The Kirschner Operation in Unresectable Esophageal Cancer

Current Application

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Hypothesis: With the introduction of safe, effective non-operative alternatives, bypass surgery for unresectable esophageal cancer is infrequently performed, but it has a limited role in palliation of esophageal cancer that needs to be defined.

Design: Retrospective cohort study.

Setting: Department of Surgery at Queen Mary Hospital in Hong Kong.


Intervention: Bypass procedures were performed using a gastric or colonic conduit to the neck.

Main Outcome Measures: Morbidity and mortality and quality of palliation.

Results: Thirty-eight patients underwent retrosternal bypass to the neck using a gastric (n=27) or colonic (n=11) conduit. Ten patients (26%) underwent unplanned bypass at the time of exploration for resection because of unexpected findings of T4 disease (n=2) or technical difficulties in addition to advanced disease (n=8). Between 1991 and 1994, 1 of 26 bypasses was unplanned and the hospital mortality was 42% (11/26), while between 1995 and 1998, 9 of 12 bypasses were unplanned and the hospital mortality was 8% (1/12). There were 12 hospital deaths in the planned bypass group (n=28) and none in the unplanned bypass (n=10) group (43% vs 0%, P=.01). The median survival in patients who underwent unplanned bypass was 6.9 months, compared with 1.9 months in patients who underwent planned bypass (P=.004). All patients were discharged from the hospital on at least a semisolid diet.

Conclusions: The Kirschner operation is largely obsolete as a planned procedure because of high morbidity and mortality. Bypass surgery, however, is a reasonable option as an unplanned procedure when resection is precluded at the time of exploration because of unexpected adverse operative findings.

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Palliation of symptoms is the primary aim of treatment in patients with unresectable esophageal cancer and requires individualization of treatment. Choosing the best method of palliation for a particular patient requires knowledge of the efficacy and complications of available treatment modalities, as well as consideration of the individual patient's performance status.

Kirschner first described esophageal bypass using a gastric conduit in 1920 for a patient with a benign esophageal stricture. In the 1970s and 1980s, the retrosternal Kirschner bypass was popularized in selected centers as a means of palliating unresectable esophageal cancer. The results of palliation with bypass are reported to be as good as those of resection and, in general, are superior and more durable than those of nonoperative treatments. Patients with unresectable disease, however, frequently present with poor performance status and are at high risk for surgical intervention. Consequently, reported morbidity and mortality associated with esophageal bypass has been as high as 60% and 40%, respectively; therefore, the Kirschner operation has fallen out of favor.

During the past decade, an increasing number of nonoperative modalities have become available for the palliation of patients with advanced-stage obstructive disease. The indications for bypass surgery have diminished in recent years, particularly with the advent of self-expanding metallic stents and effective chemoradiation therapy. The objectives of the present study...
were to analyze our recent results with esophageal bypass and to determine the role for this operation in an era of changing indications.

In the Division of Esophageal Surgery, Department of Surgery, University of Hong Kong Medical Centre, Queen Mary Hospital, 768 patients with esophageal cancer were managed between January 1, 1991, and December 31, 1998. Fifty-four patients (7%) were at the pre-terminal stage and received supportive care only; 178 patients (23%) were palliated by non-operative treatment modalities. Surgical resection was carried out in 487 patients (63%), while 11 (1%) underwent surgical exploration alone, without resection or bypass procedures. In 6 of these patients, carcinomatosis was found at the time of laparotomy, and a further procedure was deemed unjustified. In the other 5 patients, exploration of the cervical esophagus showed that the tumor had extended to the cervical region and no suitable length of esophagus was available for anastomosis (4 of these patients also had airway infiltration by tumor). Another 38 patients (5%) underwent esophageal bypass and were the subject of this study. Patient data and follow-up records were analyzed from a prospective esophageal cancer database. Hospital records were reviewed when additional information was required.

