

# Long-term outcomes of percutaneous radiofrequency thermocoagulation for glossopharyngeal neuralgia

## A retrospective observational study

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### Abstract

The aim of this study was to investigate the long-term results of computed tomography (CT)-guided percutaneous radiofrequency thermocoagulation (PRT) for glossopharyngeal neuralgia (GPN).

A retrospective review of medical records for patients with GPN who were treated with CT-guided PRT between 2003 and 2014 was performed to investigate baseline characteristics and immediate outcomes during the hospitalization. Long-term pain relief outcomes and complications were obtained via telephone survey. Duration of pain-free was assessed by Kaplan–Meier analysis.

Eighty patients with GPN were treated with CT-guided PRT, and 71 patients could be contacted for the follow-up. The mean length of follow-up after PRT was  $56.2 \pm 43.3$  months. Pain relief occurred in 63 patients (78.8%) immediately after the PRT procedure. The percentage of patients who remained in an “excellent” or “good” pain relief condition was 73.2%, 63.0%, 53.2%, and 43.0% at 1, 3, 5, and 10 years. Postprocedure complication included dysesthesias, dysphagia, and diminished gag reflex. No mortality was observed during or after PRT procedures.

This study indicates that CT-guided PRT is a safe and effective method for patients with GPN and should be considered as an alternative treatment for these patients.

**Abbreviations:** CT = computed tomography, GPN = glossopharyngeal neuralgia, MVD = microvascular decompression, PRT = percutaneous radiofrequency thermocoagulation.

**Keywords:** glossopharyngeal neuralgia, long-term outcomes, percutaneous radiofrequency thermocoagulation

## 1. Introduction

Glossopharyngeal neuralgia (GPN) is a rare disorder (only 0.2%–1.3% of facial pain syndromes<sup>[1,2]</sup>) of the glossopharyngeal (IX) and sometimes vagus (X) cranial nerves.<sup>[3]</sup> It is characterized by severe paroxysmal pain typically localized to the throat, external ear canal, posterior tongue, and angle of jaw.<sup>[4]</sup> The pain is usually described as sharp, stabbing, and maybe triggered by swallowing, coughing, talking, or chewing. The overall incidence of GPN in the general population is estimated to be between 0.2 and 0.7 case per 1000 people per year.<sup>[5–7]</sup>

The first-line treatment for GPN is anticonvulsant medications such as carbamazepine, gabapentin, or pregabalin,<sup>[8,9]</sup> and, if necessary, some antidepressants such as amitriptyline can be helpful either alone or in combination with the anticonvulsant medications.<sup>[10]</sup> When medical therapy failed to control pain, neurosurgery is considered. Microvascular decompression (MVD) for GPN is an option with good rates (80%–90%) of pain relief.<sup>[11]</sup> However, permanent lower cranial nerve damage and significant mortality can occur with open surgery.<sup>[3,12]</sup> Percutaneous radiofrequency thermocoagulation (PRT) is a well-accepted treatment for neuropathic pain,<sup>[13–15]</sup> especially for its safety. In our unit, PRT has been used to treat GPN since 2003, and a large series of patients give us an opportunity to evaluate the long-term outcome of this procedure.

The main objective of our study was to evaluate usefulness and long follow-up outcomes of PRT for patients with GPN. Duration of pain relief and complications after PRT were also our points of focus.

## 2. Methods

### 2.1. Patients

From January 2003 to December 2014, 83 PRT procedures were carried out in 80 patients at our department. This study was approved by the local ethical committee. An informed written consent was obtained from each patient, and information of the procedure and its possible complications were introduced to all patients. GPN was diagnosed according to the International Headache Society criteria.<sup>[4]</sup>

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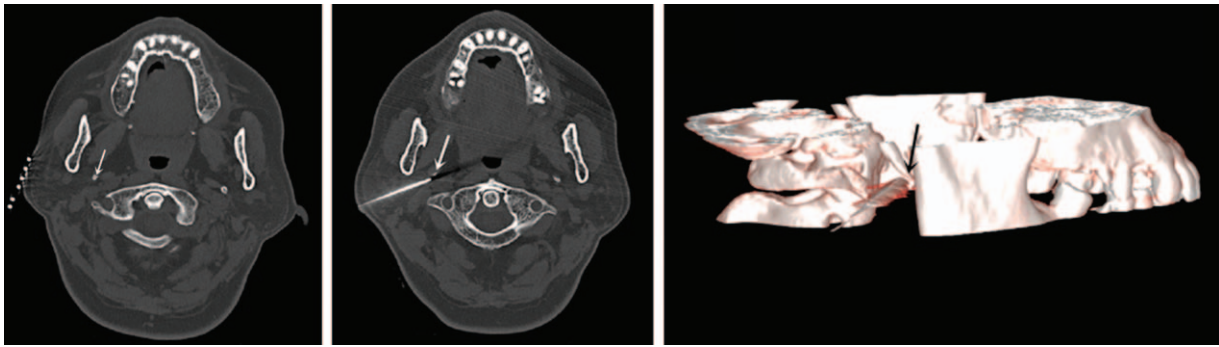
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**Figure 1.** A radiofrequency insulated needle inserted to the posterior aspect of the styloid process (arrow) under CT guidance. CT=computed tomography.

