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Options in treating trigeminal neuralgia: Experience with 195 patients

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ABSTRACT

Objective: For patients with medically unresponsive trigeminal neuralgia (TN), surgical options include microvascular decompression (MVD), radiofrequency rhizotomy (RF), and stereotactic radiosurgery (SRS). In an attempt to identify the risks and benefits and cost inherent with each of the three modalities, we performed a retrospective review of our experience with 195 cases of TN treated over the past 15 years.
Methods: Since 2001, 195 patients with previously untreated TN were managed: with MVD in 79, RF in 36, and SRS in 80. All patients reported herein underwent preoperative MRI. Women outnumbered men 122/73 ($p = 0.045$). Follow-up after surgery was 32 ± 46 months.
Results: The patients qualifying for MVD were generally healthier and younger, with a mean age ± SD of 57 ± 14, compared to those undergoing RF (75 ± 15) or SRS (73 ± 13, $p < 0.0001$). In case of relapse, medical treatment was always tried and failed prior to consideration of surgical intervention. A second surgical procedure was necessary in 2, 23, and 18 patients initially treated with MVD, RF, and SRS respectively ($p < 0.0001$). In the patients treated with MVD, RF, and SRS, the average number of procedures per patient necessary to achieve pain control was 1.1, 2.0, and 1.3 respectively ($p = 0.001$). There were 7 complications in the patients treated with MVD but no deaths. Numbness was present in 13, 18, and 29 patients treated with MVD, RF, and SRS respectively ($p = 0.008$).
Conclusion: MVD for TN is the treatment least likely to fail or require additional treatment. Patients who underwent MVD were younger than those undergoing RF or SRS. The highest rate of recurrence of TN was encountered in patients undergoing RF (64%). Facial numbness was least likely to occur with MVD (16%) compared to RF and SRS (50% and 36% respectively).

1. Introduction

In the United States, idiopathic trigeminal neuralgia (TN) has an incidence rate of approximately 12 per 100,000 people. Fortunately, for about 75% of patients who suffer with this disease, the frequent lancinating pain with which they suffer can be controlled with medications alone [1,2]. The response to medical management is estimated at 80% initially, which declines to less than 50% over time. However, this still results in a large proportion of people who continue to experience ongoing painful symptoms. For this group of patients, surgical options for their disease are available and often sought. Surgical options include microvascular decompression (MVD) [3–8], percutaneous radiofrequency rhizotomy (RF), [9–11], and stereotactic radiosurgery (SRS) [12–15]. The authors of this report sought to present their experience with the success and outcomes of the above three modalities, examining pain relief, additional treatment in recurrence, numbness, and cost.

2. Materials and methods

Since 2000, a total of 216 patients with trigeminal neuralgia and without prior surgical treatment have been cared for at our institution. Diagnosis and management were based on clinical grounds,

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Table 1
Demographic data on TIC and the 3 treatment modalities.

Treatmentmodality	Numberof patients	Men/women	Age years(mean ± SD)	Right/left side	Follow-up(months)	Current pain score(m ± SD)
MVD	79	33/46	57/14	49/30	16/22	1 ± 2
RF	36	13/23	75/15	19/17	65/57	2 ± 3
SRS	80	27/53	73/13	47/33	33/51	1 ± 2
Total	195	73/122		115/80		
p		p = 0.045	p < 0.0001	p = 0.645		p = 0.353

MVD: microvascular decompression. RF: radiofrequency rhizotomy. SRS: stereotactic radiosurgery.

and all patients were investigated with a baseline MRI to rule out a mass lesion or demyelination. All patients were interviewed and examined, and a long, detailed discussion of the different intervention modalities ensued. This was aided with the use of an illustrated handout describing the interventional procedure, risks, side effects, and predicted failure rates. For young and healthy patients, MVD was presented as the recommended procedure due to its longer lasting results and decreased probability of postoperative facial numbness. Patients suffering from severe and acutely incapacitating pain with difficulty eating, drinking, and/or talking were offered radiofrequency lesioning [9,11]. This was recommended for patients needing immediate, but less invasive surgery than MVD. When discussing surgical options with elderly patients and those with major surgical risk factors such as major cardiac disease or patients on anticoagulants, SRS was recommended. Some younger patients also elected to undergo SRS as they felt it was the least invasive. They were counseled that SRS also typically had the longest time to relief following the procedure. It is important to note that, while specific procedures were recommended, ultimately the procedure chosen was a decision made between the practitioner and patient.