Patients who presented with esophageal cancer underwent the following investigations for staging: endoscopy and bronchoscopy, barium swallow study, computed tomographic scan of the thorax and abdomen, and, from 1995 onward, endoscopic ultrasonography. Since 1998, all patients with gastroesophageal junction tumors have undergone further staging by laparoscopy and laparoscopic ultrasonography. The treatment philosophy at the University of Hong Kong Medical Centre is biased toward resection of esophageal cancer for cure and palliation, because it is believed that successful surgical resection offers the best quality of palliation, if not a cure. This is underscored by our high resection rate (63% [487/768]). The transthoracic approach with 2-field lymphadenectomy is preferred over the transhiatal approach, with the latter generally reserved for patients with poor cardiopulmonary reserve. The transhiatal approach is not used in patients with advanced disease and for tumors located in the middle third of the esophagus because of the increased risks involved. Patients with unresectable disease who underwent a bypass operation fell into 2 groups. The first group (planned bypass) consisted of patients with unresectable tumor diagnosed on preoperative investigations. This included patients with tracheobronchial tree involvement diagnosed on bronchoscopy or in whom there was clear evidence of T4 disease, such as aortic involvement, on endoscopic ultrasonography. Some patients who underwent a bypass operation had a combination of bulky, extensive intra-thoracic disease, and their general physical status precluded a thoracotomy. The second group (unplanned bypass) included surgical access for tumor resection. For some of these patients, other adverse intraoperative events occurred that led to a change of operative strategy to that of a bypass. The technique of bypass has been described. All bypasses were performed via the retrosternal route, and the stomach was the preferred conduit for reconstruction. Our preference has been to drain the distal esophagus to a jejunal loop, but in difficult cases, we have left the esophagus excluded. Previous experience with bypass surgery at the University of Hong Kong Medical Centre has taught us that, while most patients tolerate an ex-

**RESULTS**

Thirty-eight patients underwent bypass (mean age, 66 years; 33 male [87%]). All patients had dysphagia at presentation; 16 (42%) were tolerating a soft diet, 17 (45%) could only tolerate liquids, and 5 (13%) had complete obstruction. Three patients also presented with hematemesis, and 1 patient presented with hemoptysis.

Histologic findings were squamous carcinoma and adenocarcinoma in 37 patients and 1 patient, respectively. Tumors were located at various sites of the esophagus: the upper third in 3 patients (8%), middle third in 30 patients (79%), and lower third in 5 patients (13%). Eleven patients (29%) had histologic evidence of tracheobronchial invasion, and 1 patient had clinical and radiological evidence of a tracheoesophageal fistula. The extent of disease was stage III in 22 patients (58%), stage IVa in 9 patients (24%), and stage IVb in 7 patients (18%).

The demographics of the 38 patients, divided into planned and unplanned groups, are given in Table 1. There were 28 patients (74%) who had planned bypass, while 10 (26%) had unplanned bypass. Two of these patients who underwent unplanned bypass were found to have unresectable T4 disease at exploration. In the other 8 patients, the decision for bypass was based on the operative findings of advanced disease and 1 or more of the following technical difficulties: dense pleural adhesions (n=4), persistent hypoxemia on single-lung ventilation (n=3), and evidence of portal hypertension (n=1). In 6 of these patients, the planned procedure was a 3-phase esophagectomy. The decision for bypass was made at the time of thoracotomy in 4 patients and thoracoscopy in 2. In 4 other patients, the planned operation was a Lewis-
Ten of the 11 patients who developed respiratory failure, respiratory complications occurred in 14 patients (37%). went planned vs unplanned bypass (not statistically different between patients who underwent periods (1/26 vs 9/12, .001) (Table 1).

The incidence of postoperative complications was not statistically different between patients who underwent planned vs unplanned bypass (Table 2). Major respiratory complications occurred in 14 patients (37%). Ten of the 11 patients who developed respiratory failure, however, were in the planned bypass group. There were 2 incidences of anastomotic leakage in the planned bypass group, which resulted in 1 patient requiring operative drainage, while the other patient required percutaneous drainage of a retrosternal and subphrenic abscess. The 1 patient with an anastomotic leak in the unplanned bypass group was treated conservatively. There were no complications related to an excluded esophagus.

