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Clinical Study

Long term efficacy and patient satisfaction of microvascular decompression and gamma knife radiosurgery for trigeminal neuralgia

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ABSTRACT

The aim of our study was to evaluate the long term efficacy of microvascular decompression (MVD) and gamma knife radiosurgery (GKRS) with respect to pain relief and patient satisfaction. Both these modalities are accepted modalities of treatment for intractable trigeminal neuralgia. We excluded deceased patients, those who had a prior intervention and those requiring an additional intervention following initial treatment. A total of 69 patients were included in the study. Of these, 49 patients underwent treatment by GKRS and 20 by MVD. Pain status was assessed using the Barrow Neurological Institute (BNI) pain scale. The median follow up was 5.3 years. There was no significant difference between the two groups with respect to initial pain relief (100% MVD, 84% GKRS; $p=0.055$). There was no significant difference in pain recurrence between the two groups (39% GKRS, 20% MVD; $p=0.133$). At last follow up, 85% of patients who underwent MVD had total pain relief (BNI scale I) compared to only 45% of GKRS patients ($p=0.002$). There was no significant difference in the patient satisfaction with respect to undergoing the same procedure again (90% MVD, 69% GKRS; $p=0.1$) and recommending it to family members (95% MVD, 84% GKRS; $p=0.2$). MVD offered total pain relief in a significantly higher number of patients than GKRS. There was no significant difference in the patient satisfaction rate between the two groups.

1. Introduction

In one of the epidemiological studies conducted in the USA, the incidence rate of trigeminal neuralgia was 4.3 per 100,000 population and the age adjusted rate for women was significantly higher than that for men [1]. Medical management is the main stay of therapy for idiopathic trigeminal neuralgia and surgery is indicated when medical therapy fails. Various surgical treatment modalities include microvascular decompression (MVD), balloon compression, radiofrequency thermocoagulation, glycerol rhizolysis, partial sensory rhizotomy (posterior fossa), cryotherapy and neurectomy or alcohol injections. Of all these surgical modalities, MVD is more popular and it is the only non ablative technique. Gamma knife radiosurgery (GKRS) is gaining popularity for treating idiopathic trigeminal neuralgia not only due to its non-invasive nature but also because patients can be discharged on the same day with acceptable results.

We performed this study due to the lack of available literature with respect to efficacy of both MVD and GKRS treatment modalities and patient satisfaction. To our knowledge, there are only two prospective studies [2,3] which have compared MVD and GKRS. In one study the results did not reach statistical significance [2]. In another study, [3] MVD was superior to GKRS in achieving pain free status. We also identified only two patient satisfaction surveys with regards to MVD or GKRS [3,4]. Out of these, only one compares MVD and GKRS in terms of patient satisfaction [3]. Our study is the second such satisfaction survey.

MVD and GKRS are both accepted modalities of treatment for intractable trigeminal neuralgia. The aim of our study was to evaluate the long term efficacy of both these modalities with respect to pain relief and patient satisfaction. We attempted to evaluate the pain relief patterns after treatment for trigeminal neuralgia following GKRS and MVD.

2. Methods

The study was approved by our Institutional Review Board. Patients were briefed about the survey and after getting verbal consent from the patient, a telephone interview with a standardized questionnaire was conducted. Telephone interviews were conducted to assess the pain status and complete the patient satisfaction survey. Pain status was assessed using the Barrow Neurological Institute (BNI) pain scale. Patient satisfaction with

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respect to whether they would undergo the same procedure again and/or recommend it to family members was assessed at the end of telephone interview. The follow up was calculated from the date of the initial procedure to the telephone interview.

In our study, a BNI score I (no trigeminal pain, no medication) was considered as total pain relief. We divided the pain relief patterns into the following categories: no pain relief, pain relief improvement of one grade, pain relief improvement of two grades, pain relief improvement of three grades, total pain relief, initial pain relief–recurrence–total pain relief, initial pain relief–recurrence–partial improvement, initial pain relief–recurrence–no improvement.

We excluded deceased patients, those who had a prior intervention and those requiring an additional intervention following initial treatment. Patients with more than one procedure were excluded in order to reduce the bias which may arise due to the second procedure and the status of total pain relief. A total of 230 patients underwent treatment for idiopathic trigeminal neuralgia at our institute. Of these 230 patients, 148 (64.3%) underwent a single treatment, 73 (31.7%) underwent treatment twice and only nine (3.9%) underwent treatment three times. Of the 148 single treatment patients, only 121 were alive at the last follow up when the interview was conducted and were included in the study. Of these 121 patients, successful telephone interview was obtained with only 69. A standardized questionnaire was used to assess the patient satisfaction rate and status of pain at the time of interview. We also reviewed the medical records to determine the initial pain status following the procedure as well as pain recurrence.

