

## ORIGINAL ARTICLE

## MICROVASCULAR DECOMPRESSION FOR TRIGEMINAL NEURALGIA

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**Background:** Trigeminal Neuralgia (TGN) is the most frequently diagnosed type of facial pain. In idiopathic type of TGN it is caused by the neuro-vascular conflict involving trigeminal nerve. Microvascular decompression (MVD) aims at addressing this basic pathology in the idiopathic type of TGN. This study was conducted to determine the outcome and complications of patients with idiopathic TGN undergoing MVD. **Methods:** In a descriptive case series patients with idiopathic TGN undergoing MVD were included in consecutive manner. Patients were diagnosed on the basis of detailed history and clinical examination. Retromastoid approach with craniectomy was used to access cerebellopontine angle (CP-angle) and microsurgical decompression was done. Patients were followed up for 6 months. **Results:** A total of 53 patients underwent MVD with mean age of  $51.6 \pm 4.2$  years and male predominance. In majority of cases (58.4%) both Maxillary and Mandibular divisions were involved. Per-operatively superior cerebellar artery (SCA) was causing the neuro-vascular conflict in 33 (62.2%) of the cases, anterior inferior cerebellar artery (AICA) in 6 (11.3%) cases, both CSA and AICA in 3 (5.6%) cases, venous compressions in only 1 (1.8%) patient and thick arachnoid adhesions were seen in 10 (18.9%) patients. Postoperatively, 33 (68%) patients were pain free, in 14 (26.45%) patients pain was significantly improved whereas in 3 (5.6%) patients there was mild improvement in symptoms. Three (5.6%) patients did not improve after the primary surgery. Cerebrospinal fluid (CSF) leak was encountered in 7 (13.2%) patients post-operatively, 4 (7.5%) patients developed wound infection and 1 (1.8%) patient developed aseptic meningitis. Three (5.6%) patients had transient VII nerve palsy while one patient developed permanent VII nerve palsy. **Conclusion:** MVD is a safe and effective surgical option for treating patients with idiopathic TGN with better surgical outcome and fewer complications.

**Keywords:** Trigeminal Neuralgia, Microvascular decompression, neurovascular conflict, Trigeminal nerve, Tic douloureux

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## INTRODUCTION

TGN is a painful condition involving the face. It is defined by the International Headache Society as: “unilateral disorder characterized by brief electric shock-like pains, abrupt in onset and termination, and limited to the distribution of one or more divisions of the trigeminal nerve”.<sup>1</sup> Being one of the most frequently diagnosed type of facial pain, its prevalence is about 4 per 100,000. It occurs more frequently in women, with men to women ratio of 1.5:1–2:1 respectively.<sup>2</sup> It almost always occurs unilaterally. Maxillary branch being affected most commonly and the ophthalmic branch the least (<5% cases). In most of the cases pain lasts from few seconds to two minutes and may recur spontaneously with pain free intervals.<sup>3,4</sup> Most patients complain of trigger zone that if touched even during daily activities like eating, brushing teeth, applying cosmetics, talking, encountering breeze etc. can trigger the pain.<sup>3</sup> Even during the pain free periods, patients have an overwhelming fear of pain.<sup>5</sup> Pain seriously impairs the quality of

life and affects the employment in up to 34% of the patients. Depression symptoms are also very common in patients suffering from TGN.<sup>6,7</sup> Proper and detailed history remains the primary tool for diagnosis as per The International Headache Society criteria for TGN.<sup>8</sup>

In patients with first division pain only, it is important to differentiate TGN from trigeminal autonomic cephalgias like cluster headaches, paroxysmal hemicranias etc.<sup>9</sup> Neurological examination is usually insignificant in idiopathic type of TGN except for some subtle sensory deficit which may be elicited occasionally.<sup>10</sup> MRI scan of brain is mandatory to exclude other causes of TGN like multiple sclerosis and CP angle tumors.<sup>11</sup> Aetiology in most of the idiopathic TGN cases is compression of the nerve root by blood vessels.<sup>12</sup> Treatment of idiopathic TGN is challenging and conservative management with drugs is always the first line of therapy.<sup>3</sup> First line drugs being carbamazepine (200–1200 mg/dl) and oxcarbazepine (600–1800 mg/dl). Carbamazepine

