SHORT REPORTS

Peritoneal Cocoon Capsulotomy—An Alternative Surgical Approach in Treating Encapsulating Peritoneal Sclerosis

Peritoneal dialysis (PD) is a well-established form of renal replacement therapy in patients with end-stage renal failure. Encapsulating peritoneal sclerosis (EPS) is a recognized complication of PD, occasionally leading to life-threatening bowel failure. The condition is described as a form of intraperitoneal sclerosis, involving the whole thickness of the peritoneum (1) and resulting in the formation of a cocoon-like membrane encasing the small-bowel loops (2). The symptomatology of EPS spans a wide spectrum, with severe EPS having high mortality rates attributed to sepsis, malnutrition, and surgical complications.

We report clinical outcomes in 5 cases of PD-associated EPS in which a specific surgical approach based on breaking the capsule—peritoneal cocoon capsulotomy (PCC)—was applied.

METHODS

Advanced symptomatic EPS is a rare condition in our unit. Over 8 years, 9 cases were treated. Of the 9 patients, 5 received PCC, and 4 received peritonectomy and enterolysis (division of adhesions) by another surgeon. Of the 4 patients receiving peritonectomy and enterolysis, 2 made an unremarkable recovery, and 2 experienced morbidities. In the PCC group, 2 patients recovered completely, and 1 morbidity and 2 perioperative deaths occurred (American Society of Anesthesiology class V), which were partially excluded from the series. Both deaths occurred within a few days after PCC and were secondary to cardiopulmonary causes.

The decision to perform PCC in these patients was made because of life-threatening disease severity (complete bowel obstruction), which required serious consideration of surgical management, albeit from a damage-limitation perspective. The 3 patients in the PCC group with appropriate follow-up are presented here.

Surgical Approach: At laparotomy, the peritoneum is covered with a greyish-white membrane that almost

traps both the small bowel and the mesentery. The large bowel and the stomach are covered as well by this tough, fibrinous mantle (cocoon); however, the latter covering is not usually of clinical relevance. Ascites is constantly present as a result of impaired peritoneal reabsorption because of involvement of the parietal, pelvic, and subphrenic spaces. Macroscopically, the membrane overall resembles a form of aggressive peritoneal carcinomatosis, and therefore biopsy of the peritoneum is mandatory, together with ascitic fluid sampling for cytology and bacteriology.

Using electrocautery, the capsule overlying the bowel serosa is carefully incised (capsulotomy) in a transverse direction commencing close to the antimesenteric edge. Careful pressure is subsequently applied beneath the incised area with the thumbs, squeezing the small bowel on either side. This maneuver permits healthy bowel to emerge from beneath the encasing membrane. Interestingly, the underlying peritoneum is usually of normal aspect, suggesting that the capsule is actually an outsourced deposit of fibrinous material.

The entire process is repeated as many times as required along the full length of the small bowel from the duodenojejunal flexure to the ileocecal junction, with a view to freeing it completely along the mesenteric root. This method actually brings the loops of bowel out of the cocoon, thereby relieving the constricting effect, restoring absorptive capacity, and thus clearing the mechanical and functional obstruction.

It is paramount that any kind of obstruction be ruled out before attempting a perforation repair or bowel anastomosis. When repair cannot be secured, creation of a diversion stoma is recommended.

PCC CASE DESCRIPTIONS

Our first case in this series involved a 50-year-old man who presented with a 3-month history of anorexia, weight loss, and severe gastroesophageal reflux. He had dialyzed by the peritoneal route for more than 3 years before undergoing transplantation. Investigation revealed significant obstruction of the first jejunal limb. He underwent a laparotomy confirming EPS as the cause of the small-bowel obstruction. The jejunal limb was freed, and PCC was performed. Recovery was uneventful,

with no complications, and the patient is symptom-free at 6 years of follow-up.

In the second case, a 54-year-old man underwent extensive investigation for anorexia, weight loss, and abdominal distension. He had performed PD for more than 4 years before receiving a kidney graft. Diagnostic laparoscopy, performed because of inconclusive imaging, showed gross EPS. A PCC procedure was performed in a fashion similar to that described in case 1. Postoperative recovery was delayed by persistent ileus, and the patient required a prolonged course of total parenteral nutrition. Eventually, he made an unremarkable overall recovery. He is asymptomatic at 5.5 years.

