Typical Trigeminal Neuralgia: Comparison of Results between Patients Older and Younger than 65 Operated on with Microvascular Decompression by Retrosigmoid Approach

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Abstract

Objective The incidence of typical trigeminal neuralgia (TN) increases with age, and neurologists and neurosurgeons frequently observe patients with this disorder at age 65 years or older. Microvascular decompression (MVD) of the trigeminal root entry zone in the posterior cranial fossa represents the etiological treatment of typical TN with the highest efficacy and durability of all treatments. This procedure is associated with possible risks (cerebellar hematoma, cranial nerve injury, stroke, and death) not seen with the alternative ablative procedures. Thus the safety of MVD in the elderly remains a topic of discussion. This study was conducted to determine whether MVD is a safe and effective treatment in older patients with TN compared with younger patients.
Methods In this retrospective study, 28 patients older than 65 years (elderly cohort: mean age 70.9 $\pm$ 3.6 years) and 38 patients $<$ 65 years (younger cohort: mean age 51.7 $\pm$ 6.3 years) underwent MVD via the keyhole retrosigmoid approach for type 1 TN (typical) or type 2a TN (typically chronic) from November 2011 to November 2017. A 75-year-old patient and three nonelderly patients with type 2b TN (atypical) were excluded. Elderly and younger cohorts were compared for outcome and complications.
Results At a mean follow-up 26.0 $\pm$ 5.5 months, 25 patients of the elderly cohort (89.3%) reported a good outcome without the need for any medication for pain versus 34 (89.5%) of the younger cohort. Twenty-three elderly patients with type 1 TN were compared with 30 younger patients with type 1 TN, and no significant difference in outcomes was found ($p > 0.05$). Five elderly patients with type 2a TN were compared with eight younger patients with type 2a TN, and no significant difference in outcomes was noted ($p > 0.05$). There was one case of cerebrospinal fluid leak and one of a cerebellar hematoma, both in the younger cohort. Mortality was zero in both cohorts.
Conclusions On the basis of our experience and the international literature, age itself does not seem to represent a major contraindication of MVD for TN.

Keywords
- elderly
- microvascular decompression
- retrosigmoid approach
- trigeminal neuralgia
- tic douloureux

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Introduction

Typical trigeminal neuralgia (TN) is characterized by acute, paroxysmal, recurrent, lancinating, or electric shock–like pain attacks with triggering factors, localized in the area of one or more branches of the trigeminal nerve.[1–5] TN can be classified as types 1, 2a, and 2b.[2–4]

In type 1 typical TN, patients experience a memorable onset of symptoms often described as a “lightning-bolt of pain that came out of nowhere” with acute violent attacks by triggering factors. Type 2a includes those patients who have type 1 symptoms early in the disease course and experience a transition, over time, to a more constant pain (typically chronic). Type 2b is considered atypical TN and has a more insidious onset of dull, boring, constant, aching, or throbbing pain and usually a different etiology.[2–4]

With the increase in the average age of the population, the proportion of elderly patients with TN is also gradually increasing, requiring more attention to this condition in older patients.

Typical type 1 and 2a TN is due to vascular compression of the trigeminal nerve at the root entry zone (REZ) in the brainstem by the superior cerebellar artery (SCA) or other vessels.[1–5] For this reason, microvascular decompression (MVD) of the trigeminal REZ in the posterior cranial fossa is considered the etiological treatment for typical TN, with the highest efficacy and durability of all available treatments, representing the treatment of first choice for medically refractory TN.[1–9]

Owing to the risks of posterior fossa surgery and of carbamazepine and other similar drugs, some percutaneous procedures (thermocoagulation, balloon compression, and glycerol gangliolysis) and radiosurgery are often proposed for elderly patients, with acceptable but not always durable results.[10–13]

The aim of this study was to evaluate the efficacy and safety of MVD for typical TN in patients aged $>$ 65 years and to compare the outcome with a control cohort of younger patients ($<$ 64 years).