being the more effective and oxcarbamazepine being better tolerated.<sup>1</sup> Other drugs like gabapentin, baclofen and lamotrigine are also being as primary treatment or as adjunct to carbamazepine.<sup>12,13</sup> But loss of pharmacological effect or the adverse effects of the drugs limit further use of medication in almost half of the cases within 10 years of treatment.<sup>12</sup> Different ablative techniques like gamma-knife surgery, balloon compression of trigeminal ganglion and glycerol rhizolysis been tried. But they are associated with facial paraesthesia, hypoesthesia and sensory loss.<sup>13,14</sup> Ablative techniques fail to address the root cause of the disorder. MVD though inherently more invasive than ablative techniques, yet has been reported to achieve the most sustained pain relief.<sup>1</sup>

The aim of this study was to analyse the demographic features, per-operative findings, outcome and complications in patients with TGN undergoing MVD in our setup.

## MATERIAL AND METHODS

This descriptive case series was conducted in the department of Neurosurgery Ayub Medical College, Abbottabad from July 2011 to July 2013. All the patients undergoing MVD for TGN were included in the study. Detailed history and examination was performed to confirm the diagnosis of TGN. MRI brain was done to rule out secondary causes of TGN like tumours and multiple sclerosis. Patients who were refractory to medical management or themselves requested for MVD were included in the study. Written informed consent was taken regarding the surgery and patient's consent regarding the use of data for research purposes was also taken. Patient's demographic data were recorded on a *pro forma*.

Surgery was performed under general anaesthesia in the lateral park bench position with patient's chest, hips and shoulders properly taped down. Head rotated approximately 10–15 degrees away from the affected side and the neck slightly flexed. Preoperative antibiotics were used in all cases and continued for three days postoperatively. Incision was made approximately of two finger breadth behind the pinna for the length of ear. A 3 cm craniectomy defect was created to access the CP-angle. After identifying the transverse and sigmoid sinuses extradurally the bone edges were waxed. In case the mastoid air cells were encountered, they were vigorously waxed. After opening the dura under microscope, cerebellum was elevated and retracted medially and CSF was gradually sucked to allow the cerebellum to relax. After that, gradual progress into CP angle was done. After dealing with the petrosal vein, VII-VIII

complex was identified. Then arachnoid was opened around trigeminal nerve. The nerve was carefully inspected for the culprit vessels and the nerve was gently freed and a small piece of absorbable knitted fabric (surgicel<sup>TM</sup>) was then placed between them. After irrigation of the wound dura was closed and the skin closed in layers. Patients were managed in neurosurgical ICU post-operatively for a minimum of 24 hours. Patient was assessed at 1 week, 1 month and at 3 months post-operatively for pain relief and any complication related to surgery. Postoperatively the prophylactic medications were tapered off in 4 weeks. All the data were analysed in SPSS-10.

## RESULTS

A total of 53 patients underwent MVD for idiopathic trigeminal neuralgia with ages ranging from 28–69 years (mean 41.6 years). Among the patients 30 were males and 23 were females. Average length of follow-up of the patients being 5 months. V2 alone was involved in 6 (11.3%) cases, V1 alone was involved in only 1 (1.8%) case and V1 was not involved alone in any case. Both V1 and V2 were involved in 12 (22.6%) cases, V2 and V3 were affected in 31 (58.4%) patients and 3 (5.6%) patients had pain in all the divisions of trigeminal nerve.

Per-operatively SCA was causing the neuro-vascular conflict in 33 (62.2%) of the cases and AICA was involved in 6 (11.3%). Both the CSA and AICA were the culprit vessels in 3(5.6%) of the cases. Venous compressions were found in only 1 (1.8%) patients. Thick arachnoid adhesions were seen in 10(18.9%) patients.

