

An Outcome Evaluation of Sphincter Pharyngoplasty for the Management of Velopharyngeal Insufficiency

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Sphincter pharyngoplasty is frequently used for the management of children with velopharyngeal insufficiency. The purpose of this study was to evaluate outcome and revision rates of sphincter pharyngoplasty at the authors' institution. Two hundred fifty patients underwent sphincter pharyngoplasty for velopharyngeal insufficiency between January of 1987 and March of 2001. There were 117 female patients and 133 male patients, with a mean age at primary sphincter pharyngoplasty of 7.6 years (range, 1 to 45 years). Diagnoses included velopharyngeal insufficiency alone ($n = 63$), velopharyngeal insufficiency associated with cleft palate ($n = 127$), velocardiofacial syndrome ($n = 32$), submucous cleft ($n = 15$), and other ($n = 13$). Pharyngoplasty revision was defined as any secondary surgical revision of the sphincter as determined by clinical evaluation and objective speech assessment. The pharyngoplasty revision rate was found to be 12.8 percent ($n = 32$). A favorable outcome was demonstrated in 30 of these patients (93.8 percent) after pharyngoplasty revision. Two patients, one with a diagnosis of a submucous cleft and velocardiofacial syndrome and the other with a cleft palate, required a second revision because of persistent velopharyngeal insufficiency. The revision rate was highest in those patients with velocardiofacial syndrome (21.8 percent) and lowest in patients with velopharyngeal insufficiency alone (6.3 percent). Patients who required revision had significantly higher preoperative oral sentence nasometry (55.2 percent versus 46.1 percent; $p < 0.01$) and larger velopharyngeal areas (23.7 mm² versus 18.9 mm²). There was no significant difference in age or sex for those patients who required a revision compared with those who did not require revision. Mean follow-up was 2.4 years (range, 4 months to 13.6 years). Sphincter pharyngoplasty is an effective procedure for the treatment of velopharyngeal insufficiency using revision rate as the standard of success. It had an 87 percent primary success rate that increased to 99 percent after a single revision. Patients with velocardiofacial syndrome, more severe pre-

operative hypernasal resonance, and larger velopharyngeal areas were more likely to require pharyngoplasty revision. (*Plast. Reconstr. Surg.* 112: 1755, 2003.)

Velopharyngeal insufficiency results from a structural or functional defect at the level of the nasopharynx in which there is an inability to accomplish adequate velopharyngeal closure. Surgical management of velopharyngeal insufficiency has undergone many modifications since first introduced by Passavant in 1862.¹ The rationale behind any surgical intervention is to diminish airflow through the nose during speech by reducing the area of the nasopharynx.

Sphincter pharyngoplasty is usually performed for the correction of velopharyngeal insufficiency. The procedure results in a soft-tissue "diaphragm," narrowing the nasopharynx and enabling velopharyngeal closure.^{2,3} The sphincter pharyngoplasty is easily modified, which enhances the success rate of this procedure.^{2,4} A successful outcome is often determined by perceptual analysis and quantified by a detailed objective instrumental evaluation. However, it is also important to evaluate the incidence of surgical revision, as this reflects success of the surgical technique, patient selection, and flexibility of the surgical procedure. The purpose of this review was to examine the revision rates for sphincter pharyngoplasty in

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the treatment of children with velopharyngeal insufficiency. Clinical variables and speech data were analyzed to determine risk factors that may increase the likelihood of failure and subsequent revision.

PATIENTS AND METHODS

Demographics

The records of all patients who underwent sphincter pharyngoplasty for velopharyngeal insufficiency between January of 1987 and March of 2001 were reviewed. All patients were evaluated by a multidisciplinary team that included speech pathologists, audiologists, geneticists, nutritionists, dental specialists, and craniofacial surgeons. Craniofacial clinic databases, medical charts, and office notes were used for review. Each patient was characterized with regard to diagnosis, preoperative assessment, surgical intervention, postoperative care, speech analyses, secondary procedures (and their revision), and outcome.

Two hundred fifty consecutive patients underwent sphincter pharyngoplasty for velopharyngeal insufficiency and were included in this review. There were 117 female patients and 133 male patients, with a mean age at primary sphincter pharyngoplasty of 7.6 years (range, 1 to 45 years). The underlying diagnoses based on category were velopharyngeal insufficiency alone ($n = 63$), velopharyngeal insufficiency associated with cleft palate ($n = 127$), velocardiofacial syndrome ($n = 32$), submucous cleft ($n = 15$), and other ($n = 13$). Forty percent of the patients with velopharyngeal insufficiency alone ($n = 25$) had undergone previous documented tonsillectomy and adenoidectomy. Mean follow-up was 2.4 years (range, 4 months to 13.6 years).

Analysis of Velopharyngeal Function

All patients underwent screening of velopharyngeal function that included perceptual speech evaluation, clinical screening of velopharyngeal closure, and oral examination. The perceptual ratings of speech were determined during live speech samples, which included single words, sentences, and conversational speech. For this investigation, resonance was categorized as (1) hypernasal, (2) hyponasal, (3) mixed, or (3) normal. Screening for velopharyngeal closure was performed with devices sensitive to nasal airflow. Patients determined to have hypernasal or hyponasal resonance, or nasal air escape, were evaluated further using instrumentation and imaging. Imaging studies included lateral phonation radiographs to determine the ratio of nasopharyngeal depth to velar length, the height of attempted velopharyngeal contact relative to the first cervical spine, and any other occult craniofacial signs. Select patients underwent multiview videofluoroscopic and flexible nasendoscopy.

Pressure flow measures were obtained using the Perci-SARS (MicroTronics Corp., Chapel Hill, N.C.) during the repeated production of high-pressure oral consonants in repeated words and/or blowing tasks (for young children not capable of repeating words). Velopharyngeal orifice area (in millimeters squared) was calculated using these measurements. Nasometry was performed using a Kay Elemetrics 6200 Nasometer (Kay Elemetrics Corp., Lincoln Park, N.J.). Nasalance scores were collected during the production of oral and nasal loaded speech samples. See Table I⁵⁻⁷ for published normal data.

Nasoendoscopy was performed using a Pentax FNL 2.4-mm flexible endoscope. The endoscope was positioned just above the velopharyngeal port and patients were asked to repeat

TABLE I
Objective Speech Data in Patients Who Required Revision ($n = 32$)

	Presphincter	Postsphincter	Postrevision	Normal
Aerodynamic				
Velopharyngeal area, mm ²	23.7 ± 19.5	23.7 ± 22	4.17 ± 3.88	<5 mm*
Radiography				
Depth-to-length ratio	0.99 ± 0.25	N/A	N/A	0.70 ± 0.88†
Nasometry				
Nasalance	55.2 ± 17.5	40.7 ± 16.8	27.1 ± 16.4	15.6 ± 5‡

* Riski, J. E., Serafin, D., Riefkohl, R., Georgiade, G. S., and Georgiade, N. G. A rationale for modifying the site of insertion of the Orticochea pharyngoplasty. *Plast. Reconstr. Surg.* 73: 882, 1984.

† Hynes, W. Observations on pharyngoplasty. *Br. J. Plast. Surg.* 20: 244, 1967.

‡ Schoenborn, K. Ueber einer neue Methode fuer Staphylorrhaphie. *Verh. Detsch. Ges. Chir.* 4: 235, 1875.

