Acta Neurochir (Wien) (2000) 142: 901–907

Acta Neurochirurgica

Printed in Austria

Microvascular Decompression of the Facial Nerve for the Treatment of Hemifacial Spasm: Preoperative Magnetic Resonance Imaging Related to Clinical Outcomes

S. S. Chung[1], **J. W. Chang**[1], **S. H. Kim**[1], **J. H. Chang**[1], **Y. G. Park**[1], and **D. I. Kim**[2]

[1] Department of Neurosurgery, Yonsei University College of Medicine, Seoul, Korea
[2] Department of Diagnostic Radiology, Yonsei University College of Medicine, Seoul, Korea

Summary

Background. The objective of this study was to investigate the role of preoperative three dimensional short-range magnetic resonance angiography (3D-TOF MRA) in predicting the clinical outcomes following microvascular decompression for the treatment of hemifacial spasm.

Method. Preoperative magnetic resonance (MR) imaging was performed on all patients with hemifacial spasm (564 cases) between January 1992 and September 1998. Of the 564 patients, 440 patients were included in this retrospective study. The presence of vascular contact, offenders, and anomalies in the vertebro-basilar system, were determined by 3D-TOF MRA prior to microvascular decompression of the facial nerve. The preoperative findings were compared with the surgical findings and clinical outcomes.

Findings. A correlation was found between the clinical outcome ($p < 0.01$) and the presence of a vascular indentation at the root entry zone (REZ) of the facial nerve. A shift of the vertebrobasilar system to the symptomatic side was found in 214 (48.6%) patients with hemifacial spasm, compared to only 10 (13.5%) patients in the control group ($p < 0.01$). The unilateral vertebral artery was observed in 43 (9.8%) patients with hemifacial spasm and in 8 (10.8%) of the control patients. A hypoplasia of the artery was found in 8 (1.8%) patients with hemifacial spasm and in 1 (1.4%) control patient. The compressing offenders in the patients, discovered by MRI in conjunction with MRA, were as follows: 45.9% (202 patients) in the anterior inferior cerebellar artery (AICA), 34.8% (153 patients) in the posterior inferior cerebellar artery (PICA), 12.5% (55 patients) in the vertebral artery (VA) and 6.8% (30 patients) in multiple vessels. In contrast to the compressing offenders seen on the MRA, the offenders confirmed during surgery were as follows: 43% (189 patients) in the AICA, 36.4% (160 patients) in the PICA, 1.4% (6 patients) in the VA, 19% (84 patients) in multiple vessels, and 0.2% (1 patient) in the vein.

In our long-term follow-up series of the 440 patients with hemifacial spasm, an excellent surgical outcome was obtained in 86.3% of cases and a good outcome was achieved in 6.4% (mean follow-up duration, 45.5 months).

Interpretation. Preoperative 3D-TOF MRA can identify the relationship between the facial nerve and adjacent vessels in patients with a hemifacial spasm and assist in preoperative planning. This study suggests that 3D-TOF MRA is useful for selecting appropriate patients for surgical treatment and, to some extent, as an additional role for predicting the clinical outcome.

Keywords: Hemifacial spasm; microvascular decompression; magnetic resonance angiography; facial nerve.

Introduction

A hemifacial spasm is a disorder that is characterized by complex symptoms related to the hyperactive motor dysfunction of the facial nerve [11]. Although hemifacial spasm is not a life threatening disease, it often causes distress, serious social or psychological dysfunction, in addition to difficulties in conversation, reading, and driving. A clinical diagnosis of hemifacial spasm is usually made from the patient's symptoms and signs without the need for confirmation by electrophysiological or imaging studies [9, 11]. It is generally believed that hemifacial spasm is caused by vascular compression of the root entry zone (REZ) of the facial nerve. Microvascular decompression (MVD) of this facial nerve has been established as one of the standard treatments for hemifacial spasm [2, 3, 11, 13, 15]. In the majority of cases reported in the literature, one artery compresses the REZ of the nerve at a single point [3, 9, 12, 13, 15, 23]. Recently, three dimensional short-range magnetic resonance angiography (3D-TOF MRA) has proved to be the method of choice for investigating the cerebellopontine angle, particularly, the neurovascular relationship in patients with hemifacial spasm and trigeminal neuralgia [5, 7, 10, 16, 19]. To our knowledge, there is a paucity of studies relating to evaluating the preoperative MR findings in terms of predicting the clinical outcome of a large number of patients. The main objectives of this study were to investigate the role of preoperative 3D-TOF MRA in predicting the clinical outcome fol-