The third case involves a 39-year-old man who had been on PD for 2 years before switching to hemodialysis because of poor peritoneal exchanges. He presented with chronic abdominal pain, vomiting, and anemia. Investigation revealed remarkable chronic small-bowel distension consistent with an obstructive process. In view of persistent clinical symptoms, the patient was offered PCC. The postoperative course was complex, requiring 3 further laparotomies (leak, obstruction, abscess drainage). A full recovery ensued, and this patient is also asymptomatic at 5.5 years.

Pathology reports from all EPS biopsies showed large amounts of sclerotic tissue, with thick, hyalinized collagen and a prominent chronic perivascular inflammatory cell infiltrate. No perioperative blood transfusions were required in any of the patients. A nasogastric tube was routinely placed to decompress the stomach for 48 hours. Total parenteral nutrition was continued for 5–7 days unless complications ensued, and fluid balance was carefully monitored to avoid worsening ascites.

Table 1 shows outcomes for the two groups in the series.

DISCUSSION

In patients previously undergoing PD, EPS is a specific cause of small-bowel obstruction, malabsorption, and ascites. Recent literature quotes a 3.9% prevalence rate of EPS among patients on PD for a period of 8 years (3).

The apparent thickening of the intestinal wall and peritoneal membrane, together with dilated loops of bowel and occasional loculated ascites, are usual findings (Figure 1). In severe cases, treatment is most commonly surgical and, according to common practice, includes a formal peritonectomy and enterolysis (4,5).

Reports originating in the 1980s aroused some controversy about the timing for surgery. Some authors recommend early recourse to surgery as a primary means

of cure (6–9); others claim that immunomodulating drug regimens may play a significant role in downstaging the severity of EPS (10,11).

Common surgical complications include perforation, persistent or recurrent intestinal obstruction, fistula formation, intraperitoneal abscesses, sepsis, and death (4,9). Our third case highlights the need for swift repair of any suspected surgical complication. If not treated in their very early stages, postoperative leaks frequently

TABLE 1
Outcomes in the Study Groups

Variable	Peritoneal cocoon capsulotomy	Peritonectomy and enterolysis
Patients (n)	5	4
Perioperative death	2 [MI, pulmonary thromboembolism (both ASA grade V)]	0
Unremarkable recovery	2	2
Morbidity	1 (leak, obstruction, collection)	2 (1 malnutrition and persistent open abdomen; 1 enteric fistula ^a)

MI = myocardial infarction; ASA = American Society of Anesthesiologists (physical status grading).

^a Died after attempted repair at 2 years post-peritonectomy in another center.

Figure 1 — Cross-sectional image of the abdomen shows a large mass of encapsulated small bowel loops and mesentery within the mid-abdomen (arrow), with some local encapsulated fluid.

lead to catastrophic sepsis and require re-exploration, with the potential for extended bowel resection, irreversible stomas, short-gut syndrome, and occasionally, death. We are currently considering a systematic second look 24 hours after the primary procedure. Particular attention should be paid to the terminal ileum, where, in our experience, unnoticed injuries are more likely to occur.

The technique we describe here entails a less aggressive approach, which may be better suited to renal patients who frequently have comorbidities and who may be receiving immunosuppressant therapy. Breaking the capsule and releasing the small bowel by gentle pressure is feasible and less time-consuming than total enterolysis and peritonectomy—a surgical technique that is usually associated with significant blood loss and a need for transfusion.

Renal patients who are seriously compromised with long-term bowel obstruction and total parenteral nutrition are at much higher risk of developing postoperative complications with poorer long-term outcomes. We would therefore propose early surgical management in this patient group.

CONCLUSIONS

The less-aggressive surgical approach of PCC to treat severe forms of EPS has, in our limited experience, attained reasonable long-term clinical results. Those results have encouraged treatment of patients at an early symptomatic stage, with the inclusion of a “second look” policy in future patients. Larger studies are needed to evaluate the proposed technique in a wider population affected by EPS.

DISCLOSURES

The authors declare that no potential or actual personal, financial, or political interests are associated with this submission.

Marc Gingell–Littlejohn
Faisal Hanif
Brian Junor
Marc Clancy
Enric Murio*

Transplant Unit
Western Infirmary
Glasgow, Scotland, UK

*email: enric.murio@ggc.scot.nhs.uk

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