

Long-term Outcome with the Prophylactic Use of Polypropylene Mesh in Morbidly Obese Patients Undergoing Biliopancreatic Diversion

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Abstract The use of prosthetic material to prevent incisional hernia in clean-contaminated procedures as bariatric surgery remains controversial. We present our experience on 45 consecutive morbidly obese patients undergoing biliopancreatic diversion that was closed using a polypropylene mesh. Moreover, we reviewed the outcome of the 50 previous consecutive obese patients who underwent biliopancreatic diversion and conventional closure of the abdomen in order to compare the outcome between the two groups after a minimum follow-up of 2 years. Between January 2006 and February 2010, 95 morbidly obese patients underwent open biliopancreatic diversion at our department. During the first 2 years of our experience, there were 50 obese patients whose open biliopancreatic diversion was closed conventionally (without mesh). Starting on February 2008 and until February 2010, 45 patients received prophylactic midline reinforcement by the positioning of retrorectal muscle polypropylene mesh. The outcome at 3, 6, 12, and 24 months was analyzed comparing the two groups of patients. No mesh infection occurred. Minor local complications occurred similarly in both groups. The incidence of postoperative hernia was significantly higher in the group conventionally closed (30%) than in the mesh group (4.4%) at 2-year follow-up ($p < 0.05$). The prophylactic use of mesh in open bariatric surgery is safe and effective at 2-year follow-up.

Keywords Incisional hernia · Bariatric surgery

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Introduction

Abdominal wall defects that appear after surgery are known as incisional hernias. Their incidence varies between 2% and 13% in different series but may reach up to 45% in high-risk patients as the morbidly obese ones [1]. The development of hernia is the major cause of morbidity after open bariatric surgery. Due to acute and chronic pain, impaired quality of life, and potentially life-threatening disorders, such as incarcerations (6–15%) or bowel strangulation (2%), hospital readmission is often necessary with a higher cost to the health system [2, 3]. Consequently, the prevention of this complication is of primary interest. The variety of available closure methods comprises different suture materials (braided vs. monofilament, absorbable vs. nonabsorbable) and suture techniques (interrupted vs. continuous suturing) as well as the application of absorbable or nonabsorbable prosthesis (mesh), subcutaneous sutures, subcutaneous drains, and different methods of skin closure. All closing techniques abovementioned failed to prevent significantly the occurrence of postoperative hernia after open surgery in high-risk patients. The polypropylene mesh has been successfully used for the treatment of postoperative hernia in clean procedures [4]. Moreover, several reports have shown that the use of mesh can be safe in the setting of minimal contamination [5]. Recently, the prophylactic placement of mesh has been shown to decrease significantly the risk of postoperative hernia in one small series of obese patients undergoing gastric bypass [6]. Nevertheless, the use of prosthetic material in clean-contaminated procedures remains controversial and, in some reports, correlated to a high rate of local complications [7]. From 2006 to 2007, 25 biliopancreatic diversion (BPD) have been performed at our department and in more than 30% of patients an

incisional hernia has been diagnosed within 1 year after bariatric procedure. Hence, we decided to perform a clinical observational study on two consecutive series of patients undergoing BPD and different abdominal closure to evaluate safety and efficacy of polypropylene mesh placement to prevent incisional hernia. In that experience, as already described, 50 morbidly obese patients undergoing open BPD were assigned to either wound closure using a prophylactic retrorectal muscle polypropylene mesh placement or conventional suture repair of the abdominal wall. The mesh placement seemed to be safe and effective at 1-year follow-up. In fact, the incidence of incisional hernia was 32% in the group closed conventionally vs. 4% in the group closed with mesh at a minimum of 1-year follow-up (data published in 2010) [8]. However, the short follow-up after the bariatric procedure and the relative small number of patients studied did not allow us to draw definitive conclusions on the safety, efficacy, and superiority of mesh placement vs. conventional closure of the abdominal wall. In this study, we present our updated experience on 45 consecutive morbidly obese patients undergoing BPD that was closed using a polypropylene mesh between February 2008 and February 2010. Moreover, we reviewed the outcome of the 50 previous obese patients who underwent BPD and conventional closure of the abdomen in order to compare the results between the two groups after a minimum follow-up of 2 years.

