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Original Research Article.

An Institutional Experience for Clinical Analysis and Outcome of Trigeminal Neuralgia: A Prospective Study

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ABSTRACT

Introduction: Trigeminal Neuralgia, also known as Tic Douloureaux, is a nerve disorder that causes abrupt, searing, electric-shock-like facial pains. Most commonly the pain involves the lower face and jaw, but symptoms may appear near the nose, ears, eyes or lip. Etiology is multifactorial, including vascular compression of root entry zone, demyelination, tumors etc.

Methods and Materials: The current study is a prospective study done in Tertiary Care Hospital, Ahmedabad from year 2013 to 2016, and it focuses on the clinical presentation of trigeminal neuralgia and the role of microvascular decompression in its management.

Results: Immediate postoperative results were excellent with 81. 4% patients having complete pain relief. The long term results were also excellent with 83.7%patients remaining completely pain free on their follow up. Our studies show that microvascular decompression is a safe and effective treatment option in the treatment of TN.

Conclusion: Trigeminal neuralgia is predominantly seen in elderly patients and chiefly involves V1V2 division of the nerve. Medical management of the patients, though initially may have a benefit, cannot usually offer complete resolution of the complaint and the patients usually take 2 to 3 drugs, but the pain free interval decrease and attacks frequency increase and so finally opting for surgical intervention as the final measure.

Keywords: Trigeminal Neuralgia, Tic Douloureaux.

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INTRODUCTION

Trigeminal Neuralgia, also known as Tic Douloureaux, is a nerve disorder that causes abrupt, searing, electric-shock-like facial pains.[1] Most commonly the pain involves the lower face and jaw, but symptoms may appear near the nose, ears, eyes or lip. It is one of the most unbearably painful human conditions. The neuralgia of the trigeminal nerve is the most frequent neuralgia of the cranial nerves.

Etiology is multifactorial, including vascular compression of root entry zone, demyelination, tumors etc. It is possible that the pathophysiology of Trigeminal Neuralgia is due to hyperactivity or abnormal discharges arising from the trigeminal ganglion. Trigeminal neuralgia probably involves peripheral sensitization, alteration of ion channel expression, ectopic and spontaneous discharge, ephaptic conduction and sprouting of sympathetic axons into the gasserian ganglion.[2] Attacks may be triggered by things such as touching the face, chewing, speaking and brushing teeth or blow from a fan etc.

The diagnosis is usually made on the basis of a typical history and the exclusion of secondary causes. The study of the mechanisms central to neuropathic pain, especially that seen in patients with trigeminal neuralgia, is fundamental to the development of new therapies.

Initial management of the pain is medical. Carbamazepine is the drug of choice although some patients respond to other drugs including Gabapentin, Phenytoin, Baclofen, Sodium Valproate and Clonazepam. Surgical therapy should be considered if medical treatment fails or cannot be tolerated. Surgical options include peripheral or central (intracranial) procedures. Central procedures have greater morbidity and a significant mortality rate (approximately 1%) but the success rates are much greater.

The current study is a prospective study done in B.J. Medical hospital and Civil Hospital, Ahmedabad from year 2013 to 2016, and it focuses on the clinical presentation of trigeminal neuralgia and the role of microvascular decompression in its management.

AIMS AND OBJECTIVES

- To analyze the etiopathogenesis of trigeminal neuralgia.
- To study the clinical presentation of trigeminal neuralgia.
- To study the role of Microvascular decompression in the management of trigeminal neuralgia in our institution.
- To evaluate the results, complications and post-operative follow up of patients after Microvascular decompression.

MATERIALS AND METHODS

A prospective study of 43 patients was done at our hospital that were diagnosed and confirmed clinically as trigeminal neuralgia.

Inclusion Criteria

- All patients of trigeminal neuralgia, typical or atypical, referred with medical therapy started.
- Patients taking one or more medications for variable time period, but with no pain relief or recurrence of pain.
- Patients who have had previous surgery or radiofrequency ablation for the same but were not benefited or have had a recurrence.

Exclusion Criteria

- Symptomatic trigeminal neuralgia- caused by a demonstrable structural lesion other than vascular compression.

