New endoscopic secondary tracheoesophageal voice prosthesis placement technique

CLAUDINEY C. COSTA, MD, MÁRCIO ABRAHÃO, MD, PHD, ONIVALDO CERVANTES, MD, PHD, and JOSÉ F. S. CHAGAS, MD, PHD, Sao Paulo, Brazil

OBJECTIVE: **The aim of this study was to present a new technique of secondary vocal prosthesis placement on an outpatient basis without general anesthesia by means of digestive endoscopy.**
METHODS: **It is a prospective study, 35 laryngectomized patients were sedated with midazolam and underwent digestive endoscopy and tracheoesophageal punch with vocal prosthesis insertion.**
RESULTS: **A success rate of 94.2% was achieved with this surgical technique. The mean procedure time was estimated at 12 minutes, and no serious complications due to the prosthesis insertion were observed.**
CONCLUSION: **The advantages of this new technique over the classic technique are lack of use of general anesthesia, performance of procedure on an outpatient basis, lower complication risks (including hemorrhage, mediastinitis, vertebral fracture, esophageal perforation; and minor oropharyngeal, and esophageal mucosal trauma), and direct visualization of the prosthesis in the esophageal lumen.** (Otolaryngol Head Neck Surg 2003;128:686-90.)

In 1980, Singer and Blom[1] introduced a new voice rehabilitation technique in laryngectomized patients using a tracheoesophageal prosthesis secondary to the laryngectomy, with patients under general anesthesia. Since then, several complications related to the procedure were described, such as digestive hemorrhage, esophageal perforation, cervical vertebral fractures, and mediastinitis.[2,3]

Changes were made to the prosthesis during this past decade in an attempt to increase its resistance to colonization and its durability and to reduce patient manipulation requirement and foreign body reaction; nevertheless, the need for general anesthesia because of its secondary insertion remains.[3,4]

We developed a secondary vocal prosthesis technique using digestive endoscopy that can be performed on an outpatient basis without general anesthesia and reduces complication risks related to the traditional surgery technique of secondary vocal prosthesis placement.

PATIENTS AND METHODS

Patient Selection

Patients undergoing secondary voice prosthesis placement during June 1999 through January 2001 were selected from the Head and Neck Surgery Department of Hospital e Maternidade Celso Pierro at Pontifícia Universidade Católica de Campinas (HMCP-PUCCAMP), Campinas, Sao Paulo, Brazil. Included in the study were 35 oncologic patients with total laryngectomy or pharyngolaryngectomy with voice rehabilitation through use of an indwelling tracheoesophageal prosthesis (Video Gastric Endoscope Fujinon eve series 400, Saitama, Japan). Patients received phonoaudiologic and surgical follow-up at the Head and Neck Surgical Department of HMCP-PUCCAMP.

The vocal prosthesis was placed in patients who were unable to achieve esophageal voice years after surgery and in those recently operated on, after wound healing and nasogastric tube removal. The criteria used for prosthesis insertion were an eager patient who was fully able to comprehend prosthesis function and management, with manual capability for prosthesis maintenance and occlusion; an ideal tracheostoma size; the absence of psychiatric or progressive neurologic disease; and the absence of severe hypopharyngeal stenosis. Aside from these criteria, we included sufficient financial conditions for prosthesis acquisition.

Gender distribution was 2 female and 33 male patients (age range, 40 to 80 years; mean age, 54.4

From the Head and Neck Surgery Department, Federal University of Sao Paulo-Escola Paulista de Medicina, and Head and Neck Surgery Department, Hospital e Maternidade Celso Pierro at Pontífice Universidade de Campinas.

Reprint requests: Claudiney Candido Costa, Rua 16 A, Q 23 A Lt 18/19, 262 Apto 201 Ed Carajás, CEP 74075-150 Setor Aeroporto, Goiânia, Goiás, Brazil; e-mail, orlccp@uol.com.br or orlccp@ig.com.br.

