Original Article

Microvascular Decompression for Hemifacial Spasm Using Oxidized Cellulose; Clinical Outcome and Complications

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ABSTRACT
Background: Microvascular decompression (MVD) of the facial nerve has been established as one of the standard treatments for Hemifacial spasm (HFS), adequate mobilization of the offending vessel(s) away of the nerve is the key to improving the clinical outcome and preventing recurrence, different types of implant materials have been used to move the vessel away from the nerve, Teflon recently being almost the standard. Objectives: The aim of this study is to describe the use of Fibrillar (oxidized cellulose) instead of Teflon in order to mobilize the offending vessel away from the facial nerve in MVD surgery. Patients and Methods: Twenty eight patients, who underwent MVD for hemifacial spasm using fibrillar oxidized cellulose, were evaluated describing the operative finding, surgical technique, clinical outcome and recurrence rate. The median follow-up period was 3.5 years (range, 1–5 years). Results: Excellent surgical outcome was found in twenty two patients 78.6%, two patients with good outcome, one poor and one failure. Two patients 7% had postoperative recurrence one in the early postoperative and the other patient one year later. Conclusion: Using Fibrillar cellulose for mobilization of the offending vessels can be a good alternative to Teflon in MVD surgery, further studies comparing different implant materials is still needed in order to increase the success rate for MVD for hemifacial spasm.

INTRODUCTION

Hemifacial Spasm (HFS) is a benign, chronic, involuntary movement of one side of the face, characterized by twitching, tonic spasm, and synkinesis of the muscles innervated by the facial nerve. Primary HFS fulfills the three following criteria: (1) not a sequelae of ipsilateral facial palsy, (2) chronic in evolution and self-limiting, (3) with normal investigations, except sometimes for the presence of a vascular compression of the seventh nerve, generally in the root exit zone (REZ) at imaging.

Hemifacial spasm (HFS) is an infrequent disorder with an estimated yearly incidence of approximately 1 person per 10,000 people, it is seen almost exclusively in middle-aged and older patients, with a female predominance, occurrence in childhood and adolescence is extremely rare.

There is now considerable evidence that primary HFS is related to functional changes in the facial motor nucleus, caused by vascular compression of the facial nerve at REZ.

Nonsurgical treatments, such as medications and local intramuscular botulinum toxin (BT) injections, have been ineffective as long-term solutions for HFS.

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Gardner was the first to describe MVD for HFS using pieces of absorbable gelatin sponge (Gelfoam) to mobilize the offending, in the next decade, Jannetta began to popularize microvascular decompression (MVD) of the seventh nerve to treat HFS with cure rates ranging from 90.5%–96.7%.

Teflon Pledgets has been traditionally been used to move the offending vessel away from the nerve several other methods and materials have been used for mobilization of the vessels among which, is gelfoam, muscle piece and sling sutures. The aim of this study is to present our experience in using fibrillar (oxidized cellulose) instead of Teflon in order to mobilize the offending vessel away from the facial nerve in MVD surgery.

We present a series of twenty eight patients who underwent MVD for hemifacial spasm using fibrillar oxidized cellulose, describe the operative findings and technique and analyze the clinical outcome and the complications.

PATIENTS AND METHODS

Patients

During the period from August 2009 till December 2014, twenty eight patients with hemifacial spasm underwent MVD. All of the surgical procedures were performed by a single neurosurgeon (the first author)
The patients consisted of eighteen females and ten males with a mean age of 44.5 years (range, 25–68 years). The patients included a brother and sister. The preoperative duration of symptoms was 65.9 months (range, 18 months to 12 years). The median follow-up period was 3.5 years (range, 1–5 years).

Two patients needed reoperation due to symptom recurrence after initial improvement. All the patients underwent preoperative evaluation with computed tomography, magnetic resonance imaging (MRI) (Fig. 1) with and without the addition of a contrast agent. Pure tone audiometry and speech audiometry were performed pre- and post-operatively by an otologist in all patients.

**Surgical technique**

All of the procedures were performed via a lateral retrosigmoid suboccipital approach, which has been previously described in the literature. After careful dissection of the arachnoid membrane and gentle retraction of the flocculus, the root exit zone (REZ) of the facial nerve was observed. The compressing (offending) vessel was identified near to the REZ (Fig. 2).

The offending vessel was carefully traced under microscope, moved away from the nerve. Several pieces of fibrillar oxidized cellulose (Fibrillar Surgicel, Johnson and Johnson, New Brunswick, NJ) were placed between the compressing vessel and the REZ. (Fig. 3)

**Evaluation of outcomes**

The outcome was defined as excellent (total spasm cease), good (the patient felt cured but with residual spasms or twitches under stressful or emotional conditions) and poor (little relief, spasms still bothersome though decreased in intensity and/or frequency) or failure (no relief) or recurrent reappearance of the spasms after a period of spasm free more than 3 months.

