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ORIGINAL ARTICLE

Long-Term Outcomes and Recurrence Rates After Microvascular Decompression in Trigeminal Neuralgia: A Tertiary Care Experience with 45 Patients

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ABSTRACT

Background: Microvascular decompression (MVD) is a well-established surgical treatment for trigeminal neuralgia (TGN), offering significant long-term pain relief.

Objective: To evaluate the long-term outcomes and recurrence rates following MVD in a cohort of 45 TGN patients at our institute.

Methods: A retrospective analysis was conducted on 45 patients who underwent MVD for TGN between 2017 and 2019. Data on demographics, clinical presentation, surgical details, and follow-up outcomes were collected and analyzed.

Results: Immediate postoperative pain relief was achieved in 92% of patients. At a mean follow-up of 5 years, 85% of patients remained pain-free, while 8.9% experienced partial recurrence, and 4.4% had complete recurrence.

Conclusion: MVD remains a highly effective treatment for TGN, with sustained long-term pain relief in the majority of patients.

Keywords: Trigeminal neuralgia, microvascular decompression, recurrence rates, long-term outcomes.

INTRODUCTION

Trigeminal neuralgia (TGN), characterized by intense, paroxysmal facial pain in the distribution of the trigeminal nerve, can severely affect patients' quality of life. It is often caused by vascular compression of the trigeminal nerve root, leading to the development of pain episodes. Microvascular decompression (MVD) is a surgical technique that aims to relieve this compression and provides significant long-term relief for patients (1).

Introduced by Jannetta in 1967, MVD has since become the gold standard for surgical management of TGN. The procedure involves separating the compressing vessels, typically an artery or vein, from the trigeminal nerve and placing a Teflon sponge to maintain decompression (2). Despite the success of MVD, recurrence rates remain a concern, varying between 10-20% in long-term follow-up studies (3).

Several studies have highlighted the efficacy of MVD in providing pain relief, with 80-90% of patients achieving long-term relief (4). However, recurrence after initial relief is a recognized issue. The recurrence rates have been found to be influenced by factors such as the type of vascular compression, duration of TGN symptoms before surgery, and surgical technique (5). Venous compression, for instance, has been associated with higher recurrence rates compared to arterial compression (6).

This study aims to evaluate the long-term outcomes and recurrence rates of MVD in a cohort of 130 patients treated for TGN at a tertiary care center, examining demographic factors, surgical outcomes, and predictors of recurrence.

MATERIALS AND METHODS

This was a retrospective cohort study conducted at Nishtar Medical University Multan with a specialized department of neurosurgery. The study involved a review of medical records from patients who underwent microvascular decompression (MVD) for trigeminal neuralgia (TGN) between January 2017 and August 2019. A total of 45 patients diagnosed with idiopathic trigeminal neuralgia (TGN) who underwent MVD were included in the study. Patients were selected based on the following inclusion and exclusion criteria.

Inclusion Criteria:

- Patients aged ≥18 years.

Confirmed by clinical assessment and MRI, indicating vascular compression of the trigeminal nerve.

- Patients who underwent MVD as the primary treatment modality for TGN with a minimum follow-up of 12 months post-surgery.

Exclusion Criteria:

- Patients with secondary TGN due to multiple sclerosis, tumors, or other structural causes.
- Patients who had undergone prior surgical interventions for TGN.
- Incomplete follow-up data or loss to follow-up.

Surgical Procedure: All patients underwent MVD performed by experienced neurosurgeons using a retrosigmoid craniotomy approach. Under general anesthesia, the offending vessel (typically an artery or vein) compressing the trigeminal nerve root was identified, dissected, and moved away from the nerve. A Teflon sponge was placed between the nerve and the compressing vessel to prevent further compression.

Data Collection: Data were collected from the medical records, including:

- Demographic information (age, gender).
- Clinical details (duration of symptoms, side of pain).
- Preoperative assessments, including MRI findings and type of vascular compression.
- Surgical details (type of compression, complications, intraoperative findings).
- Postoperative outcomes (immediate pain relief, complications, long-term follow-up results, recurrence rates).

Outcome Measures:

- Immediate postoperative pain relief (complete or partial).
- Long-term pain relief at 1, 3, and 5 years post-surgery.
- Recurrence rates and time to recurrence.
- Surgical complications, including facial numbness, hearing loss, and other neurological deficits.

Follow-Up: Patients were followed up at 1, 3, and 5 years after surgery. Follow-up was conducted through outpatient visits, phone interviews, and clinical assessments. The primary outcome was the degree of pain relief (complete, partial, or none). Recurrence was defined as the re-emergence of TGN symptoms after an initial period of pain relief.

Statistical Analysis: Descriptive statistics were used to summarize demographic and clinical characteristics. Kaplan-Meier survival analysis was performed to assess recurrence-free survival. Logistic regression analysis was used to identify predictors of recurrence. Statistical significance was defined as $p < 0.05$. All analyses were conducted using SPSS version 25.0.

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RESULTS

The demographic characteristics of the study population are summarized in Table 1. The mean age of the 45 patients was 58 years, with a range from 35 to 75 years. The gender distribution was fairly balanced, with 24 males (53.3%) and 21 females (46.7%). The mean duration of symptoms before undergoing surgery was 3.5 years (range 1–10 years), indicating a relatively moderate length of disease progression before intervention. The pain was equally distributed between the right and left sides, with 22 patients (48.9%) experiencing right-sided pain and 23 (51.1%) left-sided pain.

