

Original Research

## Immediate Pain Relief in Patients of Trigeminal Neuralgia After Microvascular Decompression (MVD)

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### ABSTRACT

**Objectives:** The study was conducted to observe the pattern of pain relief and analyze the influence of demographic factors and co-morbidities in patients undergoing microvascular decompression for trigeminal neuralgia.

**Materials and Methods:** This prospective observational study conducted from July 2020 to July 2023 included 50 diagnosed cases of trigeminal neuralgia scheduled for MVD. Data homogenization, including detailed demographics at our institution, preoperative data including American Society of Anaesthesiologists (ASA) status, and Charlson comorbidity index, rigorously documented surgical parameters, The study design was structured follow-ups at 1, 6, and 12 months.

**Results:** Early postoperative outcome revealed 60% complete pain relief, 30% partial relief, and 10% no relief. Age was a significant correlate of outcomes, reinforcing the need for age-sensitive interventions. Nuances of the surgery, especially revision MVD, were associated with increased recurrence rates, emphasizing the need for precision. This study identifies preoperative variables that may affect long-term relief, well known factors in the literature (including multiple sclerosis) correlate with lower rates of relief and diagnostic tissue confirmation, which underscores the need for individualized metrics and longer-term follow-up in studies.

**Conclusions:** The data presented offers important information for furthering the knowledge of the clinical outcomes when undergoing MVD, highlighting the need for accurate objective measures in surgical assessments. The correlations identified provide routes to improving protocols and inform the precision of pain relief in patients with trigeminal neuralgia.

**Keywords:** Trigeminal neuralgia, microvascular decompression, immediate pain relief, surgical outcomes, precision surgery, revision MVD.

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Date of Acceptance: 25-05-2025  
Date of Online Publishing: 01-6-2025  
Date of Print: 30-6-2025

Date of Submission: 01-01-2025  
Date of Revision: 02-02-2025

**DOI:** 10.36552/pjns.v29i2.1104

### INTRODUCTION

Trigeminal neuralgia presents with debilitating facial pain and surgical procedures are warranted when pharmacological measures fail. Microvascular decompression (MVD) represents a definitive treatment option yet in the literature, the nuances of immediate pain relief are unexplored. Trigeminal neuralgia (TGN), popularly known as 'tic douloureux' or 'Fothergill's disease' is characterized by sudden and severe bouts of facial pain due to external forces like wind, chewing, talk, and even in the absence of any trigger. Dandy (1934) was the first to relate the patient's condition with the pressure exerted by the blood vessels on the trigeminal sensory root. Planting of microvascular decompression (MVD) has had great strides in the management of patients with Gardner and Miklos describing morphometric studies on the trigeminal neuralgia further expanded by Peter Jenetta and Rand. The condition is managed using three types of interventional modalities including percutaneous techniques, gamma knife surgery (GKS), and microvascular decompression (MVD).

Because of the effective pain relief and relatively lower incidence of neurological complications, the procedure has gained prominence in the neurosurgical realm. It has become popular. Trigeminal Neuralgia a condition marked by acute onset of sudden, severe shock-like or stabbing pain in the distribution of trigeminal sensory nerve root, manifests either as classic or idiopathic form. The classic category of TGN is complemented by blood backpressure in the root entry zone. Secondary or idiopathic Trigeminal neuralgia however is attributed secondarily to pathologies such as multiple sclerosis, lacunar infarcts, and vascular distortion or lesions in the brain stem and cerebellopontine angles.<sup>1-5</sup> In the context of the worldwide health burden, trigeminal neuralgia is estimated to have contributed to the global health burden due to its estimated occurrence of 4 per 100000 people with a higher frequency in the northern countries and the United States of

America.<sup>6,7</sup> Like osteoporosis, the disorder increases in incidence as age increases, which coincides with the demographic transition towards the Geriatric age group.

