Twelfth Rib Resection: a Direct Posterior Surgical Approach for Subphrenic Abscesses

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ABSTRACT
Objective: To assess the results of twelfth rib resection as a direct posterior surgical approach to subphrenic abscesses in case of failure of percutaneous drainage, abandonment of percutaneous drainage in view of a too high risk of perforation of adjacent organs, or contamination of the pleural space, or an inaccessible abdomen.

Design: Retrospective study.

Setting: University hospital, The Netherlands.

Patients: 17 patients who required rib resection for subphrenic abscesses that developed after infected necrotising pancreatitis, splenectomy, or anastomotic disruption.

Interventions: 18 rib resections.

Main outcome measures: Outcome and morbidity.

Results: Twelfth rib resection was successfully in 13 of 17 patients. Four patients died from multiple organ failure despite subsequent (re) laparotomies for additional surgical drainage.

Conclusion: Twelfth rib resection can be useful for the treatment of subphrenic abscesses in selected patients.

Key words: subphrenic abscess, twelfth rib resection, morbidity, outcome.

INTRODUCTION
The traditional treatment of subphrenic abscesses is operative drainage as originally described by von Volkmann in 1879. At that time, without operative drainage, mortality was as high as 90%–100% (14). In the early twentieth century, Barnard showed that surgical drainage of subphrenic abscesses reduced mortality to 38% (2). In 1938, Ochsner and DeBakey reviewed 3608 collected and personal cases with a mortality of 33% after surgical drainage (15). For more than 40 years, the mortality continued to be as high as 30%–50% (5, 7, 17, 19, 22).

Since the 1980s, percutaneous drainage has replaced operation as the treatment of choice, and, although reported success rates vary widely, mortality has declined significantly to 5%–20%. Failure of percutaneous drainage has been reported in 5%–35%; abscesses that follow pancreatitis and traumatic injuries of the pancreas are particularly difficult to treat percutaneously (1, 3, 4, 6, 8–10, 12, 13, 17, 18, 20, 21). Whenever percutaneous drainage of subphrenic abscesses has failed or has to be abandoned because the risk of perforation of adjacent organs or contamination of the pleural space is too high, it is necessary to operate. Because the transperitoneal approach may be too risky in some patients after multiple laparotomies and with a hardly accessible abdomen, other surgical approaches have been developed. In 1923, Nather and Ochsner (14) had already described a posterior, extraperitoneal approach to subphrenic abscesses by resection of the twelfth rib and they developed this further 10 years later (16).

In this study, we report our results of this uncommon method of treating subphrenic abscesses.

PATIENTS AND METHODS
Between 1986 and 1997, 17 patients (13 men and 4 women, median age 58, range 33–76 years) underwent resection of the twelfth rib for drainage of subphrenic abscesses. Eight patients had infected necrotising pancreatitis. Five patients had developed subphrenic abscesses after splenectomy, of whom three had been operated on for haemolytic disorders and two for aneurysms of the splenic artery. Two patients developed abscesses after anastomotic disruption following colorectal resections for carcinoma, one after resection of the oesophagus for carcinoma, and the fourth patient after a Nissen fundoplication.

Rib resection was performed a median of 25 days after the primary operative or radiological intervention (range 0–90). Two patients, who were critically ill with dorsal pancreatic abscesses, had twelfth rib resection as their primary treatment.
Four of the patients had already had unsuccessful percutaneous drainage. The median number of interventions (percutaneous drainage procedures or (re)laparotomies) before resection of the twelfth rib was one (range 0–8).

Ochsner’s posterior extraserous approach
The patient is placed in the lateral position with lateral flexion of the body to widen the intercostal spaces for maximal exposure and the skin incision is made over or just below the twelfth rib (Fig. 1). The rib is then exposed by dividing the latissimus dorsi and serratus posterior inferior muscles, and the rib removed subperiosteally for at least 10 cm. Then, the periostal bed of the twelfth rib is incised, not in line with the twelfth rib, but transversely at the level of the spinous process of the first lumbar vertebra, so as not to enter the pleural space. Sometimes, the pleura descends to the level of the twelfth rib, but never to the level of the first lumbar vertebra. Fibres of the serratus posterior inferior and quadratus lumorum muscles, both attached to the lower margin of the twelfth rib, and fibres of the intercostal muscles of the eleventh intercostal space are also incised. Care is taken not to damage the twelfth intercostal nerve so as to avoid annoying intercostal neuralgia. Then, sometimes, some of the lower fibres of the diaphragm must be divided. Digital blunt dissection of the periphrenic fat is done upwards; care should be taken not to transsect the renal fascia (Fig. 2). By blunt dissection upwards, the subphrenic space can be entered and abscesses can be drained. Large tubes can be left in place to maintain adequate drainage and, when necessary, to rinse abscess cavities with normal saline (Fig. 3). After removing of the tubes, patients have gauze dressings applied. Wound healing is by secondary intention and wound contraction.