The 30-day mortality was 18% (7/38), and the overall in-hospital mortality was 32% (12/38). All the hospital deaths were in the planned bypass group (43% [12/28]) (P=.01). The causes of death included major pulmonary complications (7 patients), anastomotic leak (1 patient), and tumor progression (4 patients). Eleven of the 12 deaths occurred between 1991 and 1994 (42% [11/26]), while only 1 patient died between 1995 and 1998 (8% [1/12]).

Twenty-six patients (68%) were discharged from the hospital. At the time of discharge, 14 patients were able to tolerate a solid diet and 12 were able to tolerate a semisolid diet. Oral intake was maintained in these patients for a median of 18 weeks (range, 3-96 weeks). Six of the 12 patients who were not discharged from the hospital were receiving oral intake before death: 1 was on a solid diet, 2 were on a semisolid diet, and 3 were on a liquid diet.

The median survival of all patients who underwent bypass was 3.6 months (range, 0.1-22.9 months). The median survival for patients who underwent unplanned bypass was 6.9 months, compared with 1.9 months for the planned bypass group (P =.004) (Figure 2). When hospital deaths were excluded in the planned group, however, median survival was 5.1 months, which was not significantly different from that of the unplanned group (P=.06).

Table 1. Comparison Between Patients Who Underwent Planned vs Unplanned Bypass: Preoperative and Operative Factors

<table>
<thead>
<tr>
<th>Preoperative or Operative Factor</th>
<th>Planned (n = 28)</th>
<th>Unplanned (n = 10)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y</td>
<td>65 ± 2</td>
<td>67 ± 3</td>
<td>.65</td>
</tr>
<tr>
<td>Smoking history</td>
<td>20</td>
<td>6</td>
<td>.69</td>
</tr>
<tr>
<td>Pulmonary disease</td>
<td>8</td>
<td>1</td>
<td>.40</td>
</tr>
<tr>
<td>Abnormal electrocardiogram</td>
<td>2</td>
<td>0</td>
<td>&gt;.99</td>
</tr>
<tr>
<td>Albumin, g/dL†</td>
<td>4.1 ± 0.2</td>
<td>3.9 ± 0.06</td>
<td>.45</td>
</tr>
<tr>
<td>Percentage forced expiratory volume in 1 s</td>
<td>89 ± 4</td>
<td>92 ± 7</td>
<td>.76</td>
</tr>
<tr>
<td>Tracheobronchial invasion</td>
<td>11</td>
<td>0</td>
<td>.03</td>
</tr>
<tr>
<td>Stage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>15</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>IVa</td>
<td>6</td>
<td>3</td>
<td>.23</td>
</tr>
<tr>
<td>Colonic conduit</td>
<td>7</td>
<td>0</td>
<td>.23</td>
</tr>
<tr>
<td>Blood loss, mL</td>
<td>471 ± 39</td>
<td>470 ± 127</td>
<td>.99</td>
</tr>
<tr>
<td>Operative time, min</td>
<td>204 ± 9</td>
<td>258 ± 14</td>
<td>.003</td>
</tr>
<tr>
<td>Year of operation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1991-1994</td>
<td>25</td>
<td>1</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>1995-1998</td>
<td>3</td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>

*Values are given as number of patients and mean ± SEM.
†To convert albumin to grams per liter, multiply by 10.
The role of bypass surgery in the palliation of patients with unresectable esophageal cancer has been difficult to define. However, reported mortality after bypass surgery has been generally high, ranging from 10% to 40%, and highlights the difficulty of operating on high-risk patients with advanced disease. Meunier et al8 studied 32 patients who underwent bypass, of whom 20 had a tracheobronchial fistula, and reported a hospital mortality of 34%. Segalin et al9 described a series of 49 patients, of whom 17 had stage IV disease and 25 had tracheobronchial invasion. Their reported postoperative morbidity and hospital mortality were 57% and 20.4%, respectively. The median survival was 6.2 months.

