Intraoperative Tracheoesophageal Partywall Thickness (PWT) Measurement in Laryngectomy Patients Using Modified PROVOX Guidewire

Suhail Sayed · Devendra Chaukar · Pankaj Chaturvedi ·
Prathamesh Pai · Gouri Pantvaitya · Anuja Deshmukh ·
Deepa Nair · Anil D’cruz

Received: 25 October 2012 / Accepted: 1 December 2012 / Published online: 8 December 2012
© Association of Otolaryngologists of India 2012

Abstract Post laryngectomy voice rehabilitation using primary tracheoesophageal puncture (TEP) and voice prosthesis insertion is considered the “gold standard” method. No special effort is taken to measure the tracheoesophageal partywall thickness before inserting voice prosthesis. TE puncture related problems (peri-prosthetic leakage) are commonly seen in our population as compared to device failures (central leak). An accurate prosthesis inserted primarily may prevent the development of peri-prosthetic leakage. We surmise that tracheoesophageal party wall thickness (PWT) to be an important factor determining this phenomenon. There is still no consensus on the size of the prosthesis to be inserted during a primary TEP. To cater this, we propose a simple, quick and accurate method of measuring tracheoesophageal PWT intraoperatively. This method will guide us to determine an accurate prosthesis size which can be inserted during primary TEP. We also propose that this method will prevent future TE puncture related problems.

Keywords Voice rehabilitation · Voice prosthesis · Peri-prosthetic leakage · Tracheoesophageal partywall

Introduction

Primary tracheoesophageal puncture (TEP) is considered the ‘gold standard’ for voice rehabilitation following total laryngectomy with success rates as high as 90 % [1, 2]. It is a common practice to empirically use a 8/10 mm size

prosthesis in majority of the patients [1]. The size of the prosthesis inserted during primary TEP is based on the tracheoesophageal partywall thickness (PWT), which is arbitrarily taken to be between 8 and 10 mm [2]. We postulate that, the tracheoesophageal PWT varies in different individuals and hence it is imperative to have an accurate measurement of PWT before inserting the prosthesis. This method will avoid the insertion of an ill-fitting prosthesis and prevent the associated problems like peri-prosthetic leakage/‘pistoning’ or granulation’s occurring after insertion of an oversized and undersized prosthesis respectively [3]. In our experience with laryngectomy patients using voice prosthesis, peri-prosthetic leakage accounted for 55 % of TEP related problems, thus suggesting a possible implication of the tracheoesophageal PWT (Fig. 1). To date there has been only a single method proposed for measuring the PWT by using external metal callipers [3]. However, it has not been widely used since it is cumbersome to use and underestimates the actual partywall thickness. There still exists a need to provide the clinician with a robust design which gives an accurate measurement and is user friendly too. Herein, we present a relatively simple, accurate and quick method of measuring the PWT intraoperatively which will aid the clinician in inserting the patient with appropriate size prosthesis.

Materials and Methods

Thirty-five (33 males and 2 females) patients who underwent total laryngectomy with primary tracheoesophageal puncture at a tertiary cancer institute hospital were included in this study. Nine patients had supraglottic carcinoma, 15 had glottis carcinoma, ten had pyriform sinus carcinoma and one had carcinoma thyroid involving the larynx.

S. Sayed (✉) · D. Chaukar · P. Chaturvedi · P. Pai ·
G. Pantvaitya · A. Deshmukh · D. Nair · A. D’cruz
Head & Neck Services, Tata Memorial Hospital, Mumbai, India
e-mail: drsuhailsayed@gmail.com

Fig. 1 Pistoning of the prosthesis on post-op day 7 leading to periprosthetic leakage

All patients underwent primary TEP had their partywall thickness measured prior to the insertion of the prosthesis but, had 8 mm Provox prosthesis (Atos medical, Horby, Sweden) inserted as per routine practice. Constitutional parameters (height and weight) were evaluated prior to surgery. The intraoperative measurement of PWT was done using the modified Provox guidewire (Atos medical, Horby, Sweden) which was fitted with a flexible silicon measuring device as discussed below.

Provox Guidewire Modification

The guidewire provided with the Provox 1 package measures approximately 90 cm. In our design we have divided the Provox guidewire into three equal parts, each serving a specific purpose (Fig. 2).

Apart from the 1st part, both the guidewires have a plastic knob at one of their ends for attachment to the pilot

Fig. 2 Modification of the Provox guidewire in three equal parts. *Part 1* pilot guidewire, *Part 2* guidewire having the measuring device, *Part 3* guidewire with the prosthesis attachment; plastic knob at the end for attachment (arrow)

guidewire (Part 1). Part 2 of the guidewire has 16 FG flexible silicon measuring device calibrated from 4 to 26 mm with a flange at the esophageal end to serve as a hinge during PWT measurement.

