TREATMENT OF TRIGEMINAL NEURALGIA BY POSTERIOR FOSSA MICROVASCULAR DECOMPRESSION

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A series of 109 cases of microvascular decompression for intractable trigeminal neuralgia was reviewed. Operations were performed by a single surgeon and cases were reviewed independently by the one author. The failure rate in this study was 17.6%. A further 6.5% of cases endured brief recurrences not requiring treatment. Two-thirds of significant recurrences occurred within the initial 12 months. Long-term complications were experienced in 7.4% of cases. There was one postoperative mortality occurring in a patient with a large fibroblastic meningioma invading the brain stem. The classic Jannetta approach was modified following the first 32 cases allowing the cerebellum to be depressed inferiorly with a subsequent decline in the rate of loss of hearing from 12.5 to 3.7%. In over 70% of cases an aberrant superior cerebellar artery was found compressing the fifth cranial nerve. Patients had dental work performed in an attempt to control the pain prior to operation in 44% of cases.

Key words: microvascular decompression, trigeminal nerve, trigeminal neuralgia, vascular compression.

INTRODUCTION

Trigeminal neuralgia is characterized by a severe lancinating pain arising in the distribution of the divisions of the trigeminal nerve. In two-thirds of cases, medical therapy, principally carbamazepine, effectively controls the pain.[1,2] However, many patients cannot tolerate the side effects while in other patients the pain breaks through drug control.

A range of interventional procedures have been used including injections into the gasserian ganglion of alcohol and glycerol.[3,4] Frazier transected the nerve by way of a temporal craniectomy.[5,6] More recently balloon compression and radiofrequency lesioning of the gasserian ganglion have been favoured by some surgeons.[7–9] Microvascular decompression of the trigeminal nerve at the entry zone into the pons is the most reliable and increasingly the preferred procedure.

In 1934 Walter Dandy reported a series of posterior fossa rhizotomies for trigeminal neuralgia in which 60% of cases showed neural compression.[10] However, development of the technique of microvascular decompression was delayed until the introduction of the operating microscope in the late 1950s.[11,12] Jannetta is widely credited with being responsible for popularizing the technique.

Since the 1960s large series have been reported but few Australian series are available.[13–19] Small Australian series have been reported by Weidmann, 10 cases, and Petty and Southby, 19 cases.[1,20] Our current series is made up of over 100 cases followed for an average of 57 months in which clinical outcome was assessed independantly of the surgeon involved.

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METHODS

The records of 109 cases of microvascular decompression of the fifth cranial nerve for 98 patients were assessed. The cases spanned the years 1977–91. Operations were performed by a single surgeon and the outcome was assessed independently of the surgeon involved.

All patients were sent a questionnaire. Ambiguous details were clarified by telephone interview.

For all patients not located initially a search of the Queensland electoral role was undertaken and patients' relatives and general practitioners were contacted in an attempt to locate them. A search of death certificates by the Registrar General's Office was commissioned for the remaining missing patients. Of the original 98 patients 18 patients had died and six patients were lost to follow up. Questionnaires were received from the remaining 76 patients.

Surgical procedure

The anaesthetized patient was placed in the park bench position with the head held in mayfield tongs. A 7 cm curved postauricular incision was made and a 3 × 2 cm bone plate removed. In the first 32 cases the dissection followed along the petrosal surface of the cerebellum. Silastic discs were then packed around the nerve at the entry zone after dissecting the arteries free.

In the remainder of the cases the approach was over the tentorial surface of the cerebellum. The superior petrosal veins were coagulated and cut in all cases. The arterial loops were separated from the entry zone of

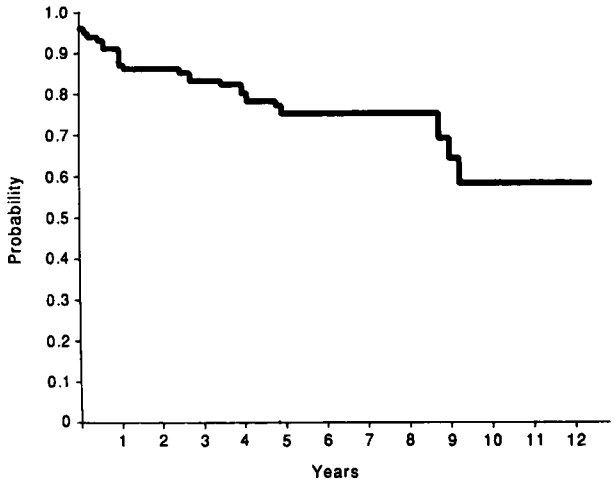

Fig. 1. Kaplan-Meier plot of the probability of remaining pain free after microvascular decompression. Recurrences include the 3.7% of initial failures, the 13.9% requiring further treatment and the 6.5% of cases in which a minor recurrence occurred.

