



TRIGEMINAL NERVE COMPRESSION (TGNC) SURGICAL TECHNIQUE FOR THE TREATMENT OF TRIGEMINAL NEURALGIA; STUDY OF 40 CASES IN 5 YEARS

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ABSTRACT:

Background: To evaluate the outcome of an innovative surgical approach i-e compression technique of trigeminal nerve at the intra- cisternal part of the nerve for relief of trigeminal neuralgia pain.

Methods: This observational study was conducted in Hayatabad Medical Complex and Lady Reading hospital Peshawar from Jun 2014 to Jun 2019. After Ethical Committee permission all cases of Trigeminal Neuralgia operated via TGNC Technique were studied and followed Post operatively for maximum 1 year.

Results: During our study period 40 patients were operated. There were 25 (62.5%) female & 15(37.5%) male patient with male to female ratio of 3:5. The patients ages were in the range of 34 to 84 years with mean of 54.76 ± 9.6 SD. Majority of the patients were complaining of pain in the right side of the face having frequency of 33 (82.5%) and both V2, V3 were involved in the facial pain with greatest proportion almost frequency of 16 (40%). Total 38 patients were completely pain free at 1year post op. However 2 patients presented with recurrent pain in the same area and same side of the face.

Conclusion: Compression of intra-cisternal component of trigeminal nerve for trigeminal neuralgia is the safe and effective procedure and potentially alternative to MVD procedure or at least the only gold standard option in cases where no significant vascular loop conflict is found .It has the potential to be performed endoscopically via single bur hole in the near future .

Key Words: Compression, Intracisternal component, Trigeminal nerve, Trigeminal Neuralgia.

Abbreviations: TGNC: Trigeminal Nerve Compression. CBC: Complete Blood Count.

INTRODUCTION:

Trigeminal Neuralgia is a painful condition of the face in which the patient experiences sudden, severe, shock like pain for short duration and is distributed in one or more sensory branches of trigeminal nerve.¹ Every year 4.3 new cases of trigeminal neuralgia are diagnosed per 100,000 population . It is more common in females as compared to the males.² The incidence increases after the age of 40 years. One series has showed higher incidence in older population(>60yrs age) group i-e 25.9 cases every year per 100,000 .³ Galen, Aretaeus and Hippocrates termed this condition as “kephalalgia”. During 1661-67 this condition was studied extensively & a lot of new information came up. In 1756 Andre coined the name “ tic douloureux”. Jhon hunter described trigeminal neuralgia more clearly stating, “ it is the disease of nervous system in which pain is referred to the teeth, gums and tongue in the absence of obvious organic lesion”⁴

Peter jenneta proposed the pathophysiology of trigeminal neuralgia is the indenting SCA(or any other nearby vessel) which causes demyelination of the nerve causing ephatic nerve impulse at DREZ of trigeminal nerve but there are very strong counter arguments and evidences one of them is Adams et al/Sunderland et al proving in their large series of cadveric dissections vascular compression in asymptomatic cadaver dissection is as frequent as 70%.

At some point in 1989 Adams et al compromised with jenita to propose MVD operation probably works by causing slight injury to the nerve while unintentional manipulation

The same was inference of Gardener et al. Trigeminal neuralgia can be treated by atraumatic manipulation of trigeminal nerve.” Gardenr published 112 cases in 1960 , he gently brushed the trigeminal nerve with cotton pledget and ringer irrigation without removing vascular loop.

Nowadays ,Trigeminal neuralgia is treated by both pharmacological and surgical methods. Carbamazepine and ox-carbamezapine are the firstline drugs which gives good to excellent pain control in 50% of patients baclofen and gabapentine are only recommended as a co-therapy.^{5- 8}

All trigeminal neuralgia cases refractory to the medical management or those unable to tolerate side effects of carbamazepine are subjected to one of various surgical procedures which includes the gold standard MVD procedure or nerve destructive procedures i-e peripheral neurectomy , glycerol rhizotomy and radiofrequency ablation, balloon compression rhizotomy, stereotactic radiosurgery. In 1967 Dr. Peter Jannetta was the person who performed first MVD for trigeminal neuralgia by separating the 5th nerve from offending vessel (SCA, AICA and other least common vessels) by means of the Teflon sponge , in comparison to other surgical techniques microvascular decompression is safe and effective procedure(currently termed a Gold Standard) indeed.⁹⁻¹³ There is often a tricky intraoperative situation which every surgeon might have faced i-e when NO obvious/significant vascular loop is found compressing the nerve, various methods are devised to overcome this tricky situation. In 2013 Revuelta – Gutierrez R and colleagues introduce a technique for these cases i-e gentle Compression of intra-cisternal part of trigeminal nerve was done by Mallis forcep to give iatrogenic neuropraxia which showed results comparable to MVD.¹⁵ They Stated “Pain control of trigeminal neuralgia for prolong periods can be obtained by this novel technique of intracisternal compression of trigeminal nerve with minimum morbidity and mortality in the experienced hands”.¹⁶ The same technique is followed by us since last five years as a surgical protocol for any MVD case in which loup couldn’t be found or was technically difficult to separate from the nerve. And for documentation and registration purposes this modification to the MVD procedure is termed as TGNC(Trigeminal Nerve Compression Technique).

