

## Original Article

## Flexing the Neck Relieves Tension on Cervical Esophageal Anastomosis

Noureddin Pirmoazen MD FACS\*, Morteza Seirafi MD\*\*, Mojtaba Javaherzadeh MD\*\*\*, Farrokh Saidi MD FACS FRCS\*

**Background:** The conventional method of bridging anatomic defects of the upper digestive tract in the neck is by tissue transfer—either gastric or colon pull-through, free jejunal graft, or full-thickness skin flaps. An alternative way of closing such defects is to flex the neck. This moves the remnant proximal esophagus or pharynx a considerable distance downwards—a standard tension-releasing maneuver in tracheal resection and reconstruction.

**Methods:** Neck flexion was used in 7 patients grouped into three separate surgical conditions: A) in two patients after esophagectomy, where the pulled-up stomach would not reach the remnant proximal esophagus or the pharynx; B) in three patients where the defect after removal of the diseased portion of the cervical esophagus measured 4.5, 5.0, and 8.0 cm, respectively; and C) in 2 patients with 4.5- and 1.5-cm long circumferential postoperative esophageal strictures managed by Heineke-Miculicz repair.

**Results:** No postoperative cervical fistulas were seen. One patient, whose 8-cm long cervical esophageal defect had been closed by end-to-end anastomosis, developed a stricture.

**Conclusion:** In special situations, flexing the neck allows for safe anastomosis or closure of esophageal defects in the neck, obviating the need for tissue transfer.

*Archives of Iranian Medicine, Volume 9, Number 4, 2006: 339 – 343.*

**Keywords:** Anastomosis • esophagus • neck position • tissue transfer

### Introduction

In the course of gastrointestinal reconstruction after an esophagectomy, the cervical esophageal anastomosis may appear to be under considerable tension. Usually nothing happens if the stomach has been well mobilized and no hang-ups encountered in transposing the stomach to the neck. At worst, a nonlethal cervical leak or stenosis may develop.<sup>1</sup> Very rarely, however, the tension at the site of

anastomosis is clearly excessive and cannot be ignored. The situation then becomes problematic as salvage procedures such as colon bypass, free jejunal, or pedicled full-thickness skin grafts significantly increase the scope of the operation. Under such circumstances, an escape maneuver is to flex the neck acutely forward, bringing the remnant proximal esophagus or pharynx downwards to meet the maximally pulled-up stomach. This maneuver, as simple as it is obvious, can also be used in situations other than reconstruction after total esophageal resection. The principle is the same as the tension-relieving maneuver used after tracheal resection and reconstruction.

### Patients and Methods

Figure 1 diagrammatically summarizes three separate clinical situations where neck flexion proved helpful.

**Authors' affiliations:** Department of Surgery, \*Modarress Hospital, Shaheed Beheshti University of Medical Sciences, \*\*Iran Mehr Hospital, Department of Thoracic Surgery, \*\*\*Masih Daneshvari Hospital, Shaheed Beheshti University of Medical Sciences, Tehran, Iran.