Postoperatively at 3 months follow-up 33 (68%) patients were pain free, in 14 (26.45%) patients pain was significantly improved whereas in 3 (5.6%) patients there was mild improvement in symptoms. Three (5.6%) patients did not improve after the primary surgery. Among them one was re-operated 8 weeks after the first surgery. CSF leak was the major complication encountered 7 (13.2%) patients post-operatively, 4 (7.5%) patients developed wound infection and 1 (1.8%) patient developed aseptic meningitis. Three (5.6%) patients had transient VII nerve palsy that improved in follow up visits, while one patient developed permanent VII nerve palsy that didn't improve during follow-up.

## DISCUSSION

TN is a severe, intermittent, electric-shock like pain in the face which though is not life threatening itself but the pain, associated anxiety and depression significantly hampers the quality of life.<sup>15</sup> A

majority of patients with TN undergo unnecessary dental extractions as this pain is misdiagnosed as caused by dental pathologies.<sup>16</sup> Proximal aetiologies of TN include neoplasm or demyelinating disorders but in 80–90% of the cases are related to the compression of the nerve by adjacent vessels.<sup>17,18</sup> This led to the development of MVD procedure and ever since the first reported case of MVD by Janetta in the 1960s, different adaptations in the procedure have improved the patients' outcome.<sup>19</sup>

Many researchers including our previous study about spectrum of TN, have documented an increased incidence of TN in females but in our study number of males exceeded those of females.<sup>12,16</sup> This may be because females either responded better to conservative medication or consented less for the invasive surgery.

CT and MRI are routinely carried out to identify the space occupying lesion or MS as a cause of TN, though high resolution MRI gives a clearer anatomical relationship between vessels and nerve. The effectiveness of preoperative MRA has been questioned because normally SCA lies very near to trigeminal nerve and secondly it was unable to delineate the NVC in most cases.<sup>19</sup> In our study V2 and V3 were affected in most of the cases. Similar observations are recorded in other studies.<sup>16,20–22</sup> During surgery SCA has been seen to be a major cause of NVC in our study. Zhang *et al* reported similar results, but there is an increased incidence of arachnoid adhesions in our patients.<sup>20</sup>

At six months duration patients having good response were: 68% being pain free and additional 26.4% having significantly improved symptoms. These results are comparable to other studies which have reported success rates in range of 55–94%.<sup>19,20,22,23</sup> Although the mean duration of follow-up in our study is only 6 months and the number of patients are less, yet the results are promising. Some of the criticism about MVD is based on the presumably high mortality and morbidity. The complications and their rates in our study are quite comparable to the ones reported in literature, though the rate of wound infections in our patients is little high.<sup>20,22–24</sup>

Transient ataxia, disequilibrium, and vomiting have been reported in immediate postoperative period, but usually settle without any intervention.<sup>22</sup> Various methods have been used to avoid the CSF leak. Preoperative lumbar drainage of CSF has been used by some surgeons.<sup>3</sup> Augmentation of the dura with pericranium, use of surgicel and gelfoam have been done. Some use the same bone to fix it with screws and plates while others have tried methyl methacrylate to close the bony defect.<sup>19</sup> In our study preoperative CSF

drainage was not used in any of the case. The patients that had the CSF leak postoperatively were managed by non-operative measures and all of them responded.

## CONCLUSION

Microvascular decompression is a safe and effective surgical option for treating patients with idiopathic TGN with better surgical outcome and fewer complications.

## AUTHOR'S CONTRIBUTION

SAK: Principle author, collected data, data analysis, manuscript writing, BK, AAK, EAK: Data collection, literature search, helped in manuscript writing, SM, GM, IH, KKZ: Patient follow-up and data collection, SNB: Supervised the whole study process and proof reading.

