

Stapled closed technique for laryngectomy and pharyngeal repair

F AHSAN, K W AH-SEE, A HUSSAIN

Abstract

Background and aims: Total laryngectomy is a recognised treatment for advanced laryngeal carcinoma. Traditionally, pharyngeal repair is performed with layered sutures. We describe our experience with a technique of closed pharyngoplasty using a linear stapler device.

Material and methods: Ten total laryngectomies were performed from July 2002 to July 2004, using an Ethicon TLC 75 linear stapler for pharyngeal closure. Data collected included age, sex, staging, endoscopic assessment, surgical margins and post-operative course (including complications and swallowing).

Results: Patients comprised eight men and two women. The mean age was 55.4 years. Six patients had stage T₄ endolaryngeal carcinoma and four had stage T₃. Four patients underwent pre-operative radiotherapy. Clear surgical margins were achieved in all patients. One patient developed a pharyngocutaneous fistula. Patients resumed oral intake at 48 hours, or at 72 hours if they had undergone pre-operative radiotherapy. Patients' mean hospital stay was seven days.

Conclusion: This stapled closed technique for pharyngoplasty is efficient and eliminates the risk of wound contamination, thus theoretically reducing the risk of tumour seeding. In addition, we were able to commence patients on oral fluids at a mean of 48 hours after surgery. The mean hospital stay was seven days. We recommend this technique as an alternative for repairing the pharynx in patients undergoing total laryngectomy for endolaryngeal carcinoma.

Key words: Laryngeal Neoplasms; Laryngectomy; Surgical Staples

Introduction

Stapling devices are widely used in surgery of the gastrointestinal system. The use of automatic stapling devices for pharyngeal closure after total laryngectomy is tempting but has received only sporadic interest. The use of staplers for pharyngeal repair after excision of a Zenker's diverticulum was described by Hoehn and Payne in 1969.¹ Most subsequent reports have described the use of stapling devices either for the repair of open pharyngeal defects after laryngeal resection,^{2–5} or for the 'closed technique' (i.e. application of the stapling device to the pharynx after skeletonisation of the larynx, just before laryngeal resection).^{6–11}

Three published series have reported results for the closed technique using the Autosuture TA 90 and TA 55 mm stapler devices.^{7–9} Only one published series has reported use of the Ethicon TCL 75 stapler for the closed technique.¹¹ The closed technique provides a rapid, secure and watertight pharyngeal closure with no wound contamination. The benefits of this technique are reduced surgical time and decreased morbidity due to wound infection from salivary contamination.^{8,11}

We describe our experience of the closed technique using the Ethicon TLC 75 linear stapler. All patients in this series were commenced on oral intake after 48 hours (or 72 hours if they had previously received radiotherapy).

Material and methods

Ten total laryngectomies were performed from July 2002 to July 2004 using the Ethicon TLC 75 linear stapler (Ethicon Endo-Surgery, LLC Guaynabo, Puerto Rico 00969 USA) for pharyngeal closure. Data collected included age, sex, staging, endoscopic assessment, surgical margins and post-operative course (including complications and swallowing).

Operative technique

Panendoscopy was performed in all patients in order to verify that the tumour was entirely endolaryngeal. After standard skin incision and subplatysmal flap elevation, the larynx was skeletonised in the usual fashion. The pharyngeal constrictor was detached from the lateral border of the thyroid ala, and the hyoid bone was released from the suprahyoid muscles and its lateral attachments. The epiglottis was skeletonised while preserving mucosa superiorly and the larynx thus mobilised further along its superior aspect. This manoeuvre was critical, and special care was taken throughout to avoid inadvertent entry into the pharynx. The trachea was then transected and a separate tracheostoma created. The larynx was then completely mobilised and skeletonised and suspended above the pharynx (Figure 1).

From the Department of Otolaryngology and Head and Neck Surgery, Grampian University Hospitals, Aberdeen Royal Infirmary, Scotland, UK.

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FIG. 1

Larynx mobilised and skeletonised and suspended above the pharynx.

The stapling device was positioned between the larynx and the pharynx (Figure 2). Care was taken, as the epiglottis could hinder application of the stapling device. The device was positioned as close as possible to the larynx to avoid unnecessary resection of pharyngeal mucosa. The stapling device was then applied and activated; this manoeuvre transected the pharynx and at the same time stapled the pharyngeal mucosa. The stapling device was then released and the closure checked to ensure an intact-stapled closure (Figure 3). Occasionally, a small amount of mucosa was seen to remain; this could be stapled using an Ethicon pharyngeal pouch stapler if required (Figures 4 and 5). Primary tracheoesophageal puncture could be



FIG. 2

Stapling device positioned between the larynx and pharynx.



FIG. 3

Closed pharynx.

performed at this time. A stoma-gastric or naso-gastric tube was inserted as required. The neck wound was closed in the usual fashion, with closed suction drains.

