Original Article

Intra-operative Findings in Microvascular Decompression for Trigeminal Neuralgia

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Objective: This retrospective review revealed the commonly compressed location and type of trigeminal nerve-compressing vessel. Despite there being many studies about the intra-operative findings vis-a-vis microvascular decompression, none focus on ethnic Thai patients who can be different at the microanatomic level of vessels.

Materials and Methods: The study was a retrospective cohort design; with data collected from the medical records at Srinagarind Hospital between 2010 and 2016 among patients who underwent microvascular decompression. Medical records were reviewed as well as the video of the first 200 surgical operations.

Results: From among the 200 cases who underwent microvascular decompression, the authors found that the compressing vessel was most commonly the superior cerebellar artery (66.7%), followed by the petrosal vein (33%), the transverse pontine vein (12%), and other vessels (<5%). Fifty cases (25%) were compressed by more than one vessel. In 80% of the cases of multiple vessels compression, the superior cerebellar artery was the major compressive vessel. Only 4 cases were compressed by unknown small vessels. The other 4 cases had no compressing vessels.

Conclusion: The superior cerebellar artery is the cause of 66.7% of compressive idiopathic trigeminal neuralgia, followed by veins (27.8%), while 25% have co-compression by both an artery and a vein. In 80% of cases, the superior cerebellar artery is the major compressive vessel.

Keywords: Trigeminal neuralgia, Microvascular decompression, Intraoperative findings

J Med Assoc Thai 2018; 101 (Suppl. 5): S163-S166
Full text. e-Journal: http://www.jmatonline.com

Trigeminal neuralgia has an incidence 12.6 per 100,000[1]. At Srinagarind Hospital, Khon Kaen University, 40 patients with naive trigeminal neuralgia present each year and a surgical treatment is performed every week as Srinagarind Hospital is the center for treatment of TN patients in cooperation with Khon Kaen University Dental Hospital. Patients are also referred from dentists across the northeast region of Thailand.

The surgical treatment of choice for idiopathic trigeminal neuralgia caused by neurovascular compression is microvascular decompression [MVD][2]; with the aim of separating all compressing vessels from the trigeminal nerve at the cerebellopontine angle space. By comparison with other surgical procedures, MVD will reduce pain by up to 90%. After surgery, 80%, 75%, and 73% of patients are pain free after 1 year, 3 years, and 5 years[3].

Using an operating microscope, the surgeon will draw the compressing vessel away from the trigeminal nerve[4]. Restricting the operation area without can reduce the injury to brain tissue, vessels, and other nerves. If the neurosurgeon knows the location where compression commonly occurs, and the common types of compressing vessels, they can perform the procedure with minimal complications and a lower rate of recurrence[5].

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Materials and Methods

This was a retrospective cohort study, with

How to cite this article: Kitkhuandee A, Kittiarnan P, Jorns TP, Thirapatarapan P, Thanapaisal C. Intra-operative Findings in Microvascular Decompression for Trigeminal Neuralgia. J Med Assoc Thai 2018;101;Suppl. 5: S163-S166.

data collected on trigeminal neuralgic patients. The inclusion criteria were patients diagnosed with TN, admitted in Srinagarind Hospital between April 2010 and March 2016 and treated by MVD procedure. This was a retrospective study, so patient names and any data specify to the patient or affecting the patient was censored. The study was reviewed and approved by the Khon Kaen University Ethics Committee (#HE571374).

The exclusion criteria follow. We excluded patients (a) having tumor compression (b) undergoing combined treatment for hemifacial spasm or glossopharyngeal neuralgia (c) having trigeminal neuropathic pain or (d) undergoing any percutaneous treatment of trigeminal neuralgia. The data for 200 cases were collected from medical records, microscopic finding from operative notes, and video recordings (i.e., 174 cases underwent operative microscopic recording. We also collected the demographic data including sex, age, and operating data (including location and site of lesion, type of compressive vessel, and compressive location-i.e., up (shoulder), down (axilla), proximal (root entry zone), or distal (before reaching dural cave). Double data entry techniques were used to ensure accuracy of the data. Frequency, ratio, and percentage were used to describe the data.

Results

The 200 cases from the medical records included 124 women and 76 men. Age ranged between 22 and 76 years (median 57). TN affected the left side in 70 cases, the right in 128 cases, and both sides in 2 cases.

The compressive vessel was most commonly a distributive single artery (119 cases), followed by a vein in 29 cases, 2 arteries in 10 cases, both an artery and a vein in 36 cases, 2 veins in 4 cases, by an unknown small vessel in 4 cases, and by no vessel in 4 cases (Table 1).

