



Prophylactic Preperitoneal Mesh Placement in Open Bariatric Surgery: a Guard Against Incisional Hernia Development

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Abstract

Background Incisional hernia is one of the most common late complications of open bariatric surgery. The aim of this study was to assess the safety and efficacy of preperitoneal prosthetic enforcement of midline incisions during open bariatric surgery in preventing incisional hernia development.

Methods This study randomized 64 morbidly obese patients admitted to undergo open bariatric surgery into two equal groups (I and II). A prophylactic sheet of polypropylene mesh was fixed in the preperitoneal space during wound closure in group I while in group II the wound was closed conventionally.

Results This study included 51 females and 13 males ranged in age from 19 to 60 years. No significant difference was observed in mean age, mean preoperative body weight, mean body mass index, mean hospital stay, and mean follow-up period of either group. Three open procedures were done: vertical banded gastroplasty, Roux-en-Y gastric bypass, and vertical sleeve gastrectomy. No significant difference in mean operative time in either group for each operation was noted. Early postoperative wound complications were similar in either group. Incisional hernia incidence was significantly higher in group II, nine cases (28.1 %), than in group I, one case (3.1 %).

Conclusions Using prophylactic preperitoneal Prolene mesh during wound closure in open bariatric surgery is safe and effective in preventing incisional hernia development.

Keywords Prophylactic mesh · Incisional hernia · Bariatric surgery

Introduction

Morbid obesity is the major patient-related risk factor for the development of incisional hernias, with an incidence ranging from 25 to 50 % in large reviews [1, 2]. Incisional hernia is one of the most common late complications of open bariatric surgery and often requires surgical repair. So, it is a problem of clinical and economic relevance [3]. Laparoscopic bariatric surgery has significantly reduced the risk for incisional hernias in randomized studies [4, 5], but the incidence of complications such as bowel obstruction, gastrointestinal hemorrhage, and stomal stenosis were increased in a review of several studies including 3,464 patients [6]. Also included are the long learning curve and its high cost in poor countries and in countries where the bariatric surgeries are not covered by health insurance like ours, all these factors made the open procedures still having a role. The aim of this study was to assess the safety (primary end point) and efficacy (secondary end point) of preperitoneal prosthetic enforcement of midline incisions during open bariatric surgery in preventing incisional hernia development.

Materials and Methods

This study was conducted in the gastrointestinal surgery unit, general surgery department, Tanta University Hospital during the period from January 2004 to December 2006 and included 64 morbidly obese patients admitted to undergo open bariatric surgery that was the commonest approach in our unit during this period. All patients were candidates for bariatric surgery in accordance with National Institutes of Health consensus criteria for the management of morbid obesity [7]. After

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giving their written informed consent, patients were randomly assigned to one of two treatments: either wound closure using a prophylactic preperitoneal polypropylene mesh (group I) or conventional suture wound closure (group II). All patients were given prophylactic antibiotic in the form of 3 g ampicillin–sulbactam and prophylactic antithrombotic in the form of low-molecular weight heparin.

Surgical Procedure In group I, after incision of the skin and the subcutaneous fatty layer, the linea alba is incised carefully along the whole length of the wound then carefully the edges of the incised linea alba and posterior rectus sheath are dissected from the peritoneum for a distance of 4–6 cm bilaterally and for 2–3 cm beyond the upper and lower ends of the wound. The peritoneum is then opened along the incision and the bariatric procedure is performed. During closure, the peritoneum is closed separately using vicryl 0 sutures. Then, a sheet of Prolene mesh about 4–5 cm longer than the wound length and 10–12 cm width is placed over the peritoneum and fixed to the undersurface of the linea alba above and below both ends of the wound as well as to the posterior rectus sheath bilaterally at the level of the middle of the wound, then the linea alba is closed continuously using Prolene 1 suture taking bites through the mesh at regular intervals along the wound. In group II, the wound was closed by mass closure of the linea alba using continuous Prolene 1 suture with bites placed 1 cm apart and 1 cm from the cut edge. In either group, a subcutaneous closed tube drain was inserted (for 48 h); then, the subcutaneous tissue is closed with interrupted 3/0 vicryl suture and the skin with subcuticular 3/0 Prolene suture.

The bariatric procedure, operative details especially operative time and early postoperative wound complications were recorded in all cases. All cases were examined carefully during their regular follow-up visits (at 1, 3, 6, 12 months, and then yearly) to detect the development of incisional hernia and ultrasonographic assessment was done in suspected cases. Statistical differences between the groups means were analyzed using unpaired Student's *t* test, ($P < 0.05$ was considered significant).