Patients who had not undergone radiotherapy prior to surgery were commenced on oral fluids after 48 hours. Those who had undergone radiotherapy prior to surgery were commenced on oral fluids after 72 hours. Patients' oral fluid intake was gradually increased over the next few days, and patients were discharged home by the seventh post-operative day.

Results

A summary of results is shown in Table I. The patients comprised eight men and two women. Their mean age was 55.4 years (range 47–78). Six patients had stage T₄ laryngeal carcinoma, three had stage T₃ and one had stage T₂. All patients had endolaryngeal tumours. Four patients had previously undergone therapeutic radiotherapy.



FIG. 4

Second stapler.

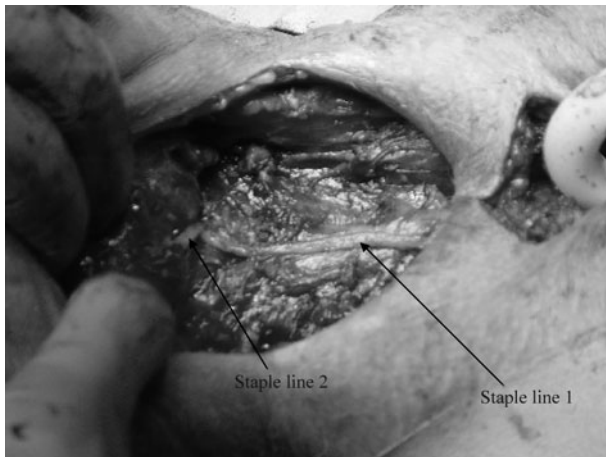


FIG. 5
Closed pharynx with two staple lines.

Skeletonisation and application of the stapling device was achieved easily in all patients. Three patients who had neck nodes also underwent neck dissection. In two patients, primary tracheoesophageal puncture was performed using a long-angled haemostat in the usual fashion, while two patients underwent secondary tracheoesophageal puncture.

One patient with a history of prior irradiation developed a pharyngocutaneous fistula on post-operative day six; this was managed conservatively. All other patients were commenced on oral fluids 48 hours post-operatively (72 hours if they had received previous radiotherapy). All the patients were managing good oral intake prior to discharge. The mean hospital stay was seven days. The surgical excision margins were negative in all patients.

Discussion

The use of an automatic stapling device is an attractive option during total laryngectomy, as it enables rapid achievement of a watertight closure of the pharyngeal mucosa, thus reducing the total operative time. Furthermore, sealing off the pharynx just prior to laryngeal resection also eliminates the risk of salivary wound contamination, and theoretically reduces the risk of tumour seeding.

The operative technique is initially similar to standard total laryngectomy. After laryngeal skeletonisation as

described above, the remainder of the procedure follows quickly, and laryngeal resection and pharyngeal closure are achieved simultaneously using the stapler.

Only one patient developed a pharyngocutaneous fistula in our series. Therefore, our patients' fistula rate was at the lower end of the reported range; fistula rates of 4 to 66 per cent have been published for patients undergoing total laryngectomy,¹²⁻¹⁵ while higher fistula rates have been reported for previously irradiated patients.^{16,17} The one patient in our series who developed a fistula had undergone previous irradiation. As regards the five other previous series using the closed technique, the first did not report a fistula rate,⁶ the second reported no occurrence of fistulae in a group of 13 patients,⁷ the third reported only one fistula in a group of seven (and this patient had undergone previous radiotherapy),⁸ the fourth reported one fistula in a group of 15,¹⁰ and the fifth reported no fistulae in a group of 12.¹¹ A study comparing manual versus mechanical sutures for pharyngeal closure found that mechanical sutures applied with a closed technique reduced the rate of complications such as fistula, infection and haemorrhage.⁹ It would appear that concerns regarding the risk of fistula formation following the closed technique are mainly theoretical in nature and are not confirmed by actual practice, although one should be aware that the total number of reported patients is small.

As the tumour is not visualised directly during the resection technique described, there remains concern as to the completeness of resection and therefore the potential for oncological compromise. However, this concern has not been borne out by our experience. We advise strongly that all patients be assessed thoroughly via radiography, flexible nasolaryngoscopy and rigid intra-operative endoscopy, before being deemed appropriate for the stapled closed technique.

During follow up, all our patients continued to demonstrate adequate swallowing function and tracheoesophageal voice.

Conclusion

Stapled closed technique for total laryngectomy and pharyngoplasty is technically simple, efficient and quick to learn. This technique does not appear to increase the rate of pharyngocutaneous fistula formation, and tracheoesophageal puncture can be performed primarily. This technique eliminates the risk of wound contamination and theoretically reduces the risk of tumour seeding. We recommend it as an alternative technique for pharyngeal repair in patients undergoing total laryngectomy.

