DOI: https://doi.org/10.53350/pjmhs02024181526

**ORIGINAL ARTICLE**

# Immediate Pain Relief in Patients with Trigeminal Neuralgia Following Microvascular Decompression

MUHAMMAD AQEEL NATT[1], MUHAMMAD IMRAN KHAN[2], ABDUL BARI[3], SALEEM AHMED BHUTTO[4], SYED IRFAN RAZA ARIF[5], JAMSHED KHAN[6]

[1]*Assistant Professor Neurosurgery, Punjab Institute of Neurosciences Lahore*
[2]*Associate Professor Neurology, Sialkot Medical College Sialkot.*
[3]*Assistant Professor Neurosurgery, NUST School of Health Sciences/PAEC General Hospital Islamabad.*
[4]*Assistant Professor Anatomy, Frontier Medical and Dental College Abbottabad*
[5]*Assistant Professor Anatomy, Bashir College of Dentistry Islamabad*
[6]*Professor of Anatomy, Loralai Medical College, Loralai*
*Correspondence to: Muhammad Imran Khan, Email: drimrankhannmc@gmail.com*

## ABSTRACT

**Background**: Trigeminal neuralgia (TN) is a debilitating condition characterized by severe facial pain. Microvascular decompression (MVD) has emerged as a definitive surgical treatment, offering potential for immediate pain relief.
**Objective**: To evaluate the efficacy of MVD in providing immediate postoperative pain relief in patients with TN.
**Methods**: A retrospective cohort study was conducted involving 134 patients diagnosed with TN who underwent MVD between July 2022 and June 2023 at Department of Neurosurgery, Punjab Institute of Neurosciences Lahore. Immediate postoperative pain relief was assessed using the Barrow Neurological Institute (BNI) pain intensity scale.
**Results**: Of the 134 patients, 128 (95.5%) achieved complete pain relief (BNI score I) within 24 hours post-surgery. Six patients (4.5%) experienced partial pain relief (BNI score II), with no patients reporting no relief (BNI score III or higher).
**Conclusion**: MVD is highly effective in providing immediate pain relief in TN patients, with a success rate of 95.5%.
**Keywords**: Trigeminal neuralgia, microvascular decompression, immediate pain relief, Barrow Neurological Institute pain intensity scale

## INTRODUCTION

Trigeminal neuralgia (TN) is a severe and often debilitating condition characterized by recurrent, sharp, and sudden-onset facial pain along the distribution of the trigeminal nerve. The condition is primarily seen in individuals over 50 years of age and is more common in females. TN can lead to significant impairment in the quality of life, causing functional limitations, emotional distress, and increased healthcare utilization. The pain is often triggered by non-noxious stimuli such as touch, wind, or chewing[1].

TN can be categorized into two types: classical trigeminal neuralgia, which is caused by vascular compression of the trigeminal nerve root, and secondary trigeminal neuralgia, which is associated with conditions such as multiple sclerosis[2]. Vascular compression is the most common cause of TN, where an artery or vein compresses the nerve root, leading to demyelination and hyperexcitability of the nerve fibers. This compression is usually from the superior cerebellar artery, though the anterior inferior cerebellar artery and veins may also contribute to the compression[3].

The first-line treatment for TN usually involves pharmacological interventions, including anticonvulsants like carbamazepine or oxcarbazepine. However, long-term medication use is often associated with adverse effects, including cognitive impairment, dizziness, and ataxia, prompting the need for alternative treatments[4]. For patients with medically refractory TN, microvascular decompression (MVD) is considered the gold standard surgical treatment. MVD works by relieving vascular compression of the trigeminal nerve root and is associated with high success rates, with pain relief reported in 70-95% of patients[5].

MVD involves a retrosigmoid craniotomy, during which the offending vessel compressing the trigeminal nerve is identified, separated, and padded with a Teflon cushion to prevent further compression[6]. Immediate postoperative pain relief is typically seen in most patients, but some may experience delayed relief, with the time to complete pain resolution varying between patients. Several factors influence the likelihood of immediate pain relief, including the type of vascular compression, the severity of preoperative pain, and the duration of symptoms[7].

This study evaluates the immediate postoperative pain relief following MVD in a cohort of 134 patients with TN and explores factors such as age, gender, type of vascular compression, and preoperative pain severity as potential predictors of immediate pain relief. The results of this study will contribute to a better understanding of the factors influencing the success of MVD in TN patients and guide patient selection for surgery.

Received on 10-07-2023
Accepted on 20-12-2023

## METHODOLOGY

A retrospective cohort study was conducted at a Department of Neurosurgery, Punjab Institute of Neurosciences Lahore during from July 2022 to June 2023 to assess the outcomes of MVD in patients with TN. The study included 134 patients who underwent MVD between January 2019 and December 2023. Ethical approval was obtained from the Institutional Review Board, and all patients provided informed consent.

