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PATHOLOGIC AND CLINICAL ASPECTS OF LARGE INCISIONAL HERNIA AFTER INTRAPERITONEAL IMPLANT OF A POLYPROLENE PROSTHESIS

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Several methods for using a prosthetic material to repair incisional hernias have been described. One of the alternatives is the use of intraperitoneal placement of a polyprolene mesh. This study was done at Mansoura University Hospital, between January 1996 and January 1999, on 72 patients on whom pure intrapritoneal placement of polyprolene mesh was used. Pathologic studies of biopsies from patients who had undergone surgical reintervention were done using light microscopy, and scanning electron microscopy. The follow-up period for all patients was between 12 and 48 months. There was no periqperative mortality. Postoperatively, 2 patients required mechanical ventilation, 8 had seromas, 3 had hematomas, 1 had an abscess, and 1 had wound necrosis. There was one death due to irreversible shock. During follow-up ranging from 1 to 4 years, there were 2 hernia recurrences. Pure intraperitoneal placement of polyprolene mesh has several advantages over other techniques, including minimal dissection, and possibly, a decreased risk of infection.

Kev words: Incisional Hernia, Polyprolene Mesh, Intraperitoneal repair.

Abbreviations: Intraperitoneal placement (IPP)

INTRODUCTION

The appearance of incisional hernias following laparotomy closure continues to be an important postoperative complication. The incidence of hernias occurring after laparotomy ranges from 1% to 15%, with risk of recurrence increasing with infection of the surgical wound [1,2]. The optimal method for treating incisional hernias remains controversial. Primary closure is generally preferable, but studies have found relapse rates of 30% to 50% for incisional hernias repaired without use of prosthesis [3].

Many of these hernias can be treated using the patient's own tissue. More difficult cases, in which a large defect is present or where the patient has experienced multiple recurrences, this type of reparation would involve too great risk. In such patients one of the alternatives is the use of a prosthetic material. The use of such materials permits repair without producing tensions and achieves optimal scarring. Currently, the two biomaterials most often used for this purpose are Polyprolene and expanded Polytetrafluoroethylene [4]. Experimental trials performed with these biomaterials have supplied information on the scarring process and the immune reaction these biomaterials may induce in the recipient [5,6]. In 1997, Gillion et al [7] described their experience with pure intraperitoneal placement (PIP) of expanded Polytetrafluoroethylene to repair 60 abdominal wall defects.

The present report relates the experience acquired while treating large incisional hernias (hernial orifice> 10 cm) [8] with Polyprolene mesh. Special care was taken in the pathologic study of biopsy specimens from patients who had had a recurrence of the hernia. Light microscopy and scanning electron microscopy were employed for this purpose.

.PATIENTS AND METHODS

A total of 72 patients were operated with the use of PIP of Polyprolene mesh between January 1996 and January 1999 at Mansoura University Hospital, Surgery Department. The study subjects included 27 male and 45 female with a mean age of 56.3 years (range 35-72 years). Most patients had previously undergone emergency digestive surgery, gynecologic, biliary, or previous midline hernia repair. Causative incisions were midline (n=42), paramedian (n=28), and lumbolaparotomy (n=2). Forty-nine of these patients had experienced multiple recurrences of the hernia (68%). Patients showed a range of associated conditions, such as obesity (n=34), arterial hypertension (n=22), chronic pulmonary pathology (n=12), and diabetes (n=4).

Preoperatively, all patients were instructed in self-motivated respiratory therapy techniques and wound and skin care. Antibiotic prophylaxis consisted of sodium cefazoline (1 g IV) 2 hours prior to surgery; thromboembolic disease prophylaxis included subcutaneous administration of low-molecular weight heparin.

In all patients the hernial sac was opened to examine the contents, which were then replaced into the abdomen. The sac was cleared of adhesions and attached viscera by partial or complete resection of the adhesive bands. The prosthetic patch was positioned after adequate isolation of the complete orifice, and sutured under moderate tension with a double row of polyprolene stitches. The peritoneum was preserved when possible and sutured over the patch. Postoperative closed-suction drainage was performed in all patients for an average 7.4 days. Magnetic Resonance Image (MRI) scans were obtained on 10 patients a minimum of 1 year after the prosthetic implant. These patients were selected at random (Fig 1).

Pathology studies were performed on five tissue samples obtained during surgical reinterventions, after implant of the patch. Conventional light microscopy and scanning electron microscopy procedures were employed.

