

## Microvascular decompression for trigeminal neuralgia. A five - year follow - up study

Yot Navalitloha\*

Boonchouy Sahakitrungruang\*

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- Objective** : *To study outcome and complication of microvascular decompression for trigeminal neuralgia.*
- Design** : *Retrospective study.*
- Setting** : *Division of Neurosurgery, Department of Surgery, Chulalongkorn Hospital*
- Subjects** : *Thirteen patients who underwent retromastoid craniectomy/ craniotomy with microvascular decompression between 1996 and 1997 were interviewed and their records were reviewed.*
- Main outcome measure** : *Pain-relieved rate, recurrence rate and complications were recorded.*
- Results** : *There were 2 men and 11 women in this series. The age of the patients ranged from 31 to 72 years (mean 41.2 years). The mean follow-up period was 61 months with minimum postoperative period was 12 months. Ten patients (77%) have remained pain-free. There were 3 patients (23%) who had recurrent neuralgic pain. Five patients (38.8%) have had facial numbness and one patient (7.7%) has had hearing loss as their complications.*

**Conclusion** : *Microvascular decompression is effective procedure against trigeminal neuralgia and offers low morbidity and no mortality.*

**Key words** : *Microvascular decompression, Trigeminal neuralgia, The root entry zone, Facial sensory loss, Hearing loss.*

Reprint request : Navalitloha Y, Department of Surgery, Faculty of Medicine, Chulalongkorn University, Bangkok 10330, Thailand.

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- วัตถุประสงค์** : เพื่อศึกษาผลการรักษา, อาการแทรกซ้อนของการรักษาอาการปวดบริเวณใบหน้า ด้วยวิธี Microvascular decompression
- รูปแบบการวิจัย** : เป็นการศึกษาย้อนหลัง
- สถานที่ทำการศึกษา** : แผนกศัลยกรรมประสาท, ภาควิชาศัลยศาสตร์, โรงพยาบาลจุฬาลงกรณ์
- ผู้ป่วยที่ได้ทำการศึกษา** : ผู้ป่วย 13 ราย ที่ได้รับการผ่าตัดด้วยวิธี Microvascular decompression ระหว่างปี พ.ศ. 2529 ถึง 2540 ได้ถูกสัมภาษณ์และบันทึกประวัติผู้ป่วย ได้รับการทบทวน
- วิธีการศึกษา - วัตถุประสงค์** : ได้บันทึกอัตราการหายจากอาการปวดบริเวณใบหน้า, อัตราการกลับมามีอาการซ้ำ และอาการแทรกซ้อน
- ผลการศึกษา** : ในรายงานฉบับนี้ มีผู้ป่วยเพศชาย 2 ราย เพศหญิง 11 ราย อายุระหว่าง 31 ถึง 72 ปี (อายุเฉลี่ย 49.2 ปี) ระยะเวลาการติดตามผู้ป่วยหลังการรักษาเฉลี่ย 61 เดือน โดยมีระยะเวลาติดตามผู้ป่วยหลังการรักษาสั้นที่สุดเป็นเวลา 12 เดือน ผู้ป่วย จำนวน 10 ราย (77 เปอร์เซ็นต์) หายจากอาการปวดบริเวณใบหน้าผู้ป่วย 3 รายมีอาการปวด (23 เปอร์เซ็นต์) บริเวณใบหน้าอีกหลังจากการรักษาอาการแทรกซ้อนจากการรักษา พบว่ามีผู้ป่วย 5 ราย (38.8 เปอร์เซ็นต์) มีอาการชาบริเวณใบหน้า และมีผู้ป่วย 1 ราย (7.7 เปอร์เซ็นต์) มีอาการหูหนวก
- วิจารณ์และสรุป** : Microvascular decompression เป็นวิธีการที่มีประสิทธิภาพในการรักษาอาการปวดบริเวณใบหน้า วิธีนี้มีอาการแทรกซ้อนต่ำ และปลอดภัย

In typical trigeminal neuralgia, the patient reports severe paroxysms of pain in the trigeminal distribution, which typically last for a few seconds or up to minute. The description of the pain is characteristically consistent from patient to patient. The pain is a shooting, lancinating, electric shock-type pain occurring in volleys with an instantaneous onset and just as sudden termination. Between the severe jolts of pain, the patient is typically without symptoms. Occasionally, after severe or protracted bouts of pain, a dull background ache may be sensed in the affected area.

