

## Percutaneous Trigeminal Ganglion Compression for the Treatment of Trigeminal Neuralgia: Report of Two Cases

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Percutaneous trigeminal ganglion compression for the relief of trigeminal neuralgia is a technically simple, non-painful procedure, carried out under brief general anesthesia. The patients could tolerate well during the treatment. The operation successful rate is high, and the procedure can be repeated at the next day if the symptom was not relieved. The procedure, in the present, is the first choice for those trigeminal neuralgia patients who are poor medical risks, those who are above the age of 65, those with demyelinating disease, and those who are unwilling to accept the increased risk of a posterior fossa craniectomy. We have successfully performed this procedure for two recurrent trigeminal neuralgia patients without any surgical complication. We propose this surgical treatment algorithm for trigeminal neuralgia patients who are not able to tolerate the medical treatment.

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**Key words:** percutaneous trigeminal ganglion compression, trigeminal neuralgia

The percutaneous trigeminal ganglion compression (PTGC) technique for the treatment of trigeminal neuralgia was introduced in 1978 and published in 1983 by Mullan and Lichtor.<sup>(1)</sup> This procedure was originally recommended when other techniques failed to relieve trigeminal pain. More recently, PTGC has been widely indicated for the treatment of a great variety of facial pain, due to its simplicity and safety.<sup>(2)</sup> In this study we present our experience with PTGC, review the literature and suggest appropriate guidelines for the use of the various surgical procedures available to deal with trigeminal neuralgia.

### CASE REPORT

#### Case 1

This 65-year-old woman had suffered from right

V3 trigeminal neuralgia for many years. The initially medical treatment with carbamazepine only partially relieved the patient's symptoms. She underwent a right retromastoid craniectomy with microvascular decompression operation at our hospital two and half years ago. Post-surgically, the pain subsided. Unfortunately, over recent months, the right facial pain has reappeared. The symptoms appear to be mainly focused upon the right V2 branch of the facial nerve, and are somewhat different to what they were prior to surgery. The medical treatment was not effective. Further surgical intervention was advised, but the patient was afraid of the craniectomy procedure and rejected it. We thus decided to perform PTGC for the patient.

#### Case 2

This 35-year-old man had suffered from left V2

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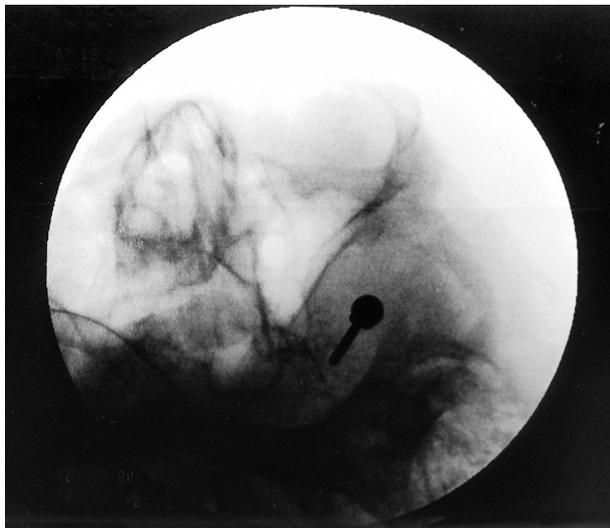
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and V3 trigeminal neuralgia for 4 years. The prescribed medical treatment only served to lessen the pain. The patient received left retromastoid craniectomy with microvascular decompression at another hospital, although the symptoms did not subside subsequent to surgery. Eight months ago, he underwent the Gamma-knife radiosurgery procedure on the trigeminal ganglion, but the pain remained, the procedure clearly failing. He visited our clinic and the risk of all surgical procedures was clearly explained to the patient. The patient decided to undergo the PTGC technique.

