FIGURE 1. A 3.0 mm PTFE graft is used for selective aortic perfusion during the aortic arch reconstruction while performing a Norwood stage I procedure with RV-PA shunt. The shunt is clipped at the base of the innominate artery after the procedure and can be used for rapid deployment of ECLS in the early postoperative period.

appendage. The baby was supported for 8 days and was successfully weaned off ECLS, extubated, and transferred to a regional hospital for convalescence.

From 2002–2005, 32 Norwood stage I procedures with RV-PA shunts were performed at our institution. Early

postoperative and 2-year mortality were 6% (2/32) and 19% (6/32), respectively. Two patients required cardiopulmonary resuscitation postoperatively, and 1 (3%) required ECLS.

DISCUSSION

This perfusion strategy for the modified Norwood stage I procedure allows the surgeon to perform the aortic arch repair by using low-flow cerebral perfusion with a brief period of circulatory arrest. It minimizes trauma to the innominate artery and prevents inadvertent decannulation by keeping the cannula out of the surgical field.

Leaving a short remnant of PTFE graft beyond the clips at the end of the procedure offers an easy cannulation site for rescue ECLS. It provides safe and rapid access for arterial perfusion and minimizes bleeding associated with cannulation of the reconstructed aorta.

Successful resuscitation of a neonate from cardiac arrest after the Norwood stage I procedure with ECLS requires rapid cannulation that can be achieved by using the described technique.

References

1. Sano S, Ishino K, Kawada M, Arai S, Kasahara S, Asai T, et al. Right ventricle-pulmonary artery shunt in first-stage palliation of hypoplastic left heart syndrome. *J Thorac Cardiovasc Surg*. 2003;126:504-10.
2. Vricella LA, Samankiatwat P, de Leval MR, Tsang VT, Vouhe PR. Simplified antegrade cerebral perfusion and myocardial protection during stage I Norwood procedure. *Asian Cardiovasc Thorac Ann*. 2004;12:372-3.
3. Al-Sehly AA, Robinson JL, Lee BE, Taylor G, Ross DB, Robertson M, et al. Pediatric poststernotomy mediastinitis. *Ann Thorac Surg*. 2005;80:2314-20.

Treatment of anastomotic leaks after esophagectomy with endoscopic hemoclips

Celal Tekinbas, MD,^a M. Muharrem Erol, MD,^a Remzi Akdogan, MD,^b Serdar Turkyilmaz, MD,^c and Mehmet Aslan, MD,^c Trabzon, Turkey

Mortality and morbidity levels following esophageal resection are high.¹ Anastomotic leaks are a major cause of this morbidity and mortality.² Early and appropriate treat-

ment is essential. Various methods and techniques are employed for fistula closure, including aggressive surgery, esophageal T-tube drainage, esophageal stent, and conservative management. Yet there is still much controversy on the best form of treatment.¹⁻³ Esophageal clips are increasingly being used for the treatment of benign esophageal diseases such as perforations. These are easy to insert and remove, and good outcomes have been reported.⁴ To the best of our knowledge, there are no previous reports concerning the use of endoscopic clips in the closing of esophageal anastomotic fistulae. We describe a case of early postoperative

From the Departments of Medicine,^a Internal Medicine,^b and General Surgery,^c Karadeniz Technical University, Trabzon, Turkey.

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Address for reprints: Celal Tekinbas, MD, Karadeniz Teknik Üniversitesi, Tıp Fakültesi, Göğüs Cerrahisi AD, 61080 Trabzon, Turkey (E-mail: celaltekinbas3@hotmail.com). *J Thorac Cardiovasc Surg* 2009;137:766-7

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FIGURE 1. Endoscopic picture shows closure of anastomotic leak with hemoclips.

esophageal anastomotic leak treated using esophageal hemoclips.

