An analysis of failed microvascular decompression in patients with hemifacial spasm: focused on the early reoperative findings
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An analysis of failed microvascular decompression in patients with hemifacial spasm: focused on the early reoperative findings

Jun Zhong · Jin Zhu · Shi-Ting Li · Xin-Yuan Li · Xu-Hui Wang · Min Yang · Liang Wan · Hong-Xin Guan

Abstract

Background Although the microvascular decompression (MVD) has become a definitive treatment for the primary hemifacial spasm (HFS), there still are some failed cases. To obtain a satisfactory postoperative outcome, those failure cases of MVD need to be analyzed.

Method Between January and October 2009, 393 patients with primary HFS underwent MVD. Postoperatively, 375 presented complete spasm-free, 7 improved apparently, and 11 without any improvement at all. A reoperation was performed in 9 of the 11 patients who had poor outcome within 5 days. Those redo MVD cases were reviewed.

Findings After the reoperation, the symptom of those patients all disappeared immediately. Therefore, the final outcomes were excellent in 97.7%, good in 1.8%, and poor in 0.5%. Up to the 1 year follow-up period, neither recurrence nor change was found. For the two patients without reoperation, their symptoms remained. The previous surgery was a failure due to insufficient decompression in two and conflict missed in seven.

Conclusions A successful MVD operation is attributable to a thorough exploration of the entire nerve course. An early relief should become the ambition of the operator while performing MVD.

Keywords Hemifacial spasm · Reoperation · Microvascular decompression · Surgery · Outcome

Introduction

The microvascular decompression (MVD) has become a definitive treatment for the primary hemifacial spasm (HFS) because it is less invasive and produces excellent results including the preservation of vascular and neural function [5, 13, 15, 18]. According to the literature, the cure rate of MVD for HFS varied from 70% to 98% [3, 6, 14]. Some authors [8, 12] believed that there was still the possibility of symptom relief within 1 year, yet they could not provide a reasonable explanation [16]. To refine the MVD surgery and increase the early cure rate, we made a retrospective study and put an emphasis on those patients with poor postoperative outcome.

Methods and materials

Patient’s data

From January to October 2009, 393 patients with primary HFS were operated on by the senior author from the Department of Neurosurgery, XinHua Hospital, Shanghai JiaoTong University School of Medicine. The present study focused on nine patients, who underwent redo MVDs due to the unimproved symptom. Those patients included three...
men and six women from age 24 to 69 (mean 49 years old). The symptom occurred in the left side in four, right in five. The interval between the two operations was 2–5 days (Table 1).

Surgery

The operation was performed with a routine retrosigmoid approach [10]. The dissection was started from the caudal cranial nerves. While the arachnoid membrane between VII and VIII and the caudal cranial nerves being opened sharply, the cerebellum as well as flocculus was gradually raised until the pontomedullary sulcus was visualized. Tracing the offending vessel was begun from zone 2 and then moved to zones 3, 1, and 4 [Zone 1, where the nerve emerges to the brainstem surface from the parenchymal and goes through the pontomedullary sulcus; Zone 2, where the root attaches to the surface of the pons; Zone 3, where it is gradually transiting to be narrower, which corresponds to the Obersteiner–Redlich zone (the traditional REZ); Zone 4, where the nerve fibrins separates from the brainstem and extends to the internal meatus [1] (Fig. 1)]. The neurovascular relationship was carefully studied to identify the vessel in contact with the facial nerve. After the offending vessel was moved away from the nerve, small pieces of shredded Teflon sponge were gently placed between the vessel and the nerve. For those reoperative patients, the previous conflict site was double checked again firstly to confirm that a satisfied decompression was completed. Then the zone 4 of the facial nerve root was dissected thoroughly, and any artery relevant to the nerve was moved away followed by placement of Teflon between them. Any suspicious venule in contact with the nerve was coagulated with low power. After thorough irrigation to make sure there was no bleeding, the dura mater was closed. A duragen was placed over the suture line. A cranioplasty of titanium wire mesh was completed. The incision was closed without drainage.

Follow-up and outcome evaluation

The patients were followed up every 3 months via telephone or clinic interview. The outcome was defined as excellent (total spasm-free), good (occasional spasm, but the degree and frequency were improved apparently), and poor (no relief).