RESULTS

The follow-up period for all patients was 12 to 48 months. No intra-operative complications occurred in the series. The average duration of hospitalization was 9.2 days. Postoperative complications are shown in (Table 1).

Table (1):*Postoperative complications*

Complication	*Number %*
Respiratory failure	2 (2.8)
Seroma	8 (11)
Hematoma	3 (4.1)
Abscess	1(1.4)
Intestinal fistula	1 (1.4)
Wound necrosis	1 (1.4)
Death	1(1.4)

Two patients required mechanical ventilation because of respiratory failure resulting from pulmonary atelectasis. Both were weaned from the ventilator after several days of intensive therapy. The seromas were treated with repeated aspiration; the hematomas resolved without treatment. One patient was complicated by intestinal fistula due to iatrogenic injury of the intestine, which was managed conservatively. The abscess required drainage and antibiotic therapy. The case of partial necrosis, wound eventually healed. One patient died due to irreversible shock immediately in the postoperative period.

Computed tomography was performed for evaluation purposes on 10 randomly selected patients (mean postoperative delay 1-3 years) after hernia repair. Each showed the biomaterial encapsulated by newly formed tissue on both sides of the prosthesis (Fig.1).

Biopsies from five patients, who had undergone surgical reintervention, were obtained for histopathologic analysis. Good integration of the biomaterial was observed in the newly formed tissue. On both sides of the implant an accumulation of four to six strata of cells was appreciated. There was no colonization at the patch-recipient interface on the edge of the prosthesis. Scanning electron microscopy revealed a highly vascularized peritoneum that was well defined by a uniform layer of mesothelial cells (Fig 2).