Rationale of the current study is to evaluate the outcome of TGNC Technique. This study is important because there is only one study published uptill now and by doing this study in our set - up it will open a gateway for future researchers to evaluvate TGNC procedure as potential alternative to MVD.

METHODOLOGY:

This observational study was conducted in Hayatabad Medical Complex Hospital Peshawar, and Lady Reading Hospital Peshawar from Jun 2014 to Jun 2019 for total duration of 5 years. All cases

operated via TGNC technique were followed to assess the safety and efficacy of the procedure excluding re-do and trigeminal neuralgia secondary to MS. Pre operative management included history, detailed clinical examination and relevant investigations including MRI of the brain with and without contrast to exclude other causes of facial pain and establishing diagnosis. All data of the cases including patient's age, gender, pre operative symptoms and signs, post operative pain control and complications were recorded in the pre designed proforma. Post operatively patients were followed for 1 year for pain recurrence in the distribution of trigeminal nerve by using visual analogue scale. Results were analyzed by SPSS version 20.

Surgical Technique:

Position: All the patients were placed in the park bench position.

Portal (Incision): Linear paramedian incision having dimensions of 5 × 6 × 4 (5 mm medial to the mastoid notch, 6 cm above it and 4 cm below it) was used.

Procedure: 3 × 3 cm retro-mastoid craniectomy was made followed by inverted Y shaped dural opening having vertical limb towards the transverse and sigmoid junction. CSF was drained from the CP angle cisterns. Then petro-tentorial corridor was followed to visualise petrosal vein, which was not coagulated in majority of the cases . 5th nerve was identified and Arachnoid was separated from it and intracisternal part was gently compressed twice by bayonet forcep at two different sites to give neuropraxia to the nerve without searching for vascular loop or inserting Teflon between vascular loop and fifth nerve. Wound was closed in the water tight fashion.

Post-operative Care: All the patients were kept in ICU for first 24 hours for monitoring , later shifted to ward. All patients were discharged on post op day 2 or 3.

Post-operative follow-up: All the patients were followe upto 1 year.

RESULTS:

During our study period 40 patients were operated. There were 25 (62.5%) female & 15(37.5%) male patient with male to female ratio of 3:5. The patients ages were in the range of 34 to 84 years with mean of 54.76 ± 9.6 SD

Table 1: Age Distribution of Cases

Age of patients	Frequency	Percent	Valid percent	Cumulative percent
34-44 yrs	20	50.0	50.0	50.0
45-54 yrs	13	32.5	32.5	82.5
55-64 yrs	4	10	10	92.5
65-74 yrs	1	2.5	2.5	95
75-84 yrs	2	5	5	100
Total	40	100.0	100.0	100.0

Majority of the patients were complaining of pain in the right side of the face having frequency of 33 (82.5%) and both V2 , V3 were involved in the facial pain with greatest proportion almost frequency of 16 (40%)

Table 2: Preoperative Trigeminal Nerve Division Involvement

Branch	Frequency	Percent	Valid percent	Cumulative percent
V ₁	1	2.5	2.5	2.5
V ₂	11	27.5	27.5	30
V ₃	4	10	10	40
V ₁ ,V ₂	5	12.5	12.5	52.5
V ₂ ,V ₃	16	40	40	92.5
V ₁ ,V ₂ ,V ₃	3	7.5	7.5	100.0
Total	40	100.0	100.0	100.0

Total 38 patients were completely pain free at 1year post op .However 2 patients presented with recurrent pain in the same area and same side of the face.

