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Intraperitoneal coated polypropylene hernia meshes: the dark side of the moon

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Intraperitoneal coated polypropylene hernia meshes: the dark side of the moon

BACKGROUND: *To date, the use of meshes in repairing abdominal wall defects has brought many advantages, especially in terms of recurrence prevention, but it is not exempt from complications, such as chronic pain, entero-cutaneous fistulas and intestinal obstruction. Here we report a case of intestinal obstruction in a patient with a large umbilical hernia treated laparoscopically by means of a composite polypropylene mesh, six year before.*
CASE REPORT: *A 49-year-old man came to our care with a 3-day history of central and right lower abdominal quadrant pain and a clinical picture of intestinal obstruction. Six years before the patient underwent a laparoscopic intervention to repair his umbilical hernia, with the positioning of a polypropylene coated mesh. Abdominal ultrasonography (US) confirmed the obstruction and demonstrated adhesions between an intestinal loop and the mesh. Intraoperatively, obstruction was confirmed and an intestinal segment had to be resected.*
CONCLUSIONS: *Small bowel obstruction is an uncommon but possible late complication after laparoscopic hernia repair with coated polypropylene mesh.*

KEY WORDS: Hernia complications, Polypropylene coated hernia mesh, Small bowel obstruction, Small bowel resection, Umbilical hernia

Introduction

In the last few years, the use of prostheses in the tension-free treatment of abdominal wall defects has dramatically reduced hernia recurrence rates, usually below 10% [1,2]. The reported incidence of postoperative abdominal incisional hernia generally ranges between 10 and 15% [1-5]. For these reasons meshes are today used routinely, especially for the resolution of difficult cases of abdominal wall defects [6-8]. The recurrence rate after traditional suture of the abdominal wall defect, which ranges from 31 to 54% [9,10] is noteworthy. Despite the use of meshes has brought a positive historical turning point in the surgical treatment of hernia, scientific community still debate about the technique of positioning and fixing, materials, new devices, and the consequences of induced chronic inflammation. These issues can affect the final result after abdominal wall prosthetic reparation, because of possible chronic pain, recurrence of the hernia or even entero-cutaneous fistulas and intestinal obstruction [11-13]. In this paper we report a case of intesti-

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nal obstruction in a patient undergone six years before to laparoscopic umbilical hernia repair with composite polypropylene mesh.

Case report

A 49-year-old man with a 3-day history of central and right lower abdominal quadrant pain associated with anorexia and vomiting, was admitted to our department. He was treated six years before by means of laparoscopic umbilical hernia repair with a coated polypropylene mesh. No history of chronic abdominal or pelvic pain was reported. Physical examination revealed abdominal distension and tenderness from the periumbilical region to the right lower abdomen and three trocar scars. Bowel sounds were high pitched, according to a diagnosis of small intestine obstruction. Blood cell count demonstrated a neutrophilic leucocitosis (12000/mm^3); urea and sodium levels were normal but potassium was low (3.2mEq/L). Abdominal US showed distended loops of the small intestine and allowed the identification of adhesions between a small intestine loop and the umbilical mesh. No signs of hernia recurrence were detected. Intraoperatively, the majority of the proximal small bowel was dilated with a jejunal loop tenaciously adherent to the umbilical region of the abdominal wall, cause of a complete obstruction with necrosis and imminent perforation of the bowel wall. The small intestine, above and below the necrotic segment, was resected including a portion of mesh (Fig. 1A) by means of GIA 50 stapler; intestinal continuity was restored with an automatic anisoperistaltic anastomosis using GIA 75 stapler. The post-operative period was regular and the patient was discharged eight days later. Histology showed marked granulomatous reaction with giant cell (Fig. 1B), prosthetic material included into the subserosa (Fig. 1C) and prosthetic material into the context of the perivisceral adipose tissue (totally integrated) (Fig. 1D).