Table 1. Long-term complications experienced

Case no.	Age	Sex	Complication
1	62	M	ataxia, hearing loss
6	66	M	ataxia, hearing loss, facial palsy, sensation loss, pneumonia
24	51	F	hearing loss, sensation loss
47	55	F	hearing loss, ataxia, sensation loss, partial facial palsy
68	41	F	minor facial palsy, paraesthesia, sensation loss
90	67	M	hearing loss
94	68	F	partial hearing loss
95	68	F	hearing loss, lateral medullary syndrome

the fifth cranial nerve using teased Teflon material. There was no retraction of the eighth cranial nerve in this approach.

RESULTS

The average age of patients in this series was 68.5 years (range 26–85). Females predominated (1.5 : 1). Bilateral disease developed in 13.3% of patients. Patients suffered from trigeminal neuralgia for an average of 7 years before operation. The average length of follow up was 57 months.

There was complete relief of pain and no recurrence of symptoms in 75.9% of cases. Further treatment was necessary for recurrent pain in another 13.9%. An additional 6.5% endured minor recurrences which settled without treatment. In 3.7% the operation failed to relieve the pain.

Figure 1 shows the Kaplan-Meier probability curve for a pain-free state. This graph plots all recurrences including the minor recurrences that resolved without treatment in 6.5% of cases.

Long-term complications were experienced in 7.4% of cases. These are summarized in Table 1. A further 11.2% suffered minor impairment of facial sensation alone. There are inherent difficulties in preserving cranial nerve function in patients with cerebellopontine angle tumours and two cases are not included in these figures. One patient with an acoustic neuroma suffered a facial palsy and the other, with an epidermoid tumour, suffered a partial facial palsy and facial numbness. There was one mortality (0.9%) in this series.

DISCUSSION

Many patients experienced transient problems in the postoperative period. These early postoperative sequelae are rarely mentioned in the literature and are higher than for the percutaneous techniques.[21] Diplopia as a consequence of fourth nerve handling was one of the more distressing of these temporary sequelae but resolved in all cases. Other patients had temporary facial numbness and facial paralysis secondary to cranial nerve manipulation, hearing loss due to fluid in the mastoid air cells, cerebellar signs from cerebellar retraction and cerebrospinal fluid leaks. A postoperative headache was a common experience. Long-term complications were experienced by a smaller group of patients (7.4%). Loss of facial sensation is intrinsic to other surgical approaches and is often not included when discussing complications of microvascular decompression for trigeminal neuralgia.

In this series there was one mortality representing a mortality rate of 0.9%. The patient (case 2) was found at operation to have a large fibroblastic type meningioma infiltrating the brain stem. In the previous 107 patients there has been no mortality. Other authors have reported similar results with the rate generally having decreased from 3% to virtually 0%.[22] Apfelbaum reported a similar 1% mortality rate with no deaths in the previous 110 patients.[23]

As the procedure has been refined, morbidity and mortality from microvascular decompression has decreased. Hearing loss is a significant complication of the posterior fossa exploration. Rates of unilateral hearing loss of 12, 19, 8, 0.7 and 9% have been reported.[14–16,24,25] In this group in 5.5% of cases, the patient was left with persistent, unilateral hearing loss. A large proportion of cases where hearing loss occurred was found in the first 32 operations. The classic Jannetta approach, in which the cerebellum is retracted posteriorly, was utilized in these first 32 cases. In the remaining surgical cases a more superior approach was employed. In this approach once the bone plate based on the transverse sinus is raised and the dura opened the tentorial surface of the cerebellum is depressed inferiorly allowing minimal traction on the delicate internal auditory artery. With this modification to the technique, made in late 1981, the incidence of

hearing loss dropped from the initial rate of 12.5% for the first 32 cases to 3.7% for the remaining 77 cases.