Microvascular decompression of the trigeminal nerve at its root entry zone is one of the methods currently available for the treatment of the trigeminal neuralgia. We have analyzed a small series of patients who underwent this procedure between 1986 and 1997 in an effort to learn about the outcome and complication of these patients.

### Method

This is a retrospective study. The record of all patients who underwent retromastoid craniectomy/craniotomy with decompression for trigeminal neuralgia between 1986 and 1997 at Division of Neurosurgery, Department of Surgery, Chulalongkorn Hospital were reviewed. An effort was made to contact all of these patients on January 1998, resulting in a total of 13 patients who form the basis of this report.

### Clinical Material

There were 2 men and 11 women in this series. The age of the patients ranged from 31 to 72 years with a mean age of 49.2 years. No patient had a history or symptoms of multiple sclerosis. All

patients had typical trigeminal neuralgic pain and were refractory to other therapy (Twelve patients were refractory to medical therapy, one patient was refractory to radiofrequency rhizotomy of trigeminal nerve). Although the distribution of the pain was not tabulated, the majority had pain in the second or third trigeminal division, or both, only a few ones had pain in the first division. The operation performed in each case consisted of a retromastoid craniectomy/craniotomy with decompression of the trigeminal nerve at the root entry zone by repositioning of arterial loops and interposition of pieces of Teflon felt. When veins were found compressing the nerve at the root entry zone, they were coagulated and divided. The minimum postoperative period was 12 months, and the mean follow-up period was 61 months.

**Table 1.** Characteristics of the Group.

Patient No.	Age (years)	Sex	follow-up period(months)
1	40	F	142
2	35	F	72
3	36	F	108
4	57	F	72
5	58	M	72
6	46	F	12
7	44	F	22
8	72	F	42
9	69	F	42
10	36	F	27
11	45	F	14
12	31	M	72
13	44	F	96
<b>Mean</b>	<b>49.2</b>		<b>61</b>

## Results

Ten patient (77%) have remained pain - free since initial procedure. There were 3 patients in whom the pain has recurred resulting in a 23 % recurrence rate. Two patients had minor recurrent pain which no medication was needed for pain controlling in one case and another case needed carbamazepine for pain controlling. One patient had major pain recurrence two years after initial operation. The patient had reoperated and was found superior cerebellar artery adhered to trigeminal nerve. After lysis adhesion, decompressing the artery and trigeminal nerve, he has had pain free since then.

The findings at operation are listed in Table 2. Definite compressing of the nerve by arterial loop or vein was found in all patients.

**Table 2.** Vessels found to compress the trigeminal nerve.

Vessel	No. of Patients	Per Cent
Superior cerebellar artery	9	69.2
Anterior inferior cerebellar artery	1	7.7
Superior petrosal vein	2	15.4
No name vein	1	7.7

There were no operative deaths or major strokes in this series of patients. Five patients (38.5%) have had facial numbness after the procedure. One patient (7.7%) has had hearing loss. No patient had meningitis or other complication.

## Discussion

The surgical treatment of trigeminal neuralgia closely parallels the development of modern neu-

rosurgery. Numerous surgical approaches to the problem have developed as a result of the uncertainty surrounding the etiology of the disease. One of the most controversial explanations for the disease currently is that is due to distortion and compression of the trigeminal nerve root entry zone by one or more tortuous vessels. Dandy<sup>(1)</sup> and, later, Gardner and Miklos<sup>(2)</sup> were the first to propose the vascular and compressive etiologies, respectively ; however, it was Janetta<sup>(3)</sup> who took the definitive step in developing and popularizing the posterior fossa microscopic neurovascular decompression operation for the treatment of trigeminal neuralgia. In the present series, the operating surgeons incriminated vessels as the cause of neuralgia in all cases. These figures certainly support the concept that trigeminal neuralgia is most commonly a consequence of mechanical distortion and irritation by vascular compression at the root entry zone. However, a small number of the patients in the series, and the lack of a control group in a living series of patients without symptoms make it very difficult to draw conclusions about a definite cause-and-effect sequence.