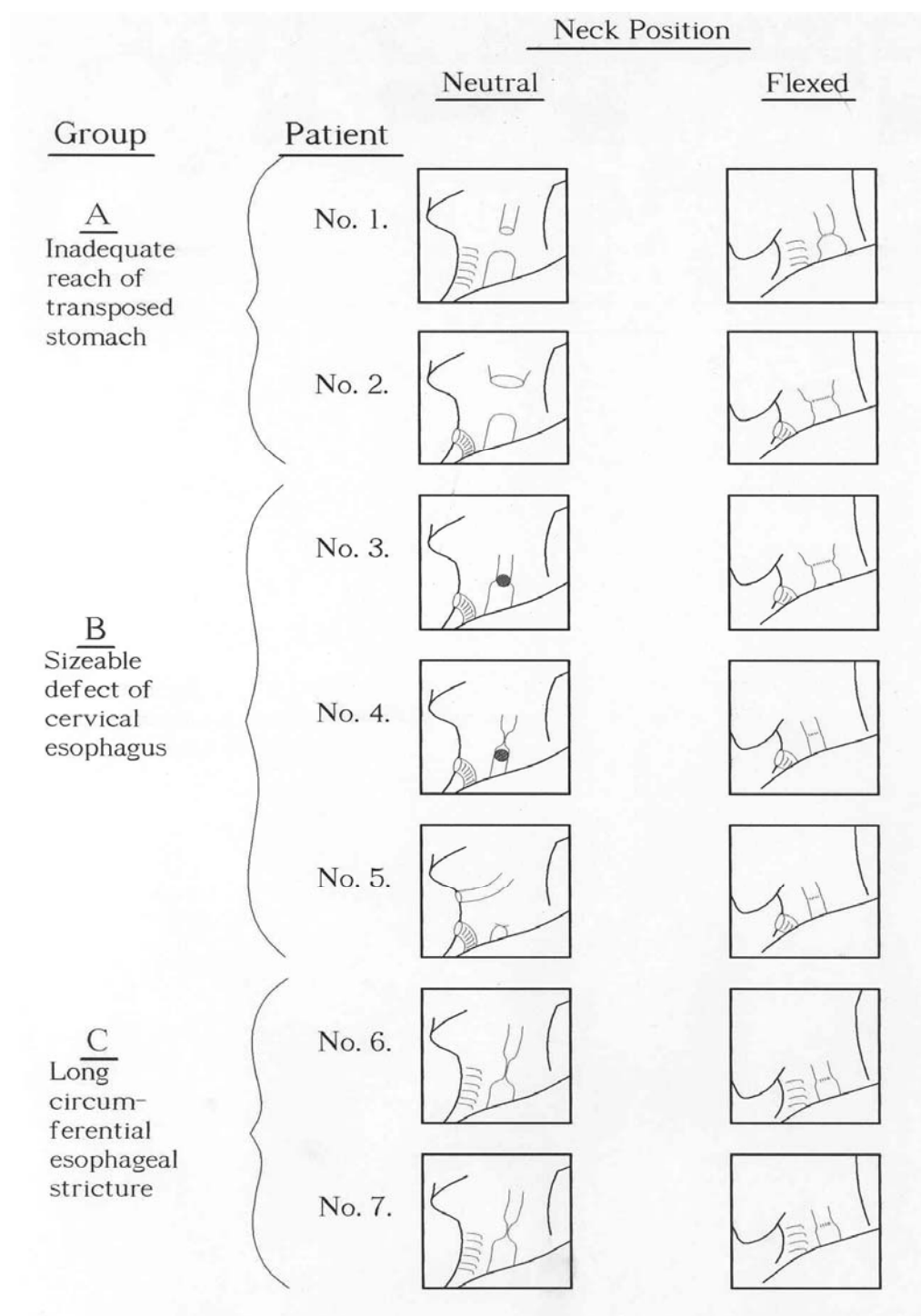
**Corresponding author and reprints:** Farrokh Saidi MD, Department of Surgery, Modarress Hospital, Shaheed Beheshti University of Medical Sciences, Tehran, Iran.

Telefax: +98-212-293-8051, E-mail: saidif@ams.ac.ir.

Accepted for publication: 27 June 2006

This study was supported by ISMO, the Iranian Chapter of TWAS.

Art Work by Mr. Mohammad-Javad Bahadorian.



**Figure 1.** Diagrammatic summary of neck flexion maneuver in three distinct anatomic circumstances.

### Group A

Patients in whom the pulled-through stomach could not be brought satisfactorily to the neck for a tension-free anastomosis:

*Patient 1.* During resection of an adenocarcinoma of the cardia in this 74-year-old male, a

severely deformed chronic duodenal ulcer was encountered requiring a relatively long pyloroplasty. This may have been a contributing factor, but the gastroesophageal anastomosis in the neck after a transhiatal pull-through, was clearly under considerable tension. This was taken down

and the gastric tube was allowed to retract to a lower position, regaining its pink color. Bending the neck brought the proximal esophageal remnant downward to meet the apex of the stomach allowing a tension-free anastomosis.