Patients and Methods

Between January 2006 and February 2010, 95 morbidly obese patients underwent open BPD at our department. During the first 2 years of our experience, 50 obese patients underwent BPD that was closed conventionally. Starting on February 2008 and until February 2010, 45 patients received prophylactic midline reinforcement by the positioning of retrorectal muscle polypropylene mesh. The 50 patients described in our previous observational

study [8] (25 conventionally closed vs. 25 reinforced with mesh) are included in the present study but with updated follow-up. The distribution of gender, age, BMI, and comorbidities are described in Table 1. The outcome at 3, 6, 12, and 24 months was analyzed (Table 2). The surgical procedure was already described [8]. Briefly, the abdominal wall was opened in the midline by incising from just below the xiphoid process to 10–15 cm above the umbilicus. A biliopancreatic diversion is then performed according to Resa technique with distal stomach preservation [9]. In patients whose BPD was conventionally closed, the abdominal wall was sutured in two layers: the peritoneum using a running suture with 0 Vicryl and linea alba by interrupted 1 Vicryl suture. In patients whose surgery was closed with mesh, the peritoneum and the posterior rectal sheath were closed with a continuous 2/0 polydioxanone suture. A polypropylene mesh was inserted between the rectus muscle and its posterior sheath and fixated with interrupted 0 polypropylene sutures. A suction drain was placed between the mesh and the rectus muscle before closing the anterior rectal sheath with a continuous 1 polypropylene suture. The patients were followed up to detect local complications or hernia appearance. Clinical examinations were performed after 2 weeks, then monthly up to 1 year and finally at second year after the bariatric procedure. An abdominal wall ultrasonography was performed at fifteenth day, sixth and twelfth month, and second year after the surgery. Statistical differences between the groups were analyzed using the Student's *t* and χ^2 tests.

Results

This study included 95 consecutive obese patients undergoing open BPD. Fifty patients whose BPD was closed conventionally were followed up for at least 2 years after surgery. Forty-five patients had the BPD closed with a mesh. Of the 45 patients whose BPD was closed with mesh

Table 1 Demographics and clinical features

	Conventional abdominal closure	Abdominal closure with polypropylene mesh	<i>p</i>
Number of patients	50	45	NS
Length of abdominal incision	15±5	15±5	NS
Operative time (mean)	120' (range 110'–135')	135' (range 120'–150')	NS
Leakage/seroma	7	7	NS
Bleeding/hematoma	1	0	NS
Surgical site infection	3	1	NS
Mesh infection	–	0	
Length of stay (days; mean)	7.5 (range 6–11)	6.5 (range 6–7)	NS
Incisional hernia (<i>n</i>)	15 (30%)	2 (4.4%)	<0.05

NS not significant

Table 2 Results after 2-year follow-up

	Conventional abdominal closure	Abdominal closure with polypropylene mesh	<i>p</i>
Number of patients	50	45	NS
Age (years; mean)	39 (range 23–66)	38 (range 27–64)	NS
Male/female (ratio)	9/41	7/38	NS
BMI (mean)	46 (range 40–65)	45 (range 40–60)	NS
Comorbidities			
Diabetes mellitus (<i>n</i>)	12	9	NS
Hypertension	16	10	NS
Hypercholesterolemia	8	4	NS
Hypertriglyceridemia	6	3	NS