RESULTS
We did a total of 18 rib resections in 17 patients. In 16 patients, the left twelfth rib was resected, but one patient required bilateral resection for bilateral pancreatic abscesses despite eight laparotomies for treatment of infected necrotising pancreatitis.

Two major complications were encountered. One patient had an accidental superficial splenic injury after primary rib resection for pancreatic abscesses; at laparotomy gauze packing was applied successfully. Simultaneously, small pancreatic abscesses were drained transperitoneally. She died two weeks postoperatively from multiple organ failure (MOF). A second patient developed an empyema of the left pleural space, which was successfully treated by tube thoracostomy. One patient developed intercostal neuralgia and also developed an incisional hernia. No patients died of complications directly related to the procedure.

After rib resection, four patients underwent reexploration by the same approach in order to improve drainage. Five patients required additional (re)laparotomies, three for persistent infected necrotising pancreatitis and two for persistent abscesses after anasto-
motic disruption. Two of these five patients ultimately required open management of the abdomen, but both died.

In total, four patients died of MOF, three of those with infected necrotising pancreatitis, and the fourth patient with abdominal sepsis.

Thirteen patients were eventually discharged. Hospital stay was prolonged: the median duration overall was 82 days (range 32–116).

Three patients were readmitted 6, 17, and 20 days after initial discharge. Repeat computed tomograms (CT) showed new or persistent subphrenic abscesses. In one patient, the subphrenic space was reopened by the same approach; one patient recovered without further intervention. Because of widely disseminated oesophageal carcinoma, treatment was abandoned in the last patient.

DISCUSSION
Subphrenic abscesses develop as the result of a physiological host response that localises infection after contamination of the peritoneal cavity, usually as the result of intra-abdominal infections after acute pancreatitis, primary gastrointestinal perforations, or postoperative anastomotic disruptions of the digestive tract.

The classic surgical approach to intra-abdominal abscesses (including subphrenic abscesses) has been surgical drainage and the insertion of tubes. Although surgical drainage did improve survival, mortality continued to be too high (2, 5, 7, 14, 15, 17, 19, 22). With the introduction of ultrasonography and CT in the early 1980s, it became possible to localise abscesses before operation. Later on, percutaneous drainage procedures, particularly under CT guidance, replaced surgical drainage as the treatment of choice for intra-abdominal abscesses and this significantly improved outcome (1, 3, 4, 6, 8–10, 12, 13, 17, 18, 20, 21).

However, in selected abscesses that are inaccessible to percutaneous drainage, operation is essential. Several authors have identified factors that are indicators of failure after percutaneous drainage of intra-abdominal abscesses including MOF, and the presence of foreign bodies, haematomas or necrotic tissue. Percutaneous drainage of (peri) pancreatic abscesses in the presence of necrosis has a particularly high failure rate (1, 6, 8–13, 18, 20).

Sometimes, the usual transperitoneal surgical approach may be too dangerous because of previous laparotomies. In the case of old and critically ill patients in whom exploratory laparotomy can lead to further deterioration and even death, less invasive drainage procedures are preferred.

In this series, twelfth rib resection was effective in 13 out of 17 patients. Four patients died of MOF despite subsequent (re) laparotomies for additional surgical drainage procedures. Of these patients, three had infected necrotising pancreatitis, known to have a poor prognosis in case of persistent MOF. Four patients needed re-exploration of the resection site, which emphasises the need for wide open drainage. Ultimately, 13 patients were discharged. Later, three patients were readmitted; two recovered, and one died as treatment was abandoned because of metastatic disease.

Major and minor complications did develop; careful surgical dissection should, however, avoid complications such as splenic injuries, empyema of the pleural space, and intercostal neuralgia.

This direct posterior extraperitoneal approach has several important advantages: it provides direct access to the subphrenic space, effective open drainage, and avoidance of contamination of the abdomen.

This retrospective series shows that twelfth rib resection remains an elegant and useful procedure for the treatment of subphrenic abscesses, particularly if percutaneous drainage has to be abandoned or fails.

REFERENCES

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