Peripheral Neurectomy: A Minimally Invasive Treatment for Trigeminal Neuralgia. A Retrospective Study

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Abstract

Aim Investigate the efficacy of peripheral neurectomy as a surgical procedure in the treatment of trigeminal neuralgia and to evaluate the results obtained by this procedure and their recurrences in a period of three years followup.

Materials and Methods Thirty patients were retrospectively reviewed who underwent peripheral neurectomy. The factors analyzed were the demographic details of the patients, side of involvement, branch of nerve involved and procedure used postoperative complications, prognosis and any additional procedure used in cases of recurrences.

Results The mean age of the patient was 57.1 years (range 35–71 years) more were males (M:F = 1.73:1) and the surgical treatment was peripheral neurectomy of the involved branch following failure of carbamazepine therapy. There was no intra operative and postoperative complications noted and follow up over 3 years revealed only two cases (6.66%) of recurrence. Two patients were lost to followup, total number evaluated between 0 and 3 years after treatment was 28 patients.

Conclusion Peripheral neurectomy is one of the oldest, minimal invasive forms of surgery, well tolerated by the patient and can be done under local anesthesia.

Keywords Trigeminal neuralgia · Diagnosis · Treatment modalities · Peripheral neurectomy

Introduction

Trigeminal nerve is the largest of all the cranial nerves. It transmits sensory sensation to the face, oral and nasal cavities and most of the scalp and carries motor supply to the muscles of mastication. Disease involving the nerve can cause trigeminal neuralgia or loss of sensory or motor function in the distribution of the nerve. It can cause intense pain along its distribution; neuropathy can affect the nerve from its origin in brainstem to its peripheral branches. The commonest cause is vascular compression by tortuous vessel (superior cerebellar artery). An inflammatory cause like meningitis can also cause trigeminal neuralgia [1]. After all options of conservative and injection treatment have been exhausted, various surgical methods are used in order to relieve the patient of excruciating pain. Numerous surgical procedures are advocated for the treatment of trigeminal neuralgia [2].

The aim of this study is to investigate the efficacy of peripheral neurectomy as a surgical procedure in the treatment of trigeminal neuralgia and to evaluate the results obtained by this procedure and their recurrences in a period of 3 years followup.

Materials and Methods

The authors retrospectively reviewed a consecutive series of 30 patients who underwent peripheral neurectomy carried out in the maxillofacial unit from June 2007 to Oct 2010 at our institution. The diagnosis was based on a detailed history, clinical examination and control of pain by Tab Carbamazepine. All these patients were taking Tab Carbamazepine average 600–800 mg/day for 3–4 years.

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Orthopantomograph (OPG) was taken for every patient to exclude any local pathology. The branch of nerve involved was identified according to the site of pain and confirmed with diagnostic block with 2% Lignocaine with adrenaline 1:200,000. All patients were investigated pre-operatively with OPG/computerized tomography scanning (CT) or magnetic resonance imaging (MRI), which revealed no underlying structural abnormalities. The follow-up period covered by this study ranged from 1 to 3 years. The factors analyzed were the demographic details of the patients, side of involvement, branch of nerve involved and procedure used postoperative complications, prognosis and any additional procedure used in cases of recurrences.

Patients with persistent pain after conservative treatment and intolerance of carbamazepine therapy; the cost of the drug & side effects of the drugs like nausea, drowsiness, fatigue etc. were selected for neurectomy.

The technique of peripheral neurectomy was:

- (a) Access to the infraorbital nerve was through intra oral approach. After taking upper vestibular incision infra orbital foramen was visualized & infra orbital nerve and its peripheral branches were identified & avulsion of the nerve was performed from the soft tissues and from the infra orbital canal by reeling on haemostat.
- (b) Inferior alveolar nerve was approached intra orally by Dr Ginwalla's incision [3] and the nerve was identified, avulsed from the distal end. Vestibular incision in premolar region was taken; the mental nerve was identified & avulsed from the mental foramen and from the soft tissues.
- (c) Supra orbital nerve was approached extra-orally by upper eyebrow incision, the nerve was identified and peripheral neurectomy was performed by avulsing the nerve.