The recurrence rate of 23% (3/13 patients) found in this series is comparable with that reported in other series with relatively long follow-up period.<sup>(4-7)</sup> For comparison, it must be kept in mind that the patients in the present series were contacted at a minimum of 12 months and an average of 61 months after operation and the number of patients is too small, it needs to further collect for the larger series.

In our three recurrent cases, there were causative vessels that compressed the root entry zone of trigeminal nerve. All pathologic vessels or anatomy were not different to other successful cases. In a

major recurrent case who was reoperated to lysis adhesion and decompress trigeminal nerve because Teflon induced a foreign body reaction at root entry zone making the vessels contacted to the nerve. Recently, there is a report<sup>(8)</sup> that Teflon itself induced granuloma at root entry zone of trigeminal nerve causing recurrence of trigeminal neuralgia. Jannetta<sup>(9)</sup> has described causes of recurrent pain. He believed that accommodation of bridging veins after decompression the nerve is more common cause of recurrent pain. The vein will accommodate to the Teflon felt by stretching and becoming longer over time so that the Teflon felt is subsequently not large enough to hold the vein away from the nerve. It is again pulsating against the nerve. In case that the pontine surface veins causing trigeminal neuralgia, these veins have a great tendency to recollateralize after being coagulated and divided. They recollateralize on the average at 4 months postoperatively, but this may occur at any time from 3 to 5 months postoperatively or even many months later, causing recurrent pain at that time. The last possible cause is continuing elongation of the hindbrain arteries over the years which can change neurovascular relationships and cause recurrence either by compression from the same blood vessel or from a new one impinging on the trigeminal nerve.

The factors that appear to be significant in determining the good result in our small series are that definite vascular compression of trigeminal nerve is all found at the time of operation either arterial or venous cause<sup>(10)</sup> and patients selection which have typical trigeminal neuralgic pain.

In our small series, facial sensory loss was experienced in 5 patients (38.5%) that did not recover

after follow-up but in other series<sup>(11,12)</sup>, it was gradually regressed and completely disappeared by 1 year after surgery. Facial sensory loss frequently encounters in reoperated case which vein around or on the nerve is coagulated and divided so that surface vein should be coagulated and divided with the point of the forceps at a distance from the trigeminal nerve to avoid heat that can cause temporary or permanent numbness, transmitted to the nerve. Additionally, excessive compression of the nerve by a bulky implant (Teflon) and/or by a large ectatic artery plus an implant may cause numbness.<sup>(9)</sup>

Another complication is permanent hearing loss which encountered in a patient (7.7%) There are two types of deafness. One is sensorineural hearing loss which if partial, it will come back to or near normal and not pose a problem. If it is total, it will not recover. Another type which is more common, is partial and temporary. It is due to postoperative middle ear effusion accompanying by a sense of fullness in the ear. This is treated with Actifed<sup>®</sup> (Glaxo Wellcome) for 3 weeks and always return to normal.<sup>(9)</sup> To avoid this disabling complication, retraction to the cerebellum should be very gentle and retractor should not be placed too deep when looking for the eighth nerve caudally so as not to injure it. In addition, the brainstem auditory evoked potential monitoring is suggested that this form of monitoring is useful in preventing unnoticed eighth nerve traction or compression injury.<sup>(9)</sup> Nevertheless, both facial sensory loss and hearing loss found in our series is comparable with larger series.<sup>(5-7)</sup>

In our small series, there were no death or disabling strokes, but a review of larger series<sup>(4,6,7)</sup> indicates that a 1% mortality rate is to be expected

even in the most experienced hands. A 1% rate of nonfatal but disabling neurologic morbidity secondary to brainstem infarction, cerebellar hematoma, supratentorial infarction and hematomas, and air embolism has also been reported.<sup>(4-7)</sup>

## Conclusions

Trigeminal neuralgia is a benign, albeit very debilitating disease. Although its etiology remains obscure, current theory suggests mechanical irritation by an offending vessel at the nerve root entry zone of the trigeminal nerve. Numerous surgical and medical procedures are available which provide substantial relief for the majority of patients. Microvascular decompression is one of the most successful procedure against this disorder. The present study indicate that one can expect a 77% successful rate with low morbidity and no mortality. The recurrent pain does occur. Further studies are needed to document the true extent of this phenomenon.

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