Results

Outcome

Among the 393 patients, after the first operation, 375 presented complete spasm-free (excellent, 95.4%), 7 improved apparently (good, 1.8%), and 11 without any improvement at all (poor, 2.8%). Except for two patients who refused the reoperation, the remaining nine patients underwent the MVD once more. Eventually, their symptoms were all gone immediately following the redo MVD. Therefore, the final outcomes were excellent in 97.7% (384/393), good in 1.8% (7/393), and poor in 0.5% (2/393). Up to the 1 year follow-up period, neither recurrence nor change was found. For the two patients without reoperation, their symptoms remained.

Surgical findings in the reoperation

The nine patients who underwent twice MVD were focused. In the first operation, the offending artery had been regarded as anterior inferior cerebellar artery (AICA) in six, AICA associated with vertebral artery (VA) in two, VA with posterior inferior cerebellar artery (PICA) in one. The conflict site had been believed in zone 1 in two, zones 1 and 2 in seven. An apparent indentation by the offending artery was found in the nerve in six. The offending artery merely contact with the nerve in three.

Table 1 Data of patients with redo MVD

<table>
<thead>
<tr>
<th>Patient no.</th>
<th>Sex</th>
<th>Age (year)</th>
<th>Side</th>
<th>History (year)</th>
<th>Final outcome</th>
<th>Complication</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>F</td>
<td>43</td>
<td>L</td>
<td>11</td>
<td>Excellent</td>
<td>None</td>
</tr>
<tr>
<td>2</td>
<td>F</td>
<td>69</td>
<td>R</td>
<td>3</td>
<td>Excellent</td>
<td>None</td>
</tr>
<tr>
<td>3</td>
<td>F</td>
<td>24</td>
<td>R</td>
<td>3</td>
<td>Excellent</td>
<td>None</td>
</tr>
<tr>
<td>4</td>
<td>F</td>
<td>42</td>
<td>L</td>
<td>6</td>
<td>Excellent</td>
<td>Incomplete facial palsy 13 days after the redo MVD</td>
</tr>
<tr>
<td>5</td>
<td>M</td>
<td>55</td>
<td>L</td>
<td>4</td>
<td>Excellent</td>
<td>None</td>
</tr>
<tr>
<td>6</td>
<td>M</td>
<td>62</td>
<td>R</td>
<td>6</td>
<td>Excellent</td>
<td>None</td>
</tr>
<tr>
<td>7</td>
<td>F</td>
<td>51</td>
<td>R</td>
<td>1/3</td>
<td>Excellent</td>
<td>None</td>
</tr>
<tr>
<td>8</td>
<td>M</td>
<td>55</td>
<td>L</td>
<td>6</td>
<td>Excellent</td>
<td>None</td>
</tr>
<tr>
<td>9</td>
<td>F</td>
<td>41</td>
<td>R</td>
<td>13</td>
<td>Excellent</td>
<td>None</td>
</tr>
</tbody>
</table>

*F* Female, *M* male, *y* year(s), *R* right, *L* left, *d* day(s), *MVD* microvascular decompression
In the reoperation, a new (real) conflict site was discovered in seven, although it was caused by the same offending artery (Fig. 2). It was demonstrated that the artery touched the nerve in three; the artery compressed the nerve and which was even deviated in four. One patient was realized that the real offending vessel was a vein that went through between facial and vestibulocochlear nerves, which was then coagulated and cut. One patient was found that a satisfied decompression had not been obtained without sufficient Teflon. Therefore, the reason of the failed surgery was that decompression was not enough in two and conflict missed in seven (Table 2).