lowing MVD treatment of a hemifacial spasm. An additional aim was to investigate the anatomy of the vertebrobasilar system in patients with hemifacial spasm using MR imaging.

Patients and Methods

Patient Population

A total of 931 microvascular decompressions for hemifacial spasm were performed at Yonsei University Hospital between August 1978 and September 1999. All patients after January 1992 who were diagnosed with a hemifacial spasm were evaluated by 3D-TOF MRA. A total of 564 microvascular decompressions of the facial nerve were performed between January 1992 and September 1998. Patients with a symptomatic hemifacial spasm caused by either tumors or other vascular lesions including dolicho-ectasia were excluded. Among those 564 patients, 124 patients were also excluded from this study, as they were presented less than 12 months ago or they were unable to be followed up. Thus in this investigation, the results of 440 patients were analyzed.

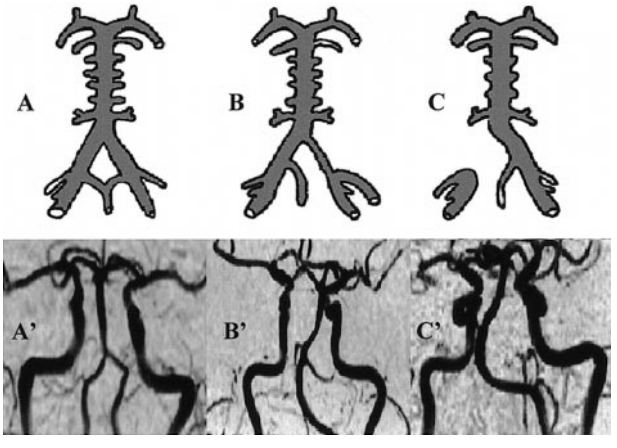

Fig. 1. Upper: Schematic drawing of three distinctive different types of the vertebral anomalies. (A) Normal appearance of the vertebral arteries. (B) Hypoplasia of the vertebral artery. (C) Nonvisualization of the vertebral artery. Lower: Three different types of vertebral arteries by 3D-TOF MRA in patients with a hemifacial spasm. (A′) Normal appearance of the vertebral arteries. (B′) Hypoplasia of the vertebral artery. (C′) Nonvisualization of the vertebral artery

Magnetic Resonance Imaging Evaluation

A preoperative magnetic resonance evaluation was performed using a 1.5-Tesla imaging system (Signa; GE Medical Systems, Milwaukee, WI). To exclude the possibility of organic diseases, a 3-D TOF MRA was obtained. The sequences included a multiplanar spoiled gradient echo sequence (SPGR) (TR = 42 msec, TE = 6.9 msec). The image slice thickness was 1 mm with an interslice gap of 0 mm. Using axial images for 3D-TOF MRA, the REZ of the facial nerve on both sides of the pontomedullary junction was evaluated for compression by the radiologist (without being given any knowledge of which side the spasm was located).

The criteria for vascular compression was the presence of prominent vessels existing in contact with the visualized segment or with the REZ of the facial nerve. In addition to vascular compression, if the compressing offender was buried in the brain stem at the REZ of the facial nerve, it was considered as a vascular indentation.

The appearance of the vertebral artery (VA) were classed into 3 groups: normal, hypoplasia, and nonvisualization (Fig. 1). *Hypoplasia* was defined as the diameter of one VA being less than 1/3 of the contralateral VA observed by MRA. *Nonvisualization*, a substitute for aplasia, was indicated by an absence of VA shadowing as indicated by MRA.