TABLE I
PATIENT DATA

Pt no	Age (y), sex	Stage	Prev surg?	Prev RT?	TEP?	Post-op compl	Margins	Post-op swallowing?
1	62, M	T ₄ N ₁ M ₀	N	Y	N	None	Clear	Y, 72 h
2	67, M	T ₄ N ₂ M ₀	N	N	N	None	Clear	Y, 48 h
3	47, M	T ₂ N ₀ M ₀	N	Y	2°	None	Clear	Y, 72 h
4	58, M	T ₄ N ₁ M ₀	N	Y	N	None	Clear	Y, 72 h
5	78, M	T ₄ N ₀ M ₀	N	N	1°	None	Clear	Y, 48 h
6	59, M	T ₃ N ₀ M ₀	N	N	N	None	Clear	Y, 48 h
7	53, M	T ₄ N ₀ M ₀	N	Y	N	PCF	Clear	Y, 72 h
8	70, F	T ₄ N ₀ M ₀	N	N	N	None	Clear	Y, 48 h
9	59, F	T ₃ N ₀ M ₀	N	N	2°	None	Clear	Y, 48 h
10	55, M	T ₃ N ₀ M ₀	N	N	1°	None	Clear	Y, 48 h

Pt no = patient number; y = years; prev = previous; surg = surgery; RT = radiotherapy; TEP = tracheoesophageal puncture; post-op = post-operative; compl = complications; M = male; F = female; T = tumour; N = nodes; M = metastases; N = no; Y = yes; 1° = primary; 2° = secondary; h = hours

References

- 1 Hoehn JG, Payne WS. Resection of pharyngoesophageal diverticulum using stapling device. *Mayo Clin Proc* 1969;**44**:738–41
- 2 Wolfensberger M, Simmen D. Staple closure of the hypopharynx after diverticulectomy and total laryngectomy. *Dysphagia* 1991;**6**:26–9
- 3 Talmi YP, Finkelstein Y, Gal R, Shvilli Y, Sadov R, Zohar Y. Use of a linear stapler for postlaryngectomy pharyngeal repair: a preliminary report. *Laryngoscope* 1990;**100**:552–5
- 4 Sessions RB, Shemen LJ, Reuter VE. Staple closure of the gullet after laryngectomy: an experimental study. *Otolaryngol Head Neck Surg* 1986;**95**:491–9
- 5 Westmore GA, Knowles JEA. The use of stapling instrument for post-laryngectomy pharyngeal repair. *J Laryngol Otol* 1983;**97**:775–8
- 6 Lukyanchenko AG. Suturing of a laryngeal defect in laryngectomy [in Russian]. *Vestn Otorinolaringol* 1971;**33**:29–30
- 7 Simoncelli C, Altissimi G. Mechanical sutures of the pharynx during total laryngectomy: proposal of a closed technique [in Italian]. *Acta Otorhinolaryngol Ital* 1990;**10**:465–74
- 8 Agrawal A, Schuller DE. Closed laryngectomy using the automatic linear stapling device. *Laryngoscope* 2000;**110**:1402–5
- 9 Montoya FS, Ruiz De Galarreta JC, Del Rey AS, Ibarguen AM, De Matrana AZL. Comparative study between the use of manual versus mechanical sutures in the closing of the mucous defect following a total laryngectomy [in Spanish]. *Acta Otorrinolaringol Esp* 2002;**53**:343–50
- 10 Manola M, D'Angelo L, Longo F, De Vivo S, De Maria G, Ionna F. The stapler in total laryngectomy with close technique [in Portuguese]. *Tumori* 2003;**89**(suppl 4):260–2
- 11 Dedivitis RA, Guimaraes AV. The use of stapler for pharyngeal closure after total laryngectomy. *Acta Cirurgia Brasileira* 2004;**19**(1):66–9
- 12 Bresson K, Rasmussen H, Rasmussen PA. Pharyngocutaneous fistula in totally laryngectomised patients. *J Laryngol Otol* 1974;**88**:835–42
- 13 Lundgren J, Olafsson J. Pharyngocutaneous fistula following total laryngectomy. *Clin Otolaryngol* 1979;**4**:13–23
- 14 Davis RK, Vincent ME, Shapshay SM, Strong MS. The anatomy and complications of “T” vs. vertical closure of the hypopharynx after laryngectomy. *Laryngoscope* 1982;**92**:16–22
- 15 Weingrad DN, Spiro RH. Complication after laryngectomy. *Am J Surg* 1983;**146**:517–20
- 16 Stell PM, Cooney TC. Management of the fistula of the head and neck after radical surgery. *J Laryngol Otol* 1974;**88**:819–34
- 17 Dedo DD, Alonso WA, Ogura JH. Incidence, predisposing factors and outcome of pharyngocutaneous fistula complicating head and neck cancer surgery. *Ann Otol Rhinol Laryngol* 1975;**84**:833–40

Address for correspondence:
Mr F Ahsan,
3 Bervie Drive,
Murieston,
Livingston EH54 9HA, Scotland, UK.

E-mail: farhan099@hotmail.com

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