

Preservation of Facial Nerve During Supraorbital Approaches: A Cadaveric Surgical Simulation Study

Sergio Garcia Garcia MD; Halima Tabani MD; Sirin Gandhi MD; Michael T. Lawton MD; Arnau Benet M.D. University of California, San Francisco

Introduction

The supraorbital keyhole approach (SOKA) and its variations are used to address a variety of indications. While performing these approaches, inferolateral extension of the skin incision endangers the temporal branch of facial nerve (FN), leading to transient or permanent facial palsy. This study aimed to define a safety area for preserving the temporal branch of FN during supraorbital approaches via an eyebrow incision.

Methods

A bicoronal incision was performed in 3 cadaveric heads; the main branches innervating the frontooccipitalis (FO), and orbicularis oculi (OO) muscles were identified and followed proximally until the temporofacial division of the main stem of FN. The supraorbital notch (SON) was exposed bilaterally and linked by a thread defining an X-axis of coordinates. Another thread was placed in the lateral aspect of the orbitozygomatic junction (OZj) defining the Y-axis. Coordinates (x,y) were assigned to the origin of FN and all its subdivisions. A safety area, where no branches were found lateral to the orbital rim was outlined, with four coordinates represented in a single pooled Cartesian space. The probability of finding a FN branch was calculated for each 5mm eccentric to this zone.

Results

FN dissection was successfully conducted in 6 specimens and an intricate pattern of innervation was observed, with multiple interconnections between the main temporal branches. A safety area where no branches were found was defined, 8mm superior and 10 mm inferior along the vertical axis crossing the OZj. These distances could be safely extended 39mm lateral to the SON (Figure 1). Beyond these limits, the probability of injuring a branch of the FN was higher while extending the incision inferolaterally.

Probability of Injuring FN branches while performing SOKA

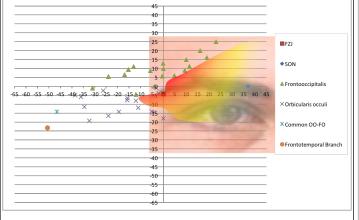


Figure 1. The coordinates of the registered points along the course of the nerve. The increasing color gradient (from yellow to orange to red) represents increasing probability of injuring a branch of the FN as the incision is extended laterally and inferiorly

Conclusions

We define a safety area for performing the skin incision for SOKA. The probability of FN injury increases beyond the area defined. However, given the dense interconnections, transection of some of these distal branches would not result in a permanent palsy of the OO or FO muscles.

Learning Objectives

- 1. To understand the anatomy and course of facial nerve and its branches;
- 2. To identify safe entry zones to be used while using the supraorbital approach and its variations, in order to prevent inadvertent damage to facial nerve and its branches.