,27,32,34,35,38,39} Decompression of Gasser ganglion yielded early pain relief at a rate of around 90%⁹ to 98%²⁵. Glycerolization procedure yielded a lower pain relief rate (83% to 96%) in reported series.^{2,3,12,13,24,33}

Hakanson introduced percutaneous glycerol injection in 1981.¹³ Several authorities have reported that glycerol injection avoids sensory loss and dysesthesia.^{12,24,40} The results of 122 patients with TNG who underwent percutaneous retrogasserian glycerol injection by Fujimaki showed the recurrence rate of 54 months follow up, with 63% of definite facial hyposthesia and 26% unpleasant dysesthesia. The patients with previous peripheral procedures developed 50% sensory disturbances. Because of high recurrence rate and sensory disturbances associated with percutaneous retrogasserian glycerol injection, the author prefers MVD.¹⁰ Hakanson noted a 60% incidence of slight sensory disturbances in the face, but the numbness faded after several weeks.⁵⁰ Lunsford reported a 37% incidence of mild sensory disturbances and a 7% incidence of annoying paresthesia.²⁴ A higher incidence of sensory deficit and dysesthetic pain will occur following repeated percutaneous glycerol injection.^{10,24} The risk of sensory disturbances is even higher when compared to conventional radiofrequency rhizotomy in which the lesion can be more accurately controlled.^{35,38} Nearly 20% of 1000 patients in a follow up between 1972 and 1980 reported by Ziegfried, treated by radiofrequency for TNG have had pain recurrence.³² Pain relief of 94.8% in a series of 1000 consecutive patients was obtained with an average follow up of 9.3 years and a recurrence rate of 18.1% after percutaneous retrogasserian thermorhizolysis.⁴

Percutaneous microcompression (PMC) of gasserian ganglion has had the initial relief of pain in 96% for TNG.²³ The phenomenon by which the pain relief is

achieved either by decompression of the nerve in MVD or compression in PMC, is obscure.¹ Percutaneous trigeminal ganglion decompression of TNG was introduced in 1983 by Mullan and Lichtor. Different injury of axons compared to relative sparing of cell bodies in the trigeminal ganglion suggests that axonal regeneration is possible and may contribute to the recovery of motor and sensory function in patients after PMC, and trigeminal pain is relieved after greater damage to large myelinated nerve fibers than the ganglion cell.^{22,29}

No matter what the mechanism of pain relief after MVD is, we have found that this technique has been an effective procedure in the treatment of TNG.

Satisfactory results of our 10 cases of HFS, who underwent MVD of 7th nerve showed the efficacy of the technique, with recovery rate of 90% (nine out of 10 cases). The success rate of more than 95% has showed that MVD of the 7th nerve is probably an alternative choice in the treatment of HFS.^{14,15}

Spasmodic torticollis has been known as a movement disorder with unknown etiology involving the nuchal musculature and the results of various treatments have been disappointing. MVD of spinal accessory nerve and the brain stem was performed from 1981 to 1988 in 21 patients by Jho, with the minimum follow up of two years. 55% of these patients (11/20) obtained a complete cure, 15% (three out of 20 cases) improved with minimal symptoms and 15% (3/20) improved with moderate symptoms and 15% (3/20) with no changes.²⁰ In three cases of ours, we failed to find a cogent vascular compression of the corresponding accessory nerve.

A case of vertigo and a case of arterial hypertension who responded to MVD of relevant nerve are not enough to reach a statistical conclusion. An unequivocal statement can not be given about the role of MVD in alleviating hypertension because studies conducted so far have not established that MVD has a role in hypertension and further data is needed.

RESULTS

MVD of cranial REEZ with its relevant indication is a technique which has been currently producing better results in some reported series in comparison to other procedures for treatment of some cranial rhizopathies such as TNG and HFS.¹⁰ gained from 81 operated cases and their follow up for at least 6.5 years, we are convinced that MVD is the procedure of choice in the treatment of TNG and HFS, nevertheless the role of MVD in other cranial nerve dysfunctions in our series remains unresolved.

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