All operations were performed under general anesthesia. Antibiotics & anti inflammatory therapy was prescribed post operatively. The patients were followed up post operatively for 3 years.

The outcome/complications were assessed in terms of recurrences of pain, need for any other procedure to overcome pain. The complications specifically sought were infection at the site of operation, bleeding & suture dehiscence. They were graded as good, fair and poor.

Good when there was no recurrence of pain,

Fair when there was recurrence of pain after certain period of time,

Poor when there was no improvement in pain episodes even after neurectomy.

Results

30 patients underwent 31 neurectomies of which 19 were males & 11 were females whose average age was 57.1 years (range 35–71 years) (Table 1).

The third division (inferior alveolar) was most commonly affected by the disease, in 20 patients (66.66%) (Table 2). The second division (infra orbital) was afflicted in 9 patients (30%), second and first division were involved in only in one patient (3.33%). None of the patients had lingual nerve involvement. The right side was affected in 22 patients (73.33%), while left side in 8 patients (26.66%). Both facial sides were not affected in any patient in this series. The mean followup period was 2.46 years (range 0–3 years). There were no intra-operative or post operative complications. None of the patients had postoperative infection, suture dehiscence. All patients were relieved of pain and had discontinued the medications. They were followed up for 3 years. Only 2 patients (6.66%) had recurrence of pain after a period of 1 year, they were prescribed Tab Carbamazepine 200 mg 12 hourly and were relieved of symptoms. Since 2 patients (6.66%) were lost to followup, the total number evaluated between 0 and 3 years after treatment was 28 patients. Also 2 patients had recurrence of symptoms.

Discussion

The approach to the treatment of trigeminal neuralgia varies greatly, but most authors agree that it should be gradual, from pharmacological therapy to very invasive, intracranial procedures [3–7]. Currently available surgical options are (1) *Non-invasive technique*: (a) peripheral neurectomy, (b) Alcohol injections, (c) Cryotherapy, (d) Selective radio frequency thermocoagulation (2) *Invasive technique*: (i) Open: microvascular decompression, (ii) Percutaneous: (a) radiofrequency rhizotomy, (b) Retrogasserian glycerol rhizotomy, (c) Balloon compression of trigeminal nerve, (d) Stereotactic radiosurgery—Gamma knife [8].

Any treatment of idiopathic neuralgia is successful as long as it eliminates the pain [9, 10]. The persistence of pain after pharmacological and injection (alcohol) therapies requires surgical intervention, these are the neurectomy of peripheral divisions of the trigeminal nerve and various neurosurgical procedures [10–13]. One of our patients reported to our institute with right side inferior alveolar neuralgia (not included in this study). He presented with Osteomyelitis of ramus region and sloughing of soft tissues extending from 44 to ramus region. He had received 3–4 alcohol block injections in a private clinic over a period of 2 years to relieve his pain as one of the treatment modalities of trigeminal neuralgia. Though alcohol block injections are also considered

Table 1 Summary of demographic, follow up and outcome characteristic of 30 patients treated for trigeminal neuralgia