**Inclusion Criteria:** Patients diagnosed with TN based on clinical symptoms and neuroimaging (MRI), who were unresponsive to pharmacological management and underwent MVD, were included.

**Exclusion Criteria:** Patients with secondary causes of TN (such as multiple sclerosis or tumors), previous neurosurgical procedures for TN, or significant comorbidities were excluded.

**Preoperative Evaluation:** Each patient underwent a detailed preoperative assessment, including clinical evaluation, neurological examination, and high-resolution MRI. Preoperative pain severity was recorded using the Barrow Neurological Institute (BNI) pain scale, which classifies pain intensity into five categories: I (no pain), II (occasional pain), III (no pain with medication), IV (some pain), and V (severe pain).

**Surgical Procedure:** MVD was performed via a retrosigmoid approach under general anesthesia. Intraoperative facial nerve monitoring was utilized to minimize the risk of nerve injury. The offending vessel (most commonly the superior cerebellar artery) was decompressed by separating it from the trigeminal nerve root using a Teflon sponge.

**Postoperative Assessment:** The primary outcome was immediate postoperative pain relief, evaluated within 24 hours using the BNI pain scale. Secondary outcomes included complications such as transient facial hypoesthesia, hearing loss, or cerebrospinal fluid leakage.

**Data Analysis:** Data were analyzed using SPSS version 25. Logistic regression was used to identify predictors of immediate pain relief, including age, gender, duration of symptoms, type of

vascular compression, and preoperative pain severity. A p-value of <0.05 was considered statistically significant.

## RESULTS

A total of 134 patients, with a mean age of 58.4 ± 9.2 years, were included in the study. The cohort consisted of 45 males (33.6%) and 89 females (66.4%). The majority of patients (57.5%) had involvement of the mandibular branch (V3) of the trigeminal nerve, followed by the maxillary branch (V2) in 33.6%, and the ophthalmic branch (V1) in 8.9%. Bilateral involvement was noted in 6.0% of patients. The most common cause of vascular compression was the superior cerebellar artery (76.1%), followed by the anterior inferior cerebellar artery (13.4%) and venous compression (10.4%). (Table 1)

Table 1: Demographic and Clinical Characteristics of Patients

| Characteristic | Value |
|---|---|
| Mean age (years) | 58.4 ± 9.2 |
| Gender (Male) | 45:89 |
| Duration of symptoms (months) | 24.3 ± 18.5 |
| Affected branch of trigeminal nerve | |
| V1 (Ophthalmic) | 12 (8.9%) |
| V2 (Maxillary) | 45 (33.6%) |
| V3 (Mandibular) | 77 (57.5%) |
| Bilateral involvement | 8 (6.0%) |
| Type of vascular compression | |
| Superior cerebellar artery | 102 (76.1%) |
| Anterior inferior cerebellar artery | 18 (13.4%) |
| Venous compression | 14 (10.4%) |

Of the 134 patients, 128 (95.5%) achieved a BNI Score I, indicating no pain, while 6 patients (4.5%) reported occasional pain, corresponding to a BNI Score II. No patients experienced persistent pain, as evidenced by the absence of individuals in BNI Scores III, IV, or V. Thus, a small group (4.5%) experienced partial pain relief, while none reported severe postoperative pain. (Table 2)

Table 2: Immediate Postoperative Pain Relief Outcomes

| BNI Score | Number of Patients | Percentage (%) |
|---|---|---|
| I (No pain) | 128 | 95.5% |
| II (Occasional pain) | 6 | 4.5% |
| III (No pain with medication) | 0 | 0% |
| IV (Some pain) | 0 | 0% |
| V (Severe pain) | 0 | 0% |

No patients experienced severe postoperative complications. Minor complications included transient facial hypoesthesia in 5 patients (3.7%), which resolved within 2 months.

Logistic regression analysis revealed that the type of vascular compression and preoperative pain severity were significant predictors of immediate pain relief. Patients with arterial compression (superior cerebellar artery or anterior inferior cerebellar artery) were 3.5 times more likely to achieve complete pain relief compared to those with venous compression ($p = 0.002$). Furthermore, patients with more severe preoperative pain (BNI score IV or V) had a 2.7 times higher likelihood of achieving complete pain relief ($p = 0.03$).

Table 3: Logistic Regression Analysis for Predictors of Immediate Pain Relief

| Variable | Odds Ratio | p-value |
|---|---|---|
| Type of vascular compression | 3.5 | 0.002 |
| Preoperative pain severity (BNI IV/V) | 2.7 | 0.03 |
| Duration of symptoms | 1.1 | 0.21 |

## DISCUSSION

This study confirms that microvascular decompression (MVD) is an effective and safe surgical intervention for providing immediate pain relief in patients with trigeminal neuralgia (TN). The high rate of complete postoperative pain relief observed (95.5%) in this cohort underscores the effectiveness of MVD as the treatment of choice for TN, especially in patients who have failed medical management. These results are consistent with previous studies which have reported similar success rates ranging from 80% to 95% for MVD in TN treatment[1,2].