BMI body mass index, *NS* not significant

reinforcement, 25 patients (55.5%) completed their 2-year follow-up and 20 (44.5%) reached at least 1-year follow-up. The incidence of minor local complications was similar in both groups. Particularly, surgical site infections occurred in three cases of the group conventionally closed and in one case of the group who received mesh reinforcement ($p > 0.05$). We experienced one case of hematoma in group conventionally closed vs. no case in mesh group and seven cases of seroma in both groups studied ($p > 0.05$) (Table 1). No mesh infection was recorded. The length of hospital stay was similar in both groups. The incidence of incisional hernia was significantly higher in patients whose BPD was closed conventionally (15 cases reported with an incidence of 30%) than in those ones whose BPD was closed with a mesh (two cases reported with an incidence of 4.4%) ($p < 0.05$) at 2-year follow-up. The incidence of incisional hernias and surgical local complications were not significantly correlated to comorbidities in both groups (Table 1). Only the surgical procedure (no mesh vs. mesh) was shown to be significantly and statistically correlated to the development of postoperative hernia ($p < 0.05$). The average time of presentation of the postoperative hernia was 180 ± 60 days in patients whose BPD was closed conventionally. The 15 patients who developed postoperative hernia after conventional closure were admitted to a hospital for prosthetic repair of the abdominal hernia. All procedures have been performed laparoscopically. In the two patients who experienced incisional hernia after mesh placement, the diagnosis was done after 6 months and 1 year, respectively. These two patients did not present local complications or surgical site infection at the time of BPD. In both cases, the occurrence of hernia was related to intrafascial prosthesis dislocation confirmed by CT examination. Both patients were successfully treated by an open approach with removal of the prosthesis and hernia repair by mesh replacement. Mesh removal was never indicated except for the two cases of recurrence abovementioned. There were no missing patients at follow-up in both groups of patients.

Discussion

The main finding of this study is that mesh placement in clean-contaminated bariatric surgery is safe (no prosthesis infection) and effective to prevent incisional hernia after open bariatric surgery at 2-year follow-up. Our preliminary results [8] obtained from a smaller number of patients and a shorter follow-up are furthermore confirmed by the present study. Obesity is one of the most common factors affecting wound healing with an incidence of postoperative hernias after bariatric procedures higher than 45%. Several attempts have been made to reduce incisional hernia but neither new generations of sutures nor the use of different surgical techniques have demonstrated any positive and significant impact in the occurrence of this complication. The use of polypropylene mesh is known to be safe and effective in the treatment of incisional hernia. However, the use of prosthetic materials in clean-contaminated procedures as BPD is still controversial [10]. Some reports have already described the safe use of synthetic mesh in the presence of open gut [11, 12]. Furthermore, successful parastomal hernia prophylaxis has been reported also with the use of polypropylene mesh [13, 14]. However, there are few studies reporting on the successful use of prophylactic mesh for the primary abdominal closure in high-risk patients [6, 7]. Only two studies report on the safety and effectiveness of prophylactic prosthetic mesh placement in morbidly obese patients [8, 10]. Strzelczyk et al. performed a randomized trial showing that the use of mesh prevented postoperative hernia without major complications in morbidly obese patients undergoing gastric bypass surgery [10]. On the other hand, one report by Herbert et al. obtained discouraging results. In their observational study on prophylactic use of mesh after gastric bypass, 6 patients out of 16 needed mesh explantation because of collections around the prosthesis [15]. In three patients, an infection was confirmed by microbiological cultures. One patient experienced incisional hernia despite the use of prophylactic mesh.

lactic mesh. Indeed, the controversial results reported by Strzelczyk et al. and Herbert et al. on the prophylactic use of mesh after open bariatric surgery pushed us to perform our previous observational study [8] and, today, to carry on collecting and evaluating data on this topic. Our primary goal was to verify the positive and encouraging results of Strzelczyk et al. Our updated data strongly confirm Strzelczyk's findings. In particular, we did not experience cases of mesh infection. Our positive results could be explained with the meticulous surgical technique utilized. Firstly, the use of linear cutters to perform the gastrointestinal and the entero–entero anastomosis allowed us to carry out a virtual clean surgery. Moreover, the use of a closed suction drain avoided fluid collection potentially leading to infection around the prosthesis. The positive results of the present study confirm at 2-year follow-up that prophylactic retrorectal muscle polypropylene mesh is safe and effective. The incidence of postoperative hernia is significantly reduced after open BPD without major complications.

Conflict of interest None

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