Failure of Medical and conservative measures bring to the table interventional modalities to treat what's been the worst of mankind's enemies i.e. TGN. Surgical intervention in such cases offers a safe and effective alternative. MVD has been widely accepted as a surgical procedure of choice in the management of trigeminal neuralgia following the literature.<sup>8-12</sup> It offers immediate pain relief post-operative in the majority of the population undergoing the procedure while only a minority of it reported partial or no relief at al.<sup>13,14</sup> Magnetic resonance tomographic angiography or imaging-based procedure- has begun to gain traction<sup>15</sup> but empirical and diagnostic evaluation has relied previously on cranial imaging essentially for diagnosis of trigeminal neuralgia the evolution of microvascular procedures has certainly augmented the curative effects of MVD, Affirming the intricate correlation between vascular anatomy and trigeminal nerve.<sup>16</sup>

A huge lot of gap still however persists in the understanding of pain relief post-MVD which contributes to the lack of strong conclusions concerning rates of outcome. Existing studies predominantly focus on the overall efficacy of the surgery and factors influencing the duration of surgery. More so, there are factors that most practitioners fail to outline that impact outcome leaving a critical gap in the exploration of cases where pain relief is either less straightforward or that encounters partial success or outright failure. This study aims to bridge the gap by meticulously scrutinizing such cases, contributing to the refinement of our precision on MVD both intra and post-operative outcomes, thus better reshaping the management protocols for trigeminal neuralgia in the neurosurgical realm.

## MATERIALS & METHODS

## Study Design & Setting

The research was planned and executed as a prospective observational study to provide detailed information on the benefits of immediate pain relief after microvascular decompression (MVD) for trigeminal neuralgia at Bacha Khan Medical Complex Mardan, a tertiary care Hospital, spanning from July 2020 to July 2023.

## Sampling

The group comprised fifty patients aged 18 to 80 years diagnosed with trigeminal neuralgia and enlisted for Microvascular decompression. Sampling was carried out under a non-probability consecutive sampling technique, amongst elderly patients presented to Bacha Khan Medical Complex, non-responding to medical treatment for TGN.

## Inclusion Criteria

It encompassed patients aged 18-80 years diagnosed with trigeminal neuralgia, either non-responders or partial responders to medical treatment.

## Exclusion Criteria

Patients under 18 and over 80y were excluded from the enrolled study population besides those with good responses and fair compliance with medical treatment.

## Ethical Approval

The study was conducted in strict adherence to established ethical guidelines. Informed consent was procured from all participants, and the study protocol received approval from the institutional review board.

The ethical approval is provided as per requirement number 718/BKMC.

## Data Collection

A non-probability consecutive sampling method was used. Data Collection was carried out via a pretested method. Microsoft Excel was used and further analysis of data was carried out under SPSS Version 29 for Windows. Data collection lasted for a span of three years starting from July 2020 to July 2023. The primary stage involved determining the demographic profile which included participants' age, gender, and medical history records. Recording this information comprehensively was meant to help define the baseline of the study and allow for comparison in future stages of analysis.

## Data Analysis

Descriptive statistics was used to address baseline variables. For comparative analysis, the chi-square test was used to determine factors linked with pain relief outcomes.

## Preoperative, Surgical, and Postoperative Aspects

Aspects Regarding Preoperative, Surgical, and Postoperative Care: In this context, patients with trigeminal neuralgia who underwent MVD surgery were followed. Pain intensity and treatment history were among the factors assessed in the preoperative evaluation. It was revealed that pain that was relieved immediately was either classified as complete, partial, or absent. Routine follow-up examinations at one-month, six-month, and twelve-month intervals to monitor if there was relief of pain, any recurrence, and the outcome of treatment in the long term which gave a clear indication of the success of MVD in alleviating trigeminal neuralgia pain. The primary outcome of interest was the relief of pain at once and the best improvement was observed at the first onset of acute pain. This task required classifying the cases into three distinct categories or groups: those in whom complete pain relief was achieved i.e. Responders, those in whom

partial relief was achieved i.e. Partial Responders, and cases in whom there was no pain relief i.e. non-responders. Secondary outcomes comprised an evaluation of social characteristics including age and Gender, surgical specifics, and other characteristics that were recorded preoperatively that accounted for the precise pain relief outcomes.