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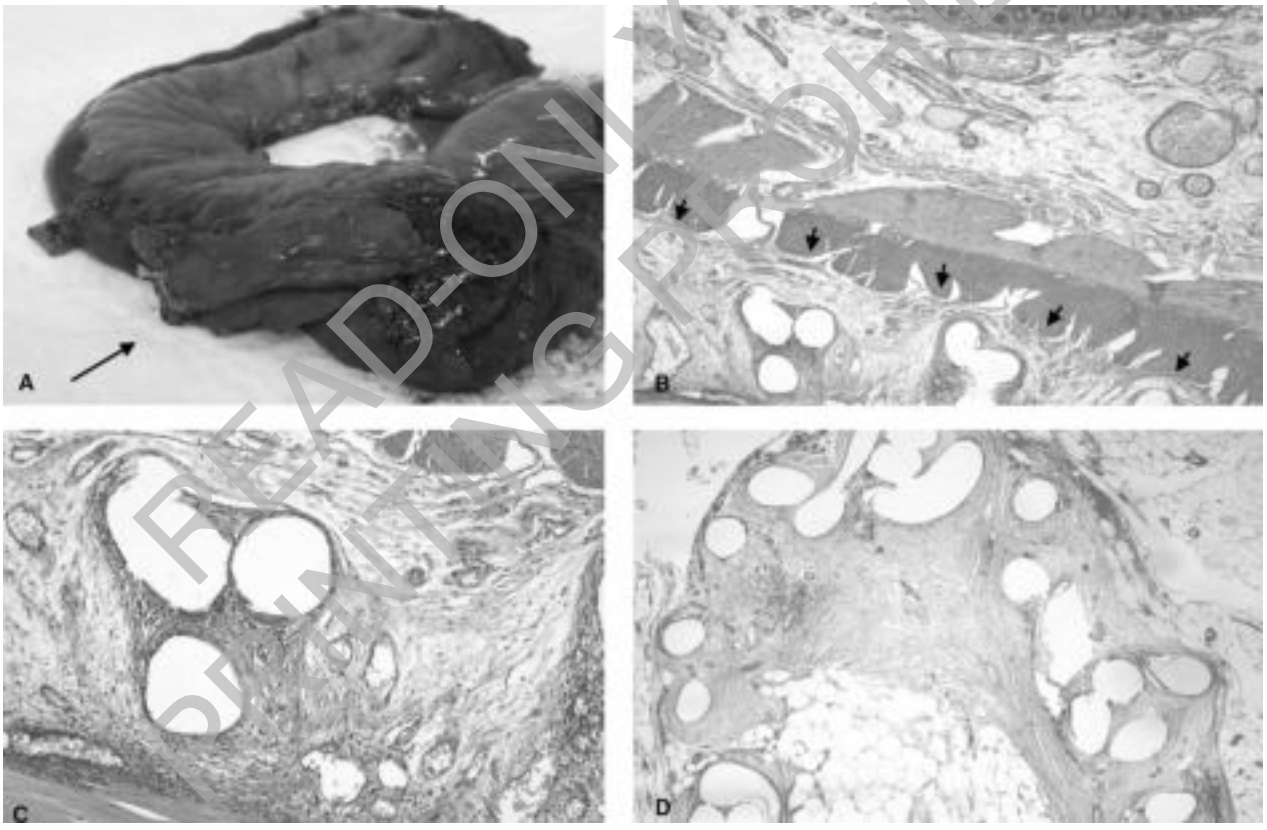

Fig. 1: Macroscopical image and histological findings of resected jejunal loop.
A) Surgical resection of a jejunal loop (39 cm). The outer surface shows diffuse areas of brown color covered by a fibrinous layer. At 12 cm from one of the resection margins the intestinal wall is melted, for a distance of 8 cm, to prosthetic polypropylene material (black arrow).
B) This section of the whole intestinal wall shows mucosa, submucosa, the muscular layer and, below, the prosthetic material (arrows) that evoked a granulomatous reaction with characteristic giant cells. (H&E staining; 10x)
C) Particular of prosthetic material incorporated into the subserosa, with obvious chronic granulomatous inflammation. (H&E staining; 20x)
D) Prosthetic material in the context of perivisceral adipose tissue (totally integrated) associated with fibroblastic scar reaction with collagen matrix and chronic granulomatous inflammation. (H&E staining; 10x)