The ectatic shifting of the VA was also classed into two groups (Fig. 2). If one VA deviated above the carotid system, it was regarded as a shifting of the VA. If not, it was regarded as non-shifting. Figure 3 shows the posterior inferior cerebellar artery (PICA) offender in contact with the REZ of the facial nerve without making any vascular indentation. This vessel was verified in the operative field. Figure 4 shows multiple offenders with a vascular indentation, which were also verified during surgery. In addition to this study, as a control, the MRA of 74 patients who had no brain disease was evaluated and compared with the results of patients with hemifacial spasm.

Clinical Assessment and Follow-Up Review

The operative findings, complications, and the presence or absence of hemifacial spasm at the time of hospital discharge were prospectively recorded. An assessment of the clinical results was performed on all patients by personal interview or by telephone. All patients received a questionnaire, which addressed the presence or absence of hemifacial spasm, in addition to the persistence of any operative complications. Personnel other than the operating surgeons performed clinical assessments and interpretation of questionnaires in all cases. The patients were classified in 5 groups. A grade of "excellent" was assigned the hemifacial spasm was absent. A grade of "good" was assigned if the hemifacial spasm was more than 90% resolved. A grade of "fair" was assigned if the hemifacial spasm was more than 50% resolved. A grade of "poor" was assigned if the hemifacial spasm was less than 50% resolved. All other results were assigned a grade of "failure". The results were recorded prospectively in database form.

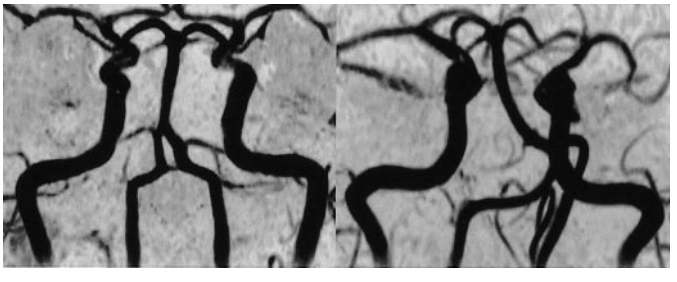

Fig. 2. 3D-TOF MRA illustrating the ectatic unilateral shifting of the vertebral artery. Left: Preoperative 3D-TOF MRA demonstrating a non-shifting of the vertebral artery. Right: If one vertebral artery deviates above the carotid system, it was regarded as a unilateral shifting of the vertebral artery

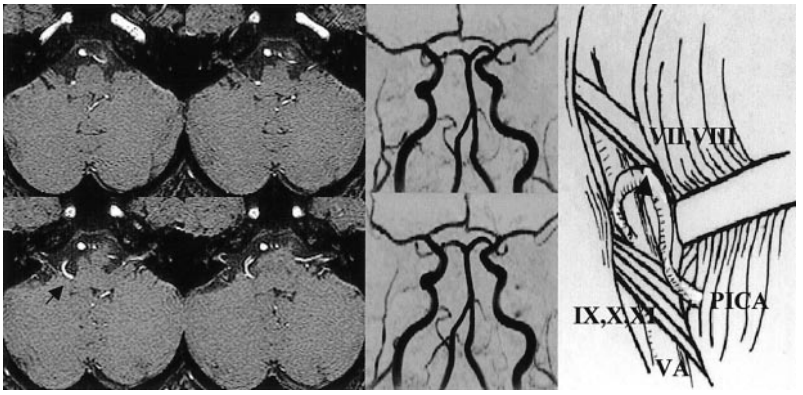

Fig. 3. 3D-TOF MRA (left, center) showing the PICA as an offender with an indentation of the REZ of the facial nerve (black arrow). Schematic drawing showing a vascular contact (black arrow) of the PICA at the REZ of right facial nerve (right)