Table 3: Pain Relief at 1year Post OP

Characteristic	Frequency	Percent	Valid percent	Cumulative percent
Complete pain relief	38	95%	95%	95%
Recurrence	2	5%	5%	100.0
Total	40	100.0	100.0	100.0

The most common post-op complication was Temporary/Transient facial hypoesthesia which occurred in 26(65%) patients and other less common complications were recurrence of pain, facial nerve paresis, CSF rhinorrhea, (by temporary facial hypoesthesia we mean self resolving condition i-e none of the patient had any degree of numbness at face at one month follow up).

Table 4: Post Operative Complications

Complication	Frequency	Percent	Valid percent	Cumulative percent
No complication	8	20%	20%	20%
Recurrence	2	5%	5%	25%
Facial nerve paresis	3	7.5%	7.5%	32.5%
Temporary facial hypoesthesia	26	65%	65%	97.5%
Csf rhinorrhea	1	2.5%	2.5%	100%
Total	40%	100%	100%	100%

DISCUSSION

History of diseases dates back to 1756 when Nicolas Andre defined this facial pain syndrome .After him it took almost a century for Victor Horsely proposed first surgical procedure as treatment option ,but it involved transaction of trigeminal nerve root which was associated with dreadful complication of hemifacial anesthesia , corneal anesthesia & corneal ulceration .In 1925 Walter Dandy suggested partial sectioning of trigeminal nerve to minimize the complication associated with earlier procedure .In 1967 Peter Jenneta described & proposed MVD procedure which is nowadays gold standard surgical option .

Recently a novel technique is published by Revuelta – Gutierrez R and colleagues in 2013 for the treatment of trigeminal neuralgia in which there was no vascular conflict at the area of DREZ involving compression of intracisternal part of trigeminal neuralgia ¹⁵. They collected data of 44 patients treated by this technique over period of 10 years from 2000 to 2010 in these patients no vascular conflict was found .This method was found highly effective in terms of pain control, recurrence and post operative morbidity and mortality. Furthermore this technique was highly appreciated by Broggi G¹⁶ and Chen KS et al,¹⁸ in their articles.Khattak A,Haider A.et al has published 80 cases in 2016 with excellent post operative pain control 96.2% and recurrence rate 3.8%³³

We applied same method to a total of 40 cases for treatment of Trigeminal Neuralgia during a total time span of 5 years . All the patients were in the age range of 34- 84 years with the mean age range of 54.76 ± 9.6 years SD while the females were predominantly affected with the male to female ratio of 3:5. Intra-operatively all our patients had undergone compression of intra-cisternal part of 5th nerve(as standard TGNC protocol) without decompression of any vascular loop or inserting muscle or Teflon patch.In majority of cases right side was involved .Most frequently involved branches were V2, V3 in 16 cases followed by V2 only in 11 cases . In series of Revuelta – Gutierrez R and colleagues the mean age of the patients was 49 years which is slightly more than the mean age of the patients in our series(54yrs).We found the complete pain relief in 38 (95%) patients out of 40 patients at 1year and recurrence of pain in the same branch of 5th nerve in 2 (5%) cases but the initial pain relief was noted in all 40 (100%) patients by using the visual analogue

scale. Revuelta – Gutierrez R and colleagues series¹⁵, initial pain relief was excellent in all 44 (100%) patients but their recurrence rate was 12 (27.2%). The rate of recurrence of pain in the series of Rev-uelta – Gutierrez R et al,¹⁵ is slightly more as compared to our series. This may be due to the shorter post operative follow-up in our study.

MVD Procedure efficacy in immediate pain relief ranges from 76.4 to 98.2% while its recurrence rate increases with increase in the post operative duration. In international series the rate of recurrence has been mentioned in the range of 8.3 to 30 % based on different durations of post operative follow-ups from 5 months to 120 months^{21-25,27-31}. This shows TGNC Technique is more effective and safer than MVD in terms of excellent initial pain relief and lesser recurrence rate.

Searching for offending/indenting vascular loop in MVD procedure requires significant retraction on cerebellum due to medial anatomical location of the loop and coagulation/cutting of petrosal veins is advisable. Since TGNC Technique does not involve the identification and removal of offending/indenting vascular loop hence minimal cerebellar retraction is required in comparison to MVD procedure. TGNC Technique can be performed using endoscope with a smaller corridor/a bur hole even and it often does not require coagulation and cutting of petrosal venous complex.

CONCLUSION

Compression of intra-cisternal component of trigeminal nerve for trigeminal neuralgia is the safe and effective procedure and potentially alternative to MVD procedure or at least the only gold standard option in cases where no significant vascular loop conflict is found.

It has the potential to be performed endoscopically via single bur hole in the near future.

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