TE Partywall Thickness Measurement Method

Following removal of the laryngeal specimen, primary tracheoesophageal puncture is done using the trochar and cannula provided by the Atos medical Inc, Horby, Sweden. The trochar is then removed and Part 1 of the Provox guidewire i.e., pilot guidewire is passed through the cannula and brought out through the pharyngeal opening (Fig. 3a). Further, the 2nd part of the guide wire having the measuring device is snugly connected to the pilot guidewire by the plastic knob and the whole assembly is gently withdrawn through the puncture site till a point where the flange is gently hinged on the esophageal side of the tracheoesophageal puncture (Fig. 3b, c). At this instance, the tracheoesophageal partywall is measured (6 mm as seen in the Fig. 3d). Once the measurement is done, the measuring device with the guide wire is guided out of the TEP, is disconnected from the pilot wire. The pilot guidewire is then attached to the guidewire having prosthesis attachment (Fig. 3e). Taking into consideration post-operative edema, a one size larger prosthesis (8 mm) is then attached to the 3rd part of the guidewire and the prosthesis is then placed snugly in the tracheoesophageal puncture tract (Fig. 3f).

Results

Thirty-five (33 males and 2 females) patients who underwent total laryngectomy underwent an evaluation for intraoperative PWT by the modified Provox guidewire. The median age was 60 years (range 37–82 years). 30 patients (86 %) had an intraoperative PWT of 6 mm; while in four patients (11 %) PWT was 8 mm and one patient (3 %) had a 4 mm PWT. The average height of the patients was 150.2 cm while the average weight was 58 kg (Table 1).

Discussion

Surgical voice rehabilitation using a voice prosthesis is now the most commonly used method worldwide [1, 2]. It has been a general observation that patients in the Indian subcontinent require a smaller prosthesis size (4.5/6 mm) as compared to the western population (8/10/12 mm) [4, 5]. The strategy of “one size fits all” is questionable and may in some cases lead to insertion of a voice prosthesis of a size larger/smaller than the actual partywall dimensions. Fitting an oversize prosthesis will lead to pistoning and peri-prosthetic leakage, while an

Fig. 3 Stepwise method of using the modified Provox guidewire for measuring the intraoperative partywall thickness

undersized prosthesis will lead to undue compression on the soft tissue causing tissue necrosis, granulations and peri-prosthetic leakage. The methodology of measuring the PWT intraoperatively and subsequently fitting appropriate size prosthesis seems to be a logical answer to prevent these complications. The method described in this pilot study report is a relatively simple, quick and accurate way of getting an idea of the partywall thickness. The measuring device used in the Provox guidewire assembly has an outer diameter of 16 FG which causes minimal TE tract dilatation and serves a useful purpose in easy expression of the tracheal flange through the partywall. The preliminary results from this method estimate 6 mm as the tracheoesophageal partywall thickness as seen in majority of the patients and hence, fitting a prosthesis one size larger i.e., 8 mm can provide a snug-fit preventing any future peri-prosthetic leakage. Amongst the patient group majority (30 patients, 86 %) of the patients had a PWT of 6 mm while four (11 %) had an 8 mm PWT with only a single patient (3 %) having a very thin i.e., 4 mm tracheoesophageal partywall. All the patients were inserted with 8 mm prosthesis as per institutional policy and study criteria.

In the literature no specific guidelines have been given with respect to the size of prosthesis to be inserted during the primary tracheoesophageal puncture. Majority of the clinicians worldwide insert either 8/10 mm prosthesis with

some others who insert a larger size i.e., 12 mm too. In our clinical setting, our general observation has been that the patients who are inserted with 8 mm prosthesis eventually develop a peri-prosthetic leakage due to loosening/‘pistonning’ are inserted with one size lower i.e., 6 mm prosthesis during follow-up. Our laryngectomy population in the Indian subcontinent has witnessed a longer prosthesis lifetime which can be attributed to our dietary habits which are rich in milk and milk products (unpublished data). It is routine practice of measuring the PWT by using a customized measuring device provided by the manufacturer (Provox/Blom-Singer) during the subsequent prosthesis replacement. Inserting prosthesis of appropriate size is mandatory for post-laryngectomy voice rehabilitation using voice prosthesis.

Our study has limitations in view of its limited sample size and lack of follow-up data of the patients. Hence it would be early to recommend a particular prosthesis size for all the laryngectomy patients. Instead, the authors through this study attempt to provide an insight into the usefulness of intraoperative partywall thickness and question the concept of ‘one-size fits all’ in the laryngectomy population [3]. A prospective study involving a larger number of patients is being conducted at the authors centre. We propose further prospective studies using this technique