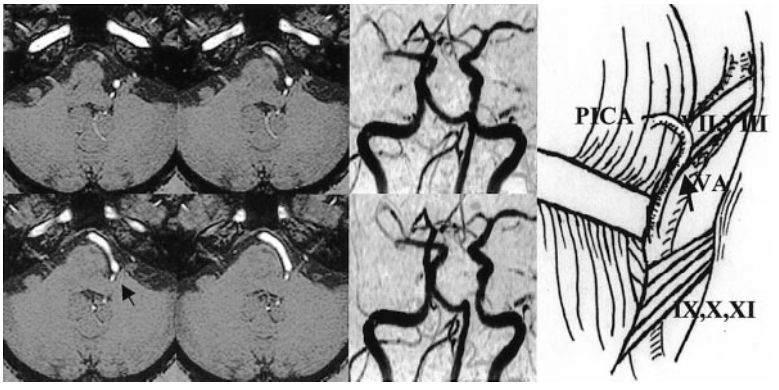

Fig. 4. MRI (left) in conjunction with MRA (center) showing multiple offenders with the PICA and the VA with a vascular indentation of the brain stem (black arrow). Right photograph showing intra-operative finding of a vascular indentation of the REZ of the facial nerve by multiple vessels at the REZ of right facial nerve (black arrow).

Statistical Analysis

Statistical analyses were conducted to examine the role of 3D-TOF MRA on the diagnosis of hemifacial spasm and the clinical outcome. The differences between the MR imaging findings and those from surgical findings were assessed using a two-tailed, unpaired, Student's t-test or the chi-square test. A Cox proportional hazards model was used to evaluate the prognostic importance of the patient's age, gender, symptom duration, VA anomalies on MR imaging, offenders on MR imaging, vascular indentation on MR imaging, offenders on the operative finding and vascular indentation on the operative findings with the clinical outcomes. A probability of less than 0.05 was considered significant.

Results

Clinical Features

The ratio of male to female was 1 : 4.6. The left side was involved more frequently than the right side (right : left = 1 : 1.12). The mean age of the control group was 51. The patients' age ranged from 22 to 71 with a mean age of 50. The mean symptom and post-surgical follow-up duration was 7.8 years and 45.5 months, respectively. Operations were performed according to a previously described technique [9].

Preoperative 3D-TOF MRA

Of 440 patients, vascular abnormalities were detected in 51 (11.5%) using MRA. Nonvisualization of the VA was found in 8 patients (1.8%) and hypoplasia in 43 patients (9.8%). Three hundred and eighty nine patients (88.5%) showed a normal-sized VA. In case of the control patients, nonvisualization of the VA was found in 1 patient (1.4%) and hypoplasia was found in 8 patients (10.8%). Sixty-five control patients (87.8%) showed a normal-sized VA. These data therefore do not support a significant relationship between the appearance of a VA and hemifacial spasm ($p > 0.05$). In patients with hemifacial spasm, unilateral shifting of the VA was found in 214 patients (48.6%). However in the control patients, shifting of the VA was found in only 10 patients (13.5%). Thus these data suggest a significant relationship between shifting of the VA and occurrence of hemifacial spasm ($p < 0.05$).

The compressing offenders found by MRI in conjunction with MRA were as follows: 45.9% (202 patients) in the anterior inferior cerebellar artery (AICA), 34.8% (153 patients) in the PICA, 12.5% (55 patients)

Table 1. *Comparison of a Vascular Indentation by the Offenders Found in the Operative Field and on the MRI in 440 Patients*

	MR finding No. of patients	(%)	Operative finding No. of patients	(%)
Yes	95	21.6	99	22.5
No	345	78.4	341	77.5