**Patient 2.** This 64-year-old female presented with a squamous cell carcinoma of the cricopharyngeal region involving the posterior wall of the larynx. Total laryngopharyngectomy and cervical esophagectomy was carried out. For unexplained reasons, the apex of the well-mobilized stomach taken transhiatally to the neck, would not reach the base of the tongue. It was, therefore, left in the neck as far as it would reach. Bending the neck moved the whole pharynx downwards for a tension-free anastomosis.

### Group B

Patients with a large anatomic defect after removal of a diseased segment of the cervical esophagus:

**Patient 3.** Fourteen months after total laryngectomy and cervical esophagectomy for advanced cervical esophageal cancer followed by gastric reconstruction, this 75-year-old female was admitted with complete obstruction due to cancer recurrence at the anastomotic site in the neck. A palliative local resection was performed resulting in a 5-cm long defect which could be readily closed on bending the neck acutely forward.

**Patient 4.** This 60-year-old female had total thyroidectomy performed for papillary carcinoma almost 20 years earlier. She subsequently required total laryngectomy because of local recurrence at which time also an esophageal stricturoplasty was carried out. She was admitted on this occasion because of complete esophageal obstruction due to local recurrence of the thyroid cancer just below the previous stricturoplasty site. The entire length of the diseased portion of the cervical esophagus in the neck was exposed and resected, resulting in an 8-cm long defect. The pathologist's report was "...a 7.5-cm long esophageal segment with an intramural papillary carcinoma of the thyroid, 4.5 cm in diameter below a fibrotic esophageal stricture." Her poor medical condition precluded mobilizing the stomach for a pull-through, while flexing the neck allowed for a primary end-to-end esophageal anastomosis in the neck.

**Patient 5.** This 61-year-old female also had total thyroidectomy performed 12 years earlier for papillary cancer of the thyroid. Total laryngectomy and cervical esophagectomy had been carried out a

year ago because of local recurrence, at which time the upper esophageal end was led out to the skin and the lower end closed off, maintaining her on gastrostomy feedings. On this occasion, the proximal esophagostomy was taken down and the closed distal esophageal end dissected out of scar tissue. On flexing the neck, the anatomic defect which measured 4.5 cm in length with the neck in the neutral position, could be closed by end-to-end anastomosis.

### Group C

Patients with long segment circumferential cervical esophageal postoperative stricture not amenable to repeated dilatations.

**Patient 6.** This 74-year-old male had resection of an adenocarcinoma of the lower esophagus carried out five months earlier. A gastric tube was fashioned from the greater curvature and moved to the neck using the endoesophageal pull-through technique.<sup>2</sup> For the first three months postoperatively, he was able to eat a regular diet, but thereafter developed progressive difficulty in swallowing solid food. Five separate attempts at endoscopic dilatation at two-weekly intervals failed to provide lasting relief. The site of anastomosis in the neck was exposed surgically, revealing a 4-cm long circumferential stricture. On bending the neck forward, a two layered Heineke-Mikulicz repair was carried out without difficulty.

**Patient 7.** A similar situation was met in this 58-year-old female who developed a cervical anastomotic fistula after an esophagectomy and transhiatal gastric pull-through for cancer of the cardia. This had been done four months earlier and the fistula had healed spontaneously. She was left, however, with a stricture which did not respond to a total of eight dilatations. An open stricturoplasty was performed at which time the left recurrent nerve was injured, and she was left with great difficulty in swallowing. On this occasion, the stricture site in the neck was surgically exposed, finding a 2-cm long circumferential narrowing within dense scar tissue alongside many silk sutures. Here, as in the previous case, flexing the neck permitted a Heineke-Mikulicz repair.