Table 2  Surgical findings for those redo MVD patients

<table>
<thead>
<tr>
<th>Patients</th>
<th>1st MVD</th>
<th>2nd MVD</th>
<th>Failure reason of the 1st MVD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Offending artery/arteries</td>
<td>Conflict site (zone)</td>
<td>Severity of compression</td>
</tr>
<tr>
<td>1</td>
<td>VA+PICA</td>
<td>2 and 3</td>
<td>Indentation</td>
</tr>
<tr>
<td>2</td>
<td>VA+AICA</td>
<td>3</td>
<td>Indentation</td>
</tr>
<tr>
<td>3</td>
<td>AICA</td>
<td>3</td>
<td>Indentation</td>
</tr>
<tr>
<td>4</td>
<td>AICA</td>
<td>2 and 3</td>
<td>Indentation</td>
</tr>
<tr>
<td>5</td>
<td>AICA</td>
<td>2 and 3</td>
<td>Indentation</td>
</tr>
<tr>
<td>6</td>
<td>AICA</td>
<td>2 and 3</td>
<td>Contact</td>
</tr>
<tr>
<td>7</td>
<td>AICA</td>
<td>2 and 3</td>
<td>Contact</td>
</tr>
<tr>
<td>8</td>
<td>VA+AICA</td>
<td>2 and 3</td>
<td>Indentation</td>
</tr>
<tr>
<td>9</td>
<td>AICA</td>
<td>2 and 3</td>
<td>Contact</td>
</tr>
</tbody>
</table>

MVD Microvascular decompression, VA vertebral artery, PICA posterior inferior cerebellar artery, AICA anterior inferior cerebellar artery

a AICA went through between facial and acoustic nerves

b A vein went through between facial and acoustic nerves

c Decompression between AICA and the nerve was not enough
Complications

Among all 393 patients, the postoperative complications were observed as hearing deterioration in 11 (2.8%), cerebrospinal fluid (CSF) leak in two (0.5%), hoarseness and choke in one (0.3%), and incomplete facial palsy in nine (2.3%). No infection was found. Among those who underwent redo MVD, no complication was showed except for one who occurred incomplete facial palsy 13 days after the second surgery. In the period of follow-up, the symptom of facial palsy had been all improved apparently. However, only 3 of the 11 hearing disorder patients had been improved.

Discussion

Even if MVD has been regarded as the most effective treatment of HFS, the rate of complete spasm-free, especially at the early stage of the surgery, varied in different centers [7, 11, 12]. This is because some authors believed that delayed relief would occur within 1 year [2, 4, 9, 11, 17]. Nevertheless, with our experience of more than 1,000 MVDs, the delayed rate has been less than 5%. In the present study of 393 HFS patients, we have not observed any delayed relief in the up to 1 year follow-up period for those non-improved patients. Contrarily, the symptoms of the nine patients who underwent redo MVDs all disappeared after the reoperation. We believe that the chance of delayed relief is very little for the following patients: (1) the diagnosis of primary HFS was definitely confirmed and the symptom presented was only in one side; (2) those without any improvement posterior to the first operation; (3) an entire nerve root was not dissected thoroughly in the first MVD; (4) the offending artery was suspicious referring to the surgical video record. Accordingly, we would rather do a reoperation as soon as possible instead of expecting a delayed relief for the above patients. A later reoperation not only costs the patients more but also makes the surgery more difficult because of the adhesion developed with time. However, for those diagnoses that were not confirmed or those symptoms that appeared in both sides or symptoms improved at some degree, we prefer to follow them up for a while.

As the surgeon can never guarantee the postoperative result before the surgery and more dissection may increase the chance of complication, it would stress both the operator and the patient to make a decision to redo the surgery. Therefore, the surgeon should not make a hurried decision to reoperate the patient without an adequate preparation. Prior to the second surgery, the operator needs to review the surgical video record in detail and meticulously analyze the possible reason for the failed surgery. Each step should be double checked, e.g., the opening of the arachnoids, exploration of the facial nerve, identification of the offending vessel, and the decompression of the neurovascular conflict, etc.

In order to achieve a satisfied outcome without enhancing the complication, a normative operative process and a real-time monitoring of the nerve function is mandatory. Therefore, a minimal invasive microsurgery is recommended. While opening the arachnoids around the nerve, those feeding arterioles should be saved. While mobilizing the offending artery, the retraction of the nerve should be avoided. When vasospasm was observed, the operation should be paused and sometimes narcine was used. When the coagulation of the vein is required, it should be far away from the nerve with a lower power. As the aim of the redo MVD is to find the real offending vessel and obtain a sufficient decompression of the entire intracranial nerve root. The following points is important for a redo MVD procedure: (1) to withdraw all the Teflon in search of any missed arteriole and then to trace the course of the artery which had been isolated by the Teflon to discover the real conflict site; (2) to dissect the entire intracranial nerve root, especially at zoon I (in the pontomedullary sulcus) and zoon IV (in the cistern) as well as the rostral portion of the nerve; and (3) any suspicious vessel should be managed including venules.