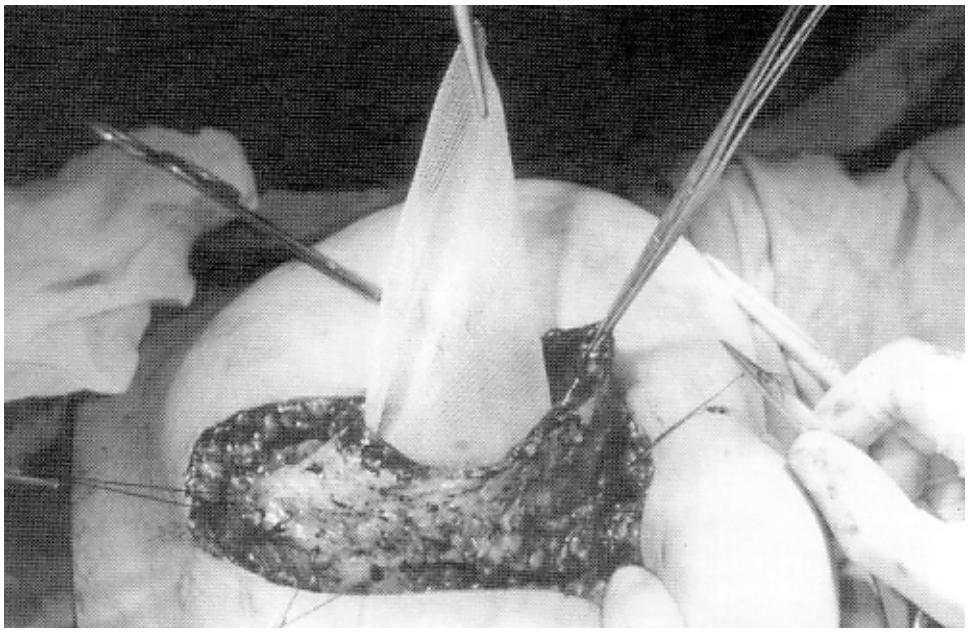


Fig (1A)Excision of the hernial sac

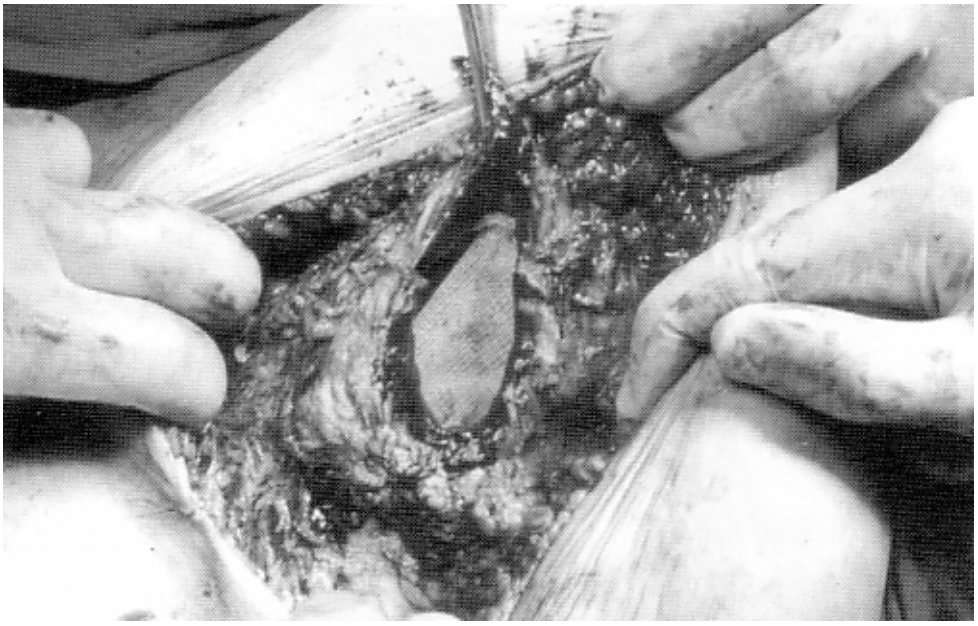
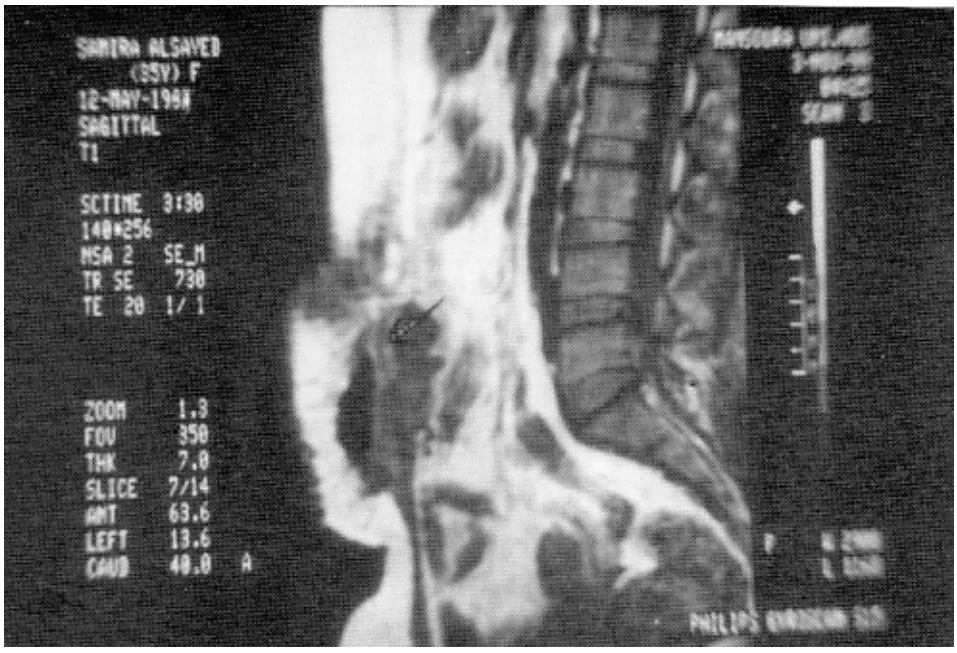


Fig (1 B)Intraperitoneal placement of the mesh



Fig(2) MRI revealed the biomaterial encapsulated by a newly formed tissue on both sides of the prosthesis

