Microvascular decompression for trigeminal neuralgia case series

2021

Mizobuchi et al. enrolled patients with TGN who underwent MVD between April 2012 and March 2015. We recorded their facial pain grade and complications at 7 d (short term), 1 yr (mid-term), and 3 yr (long term) postoperatively.

There were 166 patients, comprising 60 men and 106 women (mean age 62.7 yr). Furthermore, 105 patients were aged over 60 yr. We conducted neuromonitoring in 84.3% of the cases. The complete pain relief, mortality, and complication rates at the short-term follow-up were 78.9%, 0%, and 16.3%, respectively. Overall, 155 patients (93.4%) completed the long-term follow-up, with the complete pain relief and complication rates of 80.0% and 5.2%, respectively.

In the hands of experienced neurosurgeons, MVD for TGN can achieve high long-term curative effects. In addition, complications are uncommon and usually transient. The results indicate that MVD is an effective and safe treatment for patients with TGN, including elderly patients ¹.

Of 783 consecutive patients with Trigeminal neuralgia (TN) treated between 2007 and 2017, 11 young patients under the age of 30 years with TN met the inclusion criteria and were enrolled. Their clinical records, surgical treatments, and long-term outcomes were obtained and analyzed.

All 11 patients with TN underwent microvascular decompression (MVD). The average age at symptom onset was 24 years (range, 14-29 years), and the average age at the time of surgery was 28.9 years (range, 25-35 years). Further, 5 patients had left-sided symptoms, and 6 had right-sided symptoms. Surgery revealed only venous compression in 3 patients, only arterial compression in 5 patients, and both venous and arterial compression in 3 patients. The average duration of symptoms was 4.9 years, and the average follow-up duration was 7.4 years (range, 4.5-12.9 years). The long-term outcome was excellent in 9 patients and good in 2 patients, and there were no long-term complications.

The symptoms and surgical findings presented in this cohort for young-onset TN are similar to those reported in elderly adults. MVD appears to be a safe and effective treatment for young patients with TN ².

97 patients with primary trigeminal neuralgia (PTN) underwent fully endoscopic microvascular decompression (MVD) via keyhole approach in Capital Medical University Affiliated Beijing Shijitan Hospital from December 2014 to February 2019 was collected. During fully endoscopic MVD in PTN via keyhole approach, performer use natural clearance without grinding except developed rock bone crest or excessive retraction of the brain tissue, visually and panoramically observe and evaluate the CPA area, accurately identify the responsible vessels, to avoid the omission of responsible vessels or insufficient decompression. And the use of preplaced technology, bridging technology and submersible technology, ensure the efficacy of surgery and reduce the surgical side injuries. Barrow Neurological Institute Pain Intensity Score was used to evaluate the efficacy and identify the recurrence. The surgical efficacy was analyzed. The offending vessels were identified under...
endoscope in 96 cases. Among them, arterial compression was found in 77 cases, venous compression in 6 cases, and both arterial and venous compression in 13 cases. About the pain outcomes, 87 cases had immediate and complete relief of pain, 5 cases had almost relief of pain, 4 cases had partial relief of pain, and still needed medication control, but the dose was lower than that before operation, and 1 case had no obvious relief of pain. About complications, there were 4 cases of temporary facial numbness, 1 case of temporary hearing loss, both of them recovered after symptomatic treatment. There was no cerebral infarction or hemorrhage, intracranial or incision infection. All cases were followed up for 3.0-38.0 months with a median period of (22.4±2.2) months. During the follow-up periods, postoperative recurrence occurred in 3 cases. Fully endoscopic MVD for PTN through keyhole approach, provides panoramic view to avoid omission of offending vessels and reduce complications, seemed to be a safe and effective surgical method 3).

2020

A five-year review yielded 201 patients undergoing Microvascular decompression for trigeminal neuralgia. Petrosal vein (PV) sacrifice, vascular compressive anatomy and post-operative complications attributable to venous insufficiency were analyzed. Preoperative and postoperative pain outcomes were analyzed.