3. Results

A total of 69 patients with successful telephone interviews were included in the final analysis. Of these, 49 (71%) underwent GKS and 20 (29%) underwent MVD. There was no significant difference in the age between the two groups (MVD 61.3 years *versus* GKRS 63.39 years; independent sample t-test). The majority of the patients were women (66.7%). There was no difference in the gender distribution among the two groups. The median follow up period was 5.3 years.

3.1. Initial pain relief

Initial pain relief following the treatment was noted in 61 patients (88.4%). In the GKRS group, initial pain relief occurred in 83.7% of patients, and in 100% of MVD patients. Though all MVD patients had initial pain relief, there was no statistically significant difference when compared with GKRS patients ($p=0.055$, chi-squared test).

3.2. Recurrent pain

Recurrent pain was noted in 23 patients (33.3%). In the GKRS group, recurrent pain was noted in 38.8%, and in 20% of MVD patients. Though the proportion of patients with recurrent pain was high in the GKRS group, there was no statistically significant difference with the MVD patients ($p=0.133$, chi-squared test).

3.3. Total pain relief

Total pain relief at the last follow up by telephone interview was noted in 39 patients (56.5%). In the GKRS group, total pain relief occurred in 44.9%, and in 85% of MVD patients. The proportion of the patients with total pain relief was significantly higher in the MVD group when compared with GKRS group ($p=0.002$, chi-squared test).

3.4. Pain relief patterns

No pain relief was noted in eight patients (16.3% GKRS, 0 MVD). Pain relief improvement of one grade was noted in two patients (4.1% GKRS, 0 MVD). Pain relief improvement of two grades was noted in three patients (4.1% GKRS, 5% MVD). Total pain relief (without initial recurrence) was noted in 33 patients (36.7% GKRS, 75% MVD) (Fig. 1).

Twenty-three patients (33.3%) developed pain recurrence at some point (38.8% GKRS, 20% MVD). The initial pain relief–recurrence–total pain relief pattern was noted in six patients (8.2% GKRS, 10% MVD). The initial pain relief–recurrence–partial improvement pattern was noted in 13 patients (22.4% GKRS, 10% MVD). The initial pain relief–recurrence–no improvement pattern was noted in four patients (8.2% GKRS, 0 MVD).

3.5. Patient satisfaction survey-Would you elect to undergo same procedure again

Fifty-two (75.4%) patients were happy to undergo the same procedure again. With regards to GKRS, only 69.4% were happy to undergo the same procedure and 90% of MVD patients. There was no significant difference between GKRS and MVD patients in terms of satisfaction with respect to undergoing the same procedure again ($p=0.190$, chi-squared test).

3.6. Patient satisfaction survey-Would you recommend to family and friends

Sixty patients (87%) were happy to recommend the procedure to family and friends. With regards to GKRS only 83.7% were happy to recommend it, compared with 95% of MVD patients. There was no significant difference between the two groups in patient satisfaction with respect to recommending the procedures to family and friends ($p=0.205$, chi-squared test).

4. Discussion

Current options for patients who have inadequate or only a transient relief with medications include MVD or several palliative destructive procedures like rhizotomy directed at the trigeminal nerve root or ganglion. Though MVD is currently the most frequently reported procedure, not a single randomized controlled trial was identified [5]. MVD like any other surgical procedure is associated with complications like mortality, infection or those related to general anesthesia, and the mortality rate is generally <1%. Though MVD is generally offered to younger patients, a recent systematic review and meta-analysis suggested that the majority of elderly patients with trigeminal neuralgia can safely undergo MVD [6]. The authors included eight studies in their meta-analysis (1334 patients) and complications were not significantly higher in elderly patients. Stereotactic radio surgery is one of the non surgical tools in the management of trigeminal neuralgia and radiosurgery may be appropriate for a subset of patients who are not good surgical candidates. In addition, radiosurgery could be considered as a good choice for patients with recurrent pain after failure of MVD or percutaneous surgery.

4.1. Long term results after MVD

Barker et al. [7] conducted a study with long term follow up and found that 10 years after the surgical procedure 70% of patients were totally pain free without any medication. The annual rate of recurrence was less than 1%. Zakrzewska et al. [4] found that at 5 years the mean recurrence free rate following MVD was 84%.