Table 1 Clinical and surgical parameters of the patients undergoing laryngectomy

Serial no.	Age	Sex	Height	Weight	Site	TNM	Stage	Intraop partywall thickness (mm)	Size of prosthesis inserted (mm)	Type of prosthesis	Closure
1	65	M	157	56	RT PFS	T4aN2bM0	IVB	6	8	Provox2	Primary
2	72	M	152	55	RT PFS	T3N2cM0	IVB	6	8	Provox2	Primary
3	37	M	158	58	RT PFS	T4aN0M0	IVA	6	8	Provox2	Primary
4	56	F	149	57	LT supraglottis	T4aN0M0	IVA	6	8	Provox2	Spiral PMMC
5	62	M	156	55	Anterior commissure	T4aN0M0	IVA	6	8	Provox2	Primary
6	61	F	145	48	Thyroid with laryngeal involvement	T4aN0M0	IVA	6	8	Provox2	Primary
7	65	M	165	63	RT TVC	T4aN0M0	IVA	6	8	Provox2	Primary
8	54	M	156	59	RT PFS	T3N2bM0	IVB	6	8	Provox2	Primary
9	64	M	158	58	RT supraglottis	T4aN0M0	IVA	6	8	Provox2	Primary
10	53	M	153	55	RT glottis	T4aN2bM0	IVB	6	8	Provox2	Primary
11	46	M	147	62	RT PFS	T4aN2cM0	IVB	8	8	Provox2	Primary
12	43	M	151	58	RT PFS	T4aN0M0	IVA	4	8	Provox2	Primary
13	57	M	152	67	Post CTRT left glottis	T4aN0M0	IVA	6	8	Rovox1	Patch PMMC
14	70	M	149	54	RT transglottis	T4AN1M0	IVA	6	8	Provox1	Primary
15	50	M	156	68	RT glottic	T4aN0M0	IVA	6	8	Provox2	Primary
16	54	M	143	53	LT transglottic	T4aN0M0	IVA	6	8	Provox2	Primary
17	68	M	147	57	LEFT glottis	T2NOMO	II	8	8	Provox2	Primary
18	45	M	152	55	RT transglottis	T3N0M0	III	6	8	Provox2	Primary
19	81	M	154	62	LF supraglottis	T4N0M0	IVA	6	8	Provox1	Primary
20	60	M	144	55	RT transglottis	T4AN2BM0	IVB	6	8	Provox2	Primary
21	71	M	148	49	RT transglottis	T4AN2CMO	IVB	6	8	Provox2	Spiral PMMC
22	44	M	157	62	RT PFS	T4AN0M0	IVA	6	8	Provox2	Primary
23	64	M	143	57	RT glottis	T3N0M0	III	8	8	Provox1	Primary
24	55	M	156	59	RT glottis	T4AN0M0	IVA	6	8	Provox1	Primary
25	58	M	148	63	RT glottis	T4AN0M0	IVA	6	8	Provox2	Primary
26	82	M	157	60	RT transglottis	T4AN2BM0	IVB	6	8	Provox2	Primary
27	60	M	148	40	RT supraglottis	T4AN0M0	IVA	6	8	Provox2	Primary
28	65	M	152	54	RT transglottis	T4AN0M0	IVA	8	8	Provox2	Primary
29	60	M	148	45	Post CTRT RT transglottis	T4AN0M0	IVA	6	8	Provox2	Primary
30	48	M	145	63	Post CTRT RT PFS	T4AN2BM0	IVA	6	8	Provox2	Patch PMMC
31	54	M	137	46	RT transglottis	T4AN0M0	IVA	6	8	Provox2	Primary
32	60	M	145	46	RT PFS	T4AN2BMO	IVA	6	8	Provox2	Patch PMMC
33	60	M	139	52	Left supraglottis	T4AN0M0	IVA	6	8	Provox2	Patch PMMC
34	59	M	149	54	Post CTRT RT supraglottis	T1N2BM0	IVA	6	8	Provox2	Patch PMMC
35	60	M	142	51	Left PFS	T4AN0M0	IVA	6	8	Provox2	Primary

in Indian as well as European population to validate this technique.

Conclusion

We present a relatively simple, accurate and quick method of getting an idea of the intraoperative PWT. The technique uses the same Provox guidewire commonly used and is easy to learn. By applying this technique the laryngectomees can be fitted on table with appropriate size voice prosthesis.

References

1. Hilgers FJM, Balm AJM, Gregor RT et al (2003) A practical guide to post-laryngectomy vocal and pulmonary rehabilitation, 4th edn.
2. Brown DH, Hilgers FJM, Irish JC, Balm AJM (2003) Postlaryngectomy voice rehabilitation: state of the art at the millennium. *World J Surg* 27:824–831
3. Sayed SI, Manikantan K, Khode S et al (2010) Tracheo-oesophageal party wall thickness in laryngectomised patients in India: implications for surgical voice restoration. *J Surg Oncol* 101(1):78–83
4. Mehta AR, Sarkar S, Mehta SA et al (1995) The Indian experience with immediate tracheo-esophageal puncture for voice restoration. *Eur Arch Otorhinolaryngol* 252:209–221
5. Op de Coul BM, Hilgers FJ, Balm AJ et al (2000) A decade of postlaryngectomy vocal rehabilitation in 318 patients: a single Institution's experience with consistent application of Provox1 indwelling voice prostheses. *Arch Otolaryngol Head Neck Surg* 126:1320–1328

http://www.hoofdhalskanker.info/Provoxweb/General_Introduction.htm. Accessed 4 Oct 2012