Transnasal Endoscopic Management of Patulous Eustachian Tube: A Cadaveric Analysis

R. Peter Manes, MD1; J. Walter Kutz, MD2; Brandon Isaacson, MD2; Pete S. Batra, MD2
1Section of Otolaryngology, Yale University School of Medicine, 2Department of Otolaryngology-Head and Neck Surgery, Comprehensive Skull Base Program, University of Texas Southwestern Medical Center

ABSTRACT

INTRODUCTION

Patulous eustachian tube (ET) can result in abnormal transmission of sound from the pharynx to the middle ear (ME) via an abnormally patent ET. The objective of this study was to evaluate the technical feasibility of a reversible transnasal procedure for patulous ET using occluded silastic catheters to close the eustachian tube.

Methods: Ten sides were evaluated in 5 cadaver heads. Size 14, 16, and 18 gauge (G) catheters were occluded with bone wax to create a semi-rigid solid tube. They were placed endoscopically through the ET orifice to span the entire ET length. Proper placement in the ME was confirmed by tympanotomy. Each attempt was graded on a 4-point scale based on ease of placement: 3+, 2+, 1+, and 0.

Results: The 16G was the easiest to place with the best fit in 8 cases. The grading for the 10 sides was 3+ (4), 2+ (4), and 1+ (2). The 16G was noted for ease of placement and providing a fit that was neither too tight nor too loose.

The 14G catheter was next easiest to place and observed in the ME in 7 cases. It generally had an extremely tight fit and propensity to impart mucosal trauma. The grading was 3+ (3), 2+ (4), 1+ (2), and 0 (1). The 18G was the most difficult to place and observed in the ME in 6 cases. The catheter was noted to displace easily due to a loose fit. The grading was 3+ (1), 2+ (5), and 1+ (4).

Tympnic membrane or ossicular injury was not noted in any trial.

METHODS AND MATERIALS

Ten sides were evaluated in a total of 5 fresh-frozen cadaver heads. All heads underwent pre-procedure endoscopy with a 0-degree rigid endoscope. Size 14, 16, and 18 gauge (G) catheters of identical length were occluded with bone wax to create a semi-rigid solid tube.

Starting with the 14G to prevent incidental dilation of the eustachian tube, each catheter was placed endoscopically through the eustachian tube orifice. The tympanic membrane was removed to confirm proper placement in the middle ear.

Each attempt was graded on a 4-point scale based on ease of placement and tightness of fit: 3+, 2+, 1+ and 0. 3+ represents the best fit and easiest placement, while 0 represents a poor fit and difficult placement. Scores were obtained independently from two evaluators, and the grading from the two reviewers was compared after evaluation. If discrepancy was noted between the two reviewers, consensus was achieved after discussion between the two reviewers.

RESULTS

The 16G was the easiest to place with the best fit and was confirmed in the ME in 8 cases. The grading for the 10 sides was 3+ (4), 2+ (4), and 1+ (2). The 16G was noted for ease of placement and providing a fit that was neither too tight nor too loose.

The 14G catheter was next easiest to place and observed in the ME in 7 cases. It generally had an extremely tight fit and propensity to impart mucosal trauma. The grading was 3+ (3), 2+ (4), 1+ (2), and 0 (1).

The 18G was the most difficult to place and observed in the ME in 6 cases. The catheter was noted to displace easily due to a loose fit. The grading was 3+ (1), 2+ (5), and 1+ (4).

Tympnic membrane or ossicular injury was not noted in any trial.

DISCUSSION (cont.)

This was abandoned because of complications associated with injection into the internal carotid artery. Other methods include the application of silver nitrate, phenol, or nitric acid, as well as cautery. Poe described dissection of the anterolateral wall of the ET with placement of autologous cartilage or Alloderm.6 In 14 patients, he reported 1 case of complete relief, 5 with significant improvement and satisfied, 7 with significant improvement but dissatisfied and 1 unchanged. This, however, can be technically challenging due to the close anatomic relationship of the eustachian tube and the internal carotid artery.

Obstruction of the eustachian tube with a semi-rigid catheter provides a completely endoscopic, reversible method of obstructing the eustachian tube. In our study, a 16G catheter provided both ease of placement and appropriate fit in the ET. The 14G catheter was often found to be too large, and, as a result, difficult to place. The tight fit and force required to place the catheter have the potential to cause a significant amount of mucosal trauma. The 18G catheter was somewhat flimsy, leading to difficulties with placement. Furthermore, the loose fit and propensity to displace provided an inadequate seal of the ET.

The lack of complications, as well as the reversibility of this procedure, make this an attractive option for further study. No injuries to the tympanic membrane or ossicles were noted. Furthermore, if the ET obstruction is no longer needed or needs to be upsized, this is easily achievable utilizing the semi-rigid catheter.

CONCLUSIONS

Placement of a bone wax filled, silastic catheter to occlude the ET is technically feasible. A 16G catheter seems to be the best first choice to balance ease of placement and effective occlusion. Human studies are required to determine the efficacy of this option in the management of patulous eustachian tube.

REFERENCES