Teflon Injection Pharyngoplasty

CHARLES D. BLUESTONE, M.D.
ROSS H. MUSGRAVE, M.D.
BETTY JANE McWILLIAMS, Ph.D.
PHYLLIS A. CROZIER, M.D.
Pittsburgh, Pennsylvania

Velopharyngeal competency is essential for normal speech and deglutition. Failure of this valve to function properly may be the result of an unoperated cleft palate or a cleft palate which has been repaired but which is too short for adequate closure. This causes nasal emission of air with resultant hypernasal speech. Velopharyngeal insufficiency may also be caused by paresis of the palatal and pharyngeal muscles, a congenitally short velum, a submucous cleft, or an acquired palatal defect.

Many procedures have been utilized in the past to correct velopharyngeal insufficiency. Obturators, posterior pharyngeal flaps, and nasopharyngeal implants have been attempted. The implantation or injection of a foreign material into the submucosa of the retropharynx has long been an intriguing solution to the problem. As early as 1902, Eckstein (*3*) reported the injection of paraffin into the nasopharynx with apparent good results. The procedure was abandoned when migration of the implant resulted in mediastinitis. Later, the implantation of fascia, bone dust, and cartilage was used. Recently, Blocksma (*2*) has employed silicone rubber. All of these substances have certain disadvantages and the ideal implant material has yet to be tried and proved. A suitable substance should be finely dispersed in a harmless vehicle in order to be injectable, well tolerated by the tissues, and not resorbed in time (*1*). Teflon[1] powder mixed with glycerine appears to be most suitable and complies with the above criteria.

Teflon has been utilized with great success in the treatment of the paralyzed vocal cord. Arnold (*1*) and Lewy (*6*) reported dramatic restoration of vocal function by the injection of the Teflon paste into the paralyzed vocal cord. Ward and Wepman (*9*) injected Teflon into the posterior nasopharynx of cats and found the implant material well tolerated and the tissue response minimal. In 1964, Lewy (*7*) injected Teflon into one patient with neurogenic velopharyngeal incompetence and

The authors are associated with the Cleft Palate Research Center, University of Pittsburgh, Pittsburgh, Pennsylvania. This paper was presented at the 24th Annual Meeting of the American Cleft Palate Association in Mexico City.

This research was supported in part by PHS Research Grant DE-01697, National Institute of Dental Research.

[1] Teflon®, Ethican Company, Somerville, New Jersey.

obtained improved speech. The encouraging results gained from this case prompted the clinical study herein reported.

Method

Since October, 1964, patients examined at the University of Pittsburgh Cleft Palate Research Center were screened as possible candidates for Teflon injection pharyngoplasty. Case selection was limited by strict criteria. Patients with hypernasal speech but with good levator activity were evaluated carefully by means of Televex fluoroscopic tape recordings (*4*). Patients found to have touch closure with the head in an upright position but who lost closure in a position of extension, and patients who achieved very close approximation to closure were selected for Teflon injection. Patients with poorly defined or erratic levator action or who failed to achieve close approximation to closure were excluded from this treatment.

Twelve patients had Teflon injected into the nasopharynx during this period. All had a preoperative speech tape recording with simultaneous Televex fluoroscopy recorded on television tape. Ratings of nasality were subjectively made (on a six-point scale) and a consonant articulation inventory was taken. All had preoperative audiograms and the condition of the tympanic membranes was noted.

The group consisted of 8 males and 4 females. There were 10 children, ranging in age from 8 to 14, and 2 adults, ages 25 and 35. Ten had repaired cleft palates and two had congenitally short palates. One adult and two teenagers had the procedure performed under topical anesthesia but the rest required general endotracheal anesthesia. When general anesthesia was utilized, the preoperative television tape was studied prior to the procedure and the level of injection and the amount used was determined only by judgment. When topical anesthesia was used, the procedure was performed in the X-ray Department with the aid of Televex. This permitted accurate placement of the needle in accordance with the patient's phonation. The amount of Teflon to be used could then be determined by the velopharyngeal closure demonstrated by the patient.