0194-5998/2003/$30.00 + 0
doi:10.1016/S0194-5998(03)00196-7

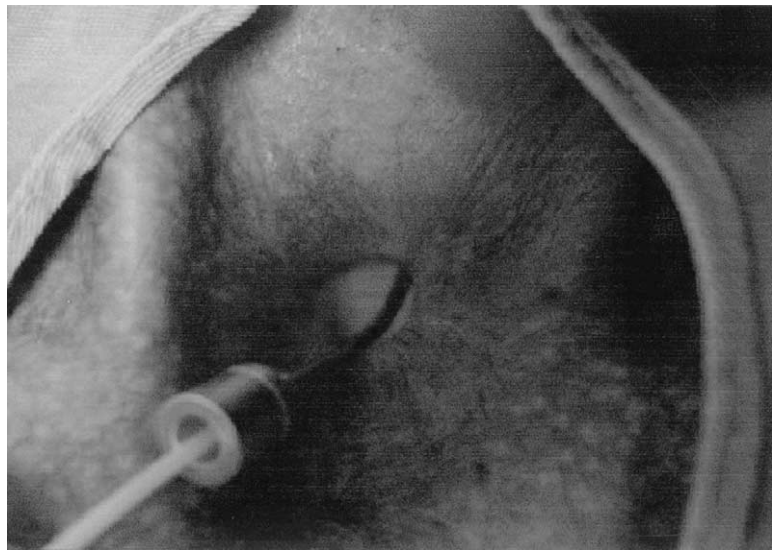

Fig 1. Site of tracheoesophageal puncture identified by transilumination (endoscope light).

years; median age, 54.5 years). The previous surgical procedures in this group consisted of total laryngectomies with bilateral neck dissection (n = 11), total laryngectomies (n = 8), total laryngectomies with unilateral cervical dissection (n = 7), pharyngolaryngectomies with bilateral neck dissection (n = 4), pharyngolaryngectomies with unilateral neck dissection (n = 2), pharyngolaryngectomy with bilateral neck dissection and reconstruction with pectoralis major myocutaneous flap (n = 1), and pharyngolaryngectomy and partial glossectomy with bilateral neck dissection (n = 1). One of the patients underwent total laryngectomy for aspiration pneumonia after partial laryngectomy. According to the International Union Against Cancer (Union Internationale Contre le Cancer system),[5] 15 patients (42.8%) were classified as stage III, and 19 (54.2%) were classified as stage IV.

Postsurgical radiotherapy was administered to 9 patients before voice prosthesis placement. Thirteen patients initiated radiotherapy after voice prosthesis placement.

Materials

Secondary placement with digestive endoscopy was performed using Video Gastric Endoscope (FUJINON EVE series 400 and Sony Triniton color monitor) after the patient received 5 mg of intravenous midazolam. The flexible endoscope was introduced through the esophagus until it transilluminated the posterior wall of the trachea. With a 2.1-mm-gauge needle 5.1 cm long, the posterior wall of the trachea was punctured 0.5 cm caudal to the superior border of the stoma (Fig 1), and the needle tip was seen in the esophagus, easily viewed on the endoscope monitor. A long catheter was inserted through the needle lumen, being gently pulled toward the oral cavity using an endoscopic biopsy clamp and guided through the monitor (Fig 2). The catheter was tied with a 0 cotton thread to a 12 nelaton probe, and at its other end we tied the vocal prosthesis (Fig 3). The probe was pulled from the oral cavity to the tracheostoma, dilating the fistula and enabling an easy prosthesis placement at the tracheoesophageal puncture (Fig 4).

After recovery in the endoscopy room, patients were discharged from the hospital. Oral feeding was allowed immediately after the insertion of the prosthesis, and patients returned for follow-up at the head and neck surgery clinic at the third and seventh days after the procedure, when complications related to the prosthesis placement technique were evaluated.

RESULTS

The voice prosthesis was successfully placed in 33 (94%) of the 35 patients. The procedure time was 7 to 20 minutes (mean, 12 minutes). In 2

Otolaryngology–
Head and Neck Surgery
May 2003

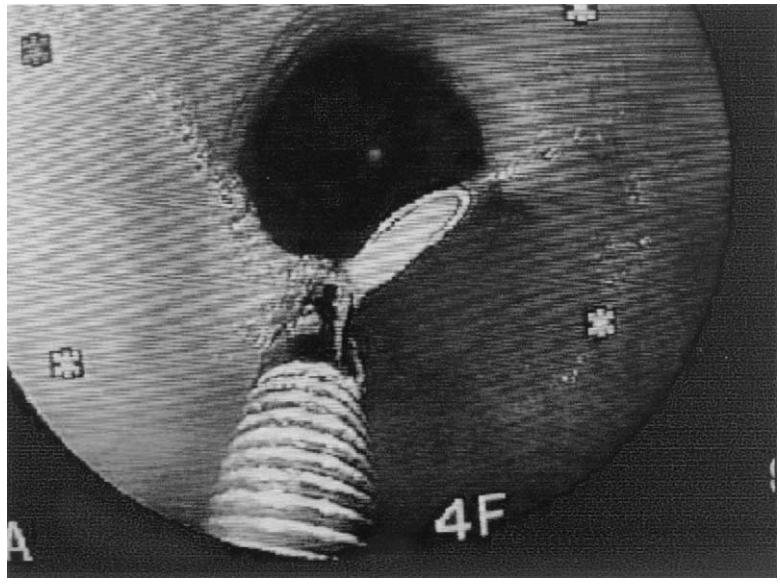

Fig 2. Needle identified in the esophageal lumen, as the thread was pulled toward the oral cavity (endoscopic visualization).