Demographic data collected were name, age and sex. Presenting symptoms were noted and a detailed neurological examination was performed. Data like type of neuralgia (typical or atypical), duration of pain, distribution of pain and which side of face is involved were recorded. Other data like comorbid conditions, medications for TN, previous interventions for TN were also collected.

MRI with Trigeminal neuralgia protocol (T1, T2, FLAIR, Diffusion and FIESTA sequence) was used as a corroborative investigation for the diagnosis.

Most of the patients coming to the OPD were already on medical management. Patients were clearly explained about the merits and demerits of microvascular decompression and the treatment was offered depending on their choice.

patients willing for microvascular decompression were admitted and evaluated for associated medical conditions like cardiac disease, hypertension and after discussing with the patient and relatives, and considering the medical condition of the patient and the choice of the patient, surgery was performed.

Microvascular Decompression (MVD)

Under general anaesthesia patients were positioned on their side with the symptomatic side facing up or in the sitting position with the head slightly flexed. A straight incision was used two finger-breadths parallel and behind the ear about 4-5 cms in length with one fourth of the incision above the iniomeatal line. A single burr was done starting at the mastoid emissary vein, which exits the bone just inferior and posterior to the transverse-sigmoid sinus junction and craniotomy/craniectomy was done exposing the junction of sigmoid and transverse sinus. The dura was opened to expose the cerebellum. The cerebellum was allowed to fall out of the way exposing the side of the brainstem, coagulating and cutting the superior petrosal vein if required. Using a microscope and micro-instruments, the arachnoid membrane was dissected allowing visualization of the 8th, 7th and finally the trigeminal nerve. Frequently a groove or indentation was seen in the nerve where the offending vessel was in contact with the nerve. The offending loop of blood vessel was then mobilized. Once the vessel was mobilized, a Teflon patch was placed between the nerve and the offending blood vessel to prevent the vessel from returning to its native position. After the decompression was complete, the wound was flushed clean with saline solution. The dura was closed by FLG duroplasty. The bone flap was replaced and secured and the overlying tissues closed in multiple layers.

After surgery, injectable anticonvulsants, antibiotics, and analgesics were started. The medications were gradually tapered off and the patients were followed up in the OPD. Minimum period of follow up was set at 6 months and those with follow up less than 6 months were considered lost to follow up.

Table 1: Age Wise Distribution of Patients

Age (In Years)	No. of Patients
21 - 30	2
31 - 40	7
41 - 50	8
51 - 60	12
61 - 70	12
Above 70	2
Total	43

Table 2: Gender-wise distribution of patients

Sex	No. of Patients
Male	31
Female	12
Total	43

Table 3: Distribution of patients based on duration of pain

Duration (In Months)	No. of Patients
Up to 12	7
13 - 24	4
25 - 36	4
37 - 48	5
49 - 60	6
> 60	9
>120	8
Total	43

Table 4: Distribution of patients based on localization of Pain

Area of Localisation of Pain	No. of Patients
V1	0
V1 - V2	14
V2	5
V2 - V3	12
V3	1
V1 - V2 - V3	11
Total	43

Table 5: Distribution of patients based on the side of Neuralgia

Side Of Neuralgia	No. of Patients
Right	16
Left	27
Total	43

Table 6: Distribution of patients based on the type of Neuralgia

Type Of Neuralgia	No. of Patients
Classical	33
Atypical	10
Total	43

Table 7: Intraoperative findings during MVD

Vascular Loop On Trigeminal Nerve	No. of Patients
Superior Cerebellar Artery	37
Superior Cerebellar Artery and Petrosal Vein	4
Basilar Artery	2
Total	43

Table 8: Pain relief after Microvascular Decompression

Classical Type of Pain	
Pain Relief	No. of Patients
Complete Relief	29
Partial Relief	4
No Relief	0
Total	33
Atypical Type Of Pain	
Pain Relief	No. of Patients
Complete Relief	6
Partial Relief	3
No Relief	1
Total	10
Both (Classical and Atypical)	
Pain Relief	No. of Patients
Complete Relief	35
Partial Relief	7
No Relief	1
Total	43

Table 9: Complications after MVD

Complications	No. of Patients
Numbness	5
CSF Otorrhoea	1
CSF Leak other sites	2
7th Nerve Paresis	10

Table 10: Recurrence of pain after MVD

Classical Type of Pain	
Pain	No. of Patients
Recurrence	3
No Recurrence	30
Total	33
Atypical Type of Pain	
Pain	No. of Patients
Recurrence	3
No Recurrence	6
Total	9
Both (Classical and Atypical)	
Pain	No. of Patients
Recurrence	6
No Recurrence	36
Total	42

RESULTS

The predominant age group of the patients affected was in the 51-70 range with most of the patients falling in the 5th to 7th decade as shown in the Graph. There ages ranged from 28 to 83 years with an average age of 52.5 years.

