

Endoscopic Extended Minipterional Craniotomy Versus Transorbital Endoscopic Approach to the Anterior and Middle Cranial Fossae: an Anatomical Study

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Learning Objectives

1. To highlight the advantages of modern minimally invasive neurosurgical techniques.

2. To describe the surgical nuances of an endoscopic extended minipterional cranitomy and the transorbital approach to anterior and middle fossae

3. To quantitatively analyze and compare the surgical exposures and degrees of maneuverability provided by each approach.

Introduction

Minimally invasive access to the skull base is a surgical challenge. In this study, we quantitatively analyzed and compared an endoscopic extended minipterional craniotomy (EMPT) with the transorbital endoscopic approach (TOEA) to anterior and middle cranial fossae (ACF and MCF, respectively).



Figure 1. Stepwise dissection of EMPT to ACF and MCF

Methods

EMPTs and TOEAs were carried out in five silicone-injected cadaveric heads (10 sides) at the Anatomical Laboratory Towards Visuospatial Innovations in Otolaryngology and Neurosurgery (ALT-VISION) at the Wexner Medical Center at The Ohio State University. Dissections were performed under endoscopic visualization and with the guidance of a neuro-navigation system. For each approach, measurements of the area of exposure, surgical freedom and angles of attack to different surgical targets in ACF and MCF, were obtained for statistical comparison.



Figure 2. Stepwise dissection of TOEA to ACF and MCF

Results

No statistically significant differences were found among the mean area of exposure afforded by EMPT and TOEA for ACF and MCF (p = 0.709 and 0.317, respectively). For ACF, the mean area of exposure was of 13.4 \pm 2.6 cm2 (mean \pm SD) versus 13.0 \pm 1.9 cm2 achieved by EMPT and TOEA, respectively. Compared to TOEA, EMPT produced a significantly larger area of surgical freedom for all surgical targets, except for the crista galli. Similarly, EMPT allowed for significantly greater angles of attack in the vertical axis for all targets, except for the crista galli. In contrast, the horizontal attack angles were similar among all approaches.



Figure 3. Area of exposure provided by EMPT and TOEA



Conclusions

EMPT and TOEA, are two minimally invasive techniques that provide similar and adequate exposure of ACF and MCF; although TOEA offers limited maneuverability. Additional research is needed to learn more about the safety and efficacy of these innovative techniques, as well as to establish their precise clinical application.

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