The findings of our logistic regression analysis reveal that the type of vascular compression and preoperative pain severity are significant predictors of immediate postoperative pain relief. Patients with arterial compression, particularly from the superior cerebellar artery (SCA), had a significantly higher likelihood of achieving complete pain relief compared to those with venous compression. This observation is consistent with earlier studies which indicate that arterial compression of the trigeminal nerve root entry zone is more likely to result in a favorable surgical outcome[3,4]. Arterial compression typically creates a more prominent and localized compression compared to venous compression, which may be more diffuse and less damaging to the nerve[5,6].

Preoperative pain severity also emerged as a significant predictor of immediate relief. This finding aligns with previous literature suggesting that patients with more severe preoperative pain, as measured by the BNI scale, are more likely to experience immediate relief postoperatively[7]. One possible explanation is that the severity of preoperative pain may reflect a more chronic and severe form of nerve damage, making the nerve more responsive to decompression[8]. It may also be that these patients have a more significant degree of vascular compression, leading to greater potential for pain relief following MVD.

The overall complication rate in this study was low, with only 3.7% of patients experiencing transient facial hypoesthesia. This is in line with other studies that report transient complications following MVD, such as facial numbness or hypoesthesia, which typically resolve within a few months[9,10]. This transient nature of complications emphasizes the safety of MVD when performed by an experienced surgical team. Major complications, such as cerebrospinal fluid (CSF) leaks or hearing loss, were not observed in our cohort, reflecting the low risk of such complications with modern surgical techniques[11,12]. This is in contrast to earlier reports that highlighted a higher risk of severe complications such as hearing loss, which has decreased with improvements in intraoperative monitoring and surgical techniques[13].

The absence of severe complications, coupled with the high rate of immediate pain relief, suggests that MVD is a reliable option for patients with TN who are unresponsive to pharmacological treatment. However, as with any surgical intervention, there are risks associated with the procedure. It is essential for clinicians to carefully assess patients for factors that might influence surgical outcomes. Preoperative assessment, including high-resolution imaging, is crucial in identifying the precise nature of vascular compression and determining the most appropriate surgical approach[14]. Moreover, patient selection plays a key role in optimizing the success of the procedure. It is particularly important to consider factors such as the duration of symptoms and the presence of secondary causes of TN, which may affect the likelihood of long-term pain relief[15].

One interesting finding in our study was the minimal occurrence of delayed pain relief. While most studies report a substantial proportion of patients experiencing pain relief immediately postoperatively, some patients may take weeks to achieve full resolution of symptoms. Factors contributing to delayed pain relief may include incomplete decompression, nerve scarring, or other postoperative complications that could delay recovery[16]. Although none of our patients experienced delayed pain relief in the immediate postoperative period, it is important to recognize that long-term follow-up is necessary to monitor for the recurrence of symptoms or the development of delayed complications. Long-term studies have demonstrated that while MVD has a high initial success rate, a small percentage of patients may experience recurrent pain over time[17]. These cases often

require further interventions, such as repeat surgery, radiosurgery, or pharmacological management[18].

In addition, while the study focused on the immediate postoperative outcomes, it would be valuable to assess the long-term efficacy of MVD in TN patients. Long-term pain relief, recurrence rates, and the durability of the procedure are important aspects of treatment evaluation. Some studies have suggested that the recurrence rate for TN following MVD can range from 5% to 15% over a period of 5 to 10 years, indicating the possibility of a relapse of symptoms after an initial period of relief[19]. Long-term follow-up is critical to determining the overall success of the procedure and informing clinical decision-making regarding repeat interventions.

Moreover, the application of advanced imaging techniques, such as high-resolution MRI, has been crucial in improving the success of MVD. Modern imaging modalities allow for more accurate identification of the offending vessels and better planning for decompression surgery, which has contributed to the high success rates observed in recent studies[20]. These advances have also minimized the risk of injury to adjacent structures, such as the facial nerve, thereby reducing postoperative complications[21].

Lastly, the psychological impact of TN and its treatment should not be underestimated. Patients with TN often experience significant distress due to the unpredictability and severity of their pain. Effective pain management, including surgical options like MVD, not only improves physical well-being but also enhances emotional and psychological health. Postoperative pain relief can lead to significant improvements in quality of life, reducing anxiety and depression associated with chronic pain[22]. However, given the complexity of TN and its treatment, a multidisciplinary approach involving neurosurgeons, neurologists, pain specialists, and mental health professionals is essential for optimizing patient outcomes.

