Esophageal Cancer Surgery: Lessons from 1,200 Resections

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Introduction

Two decades ago, cancer of the esophagus in the East and in the West was a squamous cell cancer of the intrathoracic esophagus, situated predominantly in the middle third. Today, in the East, this remains largely unchanged. In the West, however, the disease has become a Barrett's adenocarcinoma of the distal esophagus, as a consequence of gastroesophageal reflux and dysplasia occurring in specialized intestinal metaplastic epithelium.[1,2] Indeed, this condition is epidemic in the West and has, like obesity, become a major health issue. Furthermore, while the epidemiology in the East has remained unchanged, in the West, Barrett's cancer primarily affects the professional middle-age Caucasian, unlike the older blue-collar worker in the past who habituates cigarettes and alcohol. As awareness increases in the West, the disease is diagnosed at an increasingly early stage and treatment instituted in a more timely manner. In the East, diagnosis still relies on the symptom of dysphagia which usually indicates advanced disease. Treatment is therefore in many instances palliative.

A combination of both the type of patients and the nature of the disease renders the option of treatment to be fundamentally different, which then has an impact on the risks and results of the chosen therapy. By and large, treatment in the East for squamous cell carcinoma still mandates a thoracotomy, while in the West, the procedure has increasingly become a transhiatal approach. While it is expected that the mortality and morbidity rates should be lower in the West, this has not been shown to be so and the mortality rate remains at around 10-12%.[3,4] In the East, no data comparable to the Veterans Affairs database is available but a survey of 13 hospitals in Hong Kong also revealed a hospital mortality rate of about 10%.[5] Thus esophagectomy is still one of the highest risk procedures whether in the East or West.

Causes of Hospital Mortality

Two decades ago, the mortality rate for esophageal cancer worldwide was around 30%.[6] Like other centers with an interest in dealing with this condition, we embarked on a systematic approach to reduce this high rate. The first step was to collect reliable prospective, almost real-time data on all aspects of the patient episodes in hospital, including both operative and non-operative treatment. From this, starting in 1982 we could identify precisely what were the incidences of each cause of death. At around that time, the hospital mortality rate was 20%.

Medical Causes

The major causes were categorized as medical, surgical and malignant cachexia. The most common cause (45%) was pulmonary, which was not surprising given the average age of the patients (65 years), a male preponderance of 5:1, their smoking habits and most of whom underwent a transthoracic resection (72%). Identifying relevant predictive factors for pulmonary complications was important to improve outcome.[7] Our strategy to reduce this single most important complication was to: (1) enlist a good anesthetist, (2) implement epidural analgesia and patient-controlled analgesia,[8] (3) use a smaller thoracotomy, (4) insert a small (18 Fr) vacuum suction chest drain,[9] (5) practise early extubation in the operating room, (6) perform regular postoperative bronchoscopic sputum clearance,[10] (7) ambulate the patient from the first postoperative day, (8) maintain fluid restriction and albumin level, (9) perform a tracheostomy early to aid sputum suction when the coughing effort was inadequate, and (10) institute vigorous chest physiotherapy. Although even with all these and other supportive measures pulmonary complications were not eliminated, the incidence was lowered and, more importantly, the seriousness had been mitigated through early intervention. This is a theme that is relevant in the management of all other complications of esophagectomy. Cardiac complications (12%) were mostly atrial arrhythmia, and the availability of effective drugs made for rapid restoration of sinus rhythm.[11]

Surgical Causes

As for surgical complications, technical aspects are most important in preventing this occurrence [12]. Anastomotic leak was and remains a complication that strikes

fear in the heart of all esophageal surgeons, and has the same effect on us as anyone else. By examining the problem objectively and instituting solutions supported by randomized controlled trials, we have reduced leak rate that was in excess of 25% to now around 2% that are clinically in nature, and another 1% radiologically.[13,14] Changes in technique were made from a hand-sewn two layers of interrupted suture (before 1982), to the circular stapler, and in the last 8 years to a single-layer continuous suture using a 4/0 absorbable suture.[15,16] What is equally important is our willingness, indeed our obsession, to re-explore a patient, even through a re-thoracotomy, when the patient is not progressing well and no other cause is obvious, or when there is the slightest suspicion of a leak. As all surgeons are aware, how well the anastomosis was constructed technically at operation usually forewarn the risk of an anastomotic leak.

Other surgical complications are not common if care to detail is exercised at the operation. Postoperative bleeding, gangrene of conduit, chylothorax, bowel herniation into the chest, gastric outlet obstruction,[17,18] and others should be recognized early and treated.

