Abstract

Objectives: To quantify progressive nasopharyngeal and posterior maxillary wall exposure using a 0-degree endoscope through the addition of a posterior septal window and Denker’s procedure in endoscopic skull base surgery. Design: Anatomic cadaver study. Setting: Anatomic laboratory. Participants: Eight dissections in latex injected human cadaver specimens. Main Outcome Measures: The posterior head of the inferior turbinate (IT) was 0.5 cm at the IT and 2.5+/-0.5 cm at the MT. The Denker’s procedure resulted in a significant increase in lateral exposure of the posterior maxillary wall mucosa through the creation of a posterior septal window and Denker’s procedure, respectively.

Introduction

Endoscopic endonasal surgery (EES) has advanced rapidly since Hopkins modified the endoscope in the 1950s, paving the way for early pioneers to address inflammatory paranasal sinus disease in a minimally-invasive fashion. As experience accumulated and endoscopic instrumentation became more sophisticated, EES techniques expanded to address the skull base. Jho and Carrau reported the first series of endoscopic transnasal resection of pituitary neoplasms in 1997, and since that time ongoing refinement has allowed purely endoscopic resection of benign and malignant neoplasms in both the sagittal and coronal planes.

Methods and Materials

Eight dissections were performed in latex injected human cadaver specimens using a 0-degree endoscope for endonasal visualization. The procedure commenced with complete bilateral functional endoscopic sinus surgery (FESS) including sphenoethmoidectomy, frontal sinusotomy, and endoscopic medial maxillectomy. With the tip of the endoscope inserted to the head of IT or MT, visible nasopharyngeal mucosa (See Table 1) and posterior maxillary wall mucosa were measured. High-cutting instruments were then used to remove a 1 cm x 2 cm deep full-thickness window of the posterior nasal septum just above the maxillary crest. An endoscopic Denker’s procedure was performed by isolating the caudal margin of the piriform aperture and removing bone and soft tissue laterally to the level of the infraorbital foramen. Measurements of visible mucosa within the nasopharynx and posterior maxillary sinus were then repeated in order to quantify changes in surgical exposure.

Results

Visible nasopharyngeal mucosal area after FESS and medial maxillectomy was 2.0+/-0.9 cm² from the IT and 2.6+/-0.9 cm² from the MT. The septal window led to a significant increase in exposed mucosa, 4.3+/-2.2 cm² from the IT and 7.5+/-4.7 cm² from the MT (two-tailed t-test, p<0.05). Lateral exposure of the posterior maxillary sinus wall after endoscopic medial maxillectomy was 1.6+/-0.5 cm at the IT and 2.5+/-0.5 cm at the MT. Addition of Denker’s procedure resulted in a significant increase in lateral exposure to 3.3+/-0.4 cm and 4.0+/-0.1 cm at the IT and MT, respectively (two-tailed t-test, p<0.05).

Discussion

Creation of endoscopic “windows” via a limited posterior septectomy and Denker’s procedure significantly increased nasopharyngeal and posterior maxillary wall exposure in this series of endoscopic cadaveric dissections. In live-patient surgery this may translate into improved endoscopic visualization and freedom of mobility, especially when employing a two-surgeon, four-handed technique. Ostensibly, improved visualization would allow a better appreciation of nearby critical neurovascular structures, although further research is necessary to determine whether increased exposure would lead to more complete tumor resection or reduced rate of complications.

Conclusions

The posterior septal window resulted in a statistically significant increase in nasopharyngeal exposure, and Denker’s procedure a significant increase in lateral exposure of the posterior maxillary wall in skull base surgery with a 0-degree endoscope. When working with a two-surgeon, four-handed technique, 0-degree visualization gives the team the most direct operating corridor and facilitates use of instruments that are optimized for 0-degree exposure. These endoscopic “windows” provide important tools to the endoscopic skull base surgeon for maximizing targeted exposure to the skull base while minimizing surgical morbidity.

References


