**ABSTRACT**

**Objectives:** To offer a novel framework that provides residents and practitioners with a reliable and surgically relevant method for identifying the facial nerve trunk (CNVII) after exiting the skull base during parotidectomy.

**Methods:** The currently available literature and textbooks do not completely address the challenges trainees encounter in learning how to identify CNVII during parotidectomy. In response to this gap in the literature and potential associated deficits in surgical training, we developed an approach that integrates multilobar intersections (based on mathematical principles) with surgical anatomy to create a reliable method for CNVII identification during parotidectomy.

**Results:** The multilobar intersections shown via our medical illustrations and surgical photography demonstrate the application of the triangulation concept to improve the accuracy and efficiency in surgical localization of CNVII.

**Conclusions:** The integration of multilobar localization with surgical anatomy provides a reliable method for a surgeon to consistently and rapidly identify the CNVII, which inherently reduces the risk for inadvertent injury to the CNVII.

**Acknowledgement:**

The authors would like to acknowledge Ms. Gudrun Carlson for her outstanding work on the medical illustrations.

---

**INTRODUCTION**

The potential complications of parotidectomy are well-known and widely reported. These complications range from gustatory sweating, periauricular numbness, infection, and hematoma, to severely debilitating facial paralysis resulting from injury to the facial nerve (CNVII). Although retrograde dissection of a CNVII branch is an option to locate the nerve trunk, most otolaryngologists prefer to identify the nerve initially at the trunk, just distal to its exit from the stylomastoid foramen. The reasons for this preference include the smaller caliber of the distal nerve branches (which increases its risk for injury during dissection) and a reduction in the length of unnecessary dissection along the nerve branch (most parotid masses are located proximal to the distal ends of the nerves). Identification and careful dissection of the CNVII nerve trunk early in the procedure is critical to preventing injury.

We offer a reliable and efficient technique of targeted localization of the CNVII trunk, which in turn will increase the confidence of a surgeon during parotid surgery in general, and parotidectomy, in particular.

**METHODS AND MATERIALS**

Use an Address and Not a Neighborhood

The method to provide an "address" akin to GPS or other triangulation methods of localization, and not a "neighborhood" for the facial nerve during parotidectomy, requires a brief mathematical review of intersecting lines and planes.

Two non-parallel lines will intersect at a given 2-dimensional point (x,y). In contrast, three non-parallel lines will intersect at a given 3-dimensional point (x,y,z).

The intersection of two non-parallel planes, however, is a line formed by the intersection of two non-parallel planes and a mathematical principle for our description of the target localization of the facial nerve.

Our method to accurately and precisely localize the facial nerve trunk requires two landmarks: the posterior belly of the digastric muscle (PD) and the tympanomastoid suture or fissure (TM suture).

**RESULTS**

One can visualize imaginary planes formed by both the TM suture and PD (Figure 2). The 2-dimensional plane which lies on the lateral surface of the PD forms the deep plane (or floor, in a sagittal orientation), localizing the depth for the CN VII trunk. A second plane, which lies in the plane (in an axial orientation) of the TM suture, forms an intersecting plane to the PD plane. The resulting intersection forms a line. This line invariably corresponds to the location of the facial nerve trunk. Because the CN VII trunk is a linear structure corresponding to a line formed by the intersecting planes, only two intersecting reference planes are needed to localize the CNVII trunk. If we were interested in a specific point along the nerve then a third intersecting anatomic plane could be added.

A dissected facial nerve during a standard parotidectomy is seen in Figure 3A. The lines of the angled nerve dissector are sitting within the TM suture and the PD is visualized. Figure 3B shows the imaginary non-parallel planes formed by these landmarks and the resulting intersection (resultant line) overlying the main trunk of the facial nerve.

**DISCUSSION**

Existing literature on facial nerve identification

The textbooks by Bailey, Lore, and Cummings are arguably the most widely used references for Otolaryngology residents. They describe the location of the parotid nerve using common anatomical landmarks. These three similar methods are described in these texts. They provide a general region for finding the facial nerve, which is non-specific (a neighborhood) and no targeted localization can be extrapolated.

Several articles use radiological data to describe anatomical relationships between CN VII and nearby structures. Many of these studies use CT and MRI localization of CN VII by measuring distances from reference points. However, these studies are not practical from a surgeon’s perspective, because the reference points are not accessible in the surgical field.

**REFERENCES**