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Trans-oral endoscopic cerclage pharyngoplasty for treatment of velopharyngeal insufficiency

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ABSTRACT

Objectives: Velopharyngeal insufficiency (VPI) is a common problem after cleft palate repair, it leads to speech distortion with consequent affection of speech intelligibility. Many techniques have been used in the treatment of VPI with varying results and complications. The aim of this study was to evaluate the efficacy of trans-oral endoscopic cerclage pharyngoplasty in the treatment of VPI.
Methods: Eighteen patients with hypernasality after palatoplasty were subjected to trans-oral endoscopic cerclage pharyngoplasty. Pre and postoperative evaluation of velopharyngeal function were performed by using auditory perceptual assessment, nasometric assessment, and flexible nasopharyngoscopy.
Results: Significant postoperative improvement of speech parameters measured with auditory perceptual assessment were achieved, and the overall postoperative nasalance score was improved significantly for nasal and oral sentences. Also, flexible nasopharyngoscopy showed significant improvement of velopharyngeal closure. No marked postoperative complications were reported apart from throat pain and dysphagia that disappeared with time.
Conclusions: Trans-oral endoscopic cerclage pharyngoplasty is an effective method for the treatment of VPI.

1. Introduction

Failure of complete closure of the velopharyngeal port during speech and/or swallowing is called velopharyngeal insufficiency (VPI), it leads to leakage of air into the nasal cavity that results in hypernasal vocal resonance and nasal emissions of air. The effect of VPI ranges from mild speech distortion to a catastrophic disruption of speech intelligibility [1]. About 15–45% of children may have this problem after cleft palate repair, it may be due to abnormally weak palatal musculature, and also it is affected by the technique used in repair and weather the levator sling has been constructed or not [2].

Surgical techniques available to correct VPI are posterior pharyngeal wall augmentation (obtained, for example, by fat, Teflon, or hydroxyapatite injections), posterior pharyngeal flaps, or sphincter pharyngoplasty. The common goal of these surgical techniques is to create a permanent partial obstruction of the velopharyngeal space to correct hypernasal speech. Teflon injection has received attention owing to its relative simplicity. Unfortunately, long-term evolution is usually associated with local chronic inflammatory response, which eventually leads to pharyngeal mucosa lesions and Teflon extrusion. This technique is no longer used in the treatment of VPI [3]. Sipp et al. [4] used calcium hydroxyapatite, and Leuchter et al. [5] used autologous fat for augmentation of the posterior pharyngeal wall; they achieved good results, but their patient samples were small. Posterior pharyngeal flap is created by suturing a superior or, more rarely, an inferior posterior pharyngeal wall flap to the soft palate, leaving a lateral port on either side for breathing [6]. This method is ideal for patients with sagittal velopharyngeal closure (VPC) pattern with good lateral wall motion, which is necessary for closure of the lateral ports; however, complications may include hyponasality, nasal obstruction, snoring, and sleep apnea [2]. Sphincter pharyngoplasty is created by elevation of bilateral myomucosal flaps from the lateral pharyngeal wall to be inserted into an incision on the posterior pharyngeal wall. It could obturate the central and lateral portions of the velopharynx, and it is used in patients with coronal VPC pattern with good palatal

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motion [7]. The incidence of obstructive breathing that may follow pharyngeal flap is lower after sphincter pharyngoplasty [2].

The aim of this study was to evaluate the efficacy of trans-oral endoscopic cerclage pharyngoplasty in the treatment of VPI.

2. Methods

The study was conducted on 18 patients who presented with hypernasal speech after cleft palate repair in the period from March 2010 to April 2012 in the Departments of Otolaryngology in both Cairo University and Beni Suef University. The ages of the patients ranged between 4 and 9 years with a mean age of 6.5 years, 12 females and 6 males. The original defects included 7 cases of bilateral complete cleft lip and palate, 6 cases of unilateral complete cleft lip and palate and 5 cases of cleft soft palate, complete clefts were repaired by 2 flap palatoplasty while incomplete clefts were repaired by Veau–Wardill–Killner technique. The surgery was performed to narrow the velopharyngeal port. Patients who underwent secondary corrective surgery for VPI, who presented with obstructive airway diseases such as tonsillar and/or adenoid hypertrophy, and who presented with craniofacial anomalies or palatal fistulae were excluded. Children under the age of 4 years were also excluded. Informed consent was obtained from the parents of all patients, and the principles outlined in the Declaration of Helsinki were followed. In addition, the research protocol was approved by the ethics committee of our institute.