PV was sacrificed in 118/201 (59%) of patients, with 43/201 (21%) of patients undergoing partial sacrifice versus 75/201 (37%) with complete sacrifice. No cases of venous infarction, cerebellar swelling, or fatal complications were noted in either cohort. Non-neurologic complications occurred in 1.69% (2/118) of patients with PV sacrifice and 0% (0/83) of patients with PV preservation. Neurologic deficits (facial palsy, conductive hearing loss, gait instability, memory deficit) occurred in equal proportions in PV preservation and sacrifice groups (2.41% vs 1.69%) Overall, 87.3% (145/166) patients reported their pain as “very much improved” or “much improved” at one month, and no difference between groups was identified.

This study did not find higher complication rates in patients undergoing petrosal vein sacrifice during E-MVD for trigeminal neuralgia. In this series where the petrosal vein was sacrificed only 59% of the time, it appears to be a safe technique, but larger studies will be needed to determine the true incidence of complications following PV sacrifice 4).

A total of one hundred eighty-four patients were enrolled from patients with typical TN who underwent MVD at our institution between 1/3/2008 and 1/3/2016. The data were collected using electronic operative records and case notes and were retrospectively analyzed. Patients were followed up at the outpatient department or by telephone at a minimum of three months and at a maximum of forty-eight months.

72.3% of patients achieved freedom from pain after MVD, 27.7% experienced poor pain control, with follow-up at a minimum of 3 months and at a maximum of 48 months. Risk factors for poor pain control after MVD according to binary logistic regression and ROC analysis included younger age (OR: 0.90; 95% CI: 0.82-0.99; P = 0.028; AUC=0.774); poor preoperative pain control (BNI score > IV) (OR: 52.03; 95% CI: 6.44-420.16, P < 0.001; AUC=0.858); intraoperatively detected multivessel compression (OR: 2.49; 95% CI: 3.10-46.59, P < 0.001; AUC=0.871). Furthermore, combined compression of the superior cerebellar artery (SCA) and the petrosal vein (PV) was an independent risk factor predicting a poor outcome following MVD (OR: 5.69; 95% CI: 33.78-2579.03, P < 0.001; AUC=0.812).
Younger patients with TN had worse long-term pain outcomes following MVD. Additional factors associated with postoperative recurrence included poor preoperative pain control (BNI score > IV) and multivessel compression. Furthermore, SCA combined with PV was confirmed to be associated with a worse outcome.

2019

In a retrospective study, 28 patients older than 65 years (elderly cohort: mean age 70.9 ± 3.6 years) and 38 patients < 65 years (younger cohort: mean age 51.7 ± 6.3 years) underwent microvascular decompression via the keyhole retrosigmoid craniotomy for type 1 trigeminal neuralgia (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.

At a mean follow-up 26.0 ± 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.

Age itself does not seem to represent a major contraindication of microvascular decompression for typical trigeminal neuralgia.

Subjects who underwent microvascular decompression for trigeminal neuralgia at the Massachusetts General Hospital, between 1/1/2004 and 12/31/2013, had typical trigeminal neuralgia (TN), and demonstrated neurovascular compression on preoperative imaging. Bick et al., performed a retrospective case series study by reviewing the electronic medical record and performing phone interviews to determine long-term outcomes. They divided patients into 2 groups for analysis, under 60 and 60 yr of age and older.

One hundred twenty-four subjects were included in the study, 82 under 60, and 42 60 yr of age and older. The average length of follow-up was 42.4 mo. Patients in the older age group had average pain score of 1.57 at most recent follow-up, while for the younger age group it was 2.18 (P = .0084). Multiple regression analysis found that older age, male gender, and preoperative medication responsiveness were significantly correlated with lower long-term pain scores, while V2 dermatome involvement was correlated with higher long-term pain scores.

Patients 60 yr of age and older have significantly better long-term pain outcomes following MVD than younger patients.