In the present study, the overall morbidity and mortality was high—32% (12/38) of patients died in the hospital. Deaths, however, only occurred in the planned bypass group, and 11 of the 12 patients who succumbed were operated on in the earlier half of the study (1991-1994). Improvements in surgical and perioperative care probably contributed to the reduction in mortality in the second half of the study (1995-1998). However, the better result seen during this period was more likely due to improved patient selection. Unplanned bypass accounted for 75% (9/12) of patients in the latter half of the study, and hospital mortality was reduced from 42% (11/26) to 8% (1/12). In this subgroup, patients were selected on the basis that they were considered suitable for potential resection; the change of strategy to one of bypass did not appear to adversely affect outcome. The high mortality in the planned bypass group likely reflects more advanced-stage disease and poorer performance status of these patients. Correlating disease stage with mortality, one study10 divided 124 patients who underwent bypass into 3 groups according to the extent of disease and showed that hospital mortality in the group with localized disease was 0%. Hospital mortality was 7.3% and 18% in the groups with more advanced disease. One study showed that hospital mortality in patients with and without tracheoesophageal fistula was 45% and 16.6%, respectively. A 30-day mortality of 25% was shown in another study11 of 28 patients with malignant tracheo-

esophageal fistula. In the present series, tracheobronchial invasion or stage IVb disease was evident in 55% (21/38) of patients. Tracheobronchial invasion was associated with a 55% (6/11) mortality. The high hospital mortality in the planned bypass group mitigated any benefit derived in terms of palliation, and the preferred treatment of these patients should be by nonoperative means, such as placement of metallic stents. These results emphasize the importance of patient selection.

At the University of Hong Kong Medical Centre, the preference is to treat esophageal cancer by surgical resection, whether for cure or palliation; the hospital mortality is less than 5% with this approach.12 The selection criterion for bypass in the present series was therefore strictly surgical unresectability. Patients in the unplanned bypass group had advanced disease, which, together with technical difficulties, made surgical resection by a transthoracic or transhiatal approach a prohibitive risk. Our overall series of patients with esophageal cancer includes a predominance of middle-third tumors, in contrast to Western series that include a predominance of distal-third tumors.13 Despite advances in preoperative staging techniques, determination of resectability for middle-third tumors remains a challenging decision. The esophageal surgeon is occasionally confronted with the dilemma of intraoperative unresectability and should be familiar with the technique of esophageal bypass as a therapeutic option.

At our institution, a change in treatment preference is evident—the number of bypass procedures has decreased over the years; planned bypasses have been almost abandoned. Other safer and effective nonoperative options have been introduced and refined for the palliation of patients with advanced-stage disease, such as insertion of self-expanding metallic esophageal stents or chemoradiation therapy.
There is no doubt that good response to chemoradia-
tion can result in satisfactory relief of dysphagia. In
one study\(^1\) of 33 patients with stage III and IV disease
who received treatment, relief of dysphagia was achieved
in 77% of patients and was maintained in 60% until their
death; a median survival of 9 months and 7 months, re-
spectively, was reported. Endoluminal brachytherapy was
explored by others\(^1\), with an aim to minimize adverse
effects while maximizing local control. The disadvan-
tages of radiotherapy or chemoradiation therapy are the
length of time required for treatment, the delay in relief
of symptoms, postradiation strictures, and the potential
for significant toxicity as a result of chemotherapy.\(^10\),\(^17\)

The development of self-expanding metallic stents
during the past decade has significantly affected the choice
of palliative options for these patients.\(^16\),\(^19\) These stents have
the advantages of high success rates, immediate pallia-
tion, and low morbidity. They are also effective in the
management of tracheoesophageal fistulas.\(^20\) Compared with
nonoperative treatments, long-term cost-effectiveness
may be better because of the reduced need for reinter-
vention and a shorter hospital stay.\(^2\) Even so, in a re-
cent study\(^22\) of long-term results in 100 patients with
metallic stents, reintervention was required in almost one
third of patients.