Table 2. *Long-Term Surgical Outcomes in 440 Patients with Hemifacial Spasm*

Outcome	No. of patients	(%)
Excellent	380	86.3
Good	28	6.4
Fair	20	4.5
Poor	7	1.6
Failure	5	1.1

in the VA and 6.8% (30 patients) in multiple vessels. In comparison of the compressing offenders determined by MRA with those confirmed by surgery, they are as follows: 43% (189 patients) in the AICA, 36.4% (160 patients) in the PICA, 1.4% (6 patients) in the VA, 19% (84 patients) in multiple vessels, and 0.2% (1 patient) in the vein. Only 4 patients (5.4%) from the control group had compressing offenders but a vascular indentation of the facial nerve was absent. Vascular indentation of the facial nerve was another important finding of 3D-TOF MRA. It was determined that 21.6% of patients had a vascular compression by 3D-TOF MRA and 22.5% were determined by surgery (Table 1). Furthermore, there was a significant relationship between a vascular indentation found by MRI and at surgery ($p < 0.01$).

Clinical Outcomes and Preoperative Magnetic Resonance Imaging Findings

In our long-term follow-up series of 440 patients, an excellent surgical outcome was found in 86.3% of cases and a good outcome was found in 6.4% (Table 2). In the cases who showed improvement of symptoms of more than 90% ($n = 408$), 78.3% showed immediate improvement, 6.5% showed improvement within a month, and 15.2% had improved after one month. There was no significant relationship between the offenders and a delayed improvement of symptoms. The mean improvement time in patients who improved after one month was 5.7 ± 3.5 months. One patient failed to show any improvement until 12 months after surgery.

Table 3. *Cox Proportional Hazard Model Coefficients Showing Probability of Good Surgical Outcomes According to the Variables*

Variables	Multivariated *p*-value
General	
Age	0.53
Sex	0.94
Symptom duration	0.10
MR findings	
Type of VA	0.14
Type of offender	0.91
Shifting of VA	0.21
Vascular indentation	0.04
Operative findings	
Type of offender	0.14
Vascular indentation	<0.01

Two of the five failed patients had initial relief but symptoms re-occurred at 24 months and 64 months respectively. There were no operative deaths. However, there were two intracranial hemorrhages (0.45%). One patient had a serious brain stem hemorrhage adjacent to the operative site and required an emergency evacuation of the hematoma. Postoperatively, a patient had an ataxia and permanent weakness of the face and arm. Another patient had a cerebellar hemorrhage which was treated conservatively and has since returned to preoperative functional levels. Postoperative permanent severe facial weakness occurred in 3 patients (0.75%) and permanent total hearing loss occurred in 4 patients (0.9%). There were wound complications including cerebrospinal fluid leaks in 13 patients (2.95%).

The observed data (Table 3) fit the Cox proportional hazards model, which incorporated age, sex, symptom duration, VA anomalies, offenders, vascular indentation on MR imaging, offenders and vascular indentation as operative findings. The results that significantly related to the surgical outcome were the vascular indentation found on the 3D-TOF MRA ($p < 0.05$) and at operation ($p < 0.01$).

Discussion

The majority of hemifacial spasm patients have no abnormalities in the brain and fewer than 1% of patients have secondary causes such as tumors, vascular malformations, arachnoid cyst, etc [3, 17, 22]. The preferred theory of causation is a vascular compres-

sion of the facial nerve root adjacent to the pons [11, 18]. Although many approaches to treatment have been proposed, the most effective treatment is a microvascular decompression of the nerve, which in the majority of cases provides complete relief [9, 11, 13, 15].

In evaluating the relationship between the vessels and cranial nerves, the usefulness of MR imaging has been reported [5, 7, 16, 19]. Adler *et al.* [1] reported that MRA, in which tissue and arterial structures are displayed on the same image, detected an ipsilateral vascular compression of the facial nerve at the pons in 24 of 37 patients with hemifacial spasm. With 3D-TOF MRA, the branches of the vertebrobasilar arteries can be better visualized than with other MR imaging techniques and the relationship between arteries and the brain or nerve structures can become distinctly visible, unlike conventional catheter angiography [7, 8, 10, 14, 16]. Moreover, other pathological lesions such as atherosclerosis, aneurysm and AVM are excluded in axial T1 and T2-weighted investigations. In addition, by using preoperative MR imaging, a surgeon can more accurately evaluate the offender's origin. Since the field of view at operation is limited, the origin of the offender can be difficult to judge precisely [12].