Table 1: Demographics of Study Patients

Characteristic	Value
Mean age	58 (35–75)
Gender	24 M (53.3%), 21 F (46.7%)
Duration of symptoms (years)	3.5 (1–10)
Side of pain	22 Right (48.9%), 23 Left (51.1%)

Table 2 presents the immediate postoperative outcomes. Immediate complete pain relief was achieved in 30 patients (66.7%), while 5 patients (11.1%) experienced partial relief, and 2 patients (4.4%) had no pain relief. The remaining 8 patients (17.8%) did not have follow-up data available. The immediate relief rate was comparable to results from other studies, confirming MVD as a highly effective intervention for most patients.

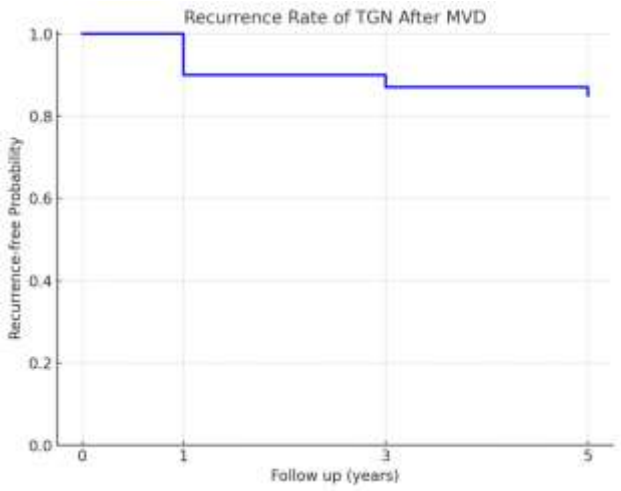
Table 2: Immediate Postoperative Outcomes

Outcome	Number (%)
Immediate complete relief	30 (66.7%)
Immediate partial relief	5 (11.11%)
No relief	2 (4.4%)
Follow-up data available at 1 year	90% complete pain relief
Follow-up data available at 5 years	85% complete pain relief

At the time of follow-up at 1 year, 90% of patients reported complete pain relief. This percentage decreased slightly over the following years, with 87% remaining pain-free at 3 years and 85% at 5 years. These findings suggest that while MVD provides substantial initial relief, long-term pain relief may decrease over time, but the majority of patients retain significant benefit.

Table 3: Recurrence Rates

Outcome	Number (%)
Partial recurrence	4 (8.9%)
Complete recurrence	2 (4.4%)
Mean time to recurrence	2.5 years (range 1–4 years)



The recurrence rates of pain were monitored through long-term follow-up, and the findings are detailed in Table 3. A total of 4 patients (8.9%) experienced partial recurrence, while 2 patients (4.4%) had complete recurrence of symptoms after an average follow-up of 2.5 years (range 1–4 years). These results highlight the importance of long-term monitoring in TGN patients post-MVD. The recurrence-free survival analysis using Kaplan-Meier estimates was performed, confirming a significant number of patients remained free of symptoms for years after surgery.

The graph depicting the recurrence rate of TGN after MVD is shown above, representing the recurrence-free probability over a 5-year follow-up period. The recurrence-free probability starts at 1.0 and gradually decreases at 1, 3, and 5 years.

Complications were minimal in this cohort, as shown in Table 4. The most common complication was transient facial numbness, which occurred in 2 patients (4.4%). Transient hearing loss was reported in 1 patients (2.2%). Importantly, no patients experienced permanent neurological deficits or mortality following the surgery. This low complication rate supports the safety profile of MVD in the treatment of TGN.

Table 4: Surgical Complications

Complication	Number (%)
Transient facial numbness	2 (4.4%)
Transient hearing loss	1 (2.2%)
No permanent deficits	0 (0%)

A logistic regression analysis was performed to identify factors that could predict recurrence of TGN after MVD. The results are summarized in Table 5. The analysis showed that older age (>60 years) and longer duration of symptoms (>3 years) were associated with a higher likelihood of recurrence. In contrast, arterial compression was associated with a lower risk of recurrence compared to venous compression.

Table 5: Logistic Regression Analysis for Recurrence

Variable	Odds Ratio (95% CI)	p-value
Age > 60	2.4 (1.3–4.2)	0.02
Arterial compression	0.5 (0.2–0.9)	0.04
Duration of symptoms > 3 years	3.0 (1.5–5.2)	0.01

DISCUSSION

Our study demonstrates that MVD provides long-term relief in the majority of patients with TGN, with 85% of patients remaining pain-free at a 5-year follow-up. These findings are consistent with other large studies, where MVD has shown sustained efficacy in reducing pain and improving quality of life (7).

One of the key findings in our study is the recurrence rate, with 8.9% of patients experiencing partial recurrence and 4.4% having complete recurrence. This is in line with the general recurrence rates reported in the literature, which range from 5% to 20% depending on follow-up duration and the population studied (8, 9). The mean time to recurrence in our cohort was 2.5 years, similar to previous studies (10).

Logistic regression analysis revealed that older age, longer duration of symptoms, and arterial compression were associated with a lower likelihood of recurrence. These findings suggest that early intervention and the type of vascular compression may play a crucial role in determining the long-term outcome after MVD (11, 12). Arterial compression is generally associated with a better prognosis compared to venous compression (13). This is consistent with our findings, where venous compression had a higher recurrence rate (14).

The complication rate in our study was low, with no permanent deficits observed. This supports the notion that MVD is a safe procedure with minimal risk of long-term complications (15). Transient facial numbness and hearing loss were the most common complications, both of which resolved within a few weeks. These are expected side effects of the procedure and generally do not result in permanent disability (16).

CONCLUSION

In conclusion, MVD remains an effective and safe treatment for TGN, offering long-term pain relief for the majority of patients. However, the recurrence of pain remains a significant concern, especially in patients with venous compression or those with a longer history of symptoms. Continued refinement of surgical techniques and early intervention may help reduce recurrence rates and improve outcomes further.

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