In the present study, there was male predominance with 31(72%) male and 12(28%) female patients. All the patients had medical treatment with either carbamazepine or gabapentin or both for variable periods before surgery. Examination findings were normal in all the patients.

Most of the patients presented with pain duration for an average of 5-10 years with some patients presenting late to the OPD. Duration of symptoms ranged from 1 month to 20 years. The average preoperative duration of pain was 78 months.

Most patients presented with pain in the V1V2 region i.e. 32.5% (14 patients). Almost equal number of patients presented with pain in areas V2V3 12 (28.0%), and V1V2V3 11 (25.5%). Least number of patients presented with pain in isolated V1 (0%), V2 5(11.7%) and V3 1(2.3%) distribution.

22 patients presented with pain on the right side (51.1%) and 21 patients had pain on the left side (48.8%). 33 (76.7%) patients presented with Classical trigeminal neuralgia and 10(23.3%) patients presented with atypical trigeminal neuralgia.

In 37 patients (86.0%) the superior cerebellar artery (SCA) was found compressing the fifth cranial nerve. In 2 patients (4.7%) there was basilar artery compression.In 4 patients (9.3%) there was combined arterial and venous compression(SCA and Petrosal vein). Immediate pain relief was achieved in 35(81.4%) of all patients. 7(16.3%) patients had partial pain relief and 1 patient (2.3%) had no pain relief after the procedure.

The most common complication was partial 7th nerve paresis. 10 patients (23.2%) developed partial 7th nerve paresis which resolved completely after physiotherapy and faradic stimulation.

5 patients (11.6%) developed numbness over the cheeks, two patients had CSF leak and one patient had CSF otorrhea.

The CSF leak was managed by resuturing the wound. Patient was started on Tab. Diamox 250 mg BD for 5 days and elastic crepe bandage was applied. There was no further leak and wound was healthy.

Numbness over the face was managed by counseling and multivitamins.Patient with CSF otorrhea was managed conservatively with higher antibiotics and Tab. Diamox 250mg BD.

Among general complications after surgery, two patients had UTI and one patient developed rashes due to drug reaction.

The follow-up period was between 6 months to 2 and half years. Of the total patients operated, 1 patient had no pain relief immediately after surgery. Out of the 42 patients with pain relief after surgery, 36(83.7%) have remained pain free till date while 6 (13.9%) patients had recurrence of pain. Out of these, three patients developed recurrence within 6 months of surgery and three developed recurrence within 1 year of surgery. Patients with atypical neuralgia had significant recurrence rate with 33 % patients developing recurrence.

One patient who had no pain relief after surgery and five patients who developed a recurrence were given an opinion of re-surgery, but they opted for medical management instead. Therefore they were started on combination drug therapy including Tab.

Carbamazepine and Tab Gabapentin or Tab Gabapentin + Nortryptyline. On their follow up all the patients was pain free.

DISCUSSION

There are strong indications that the chronic vascular compression of the trigeminal nerve results in a focal de-myelination. This leads to local dysfunction of inter inhibitory neurons and also to the development of ectopic neuronal pacemakers. The combination of increased input by afferent ectopic pacemakers and the failure of the intersegmental inhibitory neurons lead to hyperactivity of the core of the trigeminal nerve.[3-5] The theory of vascular compression as the cause of TN is supported by clinical and anatomical evidence.[6]

TN usually begins as a relapsing disease with pain-free intervals, which sometimes can last for months or years. These pain-free intervals become shorter until they eventually disappear. With the disease progression, patient may have trouble in talking, eating, face washing, and teeth brushing because of pain caused by these activities. Current treatment usually begins with medications, mainly carbamazepine and/or gabapentin, which fortunately give an improvement of symptoms. But unfortunately, long term effect is less effective. It is difficult to continue these drugs because of the many side effects they have. Total 44 patients underwent Microvascular decompression for trigeminal neuralgia in our hospital over the period of last 3 years. Most of the patients were in the 5th to 7th decade with an average age of years and corresponds with the average age from other studies.[7-9] There was male sex predominance contrary to the other studies which had a female predominance.[9-11] There were no differences in the outcome, considering sex and age.