CLINICAL SUMMARY

A 46-year-old man was transferred to our department due to dysphagia. Examination results confirmed the presence of a malignant tumor extending from the lower part of the esophagus to the cardia and fundus of the stomach. Endoscopy was performed, and biopsy results identified the tumor as adenocarcinoma. The Lewis technique (transthoracic esophagectomy), total gastric resection, and esophagojejunostomy were performed.

In the early postoperative period, there was drainage containing gastrointestinal secretions from the patient's chest drain. First, methylene blue was undertaken (12 hours postoperatively). Methylene blue was observed to exit the chest tube in a low flow. Endoscopy was performed and revealed a leak on the anterior face of the anastomosis, measuring approximately 1×9 mm. Closure of the leak was successfully achieved using 4 hemostatic clips (Model HX-600-090L, Olympus Optical Co Ltd, Tokyo, Japan) (Figure 1). Drainage from the chest drain subsequently ceased. On the following day, methylene blue swallow showed complete sealing of the anastomotic leak. No complications were observed after the procedure. On day 7, methylene blue was performed again and there was no anastomotic leak. The patient was discharged 15 days postsurgery and was well 45 days postoperatively.

DISCUSSION

Despite advances in the various treatment modalities, surgery continues to be the mainstay of treatment of patients with resectable esophageal cancer. Esophagectomy remains a challenging operation that can be associated with considerable postoperative morbidity and mortality.¹ Anastomotic leak is the most important complication after transthoracic esophagectomy. The majority of patients with intrathoracic leaks following esophagectomy or delayed diagnosis of esophageal perforation actually have advanced and severe medical conditions.²

There is no consensus on the most effective treatment of esophageal anastomotic leaks. Aggressive surgical treatment has been recommended by some authors, whereas others advocate a more conservative approach using perianastomotic drainage, total parenteral nutrition, nasogastric decompression, and broad-spectrum antibiotics. Mortality and morbidity are rising rapidly despite newer and better antibiotics and drainage.¹ If the anastomotic leaks arising after esophagectomy are minor, a more conservative approach is recommended, and surgery is recommended if the leaks are major.² The use of stent in esophagus anastomotic leaks has recently acquired greater acceptance.¹

Experimentation with endoscopic closure devices has increased therapeutic options in selected patients. A number of case reports and small case series describe the use of endoscopic clips for closing acute and chronic esophageal perforations.⁵ No report of the closure of esophageal anastomotic fistulae using endoscopic clips was encountered in the literature. Due to esophageal carcinoma, resection and esophagojejunal anastomosis were performed in our case. We determined an anastomotic leak 12 hours postoperatively, and this was closed endoscopically using hemoclips. The use of this technique meant that our patient was spared aggressive surgery, hospitalization time was reduced, and septic complications with the accompanying need for further surgery were prevented.

In conclusion, we believe that the use of endoscopic clips in the closure of esophageal anastomotic fistulae is technically very easy, safe, and useful.

References

1. Tomita M, Matsumazaki Y, Shimizu T, Hara M, Ayabe T, Onitsuka T. Retrograde tube drainage for esophageal anastomotic leaks and perforation. *Disease of Esophagus*. 2007;20:247-50.
2. Yano F, Mittal SK. Post-operative esophageal leak treated with removable silicone-covered polyester stent. *Disease of Esophagus*. 2007;20:535-7.
3. Hünnerbein M, Stroszczyński C, Moesta KT, Schlag PM. Treatment of thoracic anastomotic leaks after esophagectomy with self-expanding plastic stents. *Ann Surg*. 2004;240:801-7.
4. Fisher A, Schrag HJ, Goos M, von Dobschuetz E, Hopt UT. Nonoperative treatment of four esophageal perforations with hemostatic clips. *Disease of Esophagus*. 2007;20:444-8.
5. Qadeer MA, Dumot JA, Vargo JJ, Lopez AR, Rice TW. Endoscopic clips for closing esophageal perforations: case report and pooled analysis. *Gastrointest Endosc*. 2007;66:605-11.