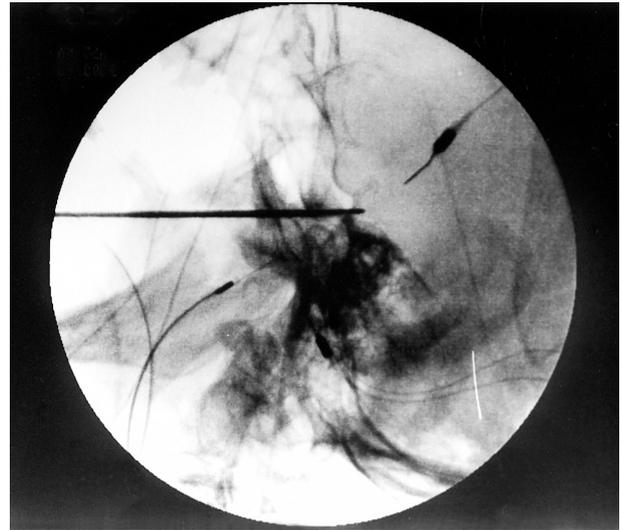
### Operative procedures

The surgical procedures for PTGC are performed under general anesthesia with intra-tracheal intubation. The patient is placed in the supine position, with slight extension of the neck and thorax. We adopted and modified the procedure as first described by Mullan and Lichtor in 1983.<sup>(1)</sup> In our version of the surgical procedure, we used a C-arm intensifier fluoroscope and stereotactic Navigator system for localization. The point of entry into the skin is 2.5 cm external to the angle of the mouth. A 14 gauge catheter is initially advanced parallel to the sagittal plane in order to avoid transfixion of the oral mucosa, the catheter then being redirected under fluoroscopic guidance until the foramen ovale is entered (Fig. 1). Penetration beyond the margins of

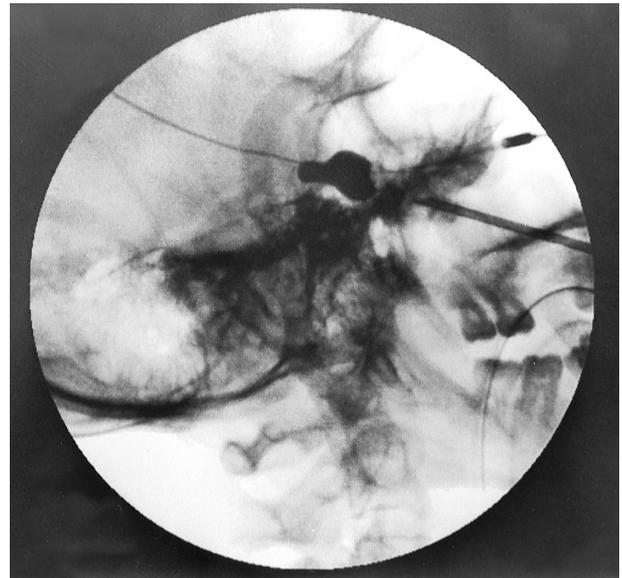


**Fig. 1** Oblique radiograph of the skull showed the catheter was just engaged in the foramen ovale of the patient 1.

the foramen ovale is to be avoided. A No. 4 Fogarty catheter with its fine steel stylet is introduced until 10 to 15 mm of the catheter lies beyond the needle tip (Fig. 2). Mild resistance is usually encountered before entry into the cave. Following stylet withdrawal, the balloon is inflated with Omnipaque



**Fig. 2** Lateral radiograph of the skull showed the stylet was in the Meckel's cave of the patient 1.



**Fig. 3** Lateral radiograph of the skull showed the inflated balloon in the cave and began to herniate through the porus of the patient 1.

water-soluble contrast medium under lateral fluoroscopic control until it begins to emerge proximate to the posterior fossa. The shape and position of the balloon are checked with respect to neighboring bone landmarks (eg clivus, sella, and petrous bone). If balloon placement is not correct, the balloon is immediately deflated and the catheter is repositioned until the ideal pear-shape appearance is achieved (Fig. 3). Use of an anteroposterior fluoroscope may help to define the location of the balloon when its shape is not deemed fully typical from the lateral projection. Following ganglion compression for one minute, the contrast medium is aspirated, the catheter is withdrawn, and the puncture site is compressed manually for 10 minutes. Since functional localization is not needed, the procedure is usually completed within 15 minutes. Patients are typically discharged the day after surgery.