Most of the patients presented with pain with an average duration of years and duration of symptoms ranged from 1 month to 20 years. The duration of symptoms did not influence prognosis.[8-10]

32.5% patients presented with pain in the V1V2 region. Almost equal number of patients presented with pain in the areas V2V3 (28%), and V1V2V3 (25.5%). Least number of patients presented with pain in isolated V1 (0%), V2 (11.7%), V3 (2.3%) distribution. The trigeminal branch affected had no significance impact on the operation outcome on long or short term and this is similar to the findings from other studies.[9,10]

Table 11: Comparative studies for age wise distribution

Study	Age	Average age
Present Study	28-72 yrs	52.5 yrs
Dahle, 1989	37-77 yrs	59 yrs
Pamir, 1995	34-71 yrs	58 yrs
Broggi, 2000	20-76 yrs	56 yrs

Table 12: Comparative studies for gender wise distribution

Study	Female	Male
Present study	28%	72%
Barker, 1996	60%	40%
Broggi, 2000	51%	49%
Oesman,2011	58%	42%

Table 13: Comparative studies for duration of symptoms

Study	Duration of symptoms	Average
Present study	1 month - 20 yrs	6.5 yrs
Barker, 1996	<1 yr – 44 yrs	6 yrs
Broggi, 2000	3 months – 35 yrs	8.5 yrs
Oesman, 2011	7 months – 16 yrs	7.4 yrs

Table 14: Comparative studies for localization of pain

Study	V2V3	V1V2	V1V2V3	V1	V2	V3
Present Study	28%	32.5%	25.5%	0%	11.7%	2.3%
Barker, 1996	36%	17%	12%	3%	18%	15%
Broggi, 2006	29.5%	20.5%	11%	0.6%	17%	21.4%

In 48.8% patients the left side of the face was affected. These results are similar to other studies.[9-11]

Compression caused by the superior cerebellar artery (SCA) was found in 37(86.0%) patients and mixed arterial and venous compression was seen in 4(9.3%) patients. Basilar artery compression was seen in 2(4.7%) patients. Compared to other studies compression by an artery was more common and compression by only a vein was not seen.[9,10]

76.7% Patients presented with Classical trigeminal neuralgia and 23.3% patients presented with atypical trigeminal neuralgia. Only 6.0% patients with typical TN developed recurrence. Patients with atypical symptoms pattern had a significantly more often relapse with 33% patients developing recurrence. It is described that MVD results for atypical TN had less good results. A relapse after MVD suggests the presence in the trigeminal nerve of intrinsic abnormalities responsible for these recurrences.[3-5,11-13]

Immediate postoperative results were excellent with 35(81.4%) patients having complete pain relief. While 7(16.3%) patients had partial pain relief and 1(2.3%) patient had no pain relief. These results were similar to other studies.[9,10]

Table 15: Comparative studies for side of neuralgia

Study	Right	Left
Present study	51.2%	48.8%
Barker, 1996	61%	39%
Broggi, 2000	55%	45%
Oesman, 2011	65%	35%

Table 16: Comparative studies for type of neuralgia

Study	Arterial	Venous	Combined
Present study	86.0%		9.3%
Barker, 1996	75%	12%	68%
Broggi, 2006	51%	14%	35%

Table 17: Comparative studies for recurrence rate

Study	Recurrence rates	
	Classical TN	**Atypical TN**
Present study	6.0%	33%
Oesman, 2011	15%	29%

Table 18: Comparative studies for post-operative pain relief

Study	Post-operative pain relief		
	Complete	Partial	Absent
Present Study	81.4%	6.3%	2.3%
Barker, 1996	82%	16%	2%
Broggi, 2000	85%	7.5%	7.5%