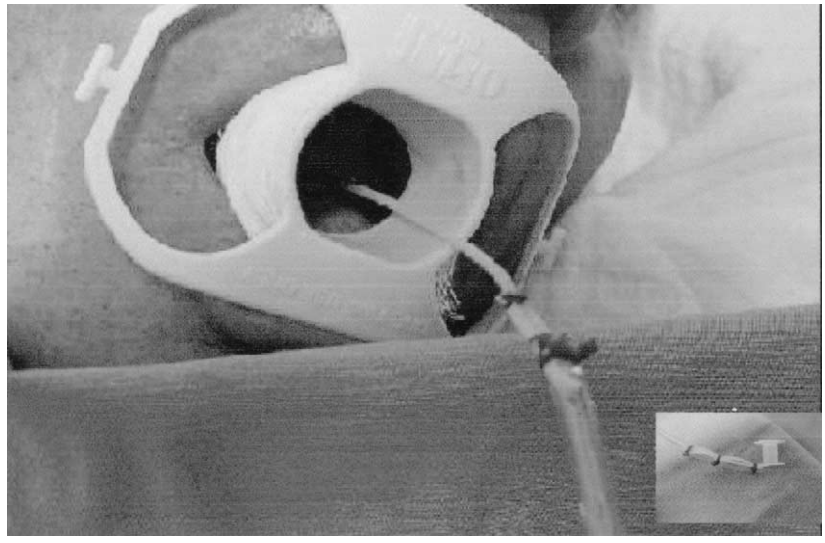

Fig 3. Catheter in the oral cavity tied to a 12nelaton probe with the vocal prosthesis at the other end.

patients, the prosthesis slipped from the probe during traction, but it was recovered using the gastric biopsy forceps, retied, and placed at the puncture site. In 2 other patients, the prosthesis was dislodged out of the fistula, and the procedure for its placement was reinitiated without any other serious consequence.

In 1 patient, bleeding at the tracheoesophageal puncture site blocked prosthesis insertion. The other failure in digestive endoscopy-aided prosthesis placement occurred in a patient with a total laryngectomy after a partial laryngectomy with cricohyoidpexy reconstruction and postoperative radiotherapy. This patient required a secondary voice prosthesis placement with general anesthesia.

Of the patients who underwent prosthesis insertion, all developed speech immediately after its placement and were discharged after recovery of midazolam-induced sedation. Oral feeding was allowed at the same day of the procedure. In patients

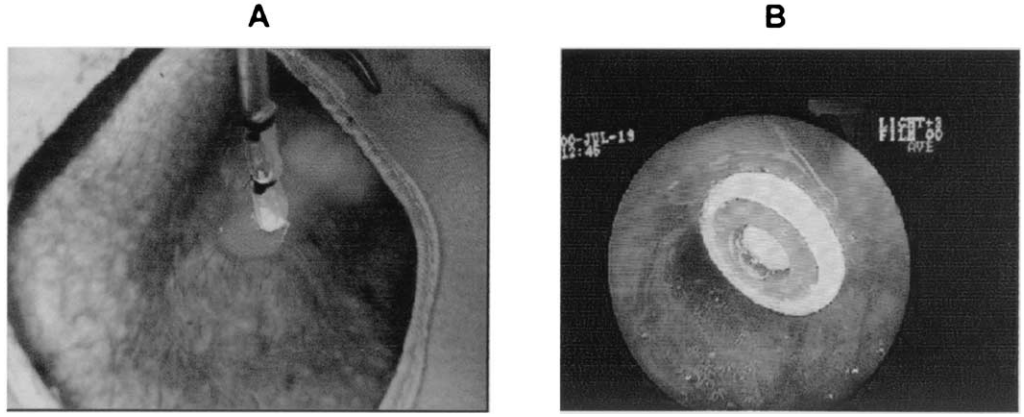

Fig 4. Prosthesis placed in the tracheoesophageal fistula: outer **(A)** and inner **(B)** view.

in whom voice prosthesis was placed immediately after wound healing and nasogastric tube removal, there was no migration of the tracheoesophageal fistula, although the continuous healing of soft tissue shortened the width without the fistula interfering with the use of the prosthesis. On the third day after prosthesis placement, 1 patient showed mucositis at the puncture site and was treated with local wound care and oral antibiotics; the patient did not lose speech capacity at any moment.

