



Original Article (BRAIN)

Complications of Microvascular Decompression in patients with Trigeminal Neuralgia

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ABSTRACT

Objective: To determine the frequency of complications of microvascular decompression for patients with trigeminal neuralgia undergoing surgical decompression.

Materials and Methods: A descriptive case study was carried out in the Neurosurgery Unit 1, Lahore General Hospital. The study included 80 patients who fulfilled the inclusion criteria. Informed consent was obtained and possible outcomes and complications of surgery were explained beforehand to the patients. Demographic details were noted. Surgical site infection, CSF leak, Facial numbness, Facial palsy, Hearing impairment, and Postoperative hematoma as complications were assessed. The presence of complications was recorded. Data was stratified for age and gender from. Chi-square was used as a statistical test, taking a p-value ≤ 0.05 as the level of significance.

Results: The study included 80 patients. The mean age of the patients was 40.8 ± 11.7 years. Overall complications were reported in 21 (26.3%) patients. Distribution of complications was as follows; surgical site infection 2 (9.5%), CSF leak (19.0%), facial palsy 5 (23.8%), facial numbness 9 (42.9%), hearing impairment 2 (9.5%) and post-operative hematoma 5 (23.8%).

Conclusion: Microvascular decompression (MVD) is recommended neurosurgical procedure for medically refractory patients with trigeminal pain if there is no contraindication for surgery. Surgical complications can be minimized by meticulous surgery resulting in adequate tissue respect. Another means to get better and long-lasting results with fewer complications is by using an autologous muscle graft.

Keywords: Microvascular Decompression (MVD), Trigeminal Neuralgia (TN).

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Date of Print: 30-06-2022

DOI: 10.36552/pjns.v26i2.634

Date of Submission: 25-01-2022
Date of Revision: 13-05-2022
Date of Acceptance: 02-06-2022
Date of Online Publishing: 30-06-2022

INTRODUCTION

Trigeminal neuralgia (TN) is neuropathic pain in the distributions of the trigeminal nerve with the characteristics of severe, sudden spasmodic, and short-duration pain which usually follows a chronic course.¹ TN has a low incidence and females are affected more as compared to males. The incidence of this pain syndrome is 4 to 13 per 100,000 per year.² Despite low incidence, it is one of the commonest neurological pain in the older adult population. Most cases are reported in old age and idiopathic type usually presents after the fifth decade of life. The disease may affect people before 30 years of age but is unusual in children.³ The male to female prevalence is 1:1.5 to 1:1.7.⁴ The most acceptable theory for trigeminal neuralgia is due to vascular compression resulting in demyelination and pain in the areas innervated by its branches.⁵ Recent diagnostic classification of trigeminal neuralgia divides it into classical, secondary, and idiopathic categories. Classical and secondary categories have identifiable and treatable causes. The most common causes are vessels like the superior cerebellar artery, anterior inferior cerebellar artery, and superior petrosal vein.^{5,6} TN usually involves one side. Sometimes the pain occurs on both sides, but simultaneous involvement of both sides is very rare.⁷ The pain is most commonly distributed in the maxillary (V2) and mandibular (V3) divisions of the trigeminal nerve.⁸

Autonomic symptoms, usually mild or moderate, can occur in association with episodes of pain in the ophthalmic (V1) division of the fifth cranial nerve, including lacrimation, conjunctival injection, and rhinorrhea.⁹ Pharmacological therapy is the treatment of the first choice in patients with classic and idiopathic types. Surgery is advised for patients who do not respond to medications.

Carbamazepine is the best drug studied so far for the treatment of classic TN and it has proven to be quite effective.¹⁰ Combination therapy is reserved for patients who don't respond to a

single drug. This includes topiramate, gabapentin, lamotrigine, tizanidine, and baclofen. During tapering of oral drugs intravenous infusion of phenytoin, fosphenytoin, or lidocaine is used as bridging therapy.¹¹ The patients with TN who are not benefited from medical treatment are offered surgery. Different surgical options are available. These include the Jannetta procedure (MVD), glycerol injection, balloon compression, peripheral neurectomy, stereotactic radiosurgery, and radiofrequency thermal lesioning.¹² One of the commonly used surgeries is Microvascular decompression which is considered a major invasive procedure. In this procedure, the surgeon drills a small hole in the skull behind the ear. The trigeminal nerve is visualized by using a microscope and the blood vessel causing nerve compression is moved away by placing a padding material.¹³ American Academy of Neurology (AAN) states that immediate pain relief is achieved in 90% of patients after microvascular decompression, but it reduced up to 73% in the next five years. The average mortality was about 0.2%. Major side effects such as CSF leaks, infarcts, and hematoma occurred in about 4% of cases.¹⁴ 11% of patients developed aseptic meningitis which was the highest percentage of complications. 10% of patients developed deafness and 7% developed loss of sensory function.¹⁴ The current study determined the frequency of complications of microvascular decompression for patients with trigeminal neuralgia undergoing surgical decompression.