Methods

Patients with TN operated on consecutively between November 2011 and November 2017 at the Department of Neurosurgery at San Filippo Neri Hospital, Rome, Italy, were studied. A total of 66 patients with typical TN were divided into two cohorts: 28 patients $>$ 65 years and 38 patients $<$ 64 years. According to the International Headache Society,[3] the diagnosis for typical TN was based on these criteria:

1. Paroxysmal attacks lasting from a few seconds to a maximum of 2 minutes
2. Distribution of severe intensity pain along one or more trigeminal divisions
3. Quality of pain: sudden burning or stabbing, intense, sharp, superficial
4. Precipitation from trigger points or by certain daily activities
5. No symptoms between the attacks
6. Absence of neurologic deficits
7. Exclusion of other possible causes of facial pain
8. Positive response to carbamazepine

Magnetic resonance imaging was performed in all cases for excluding patients with secondary TN (tumors, multiple sclerosis) and for searching possible neurovascular conflict with the REZ of the trigeminal nerve. Patients who had previous MVD or who were classified as American Society of Anesthesiologists (ASA) grade $\geq$ III were excluded. In particular, 53 elderly patients and 11 of the younger cohort were not eligible for MVD, with a classification of ASA $\geq$ III .

The operative outcomes are subjectively considered excellent (complete relief) if patients became pain free. The operative outcomes are considered good (partial relief) if patients tolerated the pain well with medications or if mild pain not requiring medications still exists. The outcomes are poor in cases of minimal or no relief from TN or because of the persistence of neurologic deficits (even if not severe).

Operative Technique

Under general anesthesia, patients were operated on in the lateral position. In all cases, brainstem auditory evoked response (BAER) with LS-CE-Chirp (Interacoustics Eclipse-EP15-ABR-System, Copenhagen, Denmark) stimulus was performed to provide intraoperative control hearing function.[14] The retrosigmoid craniectomy was $\sim$ 2.5 cm^2, with exposure of the sigmoid and transverse sinuses. The dura mater was opened, and cerebrospinal fluid (CSF) was slowly released from the arachnoid cisterns to obtain cerebellar hemisphere decompression. By using microneurosurgical technique and instruments, the arachnoid surrounding the fifth nerve was opened sharply. The whole intracisternal length of the trigeminal nerve was exposed from the REZ in the brainstem. Conflicting vessels were gently dissected and moved away from the nerve; among them, pieces of Teflon were inserted to prevent recompression. Small pieces of fibrillary Surgicel and Gelfoam were placed around, and fibrin glue was applied to fix the vessel in the new position. The superior petrosal vein and its main branches were protected and spared. The dura was closed accurately and the bone reapplied with mini-plates and mini-screws.

Statistical Analysis

Elderly cohort patients were matched to younger cohort ones. After matching, a paired sample t test was performed. Statistical significance was defined as $p \leq 0.05$. Data are expressed as means and standard deviations.

Results

►**Table 1** summarizes the results. The mean age of the elderly cohort was 70.9 $\pm$ 3.6 years (range: 65–84 years). There were 9 men and 19 women. In the younger cohort, the mean age was 51.7 $\pm$ 6.3 years (40–64 years) with 10 men and 28 women. Twenty-three elderly patients with type 1 TN were compared with 30 younger patients with type 1 TN, and 5 elderly patients with type 2a TN were compared with 8 younger patients with type 2a TN.

Table 1 Results of microvascular decompression for typical trigeminal neuralgia in patients older and younger than 65 years

	Elderly cohort (28 cases)	Younger cohort (38 cases)	*P*
Mean age, y	70.9	51.7	
Male/Female	9/19	10/28	
Type 1/Type 2a	23/5	30/8	
Trigeminal branches			
V1	13	21	
V2	28	30	
V3	24	38	
Offending vessel[a]			<0,05
SCA	22	36	
AICA	5	2	
VA	2	1	
Petrosal vein	0	1	
Major complications	none	1 CSF leak 1 cerebellar hematoma	
Mortality	none	none	
Follow-up pain control: medications required	3/28	4/38	
Subjective poor result	3/28	5/38	

Abbreviations: AICA, anterior inferior cerebellar artery; CSF, cerebrospinal fluid; SCA, superior cerebellar artery; VA, vertebral artery.
[a]In one patient in the elderly cohort and in two patients in the younger cohort, more than one vessel conflicted with the trigeminal nerve.