As shown in Figure 1, a special metal syringe which was designed by Lewy (*6*) was utilized. Twenty-four hours postoperative, the articulation test, Televex viewing, and speech tape recordings were repeated. Patients were re-evaluated by those procedures again at 6 weeks, 3 months and 1 year.

Results

All patients had improvement in the quality of the voice following this procedure. Postoperative Televex study revealed a definite swelling in the posterior nasopharynx in all patients and this bulge has persisted for one year. Five patients were found to have speech which was very close to

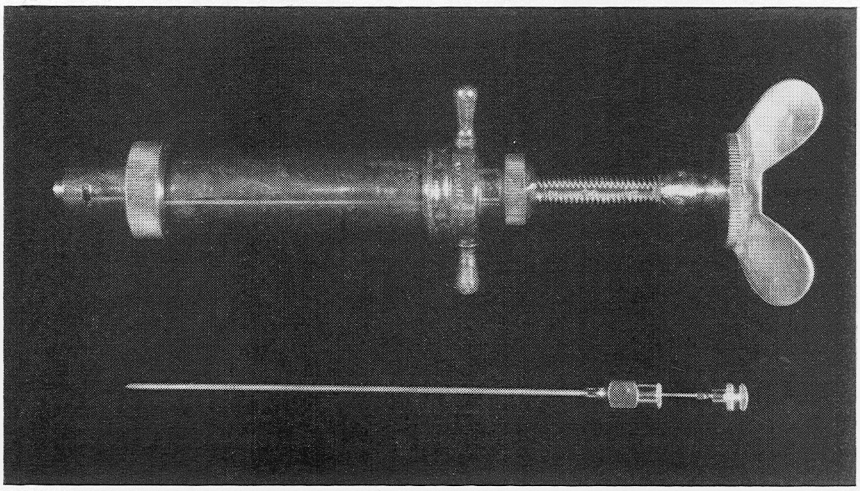

FIGURE 1. The metal syringe used for making the injections was designed by Lewy (*5*).

normal; all had improvement in their nasality ratings. Four patients had improvement in speech but velopharyngeal closure was not obtained apparently because an inadequate amount of Teflon was injected.

There were no serious complications. The postoperative audiograms were unchanged in those children without prior history or evidence of ear disease. All patients experienced mild to moderate stiffness of the neck and tender cervical lymph nodes in the postoperative period but this rarely lasted more than one week. Two patients had fever and pharyngitis immediately following injection but this was considered to be an upper respiratory infection and not associated with the implant. Throat cultures were negative and neither of these patients had any slough of mucosa over the injection sites.

Comment

During the past six months, the Taub Oral Panendoscope[2] was utilized in the pre- and postoperative evaluation of velopharyngeal closure. Lateral air loss resultant from insufficient injections of Teflon was evaluated and noted. Movies were obtained and reviewed. Our first patient was found to have excellent velopharyngeal closure post-Teflon as evaluated by the lateral Televex projection but some hypernasality persisted. Indirect visualization of the nasopharynx revealed that only one side was adequate. This patient had a second injection several months later with an excellent result.

The question as to whether Teflon will remain in the position injected

[2] Taub Oral Panendoscope®, American Cystoscope Makers, Inc., Pelham Manor (Pelham), New York.

must await continued observation. However, five of the patients who have been followed for one year or more in this study have been unchanged. Lewy (*8*) has recently reported that Teflon injected into the vocal cord remains stationary and is relatively inert after 17 months. (His was a histopathologic study of an autopsied larynx.)

Kirchner and associates (*5*) injected Teflon paste suspended in glycerine to dogs which were then sacrified 6, 12, and 18 months later. Serial sections of these larynxes were obtained and a careful histological examination revealed the implant to be virtually unchanged even after 18 months. No migration was encountered. The laryngeal cartilage and mucosa of the larynxes remained normal. No carcinogenic effect was observed.

Conclusions

Twelve patients with hypernasal speech and velopharyngeal insufficiency have had Teflon injection pharyngoplasty. All had both subjective and objective evidence of improved speech following this procedure and there were no serious complications. The results from this study indicate that Teflon is an excellent implant material for the correction of velopharyngeal insufficiency in selected cases.

reprints: *Dr. Charles D. Bluestone*
3500 Fifth Avenue
Pittsburgh, Pennsylvania 15213

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