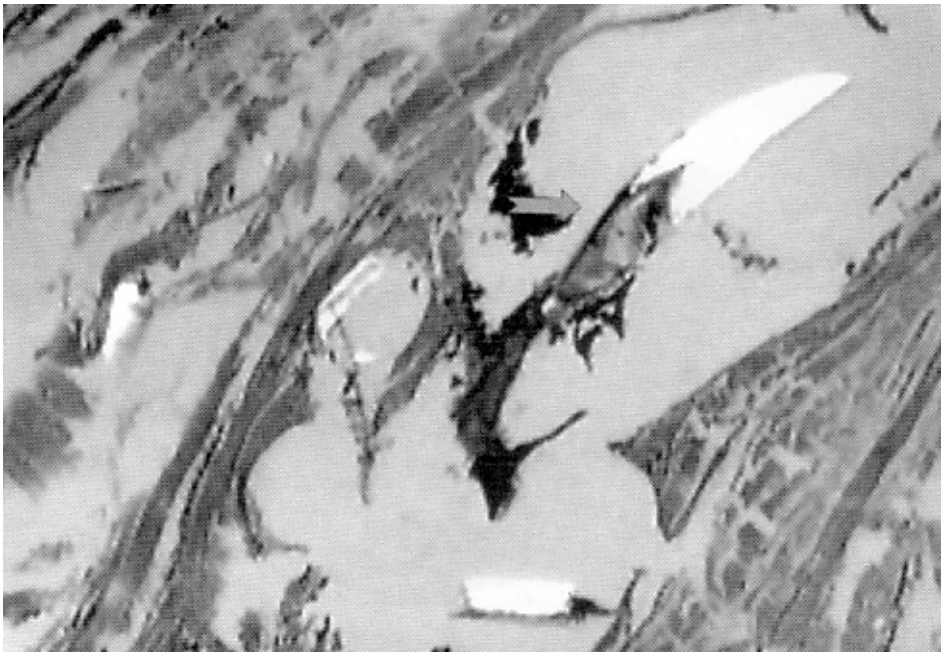


Fig (3) Fat necrosis with centered foreign body (arrow) (part of the surgical mesh). On both sides of the mesh strata of cells was revealed.

DISCUSSION

In patients with medium-sized and large incisional hernias, primary repairs generally yield poor results. Prosthetic materials have been used in wall defect repairs for more than 20 years [9]. The ideal prosthesis is strong and inert, allows incorporation of connective tissue, forms only minimal adhesions, and resists infection.

On some occasions it is necessary to place the prosthesis in direct contact with the intraperitoneal viscera. The characteristics of the prosthesis under these conditions are important, as adhesions are sometimes produced between the graft and the bowel, leading to fistulization due to erosion of the intestinal loops [10]. The successful performance of the prosthesis at the peritoneal interface has been demonstrated in experimental investigations, that revealed progressive formation of an orderly structured neoperitoncum composed of mesothelial cells, which prevents adhesions [11,12,13]. This neoperitoneum was observed during histologic analysis of the biopsy specimens in the present study.

The PIP technique is straightforward, involves minimum dissection, and allows the aponeuroses and muscle to remain intact. Proper positioning of the polyprolene prosthesis is extremely important; specifically, the material must be placed intraperitoneally so that it overlaps the hernia ring by 3 cm. Failure to superimpose the patch over the musculoaponeurotic tissue may result in recurrence rates of 4% to 11% (in case in which the prosthesis is sutured directly to the hernia ring) [14].

The prosthesis infection rate in our study was 2.8%. This compares favorably with that of Gillion et al [7], who have reported rates ranging from 3% to 8%, and Antonio et al who have reported rates 1.7%. Infection of the implant is the most serious complication of the PIP technique and almost always leads to removal of the material to avoid peritonitis. The competitive biologic relationships among the molecular surface of the prosthesis, the immune cells surrounding the implant and bacteria are important in the development of prosthesis infection. Therefore, it is essential to bring the prosthesis and tissue into contact to avoid bacterial adhesion that may produce infection [15,16,17]. This is probably accomplished by placing the prosthesis in the deepest possible position. Also adequate prophylaxis and careful intraoperative handling, reduces the infection rate [18,19].

Seroma was the most common complication and occurred in 8 patients. DeBord et al [20], and Leblanc et al [21] also reported this problem. The appearance of seroma seems to be directly related to the porosity of the biomaterial used. Adequate placement of aspiration drains and use of compression dressings on the wound have a fundamental role in preventing seroma. Moreover, intraperitoneal placement of the prosthesis, and multiperforations in the mesh form the material make drainage to the peritoneum possible.

Histopathologic analysis revealed good integration of the biomaterial in the newly formed tissue; there was mild infiltration by fibroblasts and collagen fibers. In a previous study it was shown that the deposition of connective tissue in the repair process takes place in a similar manner for both humans and experimental animals [22]. In contrast to the observations made by Bauer et al [23], no complete fibroblast and collagen ingrowth in the prosthesis was observed; rather, only infiltration was seen.

In summary, the PIP technique permits greater overlap between the prosthesis and the edge of the hernia ring. The depth at which the prosthesis is placed decreases the risk of infection of the material. The simplicity of the technique allows an adequate repair without pneumoperitoneum or major aponeurotic dissection, thereby decreasing operative time. The PIP method for repairing incisional hernias should be the preferred technique for most repairs for which the hernia is> 10 cm or is recurrent.

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