Microvascular decompression was performed in the decubitus position with facial nerve monitoring and intraoperative osmotic diuresis. Three to seven Teflon™ (Medline Industries, Mundelein, IL) felt sponges (1 × 5 mm each) were placed between the trigeminal nerve and the offending vessel. The 1-inch bone flap was replaced and affixed with titanium "I" plates. Patients were generally discharged the following day.

Radiofrequency ablation was performed in the angiography suite under monitored local analgesia and sedation. The foramen ovale was engaged using an electrode with a 5-mm exposed tip. Using the Radionics radiofrequency generator (Radionics Model RFG-3CF, Radionics, Inc. Burlington, MA), the position of the electrode was adjusted to produce paresthesia covering the area of pain with a current of 0–1 V and a frequency of 50 Hz. Once the position of the electrode was deemed satisfactory, lesions were made in a stepwise fashion from 50 to 90 °C for 50–90 s each. The position of the electrode was adjusted between every 2–3 lesions for optimal coverage.

Stereotactic radiosurgery was accomplished with a CT-compatible stereotactic ring affixed to the skull under local analgesia. The root entry zone of the trigeminal nerve was identified on fused CT and MRI images. The target was irradiated with a linear accelerator using 5 arcs and a single isocenter with a 5-mm collimator prescribing 90 Gy to the 100% isodose line.

Patients were monitored with preoperative and postoperative visual analog scores (VAS) for facial pain, preoperative and postoperative use of medications, presence or absence of facial numbness, need for a second procedure, and charges (IRB # 201206714). Hospital and physician charges were collated and summated. We tabulated and analyzed billings rather than collections, as the latter varied depending on insurance carrier. Statistical Package for the Social Sciences (SPSS) version 22 for Windows was used for analysis. Chi-Square procedure was used for categorical data analysis. For numerical data, One-Way Analysis of Variance (ANOVA) with Tukey's post hoc test was used for analysis when normal distribution was satisfied. Otherwise, nonparametric analysis procedure was used to compare means of numerical data. A "p" value of less than 0.05 was set as significance.

3. Results

3.1. Clinical outcome

Follow-up was available on 195 patients, which constitute the study population. MVD was performed on 79 patients, RF on 36, and SRS on the remaining 80 (Table 1). There were 73 men and 122 women (p = 0.045), with the right side affected in 115 patients and the left side in 80 (p = 0.645). Patients who underwent the more invasive MVD were younger (57 ± 14 yrs), compared to those undergoing the less invasive RF or SRS (75 ± 15 or 73 ± 13 respectively, p < 0.0001). Follow-up of 32 ± 46 months was available in 195. At follow-up, VAS scores were 1 ± 2, 2 ± 3, and 1 ± 2 in the MVD, RF, and SRS groups respectively (p = 0.353).

To achieve satisfactory pain relief, some patients required additional procedures following the index operation (Table 2). The number of patients requiring at least one additional procedure to achieve pain relief were 2, 23, and 18 patients in the MVD, RF, and SRS cohorts (p < 0.0001, Table 2, Fig. 1). The mean period of time in months between the index procedure and the second were 40 ± 36, 45 ± 37, and 29 ± 27 months in the MVD, RF and SRS groups. In the MVD group, one patient each underwent 2 SRS procedures, and another 3 RF procedures to achieve eventual pain relief. Both patients who failed to respond to the initial MVD had an arterial loop compressing the trigeminal nerve entry zone noted at the time of surgery. In the RF cohort, 24 patients underwent a total of 37 additional procedures (7 MVD, 19 RF, and 11 SRS) prior to

Table 2
Number of procedures and outcomes following MVD, RF, and SRS.

Treatment modality	Number of patients	Patients requiring additional procedure	Time to second procedure (months)	Additional procedures	Total # of procedures for pain control	Numbness	Still on medication
MVD	79	2 (3%)	40/36	5	84 (1.1)	13 (16%)	25 (32%)
RF	36	23 (64%)	45/37	37	73 (2.03)[a]	18 (50%)	18 (46%)
SRS	80	18 (22%)	29/27	19	99 (1.3)	29 (36%)	38 (47%)
Total	195			61	256		
p		p < 0.0001			p = 0.001	p = 0.0076	p = 0.32

MVD: microvascular decompression. RF: radiofrequency rhizotomy. SRS: stereotactic radiosurgery.
[a] The total number of procedures to achieve pain relief in the RF cohort (2.0) was significantly greater than that in the MVD and SRS cohorts.