Girard *et al.* [10] reported that MRI demonstrated a vascular contact in 100% of patients corresponding to the side of the patient's symptoms. Bernardi *et al.* [5] reported that only 65% of patients showed vascular compression on MRA. In this study, offenders were detected in all cases with hemifacial spasm. However, the offenders found by 3D-TOF MRA were somewhat different from those found at operation. This was especially so in cases with VA and with multiple offenders.

There are several possible reasons for this; first, demonstrations of tortuous vessels by MR techniques do not guarantee a vascular compression of the nerve or the REZ [18]. Normal control patients can also have a vascular contact and deformity of the brain stem. It is important to note that a tortuous VA does not have a clinical significance and its coming in contact with the nerve does not always produce a clinical problem [22]. Second, even though a thin 1 mm section was used for MR imaging, the detection of very small arteries and veins, in addition to the demonstration of the multiple offenders, is often impossible [14]. Third, multiple smaller arterioles may be involved along with the dominant larger offender such as a VA. Du *et al.* [7] suggested that the AICA running parallel to the VA was difficult to identify.

However, in contrast to the offenders, the presence of a vascular indentation caused by the offenders on preoperative 3D-TOF MRA was also well correlated with the operative finding ($r = 0.99$). All patients who showed a vascular indentation near the root entry zone of the facial nerve on preoperative MR imaging ($n = 95$) had a vascular indentation verified at operation ($n = 99$).

Although many reports in the literature suggest the surgical difficulty of cases when the offender was the VA or multiple vessels; there is some difference of opinion concerning the poor surgical outcome in those cases [5, 9, 15, 20, 23]. Bejjani & Sekhar [4] reported a suture technique for fashioning a sling to reposition the offending vessel and to relieve the vascular compression. Recurrence is also observed when an ectatic and redundant VA is affected and the offending artery has short perforators. Thus, there is insufficient room to reposition the offender, which may result in insufficient decompression. When recurrence of symptoms occurred in patients with hemifacial spasm or trigeminal neuralgia, they tended to have more than two offenders [21, 23]. This was attributed to the broader sensitive area over the REZ in those cases with multiple branch involvement. Therefore, the chance of recurrence was higher. However, the data in this study do not support a relationship between the outcome and the number of branches involved, nor of the reported poor surgical outcomes if the offender was the VA or multiple vessels.

However, the only significant variable to the surgical outcome in our series was a vascular indentation on the MR and the operative finding. In our series, all patients with a vascular indentation showed better surgical outcomes than those without ($p < 0.05$). These results suggested that a vascular contact alone might not be enough to change the myelin sheeth on the REZ in some patients. Thus, the presence of a vascular indentation in patients with hemifacial spasm may reinforce the change in the myelin sheath on the REZ which produces symptoms. Furthermore, the presence of causative vessels and a vascular indentation in patients with hemifacial spasm may be a good prognostic factor in predicting the clinical outcome.

Our data also suggest that there is no significant increase in VA anomalies in patients with hemifacial spasm and those of the control group. This finding is consistent with other studies [6, 24].

The authors determined that patients with hemifacial spasm (48.6%) had more shifting of the VA than control patients (13.5%). However, the ipsilateral or contralateral shifting of the vertebrobasilar system to the side of the hemifacial spasm did not correlate with the clinical outcome ($p > 0.05$). The data suggest that hemifacial spasm may be caused by unknown pathological changes in the vessels but not by a congenital problem such as a VA anomaly.