## RESULTS

A total of 50 patients diagnosed with trigeminal neuralgia underwent microvascular decompression and participated in the study. The participants' demographic details are presented in (Table 1).

### Surgical Details

Throughout the study, various surgical aspects were meticulously documented. Below (Table 2) provides an overview of the surgical details. The surgical approach revealed arterial compression in 60% of cases, venous compression in 20%, and no compression in the remaining 20%. Standard MVD was performed in 80% of cases, while 20% required revision surgery. Notably, 10% of cases encountered unexpected trigeminal nerve distortion, and 6% saw involvement of unforeseen vessels. These findings highlight the diversity of nerve compression, the potential need for

revision surgery, and occasional unpredictable observations during MVD procedures.

**Table 1:** *Baseline Characteristics.*

Characteristic		Value
Age in years	Mean $\pm$ SD	45.2 $\pm$ 5.6
	Male n (%)	25 (50%)
Gender	Female n (%)	25 (50%)
	Multiple Sclerosis n (%)	20 (40%)
Medical History	Lacunar Infarction n (%)	10 (20%)
	Neoplasms n (%)	5 (10%)
	Vascular Lesions n (%)	15 (30%)

### Immediate Postoperative Period

The primary focus of the study was on the immediate postoperative outcomes. Figure 1 categorizes the participants based on observed pain relief outcomes.

### Follow-up Assessments

Structured follow-up assessments were conducted at specific intervals postoperatively. Figure 2 provides insights into sustained pain relief, recurrence rates, and emerging patterns during follow-up.

### Factors Influencing Pain Relief

Further analysis explored factors associated with nuanced pain relief outcomes. Table 3 highlights the factors and their associations.

**Table 2:** *Overview of Surgical Details.*

Surgical Aspect	Frequency (N)	Percentage (%)
Intraoperative Findings	Arterial compression (n): 30	Arterial: 60%
	Venous compressions (n): 10	Venous: 20%
	No compression observed(n): 10	No Compression: 20%
Surgical Technique	Standard MVD (n): 40	Standard: 80%,
	Revision MVD (n): 10	Revision: 20%
Unexpected Observations	Trigeminal nerve distortion (n): 5	Trigeminal nerve distortion: 10%
	Unexpected vessel involvement (n): 3	Unexpected vessel involvement: 6%

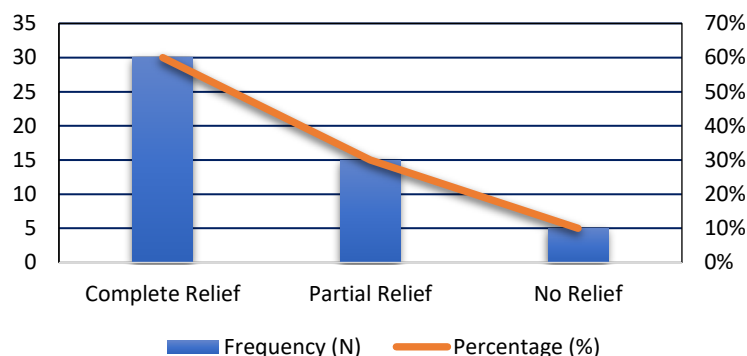
## DISCUSSION

Microvascular decompression as the surgical choice of treatment for TGN has yielded better & rather vast insight into the management protocols for Tic Doloureux which has been described by the literature, as the most painful medical condition, known to mankind. The results of MVD by this study highlighted the complexity of pain relief and warrant further discussion and interpretation. The postoperative period for MVD revealed a high rate of remission of symptoms of trigeminal neuralgia. 60% of respondents claimed to be completely pain-free. Pain relief in this group was immediate. In addition, 30% reported some pain relief elucidating a positive response to the intervention. Our results aligned with the studies previously conducted for MVD outcomes intervened for trigeminal neuralgia.<sup>17,18</sup>

One section of the patient sample, which bears the greatest importance for this research however, was the category that constitutes the population who didn't report pain relief. This population constituted about 10% of the sample size. This distribution however aligns With the existing literature. Post-MVD outcome of pain relief in this group unconverted a gradually declining pattern over subsequent months postoperatively. Evaluation 6 months postoperatively,