Of the 250 compressive vessels, most (150 vessels or 66.7%) were the superior cerebellar artery[6], followed by the veins (69 vessels or 27.6%), arteries other than the superior cerebellar artery (14 vessels), and unknown small vessel (4 vessels).

With respect to compressing location, the superior cerebellar artery compressed the nearby pons from the shoulder of the root entry zone when other types of arterial vessels mostly compress at the axilla of the root entry zone. The petrosal vein compressed the nearby pons from below; the cerebello-medullary vein commonly compressed distal from the pons near the Gasserion ganglion (below and distal to the root entry zone); and the transverse-pontine vein compressed near the pons (i.e., the shoulder of the root entry zone). Overall, most of the veins compressed at nonspecific locations (i.e., both distal-below the side where the unknown small vessel mostly compressed at the same location as the SCA (Table 2).

Table 1. Type of compressive vessels (n = 200 cases)

First compressive vessel	Second compressive vessel	Number of cases
SCA	-	105
AICA	-	10
Vertebral artery	-	4
SCA	AICA	1
SCA	Basilar artery	3
SCA	Petrosal vein	18
SCA	Cerebello-medullary vein	8
SCA	Transverse pontine vein	14
Transverse-pontine vein	Cerebello-medullary vein	6
Cerebello-medullary vein	-	4
Petrosal vein	-	15
Transverse pontine vein	-	4
Undertermined small vessel	-	4
No compressive vessel	-	4
		200

SCA = superior cerebellar artery; AICA = anterior inferior cerebellar artery

Discussion

The most compressive vessel was the superior cerebellar artery (66.6 %)[6] followed by veins (27.6%); this finding contrasts with previous studies. Compression by more than one vessel (25%) was most commonly by the superior cerebellar artery (80%). and another vessel The most common site of compression was the root entry zone and that was commonly associated with the superior cerebellar artery and veins[7]. Other arteries were commonly compressed at the axilla to the root entry zone. Unknown vessels were compressed at the shoulder to the root entry zone in 4 of 5 cases.

According to the results, the type of vessel and the compressed location are reasonably explained by the anatomy of the cerebral vessels as reported in previous studies. In the current study, by contrast, the number of compressive vessels being more than one was greater (25%) as was the proportion of compressed veins[8]. In an operation, the neurosurgeon should explore the trigeminal nerve throughout its length, both the upper and lower side, as well as the proximal and distal end, so as to ensure that there is no second compressive vessel that might cause post-operative pain.

Conclusion

The descending rank of most commonly causative compressive vessel for trigeminal nerve in the trigeminal neuralgic patient was superior cerebellar artery (66.7%), veins (27.8%), and co-compression by an artery and a vein (25%), which in 80% of cases again included the superior cerebellar artery.

What is already known on this topic?

The types of vessels and the compressive location are reasonably explained by the anatomy of cerebral vessels.

What this study adds?

The proportion of compressive vessels cases and vein compressive cases over against single vessel cases found in the current study was greater than previously reported. In an operation, the neurosurgeon should explore the trigeminal nerve throughout its length (both the upper and lower side and both the proximal and distal end) in order to rule out any second compressive vessel that may cause post-operative pain.

Acknowledgements

The authors thank (a) the Khon Kaen University Neuroscience Research and Development Group for financial support; (b) the Tawanchai Foundation for Cleft Lip-Palate and Craniofacial Deformities and the Center of Cleft Lip-Cleft palate and Craniofacial Deformities, Khon Kaen University under Tawanchai Royal Grant Project for support; and, (c) Mr. Bryan Roderick Hamman for assistance with the English-language presentation of the manuscript.

Potential conflicts of interest

The authors declare no conflicts of interest.

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Table 2. Amount of vessels classify by type and compressed trigeminal nerve location (n = 250 vessels)

Type of vessel	From all 250 vessels	Compressed above and distal to root entry zone	Compressed at shoulder of root entry zone	Compressed below and distal to root entry zone	Compressed at axillar of root entry zone
SCA	150	61	89	0	0
AICA	12	0	0	6	6
Vertebral artery	4	0	1	1	2
Basilar artery	3	1	2	0	0
Petrosal vein	33	1	2	24	6
Cerebello-medullary vein	12	0	0	3	9
Transverse-pontine vein	24	2	18	0	2
Undetermined small vessel	5	0	4	0	1
Totally	250	64	116	34	36

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