Results

This study included 64 patients: 51 females (79.7 %) and 13 males (20.3 %) with female to male ratio of 4:1. The age ranged from 19 to 60 years. The distribution of gender, mean age, mean preoperative body weight, and mean preoperative body mass index (BMI) were similar in the two groups with no significant difference (P value > 0.05). The mean duration of hospital stay was also similar in either group (7.5 ± 3.4 versus 7.2 ± 3.5) with no significant difference and so the mean follow-up period (48 versus 49 months) (Table 1). Three open bariatric procedures were done in this study: vertical banded

Table 1 Patients characteristics in both groups

Variable		Group I (no. 32)	Group II (no. 32)	<i>P</i> value	
Gender	Female	51	26	25	ns
	Male	13	6	7	ns
	F/M ratio	4/1	4.3/1	3.6/1	ns
Mean age in years		38.5±10.8	36.9±11.3	ns	
Mean BW, kg		141.2±37.5	138.7±40.3	ns	
Mean BMI, kg/m ²		52.2±9.1	51.4±10.5	ns	
Mean hospital stay, days		7.5±3.4	7.2±3.5	ns	
Mean follow up period, months		48	49	ns	

ns not significant

gastroplasty (VBG) in 20 cases, Roux-en-Y gastric bypass (RYGBP) in 29, and vertical sleeve gastrectomy (VSG) in 15. There was no significant difference in the mean operative time in either group for each operation (Table 2). Early postoperative wound-related complications (seroma, infection, and partial dehiscence) were similar in either group without significant difference (total of 12 in each group); all of them were managed conservatively. The incidence of incisional hernia was significantly higher in group II (nine cases with an incidence of 28.1 %) than in group I (one case with an incidence of 3.1 %) (P value < 0.01 ; Table 3). In group I, the hernia occurred 3 months after the operation; this patient (male with BMI 62) suffered an attack of bronchitis with severe cough in the first postoperative week that resulted in partial wound dehiscence where the peritoneum and the in front mesh kept the viscera contained within the disrupted fascia. In group II, the hernia occurred in nine cases: two of them in the first 6 months, three in the second 6 month, three in the third 6 months, and one case at 23 months from the operation. The ten cases that developed incisional hernias in the study were readmitted for open hernia repair over a period ranged from 4 to 22 month after its development.

Discussion

Multiple comparative studies have proved that both open and laparoscopic bariatric surgeries produce the aimed action

Table 2 Mean operative time in both groups

Bariatric procedure	Group I	Group II	<i>P</i> value
VBG	81.2±7	76.2±9	ns
RYGBP	151.4±9	144.9±9	ns
VSG	123.5±8	115.1±5	ns

ns not significant

Table 3 Postoperative wound complications in both groups

Wound complications		Group I (no. 32)	Group II (no. 32)	<i>P</i> value
Early	Seroma	6	5	ns
	Infection	5	5	ns
	Partial dehiscence	1	2	ns
	Total	12	12	ns
Late	Incisional hernia	1	9	<0.01 ^a

ns not significant

^aHighly significant

(weight reduction and improvement in comorbidities and quality of life) without significant difference [4, 8, 9]. The main argument in favor of laparoscopic over open bariatric surgery was less morbid surgical access to the abdomen [10]. Other advantages include less pain, early return to normal bowel function, short hospital stay, early return to normal physical activity, and better esthetic results. Studying the complications of each procedure revealed that half of the reported morbidity following open gastric bypass surgery is wound related (infection and incisional hernia) [4, 5, 8, 11], while complications as bleeding, leaks, strictures, and small bowel obstructions were found to occur significantly more in laparoscopic gastric bypass surgery [12–14]. Most of these complications are related to the steep learning curve but others like small bowel obstruction is linked to the laparoscopic procedure [14]. A big obstacle facing expanding the availability of the laparoscopic procedure is the significantly higher cost because of the use of trocars, endostapling devices, and Harmonic® scalpels to make a mean difference in instrument cost of about \$1,500 according to Nguyen's experience [15] and \$3,300 according to Jones [16]. In our home environment, there is no third party payer (the health insurance do not cover bariatric surgeries), and this study was conducted in a tertiary center with limited resources so only few patients can afford the high cost of laparoscopic surgery and the open procedure is the only viable option to a majority of our morbidly obese patients in order to improve their quality of life. Most seasoned open bariatric surgeons utilize the upper midline incision to perform the procedure and this is the case in our unit while others like Jones prefer the left subcostal approach. Jones used this approach for more than 20 years and reported significantly low wound morbidity [16]. However, it still not popularized among open bariatric surgeons.