Progressive Malignancy

Death from progressing malignancy after a prolonged stay in hospital following a successful operation is a situation specific to the social environment in Hong Kong and to our hospital. Previously, because alternative treatments were ineffective and associated with considerable risks, we were prepared to resect (or to bypass using the Kirschner operation)[19,20] even in the face of very advanced disease and operative risks. Although the majority of patients recovered from these procedures and were ambulant and eating normally, they were not discharged from the convalescent hospital to which they were transferred because of social problems such as poor family support, living in the upper floors or roofs of buildings without elevators and sharing cooking and toilet facilities, and emotionally, physically and financially unable to cope by themselves. We have therefore always used hospital mortality rate as the end point of success of an operation and not the 30-day mortality rate. To include deaths as a direct result of a technical complication of the operative procedure, as had been used in the past by those who wished to present good results, does not reflect the true burden carried by patients after an esophagectomy. As with the holistic view of a surgeon's mission, we hold that success is only achieved when a patient can be discharged to his previous environment to enjoy what has been possible prior to the illness that sought our help, and, in the case of esophageal cancer, this is the ability to eat. We recognize social circumstances as a cause of hospital mortality may not be a universal problem, but at least it is a consistently measurable end point.

Over the years, using the approach outlined, the hospital mortality rate has decreased from about 20% to 1%. From 1996 till 1999, we had no deaths for 169 consecutive resections. Since then, there were three – the first was an elderly female patient who recovered fully from the operation and died from a myocardial infarction as she was transferred to a medical ward on day 38. The second was a gentleman who had undergone prior resection for his head and neck cancer. A successful esophagectomy was performed but he died from fulminant recurrence of the head and neck cancer on day 56. The third patient died from SARS-like illness on day 17 postoperatively.

Changes in Management

During the period of improvement, there have also been advances in technology and drugs which are more effective and safer than previously. This allowed us to better select patients for appropriate treatment. Examples of such advances include the self-expanding metallic stents,[21] improved radiation techniques, and effective chemotherapy and combinations of them.

Thus there has been a reduction of the proportion of patients who underwent resection from about 70% to 55%, and, in particular, introduction of chemoradiation has made this possible.[22] On the other hand, the referral pattern to our hospital has now included more patients with more advanced disease. Coincidentally, it was noteworthy that the mortality rate was halved at a time when our resection rate was at its peak in the early 1990s. Therefore, the virtual elimination of postoperative death cannot be attributed to patient selection alone, but is more likely due to the practice that had been adopted cited earlier.

Benefits of Reducing Mortality

What are the benefits of improving the operative results? First and foremost is that survival is prolonged. In our cohort of patients, the reduction in mortality from 20% to 1% has increased median survival from 8.6 months to 17.9 months and 5-year survival rate from 18.5% to 24.5%. However, some of the gain may be in part due to the effectiveness of chemotherapy and radiotherapy because even when hospital deaths were excluded from calculation of survival, there remains a significant improvement in survival in recent years.[22]

Second, as deaths usually follow complications, and these are managed aggressively, there are the savings from reducing the number of these ill patients who are usually in the ICU. Patients with anastomotic leak, for example, would require repeated episodes of imaging, a variety of radiological and operative procedures, ventilatory support, parenteral nutrition, third or fourth generation antibiotics, and an immense amount of attention by surgeons, nurses and allied health personnel.

Third, the surgical community benefits because of the aura of good if not excellent results which encourages referral for operative treatment. Most would agree that a successful operation still offers the best palliation in terms of quality of swallowing and the widest variety of food that can be consumed. Cure is now also a distinct possibility. The need for further treatment in hospital to relieve dysphagia from persistence or recurrence of the primary tumor, such as from radiation stricture, is virtually eliminated. An uneventful surgical resection still offers the best chance of long-term survival, and is the most cost-effective.

Fourth, the argument that non-operative treatment offers less risk of death and complications cannot be sustained if resection mortality and morbidity rates can be achieved at the same if not lower levels than, say, chemoradiation. This is now a verifiable claim.

Fifth, the morale and confidence of patients and relatives are lifted knowing they are being managed by a team with an excellent track record. This in turn puts the responsibility on the surgical team to perform even better to ensure that trust has not been misplaced.

Sixth and finally, the impact of superior results are not lost to the administration when formulating policy or distributing resources. It is hard to ignore or argue against success.

Conclusion

In conclusion, improvements are possible and achievable. However, progress is slow and so requires persistence. Improvements are also incremental and therefore there is no single remedy that changes outcome overnight. Advancement comes from a team and not just the operating surgeon, as the assistants, residents and house staffs all contribute to the minute-to-minute and day-to-day care these patients need. Progress also occurs through input from other disciplines, particularly anesthesiologists (epidural analgesia), intensive care specialists and nurses whose diligence helps detect complications earlier. Improvements are not more costly, and in fact the reduction of complications derives major cost savings. Improvements are also inevitable because in the current environment of surgical practice those who do not or cannot produce acceptable if not superior results will not be tolerated by their peers, the administration, or the community.

To achieve improvement take vigilance, commitment and long hours. It will also require honest auditing, nourished by studies such as randomized controlled trials to advance knowledge. Finally, to reach the level of excellence aspired requires the will and determination to succeed.