Eventually, it was concluded that an entire nerve root exploration is the key to lead a successful MVD operation. For those without any improvement after the surgery, an early redo MVD is adoptable.

Conflicts of interest None.

References


Comment

This paper reports the practical experience of a very experienced team on MVD for primary Hemi Facial-Spasm (HFS). The authors advocate immediate reoperation after failed MVD. The strong belief of the authors is that disappearance of spasms must be obtained as soon as surgery is completed, and if not, that the patient should have re-exploration the first few days after initial surgery. The authors provide arguments for defending this attitude.

Our experience, as well as the one from other, quoted in this article, is far from to be the same as the Shanghai group’s experience. In our past published series of 147 patients followed over more than 1 year and up to 20 years (7 years on average), the long-term cure rate (=total disappearance of symptoms, confirmed by post-op facial EMG, i.e., an excellent result) was of 75%. In addition other 12% had good outcome (=no disabling symptoms in the practical daily life, in spite of some remaining occasional spasms on emotional events). Important to say 13% in the group of patients with excellent or good outcome had a delayed cure of 3 months to 1 year (three for 3 years long). Even more, most of our patients had some remaining facial muscular twitches during the first week after surgery!

Our surgery consisted of:
1. infero-lateral floccular approach of brainstem in between lower cranial nerves (IX–X) caudally and VII–VIII complex rostrally,
2. complete exposure of the facial nerve from ponto-medullary sulcus to meatus,
3. total freeing of the root from arachnoidal adhesions,
4. dissection/separation of the compressive vessels (several in 35% of patients), excepted the one(s) entering the auditory meatus,

Delay in cure can be explained: 1) by little (if not always absence of) surgical manipulations of the facial nerve while doing decompression, 2) by the care taken with the inserted material to maintain the conflicting vessel(s) apart (a small piece of Teflon plate) not to compress, even if possible not to touch at all the facial nerve. This hypothesis is consistent with the putative pathophysiological mechanisms of primary HFS. According to Möller [Möller A. (1999). Vascular compression of cranial nerves. Pathophysiology. Neurol. Resarch 21: 439–443], primary HFS would be due to hyperactivity of the facial nucleus, progressively induced by the chronic compression pulsation of the neuro-vascular conflict, especially at REZ. Thus it would be physiologically logical that the effect of surgical decompression take time to decrease and normalize. The immediate effect of MVD by the Shanghai team might be linked, not only to a very well-performed decompression, but also to a certain degree of “neo-compression” of the facial nerve by the interposed Teflon ball / pledget. This neo-compressive effect might generate an at least mild and transient conduction block.

We however agree with professor Zhong that early re-operation could be indicated when attacks of spasms are not significantly alleviated before the planned discharge, but in very specific situations. The first one would be if the entire root was not completely explored due to some (anatomic?) dangerous reasons, for the search of a missed other compressive vessel (in 35% of our cases, several vessels, almost always arteries, contributed to the disease). The second one would be if a potentially offending artery was left in place, especially at the porus of the interval auditory canal, because it was estimated risky to mobilize and transpose it for the hearing function.

We do not think there is a reliable mean to ascertain the completeness of decompression, with the exception of complete checking of the facial root from brainstem to meatus. To be mentioned, after a 3 year experience we abandoned intraoperative EMG monitoring of Lateral spread motor responses, due to practical lack of reliability [Sindou M. (2005) Microsurgical decompression for primary hemifacial spasms. Importance of intraoperative neurophysiological monitoring. Acta Neurochirurgica 147: 1019–1026]

For concluding, excepted in very limited circumstances, we strongly advise to wait, in the order of 1 year after initial surgery, before taking decision for reoperation.

Marc SINDOU
Lyon, France