In summary, performing 3D-TOF MRA for patients with hemifacial spasm not only provides the surgeon with anatomical information for better planning successful surgery but also identifies whether other pathology such as tumors or aneurysms are present. This study also demonstrated that VA shifting and a vascular indentation on the REZ of the facial nerve can be successfully evaluated with 3D-TOF MRA. Finally, a positive correlation between good surgical results and the identification of a vascular indentation is suggested by this study. 3D-TOF MRA is useful in planning microvascular decompression surgery and which arteries need to be addressed at the time of surgery.

Conclusions

In conclusion, 3D-TOF MRA is useful for the identification of the causative vessels in patients with hemifacial spasm and planning operative procedures. Furthermore, early detection of vascular anomalies may possibly prevent complications arising from an unexpected aneurysmal rupture. Particularly, our data suggest that the results from 3D-TOF MRA are useful in predicting the surgical outcome of patients with hemifacial spasm.

References

1. Adler CH, Zimmerman RA, Savino PJ, Bernardi B, Bosley TM, Sergott RC (1992) Hemifacial spasm: evaluation by magnetic resonance imaging and magnetic resonance tomographic angiography. Ann Neurol 32: 502–506
2. Adams CBT (1989) Microvascular compression: an alternative view and hypothesis. J Neurosurg 57: 1–12
3. Barker FG, Jannetta PJ, Bissonette DJ, Shields PT, Larkins MV, Jho MD (1995) Microvascular decompression for hemifacial spasm. J Neurosurg 82: 201–210
4. Bejjani GK, Sekhar LN (1997) Repositioning of the vertebral artery as treatment for neurovascular compression syndromes. J Neurosurg 86: 728–732
5. Bernardi B, Zimmerman RA, Savino PJ, Adler C (1993) Magnetic resonance tomographic angiography in the investigation of hemifacial spasm. Neuroradiology 35: 606–611
6. Chun MH, Kwun HS (1985) Anatomical observation on the arteries of the brain in Korean Adults. II. Arteria vertebrobasilaris. JCMC (Seoul) 38: 463–478
7. Du C, Korogi Y, Nagahiro S, Sakamoto Y, Takada A, Ushio Y, Hirai T, Higashida Y, Takahashi M (1995) Hemifacial spasm; three-dimensional MR images in the evaluation of neurovascular compression. Radiology 197: 227–231
8. Felber S, Birbamer G, Aichner F, Poewe W, Kampfl A (1992) Magnetic resonance imaging and angiography in hemifacial spasm. Neuroradiology 34: 413–416
9. Fukushima T (1995) Microvascular decompression for hemifacial spasm: results in 2890 cases, In: Carter LP, Spetzler RF (eds) Neurovascular Surgery. McGraw-Hill, New York, pp 1133–1145
10. Girard N, Poncet M, Caces F, Tallon Y, Chays A, Martin-Bouyer P, Magnan J, Raybaud C (1997) Three-dimensional MRI of hemifacial spasm with surgical correlation. Neuroradiology 39: 46–51
11. Hansen C, Montgomery EB Jr (1995) Hemifacial spasm: medical treatment. In: Carter LP, Spetzler RF (eds) Neurovascular surgery. McGraw-Hill, New York, pp 1119–1131
12. Illingworth RD, Porter DG, Jakubowski J (1996) Hemifacial spasm; a prospective long term follow up of 83 cases treated by microvascular decompression at two neurosurgical centres in the United Kingdom. J Neurol Neurosurg Psychiatry 60: 72–77
13. Jannetta PJ (1980) Neurovascular compression in cranial nerve and systemic disease. Ann Surg 192: 518–524
14. Jespersen JH, Dupont E, Gelineck J, Lundorf E (1996) Hemifacial spasm: magnetic resonance angiography. Acta Neurol Scand 93: 35–38
15. Kondo A (1997) Follow-up results of microvascular decompression in trigeminal neuralgia and hemifacial spasm. Neurosurgery 40: 46–51
16. Kumon Y, Sakaki S, Kohno K, Ohta S, Ohue S, Miki H (1997) Three-dimensional imaging for presentation of the causative vessels in patients with hemifacial spasm and trigeminal neuralgia. Surg Neurol 47: 178–184
17. Maiuri F, Gallicchio B, Iaconetta G, Cinalli G (1990) Megadolichobasilar artery and acute cerebrovascular pathology. Neurol Res 12: 54–56
18. Matsushima T, Inoue T, Fukui M (1990) Arteries in contact with the cisternal portion of the facial nerve in autopsy cases: microsurgical anatomy for neurovascular decompression surgery of hemifacial spasm. Surg Neurol 34: 87–93
19. Nagaseki Y, Horikoshi T, Omata T, Ueno T, Uchida M, Nukui H, Tsuji R, Sasaki H (1992) Oblique sagittal magnetic resonance imaging visualizing vascular compression of the trigeminal or facial nerve. J Neurosurg 77: 379–386
20. Payner TD, Tew JM (1996) Recurrence of hemifacial spasm after microvascular decompression. Neurosurgery 38: 686–690
21. This article states that prognosis was less good when trigeminal neuralgia was of the atypical type and involved more than one division of the nerve.
22. Sprik C, Wirtschafter JD (1988) Hemifacial spasm due to intracranial tumor. An international surgey of botulinum toxin investigators. Ophthalmology 95: 1042–1045
23. Tien RD, Wilkins RH (1993) MRA delineation of the vertebral-basilar system in patients with hemifacial spasm and trigeminal neuralgia. AJNR 14: 34–36
24. Yasargil MG (1984) Microsurgical anatomy of the basal cisterns and vessels of the brain, diagnostic studies, general operative techniques and pathological considerations of the intracranial aneurysms. In: Yasargil MG (ed) Microneurosurgery. Georg Thieme Verlag, Stuttgart, pp 128–143

