MODIFIED EXPANSION SPHINCTER PHARYNGOPLASTY FOR TREATMENT OF CHILDREN WITH OBSTRUCTIVE SLEEP APNEA

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ABSTRACT

Purpose: Lateral pharyngeal muscle wall collapse has been implicated in the pathogenesis of obstructive sleep apnea (OSA). A variety of procedures is used to prevent lateral pharyngeal wall collapse. The aim of the present study was to describe a modified expansion sphincter pharyngoplasty (ESP) addressing lateral pharyngeal muscle wall collapse in the treatment of children with OSA.

Methods: The medical charts of children with OSA and lateral pharyngeal muscle wall collapse who underwent modified ESP and children who had tonsillectomy and adenoidectomy (TA) for OSA were reviewed retrospectively.

Inclusion criteria for modified ESP patients consisted of age under 21 years, assessment of OSA by pre-and post-op polysomnogram, and lateral pharyngeal muscle wall collapse documented by drug induced sleep endoscopy.

Inclusion criteria for TA patients consisted of age under 21 years and assessment of OSA by pre-and post-op polysomnogram.

Results: Twenty-five patients (14M, 11F, age range: 2-17 years, median: 8 years), who underwent modified ESP for severe OSA and lateral pharyngeal muscle wall collapse were reviewed. One patient had bleeding three days after the surgery. The BMI ranged from 13.3 kg/m2 to 48.7 kg/m2 (median=32 kg/m2) and 18 patients (72%) were obese. The majority of children had grade III hypertrophy of adenoid (52%) and grade II (48%) and grade III (48%) hypertrophy of tonsils. All patients had severe OSA (AHI range: 20 to 154.2) before the surgery. After the surgery, 16 patients had no OSA, 4 had mild OSA, 3 had moderate OSA and 2 had severe OSA.

Conclusion: Modified ESP provided objective clinical improvement of OSA in children with severe OSA and lateral pharyngeal wall collapse and might serve as an effective alternative to TA for treatment of OSA.

BACKGROUND

Lateral pharyngeal wall collapse contributes to the pathogenesis of OSA. Lateral pharyngoplasty and expansion sphincter pharyngoplasty, have been used to address lateral pharyngeal wall collapse in adults with OSA. Expansion sphincter pharyngoplasty (ESP) involves combination of tonsillectomy, expansion pharyngoplasty, rotation of the palatopharyngeus muscle, a partial uvulectomy, and closure of the anterior and posterior tonsillar pillars. ESP prevents lateral pharyngeal collapse and reduces apnea episodes in adults with OSA. Outcomes of expansion sphincter pharyngoplasty have not been studied in children with OSA.

METHODS

The aim of the present study is to describe a modified ESP and compare outcomes of modified ESP to TA in children with OSA.

METHODS

•The medical charts of children with OSA and lateral pharyngeal muscle wall collapse who underwent modified ESP and children who had tonsillectomy and adenoidectomy (TA) for OSA were reviewed retrospectively.

•Inclusion criteria for modified ESP patients consisted of age under 21 years, assessment of OSA by pre-and post-op polysomnogram, and lateral pharyngeal muscle wall collapse documented by drug induced sleep endoscopy.

•Inclusion criteria for TA patients consisted of age under 21 years and assessment of OSA by pre-and post-op polysomnogram.

•Children were not excluded due to craniofacial anomalies, developmental delay, psychiatric illness, immunodeficiency, possible neoplasia, possible post-transplant lymphoproliferative disorder, or other chronic condition.

Description of modified ESP technique: After bilateral tonsillectomy, the anterior fascicles of the muscle were transected horizontally at the junction of upper third and mid third portions. Superficial fibers of the upper third portion of the palatopharyngeus muscle were isolated and left with the muscle’s posterior surface attached to the pharyngeal constrictor muscles. A blunt palate tunneling extending superolaterally from the arching fibers of the palatoglossus muscles into soft palate was created. The isolated portion of palatopharyngeus muscle was pulled supero-antero-laterally into the palate tunnel while the lateral pharyngeal wall tension was observed. Then the isolated portion of palatopharyngeus muscle was attached to the arching fibers of soft palate using Vicryl 4-0 round body needle. Anterior and posterior pillars in the upper third region of palatopharyngeal muscle were apposed with the Vicryl suture.

Outcome measures:

•The primary outcome measure of the study was the rate of cure that was defined as AHI less than 1. Additionally, the rates of cure were assessed for the following criteria used in previous studies: AHI less than 2, AHI less than 5, 50% reduction in AHI and AHI less than 15, 50% reduction in AHI and AHI less than 20.

•The secondary outcome measures included percentage AHI reduction, improvement in minimum oxygenation level (min SpO2), and reduction in percentage of total sleep time with oxygen level less than 90%.

Data analysis:

•Statistical comparisons between groups were performed using a one way analysis of variance or a Kruskal Wallis one way analysis of variance and within-groups were performed by a paired t-test or a Wilcoxon signed rank test as appropriate. The x2 test was used to test the cure rate between treatment groups. A p value less than 0.05 deemed statistically significant.

RESULTS

•Modified ESP Group

•Twenty-five patients (14M, 11F, age range: 2-17 years, median: 8 years), underwent modified ESP with no complications on the day of the surgery. One patient had bleeding three days after the surgery.

•The BMI ranged from 13.3 kg/m2 to 48.7 kg/m2 (median=32 kg/m2) and 18 patients (72%) were obese. The majority of children had grade III hypertrophy of adenoid (52%) and grade II (48%) and grade III (48%) hypertrophy of tonsils.

•All patients had severe OSA (AHI range: 20 to 154.2) before the surgery. After the surgery, 16 patients had no OSA, 4 had mild OSA, 3 had moderate OSA and 2 had severe OSA.

•Post-op AHI was less than the pre-op AHI (p<0.001) (Figure 1).

•Post-op min SpO2 was greater than pre-op min SpO2 (p<0.001).

•Post-op % of total sleep time with oxygen level < 90% was less than pre-op % of total sleep time with oxygen level < 90% (p<0.001).

•TA Group

•Twenty-five patients, (15M, 10F, range: 2-16 years, median: 5), had TA with no complications. There was no bleeding, dysphagia, or voice change at the follow-up visit.

•The majority of children in TA group had grade III (56%) hypertrophy of tonsils and grade II (40%) and grade III (32%) hypertrophy of adenoid.

•All patients had severe OSA (AHI range: 20.7 to 142). Post-op OSA was resolved in 2 patients, mild in 13, moderate in 4, and severe in 8.

•Post-op AHI and % total sleep time with oxygen level < 90% were less than those of pre-op (p<0.001).

•Post-op min SpO2 was greater than pre-op min SpO2 (p<0.001).

Comparison between modified ESP and TA

•Pre-op AHI of modified ESP group (median=52) was similar to the AHI of TA patients (median=49.2) (p=0.09) (Figure 1).

•Post-op AHI of modified ESP group (median=0.8) was less than that of TA group (median=2.2) (p<0.001) (Figure 1).

•Cure rates for AHI<1 (64%), AHI <2 (72%), AHI<5 (80%) and 50% reduction in AHI and AHI<15 (100%) in modified ESP were greater than those (8%, 44%, 60%, 92%, respectively) in TA group (p<0.05). Cure rate for the criteria 50% reduction in AHI and AHI<20 were similar between modified ESP and TA groups.

CONCLUSIONS

•Modified ESP provided objective clinical improvement of OSA in children with severe OSA and lateral pharyngeal wall collapse and has potential to serve as an effective alternative to TA for treatment of OSA.