## RESULTS

For these 2 patients, the symptoms completely subsided subsequent to the completion of surgery. A mild dysesthesia was noted over the affected areas for both these patients, although no anesthesia-associated complications were apparent, and paresis of the masticatory muscles was not obvious. There was no other complication for these 2 patients, both of whom were very satisfied with their surgical procedure. The procedures were totally pain-free for both patients, they both being discharged the day following surgery. At the 6 months follow-up, the patients were both pain-free and without any complication. For both, the sensation of numbness had vanished within 3 months.

## DISCUSSION

Trigeminal neuralgia is a very troublesome disease. At present, many surgical procedures are available for the relief of drug-refractory trigeminal neuralgia. The ideal operation appears to be microvascular decompression, since it would appear to elucidate the cause(s) of essential trigeminal neuralgia for the majority of patients and, also, because it can abolish pain with little or no loss of facial sensation. Having said this, however, this procedure still demonstrates appreciable drawbacks. In the reported

literatures,<sup>(3-6)</sup> a mortality of about 1 percent has been reported, post-operative complications have not all been negligible, and the incidence of trigeminal nerve damage has been reported to be significant. Trigeminal neuralgia is not a lethal condition, nor does it cause neurological deficits. In our opinion, there is no justification for exposing patients to such dangers when there are effective and safe therapeutic alternatives available, these including percutaneous procedures, which may also be advantaged by producing only slight sensory damage.

Of the percutaneous procedures, the most widely used are controlled differential thermocoagulation, and glycerolization of the trigeminal cistern, and the above-reported trigeminal ganglion compression procedure. Thermocoagulation is more difficult for the first and the second branches of the trigeminal nerve.<sup>(3,7)</sup> During the thermocoagulation surgical procedure, patients may feel quite to very uncomfortable and this may induce a very elevated blood pressure level. Furthermore, this surgical procedure may result in a remarkable sensory deficit initially, that, as longitudinal neurophysiological studies have shown, is likely to improve more slowly and less completely than that elicited by trigeminal ganglion compression surgery. Glycerolization causes severe pain and discomfort during the procedure. Furthermore, glycerolization is not easy to perform and maintain two chemicals within the trigeminal cistern for a period of time. We found the failure rate to be high and the relapse rate was higher than for the other methods, this conclusion being supported by other workers.<sup>(8,9)</sup>

The trigeminal ganglion compression technique is technically simple and it causes only mild sensory loss for the majority of cases. Under general anesthesia, the procedure is totally pain free. The patients could tolerate well during the whole procedure without discomfort. The operation time, admission days, and the cost are less than the traditional craniectomy procedure. The wound is about 2 mm over the cheek and there is no pain from the operation wound. Furthermore, the procedure demonstrates a high immediate pain-relief rate, the reported immediately successful rate is above 95%.<sup>(10-12)</sup> If the symptom was not relief immediately after the operation, the procedure can be repeated at the next day. The long-term recurrence rate was the same as

craniectomy procedure, the reported 5 years recurrence rate was 20%,<sup>(10,12)</sup> and the 10 years recurrence rate was 30%.<sup>(10-12)</sup> The complication due to the procedure was less than 1%.<sup>(10,12,13)</sup> The procedure is not selective, however, it being impossible to restrict compression to a single division of the nerve. After the successful operations, all the patients were immediately relieved of their neuralgia and all developed mild to moderately ipsilateral hemifacial numbness. The strength of the masseter muscle was also almost invariable decreased, and the patients felt malocclusion. These symptoms were well tolerated, and were progressively diminished with time.