The second and third branches of the trigeminal nerve were affected most frequently in both cohorts. All patients were classified as ASA I or II. The SCA (alone or in association with other vessels) was the dominant conflicting vessel: 22 of 28 (78.6%) in the elderly cohort and 36 of 38 (94.7%) in the younger cohort ($p < 0.05$).

Other vessels involved alone or co-involved were the anterior inferior cerebellar artery (AICA) in five elderly and in two in the younger cohort, the vertebral artery in two elderly and one younger, and the petrosal vein in one young patient.

Outcome: Complications

Headaches, nausea, and vomiting were minor and transient complications after surgery equally distributed in both cohorts, treated with symptomatic medical therapy, and they resolved a few days after surgery.

In the younger cohort, there were one patient with a CSF leak repaired with medications and one case of a cerebellar small hematoma gradually reabsorbed. Mortality was zero in both cohorts.

Regarding the hearing outcome, no patients had postoperative hypoacusia or anacusia. In a 62-year-old man, intraoperative BAER showed a lag of the V wave of 1 ms during arachnoid dissection, likely due to vasospasm of the internal auditory artery probably caused by arachnoid traction. Intracisternal injection of pure papaverine without excipients (60 mg/2 mL) diluted in 20 mL 0.9% saline solution was used as a direct treatment of the vasospasm with an immediate normalizing effect on the V wave. At the end of surgery, the patient did not have any hearing impairment.

Outcome: Pain Control

At a mean follow-up of 26.0 ± 5.5 months, 25 elderly patients (89.3%) reported a good outcome without the need for any medication for pain versus 34 (89.5%) of the younger cohort. An 84-year-old woman was lost to follow-up, dying 6 months after surgery with a basal ganglia cerebral hemorrhage. A total of seven patients (10.6%), three elderly and four from the younger cohort, reported a recurrence of pain during the follow-up.

Twenty-three elderly patients with type 1 TN were compared with 30 younger patients with type 1 TN, and no significant difference in outcomes was found ($p > 0.05$). Five elderly patients with type 2a TN were compared with eight younger patients with type 2a TN, and no significant difference in outcomes was detected ($p > 0.05$).

Discussion

Typical TN is one of the most severe facial pain disturbances. Patients with typical TN experience a severe neuropathic pain condition affecting the face. Pain is severe, debilitating, and interferes with general activity, mood, work, and social relationships, with an impact on quality of life. During prolonged attacks, pain can be severe enough to induce inadequate nutrition and hydration or hypertension. More than a third of employed patients stated that TN adversely affected their working status in terms of reduced hours, disability, or early retirement.

Many kinds of percutaneous surgical modalities (thermocoagulation, balloon compression, and glycerol gangliolysis), as well as radiosurgical techniques, are currently recommended to patients with TN resistant to carbamazepine or other similar drugs.[10–13]

All these treatments are performed routinely and considered less invasive and safer than MVD. However, considerable evidence indicates that a neurovascular conflict is the basis of the pathogenesis of typical type 1 and type 2a TN. Therefore, MVD represents the surgical technique that directly treats and can solve the cause of typical TN.[1–9] It provides the longest lasting pain relief, with very low rates of facial dysesthesia and corneal reflex dysfunction.[1–9] In addition, high-resolution magnetic resonance imaging can demonstrate the nature and location of the neurovascular conflict, allowing clinicians to plan the procedure and improve patient selection.

Immediately after MVD, most patients experience improvement or relief of pain, up to 95 to 97%.[6,7] In addition, this procedure ensures the best long-term outcome. In a series of 1,204 patients with a mean follow-up of 6 years, Barker et al[8] reported that 70% had an excellent result, remaining pain free without medication. In a series of 330 patients with a mean follow-up of 8 years, Sindou et al[9] reported that the long-term percentage of pain-free patients was 80%.

Although the excellent result of MVD for typical TN was reported in large studies in the literature, today several neurosurgeons still prefer to treat elderly patients with percutaneous procedures or radiosurgery,[2,10–13] considering the generic risks of craniotomy and MVD.