Patients underwent extensive pre- and postoperative assessment as described below.

2.1. Otolaryngologic examination

Full ear, nose and throat, and head and neck examination was performed for detection of other associated diseases. Ear examination, including tympanometry, was performed for detection of middle ear effusion, and oral examination was performed to assess the condition of the palate, and to exclude any cause of airway obstruction.

2.2. Preoperative assessment of velopharyngeal function

Patients underwent three methods of quantitative assessment of velopharyngeal function: auditory perceptual assessment (APA) of speech, nasometry, and flexible nasopharyngoscopy, as follows.

2.3. Auditory perceptual assessment of speech

Hypernasality, nasal emission of air, and weak pressure consonants were analyzed. Parameters were graded on a five-point scale (0–4) in which 0 indicates normal and 4 indicates severe hypernasality, with a total score of 12 on the three elements. A lower score on this scale indicates less dysfunction.

2.4. Nasometric assessment

Assessment of nasalance was performed using a nasometer, which provides an acoustic measure of movement of the vibrational energy through the vocal tract. Nasometric data were obtained while the patients read or repeated standardized Arabic nasal and oral sentences.

2.5. Flexible nasopharyngoscopy

Visualization of the velopharyngeal port was performed using a fiberoptic flexible nasopharyngoscope, equipped with a high-intensity cold light and a special endoscopic television system for videotape recording. The system was composed of a high resolution Karlheinz Hinze S/N 151385 endoscope, a Storz endoscope video camera, and a Panasonic SR 500 video recorder. The velopharynx was inspected, and VPC was assessed while the patients were repeating Arabic sentences loaded with high oral-pressure consonants. Consistent with recommendations of an international working group, velopharyngeal gap size was measured during maximal closure on phonation [8]. Gap size categories were defined as large (VPC $<$50%), moderate (VPC between 50% and 80%), or small (VPC $>$80%).

2.6. Operative procedure

Under general anesthesia with oral endotracheal intubation, a Davis-Boyle mouth gag was inserted and retraction of the soft palate with two rubber catheters was done, a 70° Hopkins 4-mm nasal endoscope was introduced through the mouth. A camera was mounted on the endoscope and the endoscopic view was projected on a monitor (Fig. 1). Trans-oral endoscopic cerclage pharyngoplasty was performed, in which the nasal surface of the soft palate, posterior pharyngeal wall and both lateral pharyngeal walls were marked with methelyne blue at the level of VPC as seen preoperatively by flexible nasopharyngoscopy. The marked circle was injected with adrenaline in saline 1/200,000, a 1–0 polypropylene suture material was used circumferentially to narrow the velopharyngeal port. The needle was inserted in the midpoint of the posterior pharyngeal wall just 1 mm above the marked line, deep to the muscular layer, passing to the left lateral pharyngeal wall, soft palate, and again to the midpoint of the posterior pharyngeal wall forming a submuscular circle. Another circle was created using the same maneuver but just 1 mm below the marked line. The distance between both circles is 2 mm, each circle was tied separately with the knots deepened in the posterior pharyngeal wall. The degree of suture tightness was dependant on the severity of VPI seen on the preoperative flexible nasopharyngoscopy for each individual patient.

2.7. Postoperative assessment of velopharyngeal function

Following routine postoperative instructions and follow up, patients were directed to return after 6 months for auditory perceptual assessment, nasometric assessment, and flexible nasopharyngoscopy using the same parameters that were used preoperatively.

2.8. Statistical methods

Data were coded and summarized using Statistical Package for Social Sciences version 19.0 for Windows (SPSS Inc., Chicago, IL).

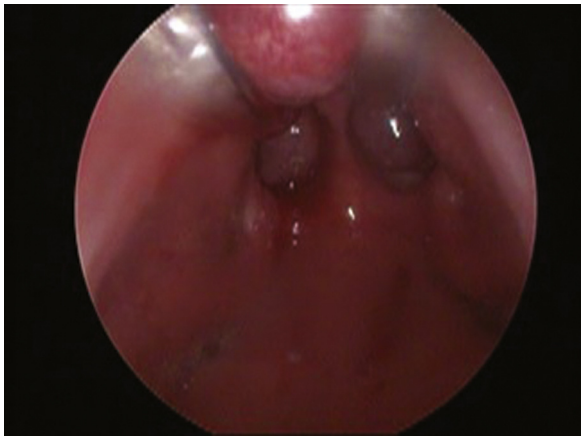

Fig. 1. Trans-oral endoscopic view for the velopharyngeal port with two catheters retracting the soft palate.