In spite of the technical ease of execution of the procedure, PTGC may pose some particular problems. Entering the foramen ovale is usually quick and simple, but on occasion, we have noted venous or arterial bleeding through the surgical cannula. Venous bleeding emerging from an appropriately located needle may arise due to the penetration of a venous sinus crossing the foramen ovale<sup>(14)</sup> although this result does not necessarily complicate the course of the surgical procedure. Further, arterial bleeding may arise as a result of damage being incurred by the carotid artery or an accessory meningeal artery traversing the foramen ovale. Such puncturing of the carotid artery may arise when the needle is directed anteriorly and medially into the area of the cavernous sinus, the risk being greater for patients with a primitive foramen lacerum medius, this consisting of a fusion of the foramen ovale with the foramen lacerum.<sup>(15,16)</sup> The bony wall separating the trigeminal nerve from the carotid artery may be paper-thin for some patients, or, on occasion, absent altogether.<sup>(17)</sup> A tortuous carotid artery may pass directly over the foramen ovale, making it virtually impossible to reach the trigeminal ganglion without puncturing the artery.<sup>(18)</sup> When arterial bleeding occurs, the procedure is best terminated at that stage and repeated on the following day. Escape of cerebrospinal fluid (CSF) from the catheter indicates that its tip lies beyond the foramen margins but does not necessarily mean that it is in Meckel's cave; CSF may flow from the subtemporal subarachnoid space into the catheter.<sup>(19)</sup> The exact positioning of the Fogarty catheter should be examined by fluoroscope during the procedure.

In summary, we propose the following surgical

treatment algorithm for trigeminal neuralgia. First and foremost in the treatment of trigeminal neuralgia, it is of great importance for the clinician to be certain of the accuracy of the diagnosis.<sup>(3-7)</sup> Other types of facial pain may mimic trigeminal neuralgia and can thus lead to the incorrect diagnosis, which will then result in inappropriate treatment, and, ultimately, failure of treatment. Once the diagnosis has been established, all patients should undergo a trial of medical therapy. Failure to respond to medical therapy should encourage the clinician to carefully reassess the diagnosis. All patients also should undergo appropriate imaging studies (brain computer tomograph with enhancement or brain magnetic resonance imaging scan), preferably by a magnetic resonance imaging scan, to rule out possible mass lesions in the cerebellopontine angle, and/or demyelinating plaque associated with MS, and/or vascular malformation.

Trigeminal neuralgia patients who are poor medical risks, those who are above the age of 65, those with demyelinating disease, and those who are unwilling to accept the increased risk of a posterior fossa craniectomy, should be treated with this percutaneous trigeminal ganglion compression procedure.<sup>(10)</sup> The trigeminal ganglion compression procedure is indicated for all patients of typical trigeminal neuralgia. For patients with posterior fossa lesion causing the trigeminal neuralgia, the focus of treatment should be on the primary lesions. The percutaneous trigeminal ganglion compression can be performed for palliative pain relief. If these procedures cannot completely relieve the symptoms, repetition is appropriate. For younger patients and those who are not in the previously described groups, the authors suggest the Jennata microvascular decompression technique,<sup>(20)</sup> as it reveals a low relapse rate. If the procedure is unsuccessful or if the recurrence of symptoms that cannot be controlled medically develops, the trigeminal ganglion compression procedure would be an appropriate next step.

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## 以經皮膚三叉神經節壓迫手術來治療三叉神經痛：二例報告

陳志豐 李石增 雷大雅 吳杰才

以經皮膚三叉神經節壓迫手術來治療三叉神經痛病患，其主要優點為操作單純，病人在全身麻醉下接受整個手術，過程中幾乎沒有疼痛和不適感；手術時間短，約在一小時以內。術後疼痛緩解率高，可達95%以上；如病患對於疼痛緩解不滿意，可於隔日再接受同一手術。住院天數少(3日)，可治療眼支之所引起的疼痛；術後感覺缺失較輕微，併發症發生機率低(<1%)，病患滿意度高；主要缺失為患側顏面輕到中度感覺缺失和咀嚼肌力減弱。其主要適應對象為需接受外科手術治療三叉神經痛病患，包括接受其他手術後症狀復發的病患。我們已成功治療二例開顱手術後疼痛復發病患，術後疼痛立即緩解，患部有輕微麻木感，除此之外病患無任何不適，住院三日即可出院。術後門診追蹤治療效果良好，且麻木感有改善，病患對於治療過程非常滿意。所以本文我們提出手術心得並建議三叉神經痛病患外科治療的原則。(長庚醫誌 2002;25:122-7)

**關鍵字：**經皮膚三叉神經節壓迫手術，三叉神經痛。