Thermal Imaging Trial in Percutaneous Radiofrequency Rhizotomy for Trigeminal Neuralgia

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Introduction

Trigeminal neuralgia (TN) is a hemifacial pain syndrome attributed to dysfunction of the trigeminal nerve. TN is treated neurosurgically by percutaneous rhizotomy and open microvascular decompression. Percutaneous rhizotomy is often poorly tolerated in awake patients; furthermore, the success rate can be variable and prognostic factors have been sought to predict response. With improving technology, thermal-imaging devices have become commercially available, smaller and relatively inexpensive. The authors seek to determine if such a device can assist percutaneous radiofrequency lysis (RFL), and predict clinical response.

Methods

Consecutive patients indicated for elective RFL were enrolled from the senior author's practice. Images were obtained prior and during lesioning using a commercially available thermal-imaging device. Images were anonymized and correlated with clinical data for analysis; no operative intervention was performed based on imaging data.

Results

9 cases were enrolled, 7 were female, mean age 72y±13, mean duration of symptoms 34months±46, 4 cases were TN-type 1, 1 was TN-type 2, 4 were for symptomatic TN related to multiple sclerosis. A median of 2 lesions at 90°C was performed. In each case, an increase in signal was detectable by the thermal-imaging device in the targeted dermatome, mean temperature increase 1.5±0.6°C. Interestingly, facial hyperemia was variable between cases; in the recurrent case the initial procedure demonstrated robust visible facial flushing and corresponding thermographic hyperemia, whereas the repeat procedure demonstrated minimal visible facial flushing and reduced thermographic hyperemia.

Conclusions

This study demonstrates that thermographic-imaging can detect dermatome-appropriate hyperemia in response to lesioning of the Gasserian ganglion during RFL procedures. Further study is in process to determine if the extent of thermographic hyperemia correlates with clinical efficacy. The real-time intra-operative graphic depiction of lesion response also raises the possibility of RFL being performed under deeper anesthesia.

Learning Objectives

1) understand the neurosurgical treatment of trigeminal neuralgia
2) address limitations of current procedures
3) investigate novel approaches that can increase clinical efficacy of current procedures

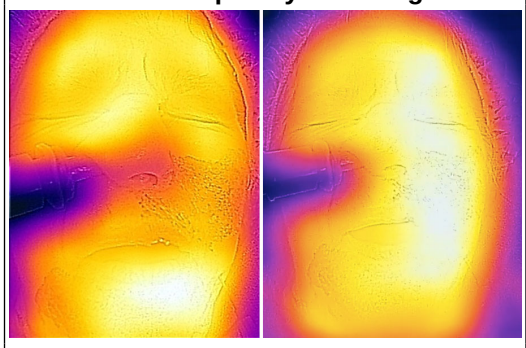
Demographics

	% / Mean ± SD
Gender	
- Male	22%
- Female	78%
Age (years)	72.2 ± 13.5
TN Classification	
- Type 1	44.4%
- Type 2	11.1%
- Multiple sclerosis	44.4%
Laterality	
- Left	44.4%
- Right	55.6%
Duration of symptoms (months)	34.2 ± 46.6
Prior ipsilateral procedure	
- Gamma Knife	11%
- Radiofrequency lysis	56%
- Microvascular decompression	22%
Time since last procedure (months)	99.1 ± 81.7

References

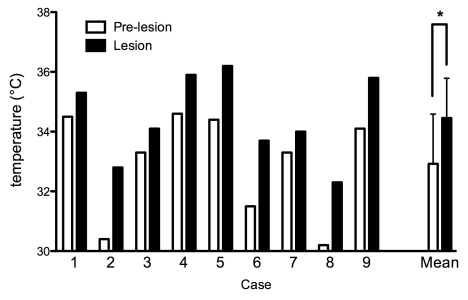
Burchiel. Percutaneous retrogasserian glycerol rhizolysis in the management of trigeminal neuralgia. J Neurosurg 1988;69:361-366. **Eller et al.** Trigeminal neuralgia: Definition and classification. Neurosurg Focus 2005;18(5). **North et al.** Percutaneous retrogasserian glyceral rhizotomy, Predictors of success and failure in treatment of trigeminal neuralgia. J Neurosurg 1990;72:851-856

Thermal images acquired during radiofrequency lesioning



During lesioning, there is a visible left-sided increase in skin temperature detected by thermal imaging.

Thermal imaging measurements during lesioning



A temperature difference could be detected during trigeminal ganglion radiofrequency lesioning