## REFERENCES

- Obermann M. Treatment options in trigeminal neuralgia. *Ther Adv Neurol Disord* 2010;3(2):107–15.
- Katusic S, Beard CM, Bergstralh E, Kurland LT. Incidence and clinical features of trigeminal neuralgia, Rochester, Minnesota, 1945–1984. *Ann Neurol* 1990;27(1):89–95.
- Emril DR, Ho KY. Treatment of trigeminal neuralgia: role of radiofrequency ablation. *J Pain Res* 2010;3:249–54.
- De Simone R, Marano E, Brescia Morra V, Ranieri A, Ripa P, Esposito M, *et al*. A clinical comparison of trigeminal neuralgic pain in patients with and without underlying multiple sclerosis. *Neurol Sci* 2005;26 Suppl 2:s150–1.
- Cheshire WP. Trigeminal neuralgia feigns the terrorist. *Cephalalgia* 2003;23(3):230.
- Tölle T, Dukes E, Sadosky A. Patient burden of trigeminal neuralgia: results from a cross-sectional survey of health state impairment and treatment patterns in six European countries. *Pain Pract* 2006;6(3):153–60.
- Zakrzewska JM. Diagnosis and differential diagnosis of trigeminal neuralgia. *Clin J Pain* 2002;18(1):14–21.
- Headache Classification Subcommittee of the International Headache Society. The International Classification of Headache Disorders: 2nd edition. *Cephalalgia* 2004;24 Suppl 1:9–160.
- Zebenholzer K, Wöber C, Vigl M, Wessely P, Wöber-Bingöl C. Facial pain and the second edition of the International Classification of Headache Disorders. *Headache* 2006;46(2):259–63.
- Cheshire WP. Trigeminal neuralgia: for one nerve a multitude of treatments. *Expert Rev Neurother* 2007;7(11):1565–79.
- Woolfall P, Coulthard A. Pictorial review: Trigeminal nerve: anatomy and pathology. *Br J Radiol* 2001;74(881):458–67.
- Nurmikko TJ, Eldridge PR. Trigeminal neuralgia--pathophysiology, diagnosis and current treatment. *Br J Anaesth* 2001;87(1):117–32.
- Cruccu G, Gronseth G, Alksne J, Argoff C, Brainin M, Burchiel K, *et al*. AAN-EFNS guidelines on trigeminal neuralgia management. *Eur J Neurol* 2008;15(10):1013–28.
- Omeis I, Smith D, Kim S, Murali R. Percutaneous balloon compression for the treatment of recurrent trigeminal neuralgia: long-term outcome in 29 patients. *Stereotact Funct Neurosurg* 2008;86(4):259–65.
- Skirving DJ, Dan NG. A 20-year review of percutaneous balloon compression of the trigeminal ganglion. *J Neurosurg* 2001;94(6):913–7.

16. Rehman A, Abbas I, Khan SA, Ahmed E, Fatima F, Anwar AS. Spectrum of Trigeminal Neuralgia. J Ayub Med Coll Abbottabad 2013;25(1-2):168-71.
17. Love S, Coakham HB. Trigeminal neuralgia: pathology and pathogenesis. Brain 2001;124(Pt 12):2347-60.
18. Khan Afridi EA, Khan SA, Qureshi WU, Bhatti SN, Muhammad G, Mahmood S, *et al.* Frequency of cerebellopontine angle tumours in patients with trigeminal neuralgia. J Ayub Med Coll Abbottabad. 2014;26(3):331-3.
19. Forbes J, Cooper C, Jermakowicz W, Neimat J, Konrad P. Microvascular decompression: salient surgical principles and technical nuances. J Vis Exp 2011;5(53):e2590.
20. Zhang L, Zhang Y, Li C, Zhu S. Surgical treatment of primary trigeminal neuralgia: comparison of the effectiveness between MVD and MVD+PSR in a series of 210 patients. Turk Neurosurg 2012;22(1):32-8.
21. Alberione F, Arena A, Matera R. [Microvascular decompression for trigeminal neuralgia: prognostic [corrected] factors]. Neurocirugia (Astur) 2008;19(3):242-7.
22. Broggi G, Ferroli P, Franzini A, Servello D, Dones I. Microvascular decompression for trigeminal neuralgia: comments on a series of 250 cases, including 10 patients with multiple sclerosis. J Neurol Neurosurg Psychiatry 2000;68(1):59-64.
23. Barker FG 2nd, Jannetta PJ, Bissonette DJ, Larkins MV, Jho HD. The long-term outcome of microvascular decompression for trigeminal neuralgia. N Engl J Med 1996;334(17):1077-83.
24. Jellish WS, Benedict W, Owen K, Anderson D, Fluder E, Shea JF. Perioperative and long-term operative outcomes after surgery for trigeminal neuralgia: microvascular decompression vs percutaneous balloon ablation. Head Face Med 2008;4:11.

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