DISCUSSION

Valvulated tracheoesophageal prosthesis introduction as a voice rehabilitation method in laryngectomized patients promoted a dramatic turn in alaryngeal voice restoration.[1,6]

Tracheoesophageal prosthesis was initially placed secondary to laryngectomy in patients without success with esophageal voice. The ongoing high success rate after secondary prosthesis placement, which several authors demonstrated with rehabilitation in up to 90% of the cases,[1,7-9] led to some modifications in the prosthesis placement technique, of which the insertion simultaneous to laryngectomy, named as primary placement, was performed for the first time in 1982 by Maves and Lingeman.[10]

Since 1982, several modifications of the prosthesis and its accessories were performed, although no changes were developed in its secondary placement, which, regardless of its type, requires general anesthesia.

Gluckman et al[3] studied the complications of tracheoesophageal punctures in 47 patients and reported a 15% complication rate: mediastinitis (n = 3), cervical cellulitis (n = 3), and cervical vertebra fracture (n = 1).

In our study there was hemorrhage at the tracheoesophageal puncture site, which blocked the prosthesis placement and was contained by inserting a tracheotomy tube with cuff. This 1 patient had had a primary prosthesis placement; presented with a pharyngocutaneous fistula, cervical cellulitis, and aspiration through the tracheoesophageal fistula; and required prosthesis withdrawal and closure of the fistula. We believe this bleeding was due to neovascular formation, because as we puncture the tracheal wall 0.5 cm caudal to the superior stoma border, the needle travels through tracheal mucosa and connective tissue initially, followed by esophageal muscular wall and mucosa. Singer and Gress[11] showed that the middle line of the posterior tracheal wall is the safest place to perform the tracheoesophageal puncture, with lowest complication risks such as hemorrhage and paraesophageal abscess.

The voice prosthesis placement using digestive endoscopy proved to be a good alternative with a mean extension time of 12 minutes. In view of the advantages observed, this new technique presents a new procedure that provides greater benefit and comfort for the patient and safety margins for the surgeon.

CONCLUSION

This new technique justifies itself at secondary voice prosthesis placement with reduced morbidity. The advantages over traditional secondary placement are (1) the lack of general anesthesia,

(2) performance on an outpatient basis, (3) fewer risks of complications, especially digestive hemorrhage, mediastinitis, cervical vertebrae fracture, and esophageal perforation, (4) less esophageal and oropharyngeal mucosal trauma, and (5) a direct view of prosthesis placement in the esophagus.

The authors thank Dr Pedro de C. Neto for helping with endoscopic tracheoesophageal puncture. We wish to thank the patients who participated in this study.

REFERENCES

1. Singer MI, Blom ED. New endoscopic technique for restoration of voice after laryngectomy. Ann Otol 1980; 89:529-33.
2. Olias J, Magalhães M, Montalvão P, et al. Implantes fonatórios: revisão de 101 casos. Rev Port Otorrinol 1996;34:21-9.
3. Gluckman JF, Silver FM, Donegan JO. Operative complications of tracheoesophageal puncture. Laryngoscope 1985;95:1360-2.
4. Perry A. In: Blom ED, Singer MI, Hamaker RC, editors. Tracheoesophageal voice restoration following total laryngectomy. San Diego (CA): Singular Publishing Group; 1998. p. 9-18.
5. International Union Against Cancer. TNM classification of malignant tumors, 5th ed. New York: Sobin & Ch. Wittekind; 1997.
6. Dedivitis RA, Guimarães AV, Hushi GD, et al. Qualidade de vida do paciente laringectomizado. Rev Bras Otorrinolaringol 2000;66:14-17.
7. Fukutake T, Yamashita T. Speech rehabilitation and complications of primary tracheoesophageal puncture. Acta Otolaryngol (Stockh) 1993;500(Suppl):117-20.
8. Max L, Steurs W, Bruyn W. Vocal capacities in esophageal and tracheoesophageal speakers. Laryngoscope 1996;106:93-6.
9. Delsupehe K, Zink I, Lejaegere M, et al. Prospective randomized comparative study of tracheoesophageal voice prosthesis: Blom-Singer versus Provox. Laryngoscope 1998;108:1561-5.
10. Maves MD, Lingeman RE. Primary vocal rehabilitation using the Blom-Singer and Panje voice prostheses. Ann Otol Rhinol Laryngol 1982;91:458-60.
11. Singer MI, Gress CD. Secondary tracheoesophageal voice restoration. In: Blom ED, Singer MI, Hamaker RC, editors. Tracheoesophageal voice restoration following total laryngectomy. San Diego (CA): Singular Publishing Group; 1998. p. 27-32.