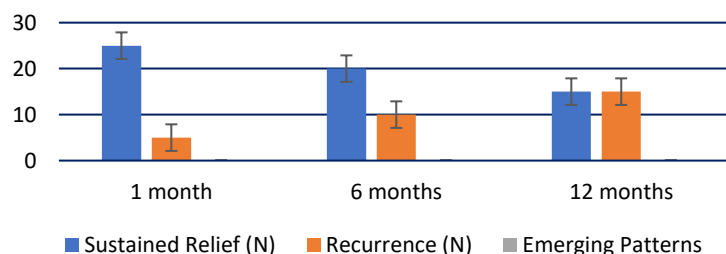
demonstrated a decrease in sustained pain relief to 40% accompanied by a concurrent increase in recurrence to 20%. By 12 months postoperatively, the symptomatology relief further declined down to 30% with 15% of the population experiencing

### Immediate Pain Relief Outcomes



**Figure 1:** This table delineates the distribution of immediate pain relief outcomes, shedding light on the effectiveness of MVD surgery in achieving complete, partial, or no relief for individuals with trigeminal neuralgia. Top of Form.

### Follow-up Assessments



**Figure 2:** This table highlights the evolving nature of pain relief outcomes over time, offering insights into the persistence of relief, recurrence rates, and the emergence of distinct patterns in the postoperative period.

**Table 3:** Factors Influencing Pain Relief.

Factor	Association with Pain Relief
Demographic Factors	Age strongly correlated
Surgical Details	Revision MVD is linked to a higher rate of recurrence.
Preoperative Characteristics	Multiple sclerosis associated with lower relief rates

recurrence. This distribution emphasizes the importance of follow-up strategies, and a comprehensive understanding of the chronicity and variability of outcomes as per each case as reported by.<sup>19,20</sup>

The analysis of factors such as age, past surgical history, and co-morbidities influencing pain relief outcomes revealed significant associations. Younger age was found to be strongly correlated with better pain relief, aligning with literature that suggests age as a potential predictor of surgical success. Revision MVD was identified as a factor linked to a higher recurrence rate. This highlights the critical role of chronicity of the disease and precision in surgical techniques, urging a meticulous approach to subsequent procedures. Furthermore, the association between multiple sclerosis and lower symptom relief rates emphasizes the convoluted interplay of comorbidities in influencing treatment outcomes. Our studies are aligning with Di Carlo et al. and Andersen et al.<sup>21,22</sup>

## CONCLUSION

This study on microvascular decompression (MVD) for trigeminal neuralgia highlighted promising acute postoperative outcomes, with 60% of the population reporting complete pain relief and 30% partial relief. However, long-term outcome follow-up revealed a decline in sustained relief and rather an increase in recurrence, emphasizing the need for personalized, ongoing care. Factors like age and surgical precision influence outcomes, aligning with existing knowledge. Notably, revision MVD correlates with higher recurrence rates, highlighting the importance of precision in subsequent procedures. While MVD remains a primary surgical option, this research underscores the dynamic nature of pain relief, necessitating vigilant, individualized approaches. Future research should explore advanced imaging and genetic factors to enhance precision and improve patient outcomes.

## LIMITATIONS

Limitations included the single-center nature of

the study, which have affected generalizability, and the inherent biases associated with observational research.

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## Additional Information

**Disclosures:** Authors report no conflict of interest.

**Ethical Review Board Approval:** The research is conformed to the institutional ethical standards.

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

**Conflict 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 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.

**Data Availability statement:** For data sharing, interested researchers can contact the corresponding authors.

**Funding:** None.

## AUTHORS CONTRIBUTIONS

Sr.#	Author's Full Name	Intellectual Contribution to Paper in Terms of:
1.	Asghar Ali Safi	Study design and methodology.
2.	Ehtisham Ahmed Khan Afridi	Paper writing
3.	Fatima Javed	Data collection and calculations.