MATERIALS AND METHODS

Study Design and Setting

It is a descriptive case study that was conducted at Neurosurgery Unit 1, Lahore General Hospital from February 2019 to October 2021. Informed consent was taken from patients and the study was done with the approval of the hospital ethical committee.

Sample Size and Sampling Technique

The sample size was 80 with a 90% confidence level, 10% margin of error, and taking complication rate of 27%. Non-Probability Consecutive Sampling was done.

Inclusion Criteria

Patients between 20 – 60 years of age, both males and females presented with symptoms of trigeminal neuralgia with foiled medial treatment.

Exclusion Criteria

Patients diagnosed with having tumors, Patients presenting for redo surgery & patients having arteriovenous malformations, atypical neuralgia, or neurological deficits.

Data Collection

Patients meeting the selection criteria were included in the research. Data was collected from the record of Neurosurgery wards, at Lahore General Hospital, Lahore.

Demographic details were noted. Surgical site infection with purulent drainage (with or without positive culture), CSF leak (was detected in the suspicious case by detecting glucose level more than 30 mg/dl through urinary glucose strips), Facial numbness (assessed clinically by cotton wool and pinprick sensation), Facial palsy (assessed clinically and graded by House-Brackmann score into normal, slight, moderate, moderately severe, and total paralysis on clinical basis), Hearing impairment (suspected on Rinne and Weber test and if suspected in above tests, was confirmed on audiometry) and post-operative hematoma (CT Scan confirmed cases).

All the relevant information was recorded in the Proforma. The presence of complications was recorded.

Data Analysis

The data analysis was done through SPSS v23.0. Mean and standard deviation was calculated for a quantitative variable like age. Frequency and the percentage were calculated for qualitative variables like gender, infection, CSF leak, facial numbness, facial palsy, hearing impairment, and postoperative hematoma. Data was stratified for age, gender, and duration of symptoms. Chi-square was used as a statistical test, taking a p-value ≤ 0.05 as the level of significance.

RESULTS

Age and Gender Distribution

A total of 80 patients were studied. The mean age of the patients was 40.8 ± 11.7 years. A total of 56 (70.0%) were males and 24 (30.0%) were females.

Frequency Distribution of Complications

Overall complications were observed in 21 (26.3%) patients. According to complications distribution, 2 (9.5%) had surgical site infection, while 4 (19.0%) had CSF leak, 5 (23.8%) had facial palsy, 9 (42.9%) had facial numbness, 2 (9.5%) had hearing impairment and 5 (23.8%) had postoperative hematoma. See Tables 1 – 2.

Table 1: Frequency distribution of complications

Complications	Frequency	Percent
Yes	21	26.3
No	59	73.8
Total	80	100.0

Table 2: Frequency distribution of individual complications.

Complication	Present	Absent	Total
Surgical site infection	2	19	21
CSF leak	4	17	21
	19	81%	100%

Facial palsy	5	16	21
	23.8%	76.2%	100%
Facial numbness	9	12	21
	42.9%	57.1%	100%
Hearing impairment	2	19	21
	9.5%	90.5%	100%
Post-op hematoma	5	16	21
	23.8%	76.2%	100%

Stratification of Complications Concerning Gender

It was found that there was no statistical difference between Gender and complications ($p > 0.868$). See Table 3.

Table 3: Stratification of Complications concerning gender.

Gender	Complications		Total	p-value
	Yes	No		
Male	15	41	56	0.868 (insignificant result)
	26.8%	73.2%	100%	
Female	6	18	24	
	25.0%	75.0%	100%	
Total	21	59	80	
	26.3%	73.8%	100%	

Stratification of Complications Concerning Age

Patients were divided into three groups according to age. Age group 20 – 30 years, age group 31 – 45 years, and age group 45 – 60 years. 23 (28.7%) patients were in the age group 20 – 30 years. 26 (32.5%) and 31 (38.8%) were in the 31 – 45 years and 45-60 years age groups respectively. It was found that there was no statistical difference between Age and complications ($p > 0.783$). See Table 4.

Table 4: Stratification of Complications concerning age.