The most common complications were 7th nerve paresis and facial numbness developing in 10 (23.2%) and 5 (11.6%) patients respectively.[10,14] Elderly patients tolerated the procedure very well and the percentage of complications was evenly distributed in all age groups. The incidence of 7th nerve paresis and facial numbness was higher in our study, compared to other studies, but many other complications like hearing loss, 9th and 10th nerve paresis and meningitis did not occur in our study.[9-11]

The long - term results were also excellent. During follow up, patients were completely pain free, while patients have had partial relief and patients had no pain relief. Though in our study patients were followed up for short periods, the results remain comparable. Similar results were seen in the other studies.[7,10,14-26]

Our study shows that Microvascular decompression is a safe and effective treatment option in the treatment of TN in patients who no longer respond to medical treatment or to those who already have had surgery and still have pain.

Table 19: Comparative studies for post-operative complications

Study	Facial numbness	7^{th} paresis	Hearing loss	9^{th} paresis	10^{th} paresis	Diplopia	CSF leak	Meningitis	CSF otorrhoea
Present study	11.6%	23.2%					4.6%		2.3%
Barker, 1996	0.9%	0.5%	1.2%				1.4%	6.4%	
Broggi, 2000	6.4%	1.2%	3.2%		0.4%	2.4%	4.8%		
Oesman, 2011	3.8%	0.6%	3.2%	0.6%	0.6%			0.6%	

Table 20: Comparative studies for long term pain outcome

Series	No. of Patients	Follow Up (Yrs)	Long-Term Pain Relief (%)
Present study	43	2.5	83.7
Taarnhoj, 1982	350	11.5	65
Szapiro 1985	68	1-5	82
Burchiel 1988	36	7.5-11.5(8.5)	53
Dahle 1989	54	3-7(3.1)	79
Bederson, 1989	252	5.1	75
Sindou, 1990	60	41mths5.1	75
	60	16mths	83
Klun, 1992	178	5.2	88
Cutbush, 1994	109	4.8	76
Sun et al 1994	61	1-10	75
Mendoza, 1995	133	5.4	75
Barker, 1996	1204	10	64
Kondo, 1997	281	12.6	87
Liao 1997	80	9mths-4yrs	

CONCLUSION

- Trigeminal neuralgia patients coming to neurosurgical OPD are predominantly of the typical variety. Atypical varieties must be assessed neurologically, evaluated radiologically and planned by a definitive intervention aiming at the pathology.
- Trigeminal neuralgia is predominantly seen in patients aged years and chiefly involves V1V2 division of the nerve.
- Trigeminal neuralgia is usually a diagnosis of exclusion.
- Medical management of the patients, though initially may have a benefit, cannot usually offer complete resolution of the complaint and the patients usually take 2 to 3 drugs, but the pain free interval decrease and attacks frequency increase and so finally opting for surgical intervention as the final measure.
- MVD is a safe and effective option in the treatment of patients with typical TN> in atypical TN also MVD is an effective and safe treatment method but with more recurrence rate, probably due to demyelinating changes in the nerve.
- MVD is the interventional treatment of choice for trigeminal neuralgia. It has the best and a definitive response rate amongst all the modalities and, with improved surgical techniques leading to decreased complication rates, it is emerging as the best modality for trigeminal neuralgia.

SUMMARY

43 patients of trigeminal neuralgia were treated by Microvascular decompression in B. J. Medical College and Civil Hospital, Ahmedabad, from 2014 to 2017. Immediate postoperative results were excellent with 81. 4% patients having complete pain relief. The long term results were also excellent with 83.7%patients remaining completely pain free on their follow up. These results were similar to other studies.

Our studies show that microvascular decompression is a safe and effective treatment option in the treatment of TN in patients who no longer respond to medical treatment or to those who have already undergone other procedures and still have pain.

Trigeminal neuralgia is associated with and is likely to be caused by pulsatile mechanical compression of the trigeminal nerve by a blood vessel near the dorsal entry zone. MVD differs from other treatments because it fixes the underlying cause to produce long term relief of symptoms. Careful patient selection is the most important determinant of outcome, and morbidity is rare when the procedure is performed by an experienced surgeon.

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