Zhao et al. summarize 5-year experience of MVD for primary TN due to venous compression alone. Thirty-four patients with primary TN caused solely by veins underwent MVD. The presenting symptoms, key operative notes, surgical outcomes together with complications were reviewed. Of all the 34 patients, 19 (55.9%) patients occurred as typical TN. The V2 division was the most commonly affected area. Most of the venous conflicts were grade III (20/34, 58.8%). Deep superior petrosal.
venous system was the most frequent offending vessel (21/34, 61.8%). The venous conflicts were located at the trigeminal root entry zone in 10 (29.4%) patients, the mid cisternal zone in 18 (52.9%) patients, and the porus of Meckel's cave in 11 (32.4%) patients. At the last follow-up, excellent outcome was obtained in 26 (76.5%) patients, 7 (20.6%) patients got good outcome, fair outcome was achieved in 7 (20.6%) patients, and 1 patient unimproved (2.9%). Cerebrospinal fluid leakage was the most common complication (5.9%). In conclusion, MVD is a safe and effective surgical option for TN due to venous compression alone. It is noteworthy to explore the entire nerve and to protect veins as much as possible.

2017

Yang et al. investigate the characteristics of superior petrosal vein (SPV) and its influence on the surgical field in microvascular decompression for trigeminal neuralgia (TN), and analyze the effect of the surgical treatment of SPV on the surgical approach, indication and prognosis.

The clinical data of 280 patients with trigeminal neuralgia between Jan. 2013 and Jun. 2016 were collected, including the trunks and the branches of SPV, intraoperative electrocoagulation status, the surgery outcome and complications.

The petrosal vein during the operation was fully preserved in 152 cases (54.29%). The SPV were completely sectioned in 25 cases (8.92%), while some branches of SPV were sectioned in 103 cases (36.79%).

They found that SPV have 1 to 3 trunks, accounted for 67 cases (23.90%), 168 cases (60%), and 45 cases (16.10%), while the SPV with 1 to 4 branches accounted for 17 cases (6.07%), 112 cases (40%), 136 cases (48.57%), and 15 cases (5.36%). The SPV was identified as offending vessel in 17 cases (6.07%).

One patient with cutoff SPV trunk encountered cerebellar infarction and recovered completely at 2 weeks after MVD by using intravenous medication.

MVD is the recommended treatment method for PTN, mostly SPV is unnecessary to be sectioned completely and small branches of SPV could be sacrificed. Very few patients may develop cerebellar infarction or hematoma.

Clinical characteristics, intraoperative findings, and postoperative curative effects were analyzed in 72 patients with trigeminal neuralgia who were treated by microvascular decompression. The patients were divided into arterial and venous compression groups based on intraoperative findings. Surgical curative effects included immediate relief, delayed relief, obvious reduction, and invalid result. Among the 40 patients in the arterial compression group, 32 had immediate pain relief of pain (80.0%), 5 cases had delayed relief (12.5%), and 3 cases had an obvious reduction (7.5%). In the venous compression group, 12 patients had immediate relief of pain (37.5%), 13 cases had delayed relief (40.6%), and 7 cases had an obvious reduction (21.9%). During 2-year follow-up period, 6 patients in the arterial compression group experienced recurrence of trigeminal neuralgia, but there were no recurrences in the venous compression group. Simple artery compression was followed by early relief of trigeminal neuralgia more often than simple venous compression. However, the trigeminal neuralgia recurrence rate was higher in the artery compression group than in the venous compression group.
Indocyanine green videoangiography was performed in 17 TN patients undergoing microvascular decompression.

von Eckardstein et al., focused on whether ICG angiography is helpful in determining the site of conflict, particularly when not directly visible via the microscope, and whether fluorescence is strong enough to shine through the nerve obliterating the direct view of the compressing vessel.

In four patients, the site of conflict was immediately apparent after opening the cerebellopontine cistern, and ICG angiography did not provide the neurosurgeon with additional information. In another two patients, imaging quality and fluorescence were too poor. Of the remaining 11 patients with a hidden site of nerve-vessel conflict, ICG angiography was found to be helpful in anticipating the site of compression and the course of the artery in 7 patients, particularly in regard to the so-called shining-through effect through fiber bundles of the thinned nerve. Of all the patients, 88% reported at least improvement or cessation of their symptoms, including all of the patients with a shine-through effect.