Age Groups	Complications		Total	P-value
	Yes	No		
20 – 30 Years	6	17	23	0.783
	26.1%	73.9%	100%	

31 – 45 Years	8	18	26
	30.8%	69.2%	100%
45 – 60 Years	7	24	31
	22.6%	77.4%	100%
Total	21	59	80
	26.3%	73.8%	100%

Stratification of Complications Concerning the Duration of Symptoms

Duration of symptoms was recorded and three groups were made, < 3 months, 3 – 5 months, and > 5 months. 30 (37.5%) patients had a duration of symptoms < 3 months. 22 (27.5%) and 28 (35.0%) had a duration of symptoms of 3 – 5 months and > 5 months respectively.

There was a statistical difference between the duration of symptoms and complications ($p < 0.008$).

Table 5: Stratification of complications concerning the duration of symptoms.

Duration of Symptoms	Complications		Total	P-Value
	Yes	No		
< 3 months	2	28	30	0.008 (significant result)
	6.7%	93.3%	100%	
3 – 5 months	8	14	22	
	36.4%	63.6%	100%	
> 5 months	11	17	28	
	39.3%	60.7%	100%	
Total	21	59	80	
	26.3%	73.8%	100%	

DISCUSSION

Microvascular decompression is considered for the treatment of trigeminal neuralgia when pharmacological therapy fails to respond or there are considerable side effects. To look for the vascular compression of trigeminal nerve ganglion we did MRI of all patients before surgery. Patients who have vascular loop compression of trigeminal nerve have shown better results after microvascular decompression.¹⁵ There are two types of MVD, an open approach and a less invasive fully

endoscopic microvascular decompression which has comparatively fewer complications.¹⁶

Comparison among different studies could not be directly done because of the disparity of definitions of operative success in terms of pain recurrence.¹⁷

It is important to determine which vessel is causing compression of the trigeminal nerve because compression caused by the superior cerebellar artery has a higher risk during surgery.¹⁸

Clinical and anatomical evidence has supported that vascular compression is the trigger of trigeminal neuralgia.^{17,18} Idiopathic trigeminal neuralgia is supposed to be due to vascular compression of the trigeminal nerve as it leaves the medulla oblongata. The success of MVD supports this theory.¹⁹

The symptoms of trigeminal neuralgia are usually waxing and waning. Sometimes remission spans are in months or years. These symptoms free periods minimize and become absent with the advancement of the disease.²⁰

As the disease advances, patients may develop pain during routine activities like talking, mastication, brushing teeth, and washing the face. Initial treatment is through medications like carbamazepine, which has proven effective in reducing the symptoms. But the response is usually short-term. Adverse effects like hyponatremia also limit its use.²⁰ Therefore surgical treatment is needed in many patients with trigeminal neuralgia.²¹

In this study, Overall complications were in 21 (26.3%) patients. According to complications distribution, 2 (9.5%) had surgical site infection, while 4 (19.0%) CSF leak, 5 (23.8%) facial palsy, 9 (42.9%) facial numbness, 2 (9.5%) hearing impairment and 5 (23.8%) had post-operative hematoma.

Overall complication rate of microvascular decompression surgery has been found as 16.09%.²² In different literatures, complications of micro vascular decompression include surgical

site infection 1.3%,^{22,23} facial palsy 2.9%,^{22,23} facial numbness 27%²⁴, cerebrospinal fluid leak 1.6%,^{23,24} hearing deficit 1.9%^{23,24} and post-operative hematoma (2.56%)²⁴.

Limitation of Study

Those cases in which there was decreased hearing part of PTA was not done preoperative was supposed that they were different preoperative.

CONCLUSION

Microvascular decompression is also known as the Jannetta procedure is the treatment of choice for trigeminal neuralgia not responding to medical therapy. Adequate tissue respect and meticulous surgery can minimize complications. Autologous muscle graft can give excellent results possibly with fewer complications.

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Additional Information

Disclosures: Authors report no conflict of interest.

Ethical Review Board Approval: The study was conformed to the ethical review board requirements.

Human Subjects: Consent was obtained by all patients/participants in this study.

Conflicts of Interest:

In compliance with the ICMJE uniform disclosure form, all authors declare the following:

Financial Relationships: All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work.

Other Relationships: All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

AUTHOR CONTRIBUTIONS

Sr. No.	Author's Full Name	Intellectual Contribution to Paper in Terms of
1.	Irfan Sheikh	Study design, and methodology.
2.	Amjad Qaisarani	Data calculation and data analysis.
3.	Rizwan Ahmed Khan	Interpretation of results, data collection and analysis.
4.	Madiha Fayyaz	Literature review and paper writing.
5.	Rizwan Ahmed Khan	Quality insurer.