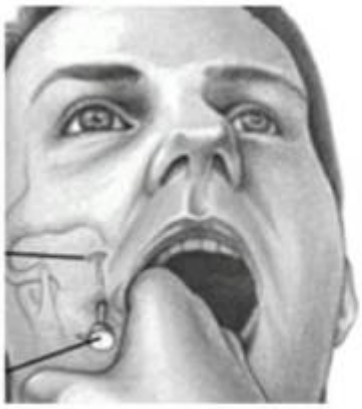
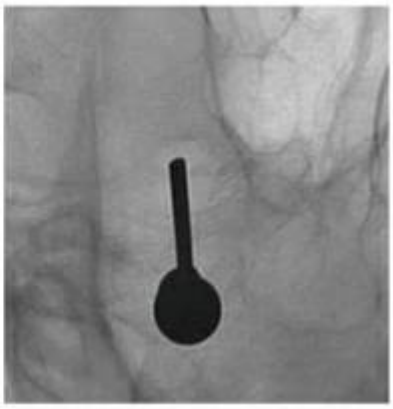
Percutaneous trigeminal rhizotomy





- Sphenopalatine ganglion stimulation for the treatment of trigeminal neuropathic pain
- Case series of CT-fusion and real-time US-guidance in percutaneous RF thermocoagulation for trigeminal rhizotomy
- Outcomes After Repeat-Percutaneous Balloon Compression for Recurrent Trigeminal Facial Pain
- Trigeminal neuralgia management in patients with multiple sclerosis: A systematic review of approaches and outcomes
- Retraction Note: Letter to editor: Comments on "a history of stereotactic radiosurgery may predict failure of procedure following percutaneous glycerol rhizotomy for trigeminal neuralgia"
- Letter: Neurovascular Compression in Patients With Trigeminal Neuralgia May be Associated With Worse Outcomes After Primary Percutaneous Rhizotomy
- In Reply: Neurovascular Compression in Patients With Trigeminal Neuralgia May be Associated With Worse Outcomes After Primary Percutaneous Rhizotomy
- A novel potential measurement indicator with objective and quantitative effect for trigeminal neuralgia: fractional anisotropy in MR-DTI

Percutaneous trigeminal rhizotomy are invasive percutaneous techniques for trigeminal neuralgia that remain safe, simple, and effective for achieving good pain control while minimizing procedural risk [1].

It has been associated with serious complications related to the cannulation of the foramen ovale. Some of these complications, such as internal carotid artery injury, are potentially lethal.

Neuronavigation was proposed as a method to increase the procedure's safety. All of the techniques described so far rely on pre- or intraoperative computed tomography scanning. Lepski et al. present a simple method based on magnetic resonance imaging (MRI) (radiation free) used to target the foramen ovale under navigation guidance.

This method proved to be safe and effective, and it is especially recommended for young, inexperienced neurosurgeons. [2].

Types

Percutaneous balloon compression trigeminal rhizotomy

Percutaneous glycerol trigeminal rhizotomy.

Percutaneous trigeminal radiofrequency rhizotomy.

Although all 3 techniques are generally safe, efficient, and effective, a clear consensus has not been reached regarding their specific indications and degree of efficacy [3].

They differ in method and specificity of nerve injury. BC selectively injures larger pain fibers while sparing small fibers and does not require an awake, cooperative patient. Pain control rates up to 91% at 6 months and 66% at 3 years have been reported. RF allows somatotopic nerve mapping and selective division lesioning and provides pain relief in up to 97% of patients initially and 58% at 5 years. Multiple treatments improve outcomes but carry significant morbidity risk. GR offers similar pain-free outcomes of 90% at 6 months and 54% at 3 years but with higher complication rates (25% vs 16%) compared with BC. Advantages of percutaneous techniques include shorter procedure duration, minimal anesthesia risk, and in the case of GR and RF, immediate patient feedback [4].

In a systematic review and meta-analysis Percutaneous radiofrequency trigeminal rhizotomy is associated with statistically significant higher odds for immediate pain relief and anesthesia and lower risk for post-operative herpes eruption as compared to Percutaneous glycerol trigeminal rhizotomy. Patients in the Percutaneous balloon compression trigeminal rhizotomy group had a statistically significant higher risk to develop post-operative mastication weakness and diplopia when compared to Percutaneous glycerol trigeminal rhizotomy [5].

Training

A real-time augmented reality simulator for percutaneous trigeminal rhizotomy was developed using the ImmersiveTouch platform. Ninety-two neurosurgery residents tested the simulator at American Association of Neurological Surgeons Top Gun 2014. Postgraduate year (PGY), number of fluoroscopy shots, the distance from the ideal entry point, and the distance from the ideal target were recorded by the system during each simulation session. Final performance score was calculated considering the number of fluoroscopy shots and distances from entry and target points (a lower score is better). The impact of PGY level on residents' performance was analyzed.

Seventy-one residents provided their PGY-level and simulator performance data; 38% were senior residents and 62% were junior residents. The mean distance from the entry point (9.4 mm vs 12.6 mm, P = .01), the distance from the target (12.0 mm vs 15.2 mm, P = .16), and final score (31.1 vs 37.7, P = .02) were lower in senior than in junior residents. The mean number of fluoroscopy shots (9.8 vs 10.0, P = .88) was similar in these 2 groups. Linear regression analysis showed that increasing PGY level is significantly associated with a decreased distance from the ideal entry point (P = .001), a shorter distance from target (P = .05), a better final score (P = .007), but not number of fluoroscopy shots (P = .52).

Because technical performance of percutaneous rhizotomy increases with training, we proposed that the skills in performing the procedure in our virtual reality model would also increase with PGY level, if our simulator models the actual procedure. Our results confirm this hypothesis and demonstrate construct validity [6].

References

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