A retrospective review of the medical records for these patients was performed to investigate the baseline characteristics and immediate outcomes during the hospitalization. For long-term outcomes, an independent interviewer collected the information on pain-free duration and complications after PRT via a telephone survey. Pain intensity was evaluated using a numeric rating scale (NRS) score (0 = “no pain,” 10 = “worst pain”). The outcome of this treatment was graded into 4 categories: pain relief was graded “excellent” if the patient was completely pain-free without the use of any medication, “good” if the patient was partially pain-free without the use of any medication, “fair” if the patient had mild pain, and relieved with anticonvulsant medications; patient still had intolerable pain even with anticonvulsant medications was considered as “poor” result.

## 2.2. PRT procedures

The PRT procedures were carried out in a disinfected computed tomography (CT) examination room. Patients were placed in a supine position with their head overhanging. The puncture channel to the posterior aspect of the styloid process was determined on the CT scan, and then the corresponding skin insertion point was marked. After sterilization and local anesthesia with 1% lidocaine of the insertion point, a 22-gauge, 10-cm radiofrequency insulated needle with a 5-mm active tip was inserted through the designed puncture channel to the posterior aspect of the styloid process under CT guidance (Fig. 1). Sensory stimulation up to 0.5 V at 50 Hz was performed to reproduce concordant pain at the posterior part of the tongue, tonsils, and pharynx. Motor stimulation up to 1.0 V at 2 Hz was negative. After confirming the needle position, intravenous anesthesia with propofol was administered (1.0 mg/kg) without

tracheal intubation. The glossopharyngeal was thermally coagulated with radiofrequency at 70°C to 85°C for 120 to 180 seconds, depending on the stimulation reaction and experience of the physician. Hemodynamics was carefully monitored during such interventional procedure.

## 2.3. Statistical analysis

Statistical analysis was performed using the GraphPad Prism version 5.0 (GraphPad Software Inc., San Diego, CA). The percentage of patients who were pain-free after PRT was calculated by Kaplan–Meier analysis.

## 3. Results

The baseline characteristics of all the patients are outlined in Table 1. Eighty patients with GPN who received PRT surgery were included in this retrospective study. Among these patients, 71 could be contacted for the follow-up data, with a mean follow-up duration of  $56.2 \pm 43.3$  months.

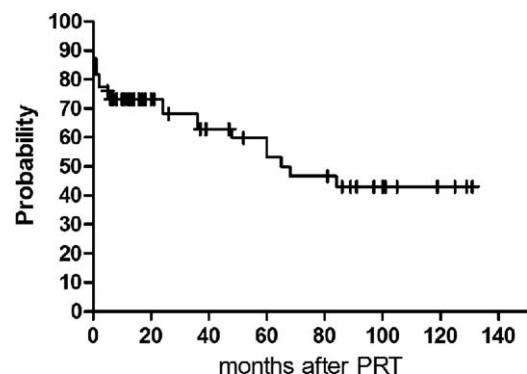
### 3.1. Efficacy in pain relief and pain recurrence

At the time of hospital discharge, 63 (78.8%) patients were pain-free. “Excellent” or “good” pain relief in all patients was 73.2% at 1 year, 63.0% at 3 years, 53.2% at 5 years, and 43.0% at 10 years (Fig. 2). Ten patients had pain recurrence after discharge: 2 patients did not require another surgery and had satisfactory pain control with medical treatment and 8 patients

**Table 1**

### Patient characteristics.

Feature	
No. of patients	80
Age, y (mean $\pm$ SD)	60.59 $\pm$ 11.29
Sex (female/male)	39/41
Duration of symptoms, mos (mean $\pm$ SD)	39.95 $\pm$ 38.35
Follow-up time, mos (mean $\pm$ SD)	56.2 $\pm$ 43.3
Side affected, n (%)	
Right	48 (60%)
Left	31 (38.8%)
Bilateral	1 (1.2%)



**Figure 2.** Acurarial Kaplan–Meier curve showing the long-term outcomes of patients pain-free after percutaneous radiofrequency thermocoagulation (PRT).

underwent additional surgery, including repeat radiofrequency thermocoagulation ( $n=3$ ), and MVD ( $n=5$ ). After the additional surgery, 7 patients were pain-free, and 1 still had pain recurrence after MVD. Nine patients died during follow-up, but they died of other reasons not related to PRT surgery.