## CONCLUSION

Microvascular decompression (MVD) remains a highly effective and safe surgical intervention for providing immediate pain relief in patients with trigeminal neuralgia (TN). The study confirms that MVD is associated with a high success rate (95.5%) in achieving immediate postoperative pain relief, with significant predictors including the type of vascular compression and preoperative pain severity. These findings support the use of MVD as the preferred surgical option for patients with medically refractory TN.

## REFERENCES


1. Holste K, Burchiel KJ. Pain outcomes following microvascular decompression for drug-resistant trigeminal neuralgia: a systematic review and meta-analysis. Neurosurgery. 2019;86(2):182-190.
2. Zhao H, Wang XH, Zhang Y, et al. Management of primary bilateral trigeminal neuralgia with microvascular decompression: 13-case series. World Neurosurg. 2018;109:e724-e730.
3. Grisell M, Linderoth B, Olofsson B, et al. Microvascular decompression for trigeminal neuralgia: a review of 1,000 cases. Acta Neurochir (Wien). 2003;145(11):889-894.
4. Burchiel KJ, Anderson VC, Hassenbusch SJ, et al. The role of microvascular decompression in the treatment of trigeminal neuralgia. J Neurosurg. 1996;84(2):221-226.
5. Zakrzewska JM, Linskey ME. Trigeminal neuralgia. BMJ. 2014;348:g474.
6. Jannetta PJ. Arterial compression of the trigeminal nerve at the pons in patients with trigeminal neuralgia. J Neurosurg. 1967;26(1):23-33.
7. Kabatas S, Yilmazer S, Ozdincler AR, et al. Microvascular decompression as a surgical management for trigeminal neuralgia. Acta Neurochir (Wien). 2009;151(3):263-268.
8. Barker FG, Jannetta PJ, Bissonette DJ, et al. The long-term outcome of microvascular decompression for trigeminal neuralgia. N Engl J Med. 1996;334(17):1077-1083.
9. Jafree DJ, Williams AC, Zakrzewska JM. Impact of pain and postoperative complications on patient-reported outcome measures 5 years after microvascular decompression or partial sensory rhizotomy for trigeminal neuralgia. Acta Neurochir (Wien). 2018;160(4):755-762.
10. Holste K, Burchiel KJ. Pain outcomes following microvascular decompression for drug-resistant trigeminal neuralgia: a systematic review and meta-analysis. Neurosurgery. 2019;86(2):182-190.
11. Jannetta PJ, Kemeny F, Babb GE. Microvascular decompression of the trigeminal nerve for the relief of trigeminal neuralgia. J Neurosurg. 1977;46(1):1-8.
12. Zakrzewska JM, Linskey ME. Trigeminal neuralgia. BMJ. 2014;348:g474.
13. Ziyal IM, Yılmaz B, Sener RN. Cerebrospinal fluid leaks and complications of microvascular decompression in the treatment of trigeminal neuralgia. Neurosurgery. 2001;48(1):108-113.
14. Gronseth GS, Brown M, Sillau S, et al. Trigeminal neuralgia: diagnosis and treatment. Neurology. 2019;92(3):121-129.
15. Arnautović KI, Radosavljević A, Šefik S. Long-term outcomes of microvascular decompression for trigeminal neuralgia. J Neurosurg. 2003;99(6):1152-1160.
16. Hasso AN, D'Angelo C, Kato Y. Delayed pain relief after microvascular decompression for trigeminal neuralgia. J Neurosurg. 1997;87(1):61-65.
17. Jones S, Lewis L, McCormick D. Recurrent trigeminal neuralgia following microvascular decompression. J Neurosurg. 2014;120(1):191-196.
18. Gharabaghi A, Mandonnet E, Raftopoulos C. Recurrent trigeminal neuralgia after microvascular decompression: long-term follow-up. Neurosurgery. 2010;66(6):1046-1052.
19. Stauffer ES, Ebeling R, Kallinowski F, et al. Long-term results of microvascular decompression for trigeminal neuralgia. J Neurosurg. 2002;97(5):1053-1061.
20. Maroon JC, Gillett GR. High-resolution magnetic resonance imaging in the diagnosis of trigeminal neuralgia. Neurosurgery. 1995;36(5):902-908.
21. Zappella S, Eynard B. Trigeminal neuralgia and intraoperative monitoring of facial nerve: relevance of the anatomical variations. Acta Neurochir (Wien). 2000;142(4):423-430.
22. Lang MA, Coudron PE. Trigeminal neuralgia: psychosocial aspects and mental health outcomes. J Neurosurg. 2016;124(3):654-658.


**This article may be cited as:** Natt MA, Khan MI, Bari A, Bhutto SA, Arif SIR, Khan J: Immediate Pain Relief in Patients with Trigeminal Neuralgia Following Microvascular Decompression. Pak J Med Health Sci, 2023; 18(1): 526-528.