Panagopoulos reported similar modification to the Jannetta technique in which lateral traction of the cerebellum is avoided, believing this to be the major cause of deterioration in eighth nerve function.[17] However, Jannetta using his technique reported a rate of hearing loss of 0.73%.[24]

It is difficult to compare recurrence rate with other series because of the different approaches to classifying data. In our analysis any report of a return of pain was considered a recurrence. As Sweet points out, Jannetta uses the term failure and rigorously classifies any patient requiring regular medication as such.[21] Other reports tend to use the performance of a second operation as the requirement to describe the initial operation as a failure. The failure rate in this study is 17.6% which represents the 3.7% of cases which failed immediately and the 13.9% of cases which required further treatment. This 17.6% failure rate compares closely with that reported by other authors which range between 14 and 28%.[21]

The average time that recurrence of symptoms occurred after the operation was 25 months. Two-thirds of significant recurrences occurred within 12 months of the time of operation. Apfelbaum reported a similar trend and stated that it appeared 'that in those patients in whom the procedure will not be completely or even partially effective, the recurrences will usually occur early, with the majority within 1–1½ years'.[23] As in Apfelbaum's group, after this initial period recurrences occurred less frequently and there was no increasing trend toward failure unlike that reported for the percutaneous procedures.

Selection of patients is an important consideration. In four cases (3.7%) pain recurred in the immediate postoperative period. All four cases had no convincing evidence of compression at operation. In the first three cases (nos 10, 43, 45) the patients were subsequently diagnosed as suffering atypical facial pain and in the fourth (no. 71) pain was possibly due to a prior brain stem infarct. In retrospect these patients could possibly have been identified before operation.

Microvascular decompression is often felt to be better tolerated and more successful in younger patients. One author has proposed a cut off age of 60.[17] However, the results for this group which has a mean age 10 years older than other series reviewed are similar to those reported elsewhere and it may be that age is not such a constraint.[13–19] The most recent patient operated on was a 95 year old woman who progressed without mishap.

The rate of bilateral disease in this otherwise typical group of trigeminal neuralgia patients was 13.3% which is higher than previously reported rates of 1 and 5%.[25,26] Many patients developed bilateral disease during the course of follow up and if only patients with bilateral disease at the time of operation are considered then the rate approaches incidences cited in these reports. The popular conception of the microvascular compression theory is that lengthening and convolution of brain stem arteries secondary to degenerative changes predisposes to vascular–neural compression. This process could be expected to occur bilaterally and a 13.3% rate of bilateral disease may be more in keeping with this supposition.

Trigeminal neuralgia frequently drives patients in desperation to seek relief often perceiving the pain as dental in origin. As early as 1787 Pujol recognized dental extraction as futile and he deplored the useless removal of an entire row of teeth as a diagnostic and therapeutic blunder.[27] In this series 44% of patients reported that they had dental work performed in an effort to relieve the neuralgia prior to being diagnosed. Trigeminal neuralgia is a diagnosis made on historical features, and with attentive history-taking the diagnosis is not usually difficult to make.

Opinions on the significance of operative findings range. The most common finding at operation in this series was an aberrant superior cerebellar artery which was identified in over 70% of cases. Reports of compression rates found at operation range from 20 to 100%.[28–30] The relationship between neurovascular contacts and the trigeminal nerve in asymptomatic patients is unclear. Between 35 and 60% of unselected post-mortem series appear to have neurovascular contacts.[31,32] The question is still not completely resolved.

The decompression procedure utilizing microsurgical techniques and retrosigmoid approach has become the dominant operative technique for relieving intractable trigeminal neuralgia. The technique of microvascular decompression provides excellent long-term relief of pain (82.4%) and appears to be tolerated by elderly patients. Mortality is now less than 1% with long-term complications experienced by some patients (7.4%). The most significant of these is hearing loss, the incidence of which in our experience has fallen dramatically with modification to the technique. As the operative procedure is further refined it can be expected that mortality, morbidity and recurrence will decline. There are indications that this is already a trend. Rates of initial failures can be predicted to further improve with refinements in diagnosis and patient selection perhaps utilizing advancing magnetic resonance imaging technology.

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