
Some Comments on the Escalation of Tracheoesophageal Voice Prosthesis Dimensions

In their recent article "Downsizing of Voice Prosthesis Diameter in Patients With Laryngectomy," Eerenstein et al¹ raise the issue of the escalating dimensions of tracheoesophageal voice prostheses and state,

Gradual dilation of the TEF [tracheoesophageal fistula] may cause bothersome leakage around voice prostheses. Prosthesis-related weight and mechanical trauma possibly exacerbate TEF dilation. If prosthesis size were to be decreased, with a concomitant decrease in prosthesis weight and diameter, dilation of the TEF would probably lessen.

I agree with this hypothesis but would add that the unnecessarily traumatic dilating effect of some commercial methods of voice prosthesis insertion probably also contributes to this problem, particularly in compromised tissue or tracheoesophageal puncture tracts shorter than 6 mm. Chronologic reports in the literature seem to support the position that increasingly larger voice prosthesis dimensions contribute to dilation and leakage. From 1978 to 1982, the first-generation tracheoesophageal voice prosthesis pioneered by Blom and Singer was 16F in diameter and the incidence of leakage around this device was infrequent. In 1981 we² reported that this problem occurred in 14 (11%) of 129 patients, and Wetmore et al³ almost simultaneously reported it in 7 (11%) of 63 patients. In retrospect, the absence of an esophageal flange (circumferential seal) on the proximal end of this early prosthesis design probably contributed to these somewhat elevated incidence rates. In 1991 Garth et al⁴ reported that only 2 (2%) of 119 patients experienced leakage around a second-generation 16F Blom-Singer voice prosthesis with an esophageal flange, and the 1994 multi-institutional report of Izdebski et al⁵ described a similar incidence of less than 5% of 90 patients.

The mid-1980s witnessed an increase in voice prosthesis diameter to 20 F, prompted by in vitro data by Weinberg and Moon⁶ demonstrating that increasing voice prosthesis diameter decreased airflow resistance through it and thus the effort to phonate. My extensive clinical experience has always supported the position that with increased prosthesis diameter comes the potential for an increased incidence of leakage around the prosthesis. A recent, currently unpublished retrospective 5 ½ year review of

253 of my patients who use a correct-length, 20F Blom-Singer indwelling voice prosthesis revealed that 28 (11%) of them experienced leakage around the device. Fortunately, in all of these patients, custom-enlarging the surface sealing area of the esophageal flange circumferentially by 3 mm, and using a "snug" prosthesis antero-posterior relationship between the flanges, completely resolves the leakage problem without requiring surgical intervention.

An even further increase in prosthesis diameter was seen in 1990 with the introduction of the 23F Provox voice prosthesis, followed more recently by a Provox II of similar diameter. Subsequent data in the literature suggest that this larger diameter, or possibly the degree of tracheoesophageal dilation associated with the method of inserting this prosthesis, may contribute to an increased incidence of leakage. Laccourreye et al⁷ reported leakage around the Provox prosthesis in (27%) of 37 patients but did not discuss the cause(s) or solutions(s). In 200 Op de Coul et al⁸ reported a decade's experience with the Provox prosthesis and described leakage around the prosthesis of 57 (18%) of 318 patients that could not be resolved by simply downsizing the prosthesis length. The authors recommend managing the problem by temporary removal of the prosthesis or with a submucosal purse-string suture around the tracheoesophageal puncture tract, although 19 of these 57 patients ultimately required surgical closure.

Issing et al⁹ reported a similar experience also suggesting that larger-diameter tracheoesophageal voice prostheses are more frequently associated with tracheoesophageal puncture dilation and intractable leakage. They stated,

According to our data the Provox prosthesis bears a higher risk in developing fistulas necessitating surgical intervention, even years after initial tumour therapy, than the Eska-Herrmann prosthesis. A major difference between the two valves is a remarkable difference in diameter, 5.5 mm for the Eska-Herrman opposed to 7.5 mm for the Provox prosthesis.