When a tumor is found to be unresectable at the time
of exploration, 2 treatment strategies exist: (1) proceed
with a bypass or (2) abandon other procedures and in-
sert an esophageal stent for palliation. Radiotherapy and
chemotherapy can be given postoperatively in either case,
although their value is uncertain. Both treatment op-
tions have advantages and disadvantages. A successful
bypass procedure can ensure adequate relief from dys-
phagia, which can usually last until the patient’s de-
mise; the disadvantages are the associated potential mor-
bidity and mortality. For stenting, abandoning further
surgical procedures is safe, but the quality of dysphagia
relief may be inferior to that of bypass surgery. Reinter-
vention may be required.

What the present study could not answer is whether
quality of life of patients who underwent bypass proce-
dures is better than that of patients who had nonope-
rative treatment. The quality of palliation was estimated
to be good or excellent in 71% of patients with bypass
in one study\(^4\); another\(^10\) demonstrated that 82% of
patients had complete and lasting relief from dysphagia.
In our patients who were discharged, 54% (14/26) were
 tolerate a solid diet, which was maintained for a
median of 18 weeks, and all patients who were dis-
charged were tolerating at least a semisolid diet. These
data, although satisfactory, cannot be directly compared
with those of other patients who did not have bypass
for palliation, because patient selection was different
and eating ability was only one aspect of the overall
quality-of-life assessment.

In summary, in this series of bypass procedures from
an experienced esophageal surgery center, we have shown
that planned bypass is associated with unacceptable mor-
bidity and mortality. We have abandoned this approach
in favor of newer and safer nonsurgical modalities. Our data
suggest, however, that bypass surgery performed as an
unplanned procedure may be a useful option in patients in
whom resection is precluded at the time of exploration be-
cause of unexpected technical difficulties or advanced dis-
ease. There was no operative mortality in the unplanned
bypass group. As improvements in staging modalities lead
to better patient selection, however, it is anticipated that
this indication will continue to decline. Validated assess-
ments of quality of life and cost-benefit analyses should be
included in future studies, especially when different mo-
dalities of palliative treatments are compared.

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REFERENCES

1920;114:606-610.

221-227.

3. Orringer MB, Sloan H. Subcutaneous gastric bypass of the excluded thoracic esoph-
agus for palliation of esophageal carcinoma. J Thorac Cardiovasc Surg. 1975;70:
836-851.

4. Segalin A, Little AG, Ruel A, et al. Surgical and endoscopic palliation of esoph-

5. Wong J, Lam KH, Wei WI, Ong GB. Results of the Kirschner operation. World J

6. Meunier B, Spiliopoulos Y, Stastik C, Lakehal M, Maalced Y, Lanouin B. Retrostero-
nal bypass operation for unresectable squamous cell cancer of the esophagus.

7. Orringer MB. Subcutaneous gastric bypass of the excluded esophagus: results of an

8. Reed CE. Comparison of different treatments for unresectable esophageal can-


10. Mannell A, Becker PJ, Nissinen M. Bypass surgery for unresectable esophageal


13. Orringer MB, Marshall B, Iannettoni MD. Transthoracic esophagectomy: clinical ex-

14. Coia LR, Engstrom PF, Paul AR, Stafford FM, Hanks GE. Long-term results of in-
fusional S-FU, mitomycin-C and radiation as primary management of esoph-

15. Carrazone A, Bonavina L, Segalin A, Ceriani C, Peracchia A. Endoscopic pallia-
tion of oesophageal cancer: results of a prospective comparison of Nd:YAG la-

16. O’Rourke IG, Tiver K, Bull C, Gebski V, Langlands AD. Swallowing performance af-

17. Sur RK, Donde B, Levin VC, Mannell A. Fractionated high dose rate intraluminal
brachytherapy in palliation of advanced esophageal cancer. Int J Radiat Oncol

18. O’Sullivan GJ, Grundy A. Palliation of malignant dysphagia with expanding me-

19. Law S, Tung PH, Chu KM, Wong J. Self-expanding metallic stents for palliation of
recurrent malignant esophageal obstruction after subtotal esophagectomy for

20. Belleguic C, Lena H, Briens E, et al. Tracheobronchial stenting in patients with esoph-

effectiveness of metal esophageal stenting in malignant disease compared with

with esophageal stents: long-term results in 100 patients. Radiology. 1998;207:
513-518.