ICG angiography could be a helpful adjunct in decompressing the trigeminal nerve and can guide the surgeon to the nerve-vessel conflict. Intensity of the fluorescence is powerful enough to shine through thinned and splayed trigeminal nerve fiber bundles.

A retrospective review of patient records from 1998 to 2015 identified a total of 942 patients with TN and 500 patients who underwent MVD. After excluding several cases, 306 patients underwent MVD as their first surgical intervention and 175 patients underwent subsequent MVD. Demographics and clinicopathological data and outcomes were obtained for analysis.

In patients who underwent subsequent MVD, surgical intervention was performed at an older age (55.22 vs 49.98 years old, p < 0.0001) and the duration of symptoms was greater (7.22 vs 4.45 years, p < 0.0001) than for patients in whom MVD was their first surgical intervention. Patients who underwent initial MVD had improved pain relief and no improvement in pain rates compared with those who had subsequent MVD (95.8% and 4.2% vs 90.3% and 9.7%, respectively, p = 0.0041). Patients who underwent initial MVD had significantly lower rates of facial numbness in the pre- and postoperative periods compared with patients who underwent subsequent MVD (p < 0.0001). The number of complications in both groups was similar (p = 0.4572).

The results demonstrate that patients who underwent other procedures prior to MVD had less pain relief and a higher incidence of facial numbness despite rates of complications similar to patients who underwent MVD as their first surgical intervention.

A retrospective analysis of clinical data was performed in 99 patients who underwent MVD from May 2012 to June 2015. The outcome data from 27 MVD operations for 27 patients aged 70-80 years (mean 74.6 years) were compared with 72 MVD operations with 72 patients aged 25-69 years (mean 55.7 years). Preoperative comorbidities were recorded and postoperative worsening comorbidities and non-neurological complications were evaluated at discharge. Efficacy of the surgery and neurological complications were evaluated in July 2015.

No decrease in activity of daily living was found in any patient. Complete pain relief without medication was achieved in 77.8% and partial pain relief in 14.8% in the elderly group, and 83.3%
and 9.7%, respectively, in the non-elderly group (p=0.750). Permanent neurological complication was not observed in the elderly group, whereas Vth nerve and VIIIth nerve complications were observed in the non-elderly group. Rates of preoperative multiple comorbidities and of cardiovascular comorbidity were significantly higher in the elderly group (p<0.01). Worsening comorbidity and new pathology at discharge were mainly hypertension in both groups, but glaucoma attack and asthma attack were observed in the elderly group. All pathologies were successfully managed.

MVD for elderly patients with TN can be achieved safely with careful perioperative management. Information of comorbidity should be shared with all staff involved in the treatment, who should work as a team to avoid worsening comorbidity. The possibility of unpredictable events in the elderly patients should always be considered.13

Since 2004, there were a total of 51 patients with TIC and 12 with HS with available MRI scans. All patients underwent preoperative MRI to rule out non-surgical etiologies for facial pain and facial spasm, and confirm vascular compression. Follow-up after surgery was 13±22 months for the patients with TIC and 33±27 months for the patients with HS.

There were 45 responders to MVD in the TIC cohort (88%), with a Visual analog scale (VAS) of 1±3. All patients with HS responded to MVD between 25 and 100%, with a mean of 75±22%. Wound complications occurred in 10% of patients with MVD for TIC, and 1 patient reported hearing loss after MVD for HS, documented by audiogram. The congruence rate between the preoperative MRI and operative findings of vascular compression was 84% in TIC and 75% in HS.