### Technique

To accommodate the extraoropharyngeal curvature resulting from acute flexion of the neck, an armored endotracheal tube was used in all seven cases. The final anatomic gap to be bridged was measured with the neck in the neutral position.

First the anterior row and next the posterior row sutures were placed but not tied. At that stage, an unscrubbed assistant would grasp the patient's occiput and gently flex the neck maximally forward. The sutures were then tied down in sequence, starting with the posterior row. The knots could be felt but not readily seen. The presence of a tracheostomy opening was no hindrance. After closing the skin incision without drainage, the underside of the chin was fixed to the anterior chest wall with two stout nylon sutures, leaving enough room for access to the tracheostomy opening if there was one. The flexed neck position was maintained during transfer of the patient from the operating table, and kept that way for the duration of the postoperative period lasting 7 to 10 days, using either well-placed pillows or an improvised posterior plaster cast. Clear liquids by mouth were started on the second or third day and advanced to soft diet as tolerated.

## Results

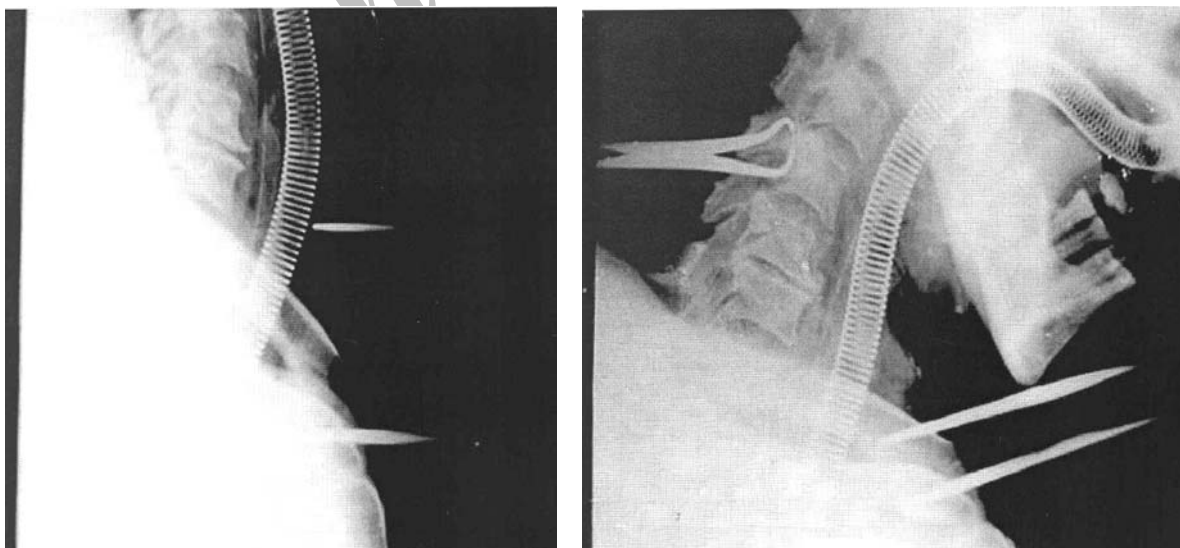
None of the seven patients developed a cervical fistula of any degree. However, patient No. 4, whose 8-cm long anatomic defect had been closed by end-to-end esophageal anastomosis, developed an anastomotic stricture, which required a total of six dilatations before she was able to swallow soft solids comfortably. At her last outpatient visit nine months later, she was found to have multiple pulmonary metastases.

Patient No. 1 was able to eat a regular diet until he died with widespread metastatic disease 2.5 years after his operation. Patient No. 2 returned with dysphagia four years after her operation with recurrent disease at the anastomotic site in the neck. This was resected and the resulting 5-cm long defect was closed using the neck flexion maneuver for the second time. Patient No. 3 lived another 5 months before succumbing to another local anastomotic recurrence, which her family refused to be reoperated upon. Patient No. 5 who had an end-to-end esophago-esophagostomy, after mobilizing the two ends of the esophagus to bridge a 4.5-cm long defect, is alive and well at 22 months follow-up and able to eat a regular diet. One of the two patients with successful Heineke-Miculicz repair of cervical esophageal stricture, patient No. 6, returned 6 months later with liver metastases and died shortly thereafter. The other patient (No. 7), is alive 36 months postoperatively and has no swallowing problems.