### 3.2. Complications

Eleven (13.8%) patients experienced dysesthesias in the area of anesthesia, and the symptom disappeared gradually with mean duration of follow-up of  $25.3 \pm 12.6$  weeks, except for 3 patients, who experienced persistent severe dysesthesias of the tongue that impaired their daily life. Additional postprocedure complications included dysphagia ( $n=5$ , 6.3%) or diminished gag reflex ( $n=2$ , 2.5%); all these symptoms improved within 2 weeks from procedure initiation. There was no mortality during and after the PRT procedure.

### 4. Discussion

Glossopharyngeal neuralgia is a rare facial pain condition, characterized by paroxysms of pain mainly in the distribution area of the glossopharyngeal nerve, and it commonly occurs in patients older than 50 years. Medical therapy is usually the first-line treatment for GPN. When medical therapy cannot control pain effectively or side effects of medications become intolerable, surgical intervention is considered.<sup>[16,17]</sup> Rhizotomy of the glossopharyngeal nerve and MVD are usually carried out with high rates of pain relief (80%–90%),<sup>[11,18,19]</sup> but persistent lower cranial nerve damage has been reported for 8% to 19% of patients,<sup>[19,20,21]</sup> and 5% risk of mortality.<sup>[22]</sup> At the same time, for older patients with GPN, the majority of them had some age-related disorders, and they were not suitable for or refused to surgical treatment. Thus, less invasive, short operative duration and quick recovery operation are especially fit for older patients.

Percutaneous radiofrequency thermocoagulation was popularized since 1974.<sup>[23]</sup> The heat produced by the radiofrequency needle is thought to selectively destroy the pain fibers (A $\delta$  and C fibers) by thermocoagulation at above 65°C.<sup>[24]</sup> PRT of the trigeminal Gasserian ganglion, as a less invasive and effective treatment, has gained widespread acceptance in the treatment of TN patients who are refractory to medical therapy.<sup>[13–15]</sup> Based on the viewpoint that both TN and GPN are neuralgic pain syndrome with similar clinical characteristics and pathophysiology mechanism,<sup>[25,26]</sup> it is reasonable to believe that the therapeutic strategies for TN may be suitable for GPN. Since the first reported use of PRT for GPN in 1979,<sup>[27]</sup> there have been several related reports with high rates of pain relief and low morbidity.<sup>[22,28,29]</sup> In our study, pain relief in all patients was 73.2% at 1 year, 63.0% at 3 years, 53.2% at 5 years, and 43.0% at 10 years. Although the possibility of pain relief after PRT was relatively lower than with MVD or rhizotomy of the glossopharyngeal nerve, it was less invasive and more acceptable for patients.

The glossopharyngeal nerve is smaller to the trigeminal nerve, exits from the jugular foramen in proximity to the vagus and accessory nerves, and lie in the groove between the internal jugular vein and internal carotid artery. It is difficult to perform it on the glossopharyngeal nerve under fluorography-guided puncture due to the location and the high risk of lesioning of the adjacent vessels.<sup>[30]</sup> In contrast, the configuration of bones and soft tissue is clearly visualized by CT imaging. Thus CT-guided puncture has an advantage over fluorography. In our

study, all patients were successfully punctured under CT guidance, which also indicates it is a reliable puncture method. In addition, vagus nerve damage or stimulation can cause severe hemodynamic problems, such as syncope, asystole, or bradycardia<sup>[31,32]</sup>; for this reason, we stress the importance of hemodynamic monitoring during such interventional procedures.

In this study, 11 (13.8%) patients experienced dysesthesias in the area of anesthesia, including 3 patients who experienced persistent severe dysesthesias of the tongue that impaired their daily life; 5 (6.3%) patients experienced dysphagia; and 2 (2.5%) patients experienced diminished gag reflex; these syndromes disappeared within 2 weeks. There was no mortality during and after the procedure. Therefore, the PRT was demonstrated to be a safe, less invasive procedure for managing GPN.

### 5. Conclusions

In our study, data from patients with GPN who received PRT are presented. The results showed that PRT is a safe, less invasive with long-term effectiveness method for patients with GPN, and should be used as an alternative treatment for patients who are refractory to medical treatments.

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