Surgical Treatment of Borderline Velopharyngeal Insufficiency Using Homologous Cartilage Implantation with Videonasopharyngoscopic Monitoring

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Borderline cases of velopharyngeal insufficiency were treated with homologous cartilage implants. The selection of patients and technique for this procedure are described. Videonasopharyngoscopy was used to identify a specific location on the posterior pharyngeal wall for the implant. A small cube of homologous cartilage was implanted in the selected site in order to achieve adequate closure.

The preliminary nasopharyngoscopic and speech evaluation results in 10 patients, who were followed every 3 months for at least 1 year, are reported. Hypercentence and audible nasal emission were eliminated. The displacement and reabsorption of the implants that occurred was minimal and did not affect velopharyngeal closure.

Homologous cartilage, which is inexpensive and easy to obtain, appears to be a good option for implantation in the posterior pharyngeal wall in borderline cases of velopharyngeal insufficiency.

**KEY WORDS:** homologous cartilage implant, velopharyngeal insufficiency, videonasopharyngoscopy, videofluoroscopy, hypernasality, audible nasal emission

The value of increasing posterior pharyngeal wall projection or prominence in treating velopharyngeal insufficiency has been known and used for a long time. Eckstein (1902; 1904) used paraffin prostheses for correcting facial and palatal defects. Since that pioneering work, other alloplasts have been utilized to improve competence of the velopharyngeal sphincter. Blocksm (1963; 1969) implanted silicone blocks, Brauer (1963) used silicone gel pillows, and Bluestone (1969) advocated the injection of Teflon.

Organic material such as cartilage has been used for the same purpose. Holloweg and Perthes (1912) implanted autologous cartilage in the posterior pharyngeal wall in a patient with hypernasality. They used an external cervical approach. Lando (1950) was the first to utilize an intraoral approach for the same procedure. Calnan (1971) employed the same material in patients presenting hypernasality after adenoidectomy.

Viñas and colleagues, in a series of papers (Viñas, 1961, 1963a and b; Viñas and Jager, 1969 and 1971), described the use of several different materials to increase the prominence of the posterior pharyngeal wall. They found the best results with cartilage implants. Hagerty and Hill (1961) described their experience with homologous cartilage and reported a 2- to 3-percent reabsorption per year. Homologous cartilage is much easier to obtain than autologous grafts. Furthermore, unpublished experience in our department has demonstrated that survival time of preserved homologous cartilage implants is longer than that of autologous implants.

In our Cleft Palate Clinic, velopharyngeal insufficiency at the end of treatment has been decreased from 30 percent to 15 percent in the last 10 years (Trigos and Ysunza, in preparation). Several factors are responsible for this improvement. One of them, and perhaps the most
important, is a complete presurgical evaluation using video nasopharyngoscopy and videofluoroscopy (Ysunza and Trigos, 1986). The choice of various surgical options for each case is made according to the specific anatomic and physiologic features of the velopharyngeal sphincter.

Borderline cases of velopharyngeal insufficiency, especially after secondary palate closure, represent a particular problem. The risks associated with conventional surgical treatment, such as a pharyngeal flap, seem to be out of proportion relative to the small size of the defect. Furthermore, muscular stimulation, speech therapy, videobiofeedback, and other techniques for correcting nasal escape do not solve the problem in all cases.

The ability to locate a specific location for implant in the velopharyngeal sphincter through use of video nasopharyngoscopy revived our interest in the old idea of implantation. The purpose of this paper is to describe the selection of cases and the technique of inserting homologous cartilage with the use of a nasopharyngoscope. The preliminary results are also reported.

MATERIALS AND METHODS

At the Hospital General Dr. Manuel Gea Gonzalez, all patients with velopharyngeal insufficiency after palate closure undergo speech evaluation, video nasopharyngoscopy, and videofluoroscopy before any further treatment is attempted.