## Discussion

Assessing cervical esophageal anastomotic tension in the neck is a subjective matter.

Regardless of the method used for reconstruction, ischemia at the apex of the transposed stomach is the principal cause of impaired anastomotic healing.<sup>3-5</sup> The proximal esophagus is well-vascularized by the inferior thyroid arteries,<sup>6</sup> and it moves a considerable distance downwards



**Figure 2.** A) Patient 1 with cervical esophagectomy completed and the neck in the neutral position. The tip of one hemostat has been placed on the rim of the proximal esophageal remnant and a second hemostat on the apex of the pulled-up stomach. B) Flexing the neck has brought the two hemostats close together.

on bending the neck, as was shown radiologically in patient No. 1 (Figure 2). This portion of the esophagus, furthermore, does not shrink in length when freed from its structural moorings, most probably because the esophageal longitudinal striated muscle layers assume their final orientation in a gradual manner from the cricopharyngeus downwards.<sup>7</sup>

How long a gap of the cervical esophagus can be bridged by flexing the neck, is difficult to say. The severe postoperative anastomotic stricture of patient No. 4 did not come as a surprise; and an eight-cm long defect may well be the limit beyond which end-to-end esophageal anastomosis should not be entertained. A most useful place for the neck flexion maneuver is as part of a Heineke-Miculicz repair of long and circumferential strictures of the cervical esophagus not responding to multiple dilatations.

There are two drawbacks to the proposed maneuver in cervical esophageal surgery: the first is that the anastomosis will not be optimal as the suture line cannot be brought into full view with the neck kept in the fully flexed position. This, however, does not seem to impair anastomotic healing as was observed in the seven cases presented. The second problem is the discomfort associated with having to maintain the head in the bent position for the duration of the postoperative period. This is not intolerable as the experience

with tracheal resection has shown. In the rare situation of an unacceptable degree of cervical anastomotic tension, neck flexion can avert the need to resort to complicated tissue transfer techniques.

## References

- 1 Casson AG, Porter GA, Veugelers PJ. Evolution and critical appraisal of anastomotic technique following resection of esophageal adenocarcinoma. *Dis Esoph.* 2002; **15**: 296 – 302.
- 2 Saidi F, Shadmehr MB, Khoshnevis-Asl G, Hiebert CA. Endothoracic end oesophageal pull-through operation. *J Thorac Cardiovasc Surg* 1991; **102**: 43 – 50.
- 3 Pierie JPEN, de Graaf PW, van Vroonhoven TH, Obertop H. Healing of the cervical esophago-gastrostomy. *J Am Coll Surg.* 1999; **188**: 448 – 454.
- 4 Honkoop P, Siersema PD, Tilanus HW, Stassen LP, Hop WC, van Blankenstein M. Benign anastomotic strictures after transhiatal esophagectomy and cervical esophagogastrostomy: risk factors and management. *J Thorac Cardiovasc Surg.* 1996; **111**: 1141 – 1148.
- 5 Briel JW, Tamhankar AP, Hagen JA, DeMeester SR, Johansson J, Choustoulakis E, et al. Prevalence and risk factors for ischemia, leak, and stricture of esophageal anastomosis: gastric pull-up versus colon interposition. *J Am Coll Surg.* 2003; **198**: 536 – 542.
- 6 Heitmiller RF. Tracheal release maneuvers. *Chest Surg Clin North Am.* 1996; **6**: 675 – 682.
- 7 Liebermann-Meffert O. Anatomy, embryology, and histology. In: Pearson FG, ed. *Esophageal Surgery*. Chapter 2. 2nd ed. New York: Churchill Livingstone; 2002.