Sl. no.	Age	Sex	Site involved	Nerve involved	Follow-up (years)	Outcome
1.	56	M	Right	Inferior alveolar	3	Good
2.	48	F	Right	Inferior alveolar	2	Good
3.	70	M	Right	Inferior alveolar	3	Good
4.	62	F	Right	Inferior alveolar	2	Good
5.	71	M	Right	Inferior alveolar	3	Good
6.	65	M	Left	Infra orbital	3	Good
7.	45	F	Right	Infra orbital	3	Good
8.	55	M	Left	Infra orbital	3	Good
9.	67	M	Right	Inferior alveolar	3	Good
10.	35	F	Right	Supra orbital & infra orbital	2	Good
11.	53	M	Right	Infra orbital	1	Good
12.	60	M	Right	Inferior alveolar	3	Good
13.	56	M	Right	Inferior alveolar	2	Fair
14.	64	F	Left	Inferior alveolar	3	Good
15.	58	M	Right	Inferior alveolar	3	Good
16.	53	F	Right	Infra orbital	0	–
17.	62	M	Right	Inferior alveolar	3	Good
18.	58	F	Left	Inferior alveolar	3	Good
19.	60	M	Right	Infra orbital	2	Good
20.	51	F	Right	Inferior alveolar	3	Fair
21.	48	M	Right	Inferior alveolar	3	Good
22.	52	M	Left	Inferior alveolar	3	Good
23.	50	F	Left	Infra orbital	3	Good
24.	60	M	Right	Inferior alveolar	3	Good
25.	63	F	Right	Infra orbital	3	Good
26.	59	M	Right	Inferior alveolar	2	Good
27.	58	M	Left	Inferior alveolar	1	Good
28.	55	M	Right	Inferior alveolar	3	Good
29.	65	F	Left	Inferior alveolar	0	–
30.	54	M	Right	Infra orbital	3	Good

Table 2 Summary of involvement of branches of trigeminal neuralgia

Sl. no.	Branch involved	Total	Percentage
1.	Inferior alveolar nerve	20	66.66
2.	Infra orbital nerve	9	30
3.	Supra orbital nerve	0	0
4.	Supra orbital and infra orbital nerve	1	3.33

as minimally invasive procedures but they have severe drawbacks & cause local edema, high risk of recurrent pain combined with moderate risk of dyesthesia & necrosis of the surrounding tissues [11]. Neurectomy of the peripheral branches of the trigeminal nerve is the simplest, safest and minimally invasive surgical method as experienced by the author. In one of our patient there was vascular compression of the nerve root during its intra cranial course which has to

be treated by vascular decompression. Due to the high cost, highly invasive craniotomy procedure and increased rate of mortality and morbidity of vascular decompression procedure, patient preferred the minimally invasive procedure i.e., peripheral neurectomy and is now devoid of symptoms post operatively, is under follow up for last 2 years.

Most of the studies done for neurectomy were published 20–50 years ago [14, 15]. Quinn [16] reported a retrospective case series of 63 patients with 112 neurectomies. A follow-up period of 0–9 years was noted, and the pain relief period of 24–32 months was reported. Grantham [14] also reported on 55 patients who had 55 neurectomies, follow-up was for 6-months to 8 years. Average pain relief period was 33.2 months. Not all patients followed up for 3 years, one was for 2 years only.

Surgical access to the infraorbital (V2) & inferior alveolar nerve is intra orally. We consider this access to be

better, primarily due to avoidance of post operative facial scars. Some authors use trans-facial access to the V2 division [17] most probably because of lower risk of the post operative wound and reduced post operative edema. No post operative complications occurred in our patients. Antibiotics and anti inflammatory therapy was prescribed post operatively after surgical procedure.

Several authors discuss the number of repeated neurectomy of peripheral divisions of the trigeminal nerve [2]. In our case of 3 year followup there were 2 cases of recurrence after a period of 1 year. They were having similar episodes of pain but of minimal intensity and frequency. They were prescribed Tab Carbamazepine 200 mg 12 hourly and were relieved of symptoms. Some authors state that the response of their patients to Tab Carbamazepine when the recurrence of pain appears is better after neurectomy [18] and lower doses of the medication are needed [2]. The same was observed in our study.

There are no major complications of these procedures other than some facial swelling and bruising in the early postoperative period [18]. There were no such complications found in our series.

Conclusion

The minimally invasive procedure is peripheral neurectomy, which consists of surgical avulsion of terminal branches of the trigeminal nerve. It is one of the oldest, minimal invasive forms of surgery, well tolerated by the patient and can be done under local anesthesia. This means that this procedure is still acceptable, is more economical, is less morbid, and can be performed in patients, mainly indicated in patients with extremes of age, debility or significant systemic diseases with limited life expectancy. This procedure is more cost effective and easily affordable by patients.

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