The most recent of the increasingly larger diameter voice prostheses is the 24F VoiceMaster. In a small series of 20 patients, 3 (15%) experienced leakage around this device (Simone Eerenstein, MD, written communication, October 17, 2002).


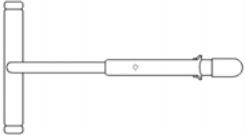
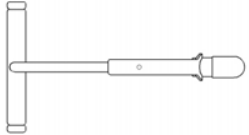
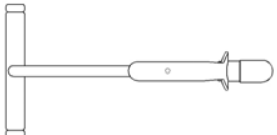

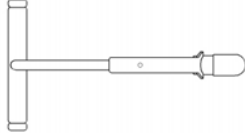



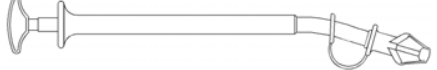
The **Figure** provides a quick reference for comparing the dimensions of various voice prostheses. Although it is not irrefutably established that leakage around a tracheoesophageal voice prosthesis is predictably related to increased dimensional characteristics or the dilating effects of insertion, an awareness of a possible relationship seems warranted.

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Tracheoesophageal Voice Prosthesis	Outer Diameter of Shaft	Outer Diameter During Insertion
Blom-Singer Low Pressure Voice Prosthesis (InHealth Technologies, Carpinteria, CA)	16F (5.3 mm) 	19F (6.3 mm) 
Blom-Singer Low Pressure Voice Prosthesis (InHealth Technologies)	20F (6.7 mm) 	22F (7.3 mm) 
Blom-Singer Indwelling Voice Prosthesis (InHealth Technologies)	20F (6.7 mm) 	22F (7.7 mm) 
Provox II Voice Prosthesis (Atos Medical AB, Hörby, Sweden)	23F (7.7 mm) 	28F-34F (9.3-11.3 mm) 
Voicemaster Voice Prosthesis (Entermed BV, the Netherlands)	24F (8 mm) 	26F-28F (8.7-9.3 mm) 

¹ Eerenstein SE, Grolman W, Schouwenburg PF. Downsizing of voice prosthesis diameter in patients with laryngectomy. *Arch Otolaryngol Head Neck Surg.* 2002; 128:838-841.

² Singer MI, Blom ED, Hamaker RC. Further experiences with voice restoration after total laryngectomy. *Ann Otol Rhinol Laryngol.* 1981;90:498-502.

³ Wetmore SJ, Johns ME, Baker SR. The Singer-Blom voice restoration procedure. *Arch Otolaryngol.* 1981; 107:674-676.

⁴ Garth RJ, McRae A, Rhys Evans PH. Tracheo-oesophageal puncture: a review of problems and complications. *J Laryngol Otol.* 1991;105:750-754.

⁵ Izdebski K, Reed, CG, Ross JC, Hilsinger RL. Problems with tracheoesophageal fistula voice restoration in totally laryngectomized patients. *Arch Otolaryngol Head and Neck Surg.* 1994; 120:840-845.

⁶ Weinberg B, Moon J. Aerodynamic properties of four tracheoesophageal puncture prostheses. *Arch Otolaryngol.* 1984; 110:673-675.

⁷ Laccourreye O, Menard M, Crevier-Bunchman L, Couloigner V, Brasnu D. In situ lifetime, causes for replacement, and complications of the Provox voice prosthesis. *Laryngoscope.* 1997; 107:527-530.

⁸ Op de Coul BM, Hilgers FJ, Balm AJ, Tan IB, Van de Hoogen FJ, Van Tintern H. A decade of postlaryngectomy vocal rehabilitation in 318 patients. *Arch Otolaryngol Head Neck Surg.* 2000; 126:1320-1328.

⁹ Issing WJ, Fuchshulber S, Wehner M. Incidence of tracheo-oesophageal fistulas after primary voice rehabilitation with the Provox or the Eska-Herman voice prosthesis. *Eur Arch Otorhinolaryngol.* 2001; 258:240-242.