However, studies comparing the efficacy of MVD with percutaneous procedures or radiosurgery showed that MVD is superior, especially regarding the long-term outcome. In particular, on comparing MVD and percutaneous radiofrequency gangliolysis, Burchiel et al[11] reported a pain-free rate of 90% and 65% after 1 year, respectively. Tronnier et al[12] compared the long-term outcome of MVD in 225 patients with that of percutaneous radiofrequency rhizotomy in 206 cases. The 2-year pain-free rate was 50% with radiofrequency and 76.4%, with MVD; in the last group, after 20 years the pain was still controlled in 63% of patients.

Radiosurgery represents another noninvasive option for patients with TN,[12,13] but it achieves the poorest short- and long-term pain relief. After a median follow-up period of $\sim$ 18 months, Jawahar et al[13] reported that only 42.3% of patients treated with radiosurgery were pain free.

In a series of 44 patients $>$ 70 years of age, Javadpour et al[15] reported that MVD can be performed in elderly patients without higher morbidity and mortality compared with younger patients. Several studies[16–19] confirmed that there is no significant difference in terms of short- and long-term pain relief between elderly and younger patients, and the microsurgical findings do not differ among the two groups. SCA alone, or in combination with AICA or a vein, is the most frequent operative finding independently of the age of the patient. The prevalence of SCA in the younger cohort of our series (93.7% versus 76% of elderly patients; $p < 0.05$) does not have a clear explanation.

In our series, 88% of the elderly patients and 87.5% of the younger cohort with typical TN experienced immediate pain relief after MVD. After a mean follow-up period of 22 months, the percentage of pain control remained the same in both groups.

Moreover, there is no evidence demonstrating that age itself is a predictor of adverse outcome and severe complications. Comorbidities such as hypertension, diabetes, and cardiovascular disease were found in several patients, especially in those older than 65 years. These associated diseases require attention and have to be treated appropriately.

No deaths or life-threatening morbidities occurred in our series. Transient headaches, nausea, and vomiting were the most frequent side effects, equally distributed in the two cohorts. Other complications could include hearing loss, trigeminal hyperesthesia, wound infection, cerebellar infarct/hematoma, CSF leak, and deep vein thrombosis, independent of age.[20–23] On the contrary, the atrophy of the cerebellum and the broadening of cisterns in the elderly offer more space, and both exposure and exploration of trigeminal nerve REZ may be easier. These factors reduce the possibility of injuries by retraction of the cerebellar hemisphere and cranial nerves. However, in elderly patients, cerebral arteries and veins are more fragile, and the microsurgical dissection should be extremely gentle to avoid any damage of small perforators feeding the brainstem. The slow suction of CSF and wide cutting of arachnoidal membranes facilitate the retraction of the cerebellar hemisphere and avoid the rupture of the superior petrosal veins and other bridging veins.[20–23] Severe morbidities and death after MVD could be caused by injury of the main branches of the superior petrosal vein. Preservation of these veins was emphasized as a fundamental key point by many authors.[5,20,21,23]

In elderly patients, it is necessary to balance efficacy and the side effects of MVD. In our series we did not observe mortality or life-threatening morbidities. In a series of 1,590 patients treated with MVD, Kalkanis et al[22] reported a mortality rate of 0.3%; these data are very close to the 0.2% observed by Sweet[23] in a series of 8,000 patients who underwent percutaneous ablative procedures. Mortality and morbidity rates of MVD seem to be independent from the age of the patients but seem to be lower in high-volume centers,[22] confirming that MVD requires sufficient experience and training to ensure the expected results.

Thus the outcome of our series seems to be in line with the quantitative analysis of safety and efficacy of MVD in patients with TN (younger and older than 65 years of age) reported recently by Wallach et al.[24] In particular, both morbidity and recurrences rates of our series are close to those emerging from their meta-analysis,[24] encouraging MVD as the treatment of choice of ASA I and II elderly patients with TN not responding to medical treatment.

Conclusion

MVD is an effective surgical option for elderly patients with typical TN refractory to medical therapy and can be performed with a low rate of complications. This microsurgical technique directly treats the cause of TN and can achieve immediate and long-term pain relief. Patients older than 65 years in good health with typical TN should have the opportunity to select MVD, as long as they are considered eligible for general anesthesia (ASA I–II). The major criterion influencing the selection of treatment must be general health conditions and not age per se.

Conflict of Interest
None declared.

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