Comments

This is an interesting paper and a well-designed study. It is an impressive number of patients and it appears that the patient material is quite homogenous. An addition this very extensive material appears to have been uniformly heated. Therefore the paper has a considerate clinical interest

B. Meyerson

This article describes a very substantial experience of 440 cases explored. In the authors' series there was no major discrepancy between preoperative MRI findings and intra-operative anatomical observations. The main conclusion of this article which raises the question of the «preoperative MRI related to clinical outcomes» is that there is a significant positive correlation between good outcome and the presence of an indentation of the offending vessels in the REZ (at MRI study and operation).

On the basis of a personal experience of a hundred of cases explored, we agree that 3D-TOF MRA with transverse sections is a simple, reliable and effective method for identifying the neurovascular conflict(s) in the facial Root Exit Zone (1).

Our study protocol is the following: Fast 2-D sagittal Gradient Echo sequence to place the area of interest on the cerebello-pontine angle (pons/medulla oblongata junction), transverse 3D MRA acquisition, and additional transverse 3D Flash GE sequence (1).

Our intra-operative anatomical observations are very similar to the ones by the Seoul team. In our series, PICA alone was the conflict in 35%, AICA alone in 34%, VBA alone in 4%. There were multiple arterial conflicts (VBA + PICA and/or AICA) in 23%. We found a venous compression alone in 1%. There was no visible vascular compression, of any type, in 3% of the patients.

Concerning outcome, we also have a similar rate of relief after surgery; and like the authors we would like to emphasize the fact that relief of spasm can be delayed. About 60% of our patients had a delayed cure – from a few weeks to a few months. In three patients the cure occured after one-year (3 years and half! in a woman who had a very atrophic nerve at the root exit zone). A decision to wait before deciding on re-operation or resuming botulinic toxin injections is therefore important.

Reference

1. Froment JC, Ledelliou M (1997) Magnetic resonance imaging in hemifacial spasm. Hemifacial Spasm: a multidisciplinary approach. In: Sindou M, Keravel Y, Moller AR (eds) Springer, Wien New York, pp 63–73.

M. Sindou

Correspondence: Jin Woo Chang, M.D., Ph.D., Department of Neurosurgery, Yonsei University College of Medicine, CPO BOX 8044, Seoul, Korea.