References

1. Devesa SS, Blot WJ, Fraumeni-JF J. Changing patterns in the incidence of esophageal and gastric carcinoma in the United States. Cancer 1998; 83(10):2049-2053.
2. Lagergren J, Bergstrom R, Lindgren A, Nyren O. Symptomatic gastroesophageal reflux as a risk factor for esophageal adenocarcinoma. N Engl J Med 1999; 340(11):825-831.
3. Birkmeyer JD, Siewers AE, Finlayson EV, Stukel TA, Lucas FL, Batista I et al. Hospital volume and surgical mortality in the United States. N Engl J Med 2002; 346(15):1128-1137.
4. Bailey SH, Bull DA, Harpole DH, Rentz JJ, Neumayer LA, Pappas TN et al. Outcomes after esophagectomy: a ten-year prospective cohort. Ann Thorac Surg 2003; 75(1):217-222.
5. Hospital Authority Hong Kong. Clinical audit on esophagectomy and hepatectomy in Hong Kong. 2002.
6. Earlam R, Cunha-Melo JR. Oesophageal squamous cell carcinoma: I A critical review of surgery. Br J Surg 1980; 67:381-390.
7. Law S, Wong K, Kwok K, Chu K, Wong J. Predictive factors for postoperative pulmonary complications and mortality after esophagectomy for cancer. Ann Surg. In press.
8. Tsui SL, Chan CS, Chan ASH, Wong SJ, Lam CS, Jones RDM. Postoperative analgesia for oesophageal surgery: A comparison of three analgesic regimens. Anaesth Intens Care 1991; 19:329-337.
9. Lau H, Law S, Wong J. Prospective evaluation of vacuum pleural drainage after thoracotomy in patients with esophageal carcinoma. Arch Surg 1997; 132(7):749-752.
10. Whooley BP, Law S, Murthy SC, Alexandrou A, Wong J. Analysis of reduced death and complication rates after esophageal resection. Ann Surg 2001; 233(3):338-344.
11. Murthy SC, Law S, Whooley BP, Alexandrou A, Chu KM, Wong J. Atrial fibrillation after esophagectomy is a marker for postoperative morbidity and mortality. J Thorac Cardiovasc Surg 2003; 126(4):1162-1167.
12. Law SY, Fok M, Wong J. Risk analysis in resection of squamous cell carcinoma of the esophagus. World J Surg 1994; 18(3):339-346.
13. Lorentz T, Fok M, Wong J. Anastomotic leakage after resection and bypass for esophageal cancer: lessons learned from the past. World J Surg 1989; 13(4):472-477.
14. Whooley BP, Law S, Alexandrou A, Murthy SC, Wong J. Critical appraisal of the significance of intrathoracic anastomotic leakage after esophagectomy for cancer. Am J Surg 2001; 181(3):198-203.
15. Law S, Fok M, Chu KM, Wong J. Comparison of hand-sewn and stapled esophagogastric anastomosis after esophageal resection for cancer: a prospective randomized controlled trial. Ann Surg 1997; 226(2):169-173.
16. Law S, Wong J. Esophagogastrectomy for carcinoma of the esophagus and cardia, and the esophageal anastomosis. In: Baker RJ, Fischer JE, editors. Mastery of Surgery. PA.: Lippincott Williams & Wilkins, 2001: 813-827.
17. Fok M, Cheng SW, Wong J. Pyloroplasty versus no drainage in gastric replacement of the esophagus. Am J Surg 1991; 162(5):447-452.
18. Law S, Cheung MC, Fok M, Chu KM, Wong J. Pyloroplasty and pyloromyotomy in gastric replacement of the esophagus after esophagectomy: a randomized controlled trial. J Am Coll Surg 1997; 184(6):630-636.
19. Ong GB. The Kirschner operation--a forgotten procedure. Br J Surg 1973; 60(3):221-227.
20. Whooley BP, Law S, Murthy SC, Alexandrou A, Chu KM, Wong J. The Kirschner operation in unresectable esophageal cancer: current application. Arch Surg 2002; 137(11):1228-1232.
21. Law S, Tung PH, Chu KM, Wong J. Self-expanding metallic stents for palliation of recurrent malignant esophageal obstruction after subtotal esophagectomy for cancer. Gastrointest Endosc 1999; 50(3):427-436.
22. Law S, Kwong DL, Kwok KF, Wong KH, Chu KM, Sham JS et al. Improvement in treatment results and long-term survival of patients with esophageal cancer: impact of chemoradiation and change in treatment strategy. Ann Surg 2003; 238(3):339-348.

Editor's Note:

This paper was presented at the 26th Congress of the Pan-Pacific Surgical Association, February 14-16, 2004, in Honolulu. The Congress, chaired by Tom Kosasa MD was outstanding. Look forward to the next Pan-Pacific Congress – world class researchers and practicers of the surgical specialties will again return to Hawaii in January 14-16, 2006.