**Statistical analysis**

The outcome and complications were analyzed using Chi-squared test or Fisher’s exact test (when the expected values in any of the cells of a contingency table are below 5). The statistical procedure was performed with SPSS 10.0 software (SPSS, Chicago, IL, USA). The level for statistical significance was reported with a P-value of less than 0.05.
RESULTS

Clinical features
The patients were eighteen females and ten males, twelve patients had the right side affected versus sixteen with the left side. The mean age of onset 32.6 range from 19 to 52. The mean age at MVD was 43.1 with a range of 28 to 62, the mean duration of symptoms was 10.6 with a range of 2-26 years. No statistically significant effect of the duration of symptoms on the surgical outcome. The mean post-surgical follow-up duration was 22.3 months.

Offending vessels and surgical findings
Offending vessels were found in all our patients with HFS they were confirmed in the operating field to be: the anterior inferior cerebellar artery (AICA) in 53.6% (13/28 patients), the posterior inferior cerebellar artery (PICA) in 28.6% (8/28 patients), and multiple vessels in 14.3% (4/28 patients; in one patient AICA + vertebral, in three patients AICA + PICA, In one patient the offending vessel couldn’t be named (Table 1), thickening in the arachnoid membranes was found in seventeen patient 61%.

<table>
<thead>
<tr>
<th>Offending vessel</th>
<th>Number of patients</th>
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<tbody>
<tr>
<td>AICA</td>
<td>15</td>
</tr>
<tr>
<td>PICA</td>
<td>8</td>
</tr>
<tr>
<td>AICA+PICA</td>
<td>3</td>
</tr>
<tr>
<td>AICA+VA</td>
<td>1</td>
</tr>
<tr>
<td>Unnamed</td>
<td>1</td>
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</tbody>
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Surgical outcomes
In our series of twenty eight patients with HFS, an excellent surgical outcome was found in twenty two patients 78.6 % 2 patients with good outcome, one poor and one failure. The recurrence after MVD occurred in two patients 7% one in 2 weeks and the second after one year both were re-operated, migration of the prosthesis was found in the early recurrence who had excellent surgical outcome initially, after re-operation the patient was spasm free, in the late recurrence, the patient had good surgical outcome initially before he had recurrence of symptoms one year later, in reoperation we could not identify an offending vessel, mild arachnoid adhesions were noted at and around the nerve, the patient had poor surgical outcome surgical outcome.

DISCUSSION

The surgical methods for MVD or HFS that was described be Gardener and later Janaetta have remained nearly unchanged over the decades except for the implant material used for mobilizing the offending vessel, describing MVD for the first time, Gardener used Gelfoam to keep the vessel away from the nerve and to prevent direct contact between them. Later, authors used different techniques and different implant materials in order to achieve adequate mobilization of the offending vessel(s) and thus adequate nerve decompression, in cases of both trigeminal neuralgia and hemifacial spasm, plastic, silicone sponge, autologous muscle, fascia Gortex vascular grafts all has been used others did not use implants at all.

Several authors have described the use of stitch sling to pull the offending vessel off the nerve in hemifacial spasm, however obtaining a sufficient operative field for placing a stitch at a suitable site and performing the stitching procedures safely is not always easy. Sindou has described the use of teflon tape to pull the vessel away of an offended trigeminal nerve.

Teflon has recently been the popular implant material used in MVD in both HFS and TN, Teflon has been used in plastic vascular surgery since the 1960s, the mechanical properties of shredded teflon has favored it over several other implant materials in MVD operations.

However, long term follow up studies revealed that the efficacy of MVD for TN gradually decreased over time because of recurrence. The incidence of recurrence of TN has been reported to vary from between 3% and 30%.

The pathogenesis of recurrence in cases treated using the interposition method includes adhesions in six patients re-operated for recurrence of TN Matsushima et al found the adhesions of the teflon feltin all cases and that adhesions were the main cause of recurrence between the prosthesis–nerve complex and arachnoid. Inflammatory responses such as granuloma is being increasingly reported and is an important cause not only of recurrence but sometimes of appearance of delayed complications.

Fibrillar cellulose is ahemostat used in neurosurgery which is mechanically light can be fashioned easily in different sizes, lengths, it is also inert non toxic, the use of fibrillar cellulose in MVD surgery has been described in TN Franzini et al 2010 who abandoned the use of teflon for Fibrillar due to previously described complications.

In our cases with fibrillar cellulose we had good or excellent outcome in 86%, with two recurrences (7%), in the late recurrence patient we did not find neither the fibrillar nor extensive adhesions, we also could not identify an offending vessel, the recurrence might be due to intrisnisc changes within the nerve fibers of the seventh nerve or the seventh nerve nucleus, we think that larger series has to discuss the outcome with using fibrillar and compare these to teflon with emphasis on the operative findings in cases of reoperation after recurrence.
CONCLUSION

MVD for HFS is an effective treatment that can offer permanent symptom relief. Using fibrillar cellulose for mobilization of the offending vessels can be a good alternative to teflon with its proven complications including granuloma and adhesions that can lead to recurrence. Fibrillar cellulose achieves sustained clinical benefit, larger series with study of operative findings in recurrent cases is needed to clearly study the complications and the behavior of this implant material and compare those to teflon.

Disclosure:
The authors have no personal, financial or institutional interest in any of the drugs, materials, or devices described in this article.

REFERENCES