Selection of Patients

Borderline velopharyngeal insufficiency is considered to be present when there is only a small defect—estimated to be less than 5 mm during video nasopharyngoscopy and videofluoroscopy during Spanish language speech samples using phonemes such as /k/, /p/, /t/, /d/, /s/, and /f/. This small opening is restricted to a specific location in the velopharyngeal sphincter. Closure pattern is not an important variable in this decision making.

Articulation deficits are always corrected before surgical treatment; that is, before the implant under consideration here.

All borderline cases seen during 1984 and 1985 were selected for the study. Once the patient was included in the investigation, an additional video nasopharyngoscopy was performed preoperatively.

Procedure

The specific location of velopharyngeal opening was shown by video nasopharyngoscopy and videofluorography to the surgical team. Within 2 or 3 minutes the patient was taken to the operating room. After the patient was sedated, the posterior pharyngeal wall was anesthetized with Xylocaine spray.

Video nasopharyngoscopy was used to identify the location for the implant and to guide the tattooing of that location through the oral cavity. The Spanish language speech sample cited earlier was used to elicit maximum velopharyngeal movement. The tattoo of methylene blue was placed with a surgical syringe with a number 27 needle (Fig. 1).

After endotracheal intubation and anesthetic induction, 1 ml of Xylocaine and adrenaline solution of 1:200,000 concentration was infiltrated at the marked site. Eight minutes later, a vertical incision was made dissecting a small pocket of approximately 5 mm in front of the prevertebral fascia (Fig. 2). It is important to keep the mark in the center of the dissected area. A 5-mm cube of homologous cartilage (preserved in merthiolate solution for at least a week) was stripped and inserted inside the pocket. The incision was closed with 4.0 Dexon in one layer.

The postoperative course was simple and usually without complications. The patients were evaluated by video nasopharyngoscopy and videofluoroscopy every 3 months during the first year and every 6 months thereafter.

RESULTS

Ten cases followed for at least 1 year were in-
FIGURE 2  Surgical technique for implantation of homologous cartilage. A. After intubation, a vertical incision is made dissecting a small pocket in front of the prevertebral fascia. A mark must be kept on the center of the pocket. B. A 5-mm cube of cartilage is inserted.

cluded in this first report. In all cases, 3 months after the operation, the velopharyngeal sphincter closed completely during speech, and nasal resonance was normal. Figure 3 illustrates a posterior pharyngeal wall after implant. Complete velopharyngeal closure is shown during production of /s/. After 1 year, only one case showed mild reabsorption (less than 10 percent). Another implant was displaced 1 to 2 mm downward. However, these two patients remained free from hypernasality, and their velopharyngeal closure during speech remained complete.

DISCUSSION

Videonasopharyngoscopy facilitates identification of the best location for placing an implant in the posterior pharyngeal wall. Borderline cases of velopharyngeal insufficiency represent a particular problem because speech is almost acceptable. Our intention was to obtain the best possible result in every patient. New materials such as Zyderm I and II have been implanted in the posterior pharyngeal wall in selected cases of velopharyngeal insufficiency. However, these materials are too expensive for our institution, and long-term results were not completely satisfactory. Our experience with preserved homologous cartilage for different implant sites has been encouraging. Its survival has been longer than autologous implants. Furthermore, it is easier to obtain, and there is a great difference in cost as compared with materials such as Zyderm.

All patients in this study achieved normal nasal resonance and retained it for the study period—as long as 1 year. We assume that reabsorption and displacement will not appreciably increase in the following years, and we hope the speech result will be permanent. Should mild hypernasality or audible nasal emission return, the procedure is simple enough to be repeated. We conclude that the implantation of homologous cartilage in the posterior pharyngeal wall with nasoendoscopic monitoring is a good option for the treatment of borderline cases of velopharyngeal insufficiency.

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FIGURE 3  Postoperative view of the posterior pharyngeal wall. A. The patient is at rest. B. The patient is speaking.
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