Discussion

No cases of late intestinal obstruction in patients undergoing laparoscopic umbilical hernia repair with coated polypropylene mesh are described in Literature. The pathophysiological mechanisms of this complication can be ascribed to the chronic inflammatory reaction due to the mesh that causes progressive erosion of the parietal peritoneum and adhesion of intestinal loops to the abdominal wall. Polypropylene prosthetic meshes are often used to repair abdominal wall hernias. These meshes are strong, inexpensive, easy to handle both in open and laparoscopic surgery and have excellent tissue incorporation. Unfortunately, polypropylene meshes have a high rate of adhesion formation to underlying tissues, as demonstrated in animal models.[14] Adhesions to intraperitoneal prosthetic surfaces occur in 80-90% of patients[15,16] and can lead to bowel obstruction requiring, usually, a difficult surgical management [17]. Among prosthetic material, the major responsible of intraperitoneal adhesions is polypropylene, commonly used in the extraperitoneal repair of inguinal hernia and defects of the abdominal wall [18]. Polypropilene is a chemically stable and highly hydrophobic material, quite biocompatible, but its synthetic nature does not favour any kind of physiological interaction with adjacent cells or tissues [19]. The modification of the surface of these meshes is a useful method to isolate them from the surrounding tissues, reducing adhesion formation [20-22]. Operative strategies designed to avoid exposure of the mesh surface to the abdominal viscera include interposition of the intact hernia sac, peritoneal approximation, and the apposition of omentum to isolate the prosthesis. Furthermore, several methods have been developed to inhibit the formation of adhesions. In some cases, a bioresorbable layer is attached or fused to the macroporous mesh surface exposed to the abdominal viscera (Sepramesh®, Proceed®, Parietex®, C-QUR™). A bioresorbable coating provides mechanical separation of injured peritoneum from the mesh, reducing adhesion formation. Absorption of the coating material occurs by enzymatic degradation and physiological uptake. Residence time varies according to the agent. Manufacturer-reported experiments have shown that the physical integrity of the coating dissipates variably between 2 days and 3 months after operation, depending on the coating agents[23]. Although clinical data are poor, polypropylene, after a long time of contact with the viscera, can cause serious complications [24,25].

Conclusions

Small bowel obstruction is an uncommon but possible late complication of laparoscopic hernia repair with coated polypropylene mesh. The reason why the visceral side of the coated mesh adhere to adjacent organs remains "the dark side of the moon". Our case shows that despite coated polypropylene mesh has been implanted for years, a coalescence between the mesh and a small bowel loop is anyway possible and requires further interventions to treat intestinal obstruction. Therefore, our experience has really shown that the use of polypropylene mesh coated with a material declared not adhesive to the viscera, stimulates a slow and progressive inflammatory process that can lead to serious surgical complications, even many years after surgery. For these reasons, randomized studies and long-term follow-up are necessary to evaluate the real incidence of this complication and the relationship with the prosthetic material and the performed technical procedures.

Riassunto

INTRODUZIONE: Ad oggi, l'uso delle reti per la riparazione dei difetti di parete addominale ha portato con sé molti vantaggi, particolarmente in termini di recidiva, ma non è esente da complicanze quali il dolore cronico, le fistole entero-cutanee e l'ostruzione intestinale. Riportiamo un caso di ileo meccanico sopravvenuto sei anni dopo che il paziente si era sottoposto ad intervento di riparazione per via laparoscopica con apposizione di una rete composita in polipropilene.

CASO CLINICO: Un uomo di 49 anni si presenta alla nostra osservazione dopo 3 giorni di dolore diffuso al mesogastrio e alla fossa iliaca destra, e un quadro clinico compatibile con un'ostruzione intestinale. Sei anni addietro, il paziente si era sottoposto ad un intervento di riparazione laparoscopica per una grossa ernia ombelicale, con apposizione di una protesi composita in polipropilene. L'ecografia addominale confermava quanto sospettato e metteva altresì in evidenza delle aderenze tra un'ansa intestinale e la protesi stessa. Durante l'intervento, il sospetto clinico veniva ulteriormente confermato e si effettuava la resezione di un'ansa intestinale ischemica.

CONCLUSIONI: L'ostruzione del piccolo intestino è una complicanza tardiva, non comune ma possibile, della riparazione di un difetto della parete addominale per apposizione di una protesi composite in polipropilene.

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