MVD is an effective and safe modality of treatment for TIC and HS. In addition to ruling out structural lesions, MRI can offer additional information by highlighting vascular loops associated with compressions. On conventional scans as obtained here, the resolution of MRI was congruent with operative findings in 84% in TIC and 75% in HS. This review emphasizes that the decision to undertake MVD in TIC or HS should be based on clinical diagnosis and not visualization of a compressing vessel by MRI. Conversely, the presence of a compressing vessel by MRI demands perseverance by the surgeon until the nerve is decompressed.14

The trigeminal nerve was sectioned into 5 zones. Zone 1, 2, 3, 4 was located at the rostral, caudal, ventral, and dorsal part of the nerve root entry zone (REZ) respectively, and zone 5 was located at the distal of the nerve root. This study contained 86 patients with trigeminal neuralgia underwent microvascular decompression. Every zone was exposed through preoperative imaging. During the operation, offending vessels were explored from zone 1 to zone 5, and different decompression techniques were used for different types of vessels.

Through zone exploration, the sensitivity of preoperative imaging was 96.5% and specificity was 100%. Location of the neurovascular conflict was in the zone 1 in 53.5% of the patients, zone 2 in 32.6%, zone 3 in 45.3%, zone 4 in 29.1%, and zone 5 in 34.9%. In total, 2 zones were both involved in 59.3%, and 3 zones were involved in 18.6%. All offending arteries were moved away and interposed with Teflon sponge. Offending veins of 11 patients were too small to interpose, and coagulated and cut was adopted. The other offending veins were interposed with wet gelatin and Teflon sponge, respectively.15
2014

Lee et al. performed a retrospective review of cases of TN Type 1 (TN1) or Type 2 (TN2) involving patients 18 years or older who underwent evaluation (and surgery when indicated) at Oregon Health & Science University between July 2006 and February 2013. Surgical and imaging findings were correlated.

The review identified a total of 257 patients with TN (219 with TN1 and 38 with TN2) who underwent high-resolution MRI and MR angiography with 3D reconstruction of combined images using OsiriX. Imaging data revealed that the occurrence of TN1 and TN2 without NVC was 28.8% and 18.4%, respectively. A subgroup of 184 patients underwent surgical exploration. Imaging findings were highly correlated with surgical findings, with a sensitivity of 96% for TN1 and TN2 and a specificity of 90% for TN1 and 66% for TN2. Conclusions Magnetic resonance imaging detects NVC with a high degree of sensitivity. However, despite a diagnosis of TN1 or TN2, a significant number of patients have no NVC. Trigeminal neuralgia clearly occurs and recurs in the absence of NVC 16).

2002

A study comprises 42 cases of trigeminal neuralgia that underwent operation with endoscopic-assisted microvascular decompression between October 1992 and October 1998. This study was performed in the Ear, Nose, and Throat Department, Nord Hospital, in Marseille, France. The decompression was performed by means of a minimally invasive retrosigmoid approach without a cerebellar retractor. The cerebellopontine angle was then explored by a 30-degree endoscope that gives a panoramic view of this space, with clear visualization of the trigeminal nerve from the pons to Meckel's cave, allowing for the identification of the precise location of the site of the conflict. Microvascular decompression was performed under the microscope by separating the offending vessel from the trigeminal nerve; separation was maintained by the insertion of a piece of Teflon.

The site of conflict was detected at the root entry zone of the nerve in 35 patients (83.3%) and at Meckel's cave in 7 patients (16.7%). In 32 cases (76.2%), the type of contact between the vessel and the nerve was of the simple type (1 vessel coming in contact with the nerve in a single point); in 6 cases (14.3%), it was a multiple type (2 vessels touching the nerve in the same point); and in 4 cases (9.5%), it was a nutcracker type (2 vessels compressing the nerve between them). After at least 1-year follow-up and a single operation (cases that required a second operation for revision were considered failures), a successful result was obtained in 31 cases (73.8%), and an improvement was obtained in 4 cases (9.5%). The operation was a failure or early recurrence occurred in 7 cases (16.7%). Postoperative complications were rare. A cerebrospinal fluid leak occurred in only 1 case (2.4%) and was subsequently treated with lumbar puncture and a compressive bandage.

The minimally invasive retrosigmoid endoscopic-assisted microvascular decompression is an acceptable treatment of primary trigeminal neuralgia. Endoscopy provides a unique way to explore the cerebellopontine angle and to identify the exact location of the neurovascular conflict 17).


