Dr. John M. Tew Jr. and his Contributions to the Neurosurgical Treatment of Trigeminal Neuralgia

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Disclosures

• Both authors report no disclosures
Introduction

• Since Harvey Cushing’s first Gasserian ganglionectomy performed at Johns Hopkins Hospital in 1898, the neurosurgical management of trigeminal neuralgia has evolved significantly.

• Many neurosurgical giants have pioneered treatments for trigeminal neuralgia including Drs. Cushing, Walter Dandy, William Sweet, Albert Rhoton and Peter Janetta.

• Dr. John M. Tew Jr. is another monumental figure in the surgical treatment of trigeminal neuralgia and his recognition as such is implicated.

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• We reviewed the publications of Dr. Tew in order to outline his many contributions to the neurosurgical management of trigeminal neuralgia
Percutaneous Stereotactic Rhizotomy

- Tew completed his neurosurgical residency at Massachusetts General Hospital under the tutelage of Dr. William Sweet
- Many neurosurgeons treated trigeminal neuralgia with application of boiling water, trauma or neurotoxic chemicals by penetrating the Trigeminal ganglion with a needle through the Foramen Ovale
  - Most patients lost sensation in the trigeminal distribution entirely
- Tew and Sweet were able to preserve sensation and obtain adequate analgesia by generating a precise amount of heat through an electrical current inserted into the ganglion which obliterated the smaller, unmyelinated pain fibers and left the larger, myelinated fibers carrying tactile sensation largely unharmed

Percutaneous Stereotactic Rhizotomy with Methohexital

- Previously, percutaneous stereotaxic rhizotomy required general anesthesia, which made real-time determination of adequate pain control impossible.

- Tew and Dr. Frank Mayfield used the short-acting barbiturate methohexital for anesthesia
  - The patient would awaken shortly following the completion of the first lesion of the trigeminal ganglion, and pinprick sensory testing in the trigeminal distribution was performed with analgesia or dense hypalgesia being the desired effect.

- If diminished or absent pain sensation was not achieved, the patient was given another dose of methohexital and another lesion was created.¹

- This enabled the surgeon to determine in real time if adequate analgesia or hypalgesia were achieved.

- High rates of analgesia and dense hypalgesia with minimal side effects were evident.¹

Stereotactic Guidance

• Tew and colleagues demonstrated the spatial relationship between the divisions of the trigeminal ganglion with nearby structures.¹

• By utilizing cadaveric specimens, Tew radiolabeled the carotid artery, cranial nerves 3, 4 and 6 along with the three divisions of the trigeminal nerve.

• Lateral radiographs were then taken of the labeled specimens, which enabled Tew to extract radiographic relationships between the trigeminal ganglion and the surrounding structures which were at risk of harm from the inserted electrode.

• This information enabled Tew and other surgeons alike to discern the three-dimensional anatomy from a two-dimensional radiograph, in turn allowing easier penetration of the trigeminal ganglion with less chance of complications.

The Tew Curved-Tip Electrode

- In the early 1980’s Tew began using a flexible, curved-tip electrode in place of a straight-tipped electrode in order to lesion pain fibers within the trigeminal ganglion.

- The ability to rotate the head of the curved tip 360 degrees relative to the cannula allowed for a more accurate lesion based on the stimulation response of the patient.

- Tew reported that of the first 150 patients treated with the curved-tip, 88% demonstrated an “excellent” response to treatment, compared to 76% of 700 patients treated with a straight-tipped electrode.

- The initial result of using the curved-tip electrode was a decrease in the incidence of postoperative motor weakness from 24% to 7.3%, accompanied by a general reduction in other complications.

- In subsequent years, the use of the curved-tip electrode would continue to result in excellent symptom amelioration with minimal complications.

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Conclusions

• Dr. John Tew has made many monumental contributions to the neurosurgical treatment of trigeminal neuralgia

• With these innovations, Dr. Tew has impacted the lives of many patients and should therefore be considered a historical giant in trigeminal neuralgia neurosurgery among the likes of Drs. Cushing, Dandy, Sweet, Rhoton and Jannetta