Abdominal wall closure after midline incision is one of the major problems in open bariatric surgery. Wound failure in the form of postoperative hernia remains a considerable problem leading to serious complications [17]. Some studies show that certain laparotomy closure techniques can reduce the likelihood of incisional hernia. Nevertheless, even in the best results,

frequency of this occurrence varies between 5 and 15 %, and that frequency increases considerably when patients are monitored for several years or when factors associated with the laparotomy greatly increase the risk of incisional hernia [18, 19]. There are few published studies reporting successful use of prophylactic mesh for the primary closure of laparotomies in high-risk patients [20, 21]. Others used it in closure of midline laparotomies in open bariatric surgery in morbidly obese patients with effective prevention of incisional hernia development [17, 22–24].

Our data support the findings of Strzelczyk et al. [17, 22] and Currò et al. [23, 24] that the use of prophylactic mesh during wound closure in open bariatric surgery significantly lowers the incidence of incisional hernia development. In this study, incisional hernia occurred in 28.1 % in the conventionally closed group versus 3.1 % in the mesh group (*P* value <0.01) over a mean follow-up period of 4 years. Strzelczyk et al. in their first study [22] reported incisional hernia incidence of 18.75 % in the non-mesh group versus 0 in the mesh group after follow-up of 12–14 months and an incidence of 21 % versus 0 in their second study [17] with a mean follow-up of 28 months. Currò et al. in their preliminary study [23] on 50 morbidly obese patients underwent BPD reported incisional hernia incidence of 32 % in the conventionally closed group versus 4 % in the mesh group at 1 year follow-up. The same authors extended their study to include 95 patients reporting 30 % incidence of incisional hernia in 50 conventionally closed patients versus 4.4 % in 45 mesh-closed patients at a minimum follow-up of 2 years [24]. The new point in this study is the plain in which the prophylactic mesh was placed during wound closure that was the preperitoneal space (Fig. 1). This space was dissected during making the incision while the peritoneum is still intact, an easier technique that avoids peritoneal lacerations. In their first study, Strzelczyk et al. [22] placed the mesh

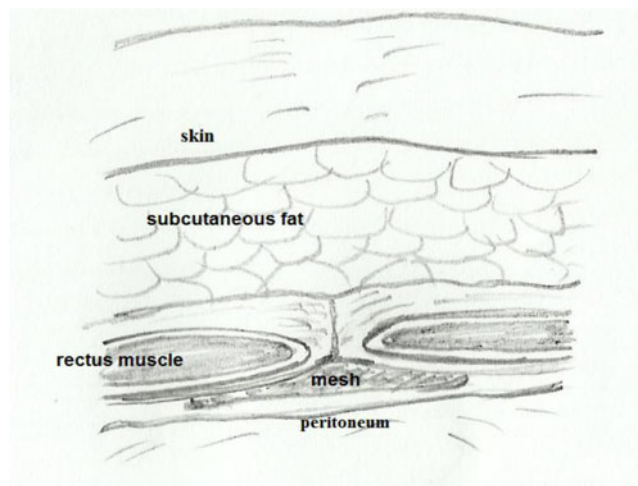


Fig. 1 Diagram showing the positioning of the mesh in the preperitoneal space

subcutaneously, but in their later study [17], they placed it in the plain between the rectus muscle and the posterior rectus sheath and so did Currò et al. in their studies [23, 24]. The advantages of the preperitoneal space include the following: it is nearly avascular plain so no risk of developing hematoma or mesh-related seroma and consecutively no need for mesh drain as were done in the other studies [17, 22–24]. It follows the principle of Pascal law through buttressing the fascial defect from inside: the mesh in this plain is not in contact with sensory nerve terminals so pain is not aggravated and lastly it will not hinder any esthetic abdominal surgery planned later after maximum weight reduction.

Using the prophylactic mesh did not increase the wound morbidity in this study where the early wound-related complications (infection, seroma and dehiscence) showed no statistically significant difference between the mesh and the non-mesh groups. Also, its placement did not significantly prolong the operative time or the hospital stay as both were nearly similar in either group as it was reported by Strzelczyk et al. [17, 22] and Currò et al. [23, 24].

The shortcoming of this study is the small number of patients it included.

In summary, our results with a mean follow-up of 4 years support the prophylactic prosthetic wound enforcement in open bariatric surgery that guard against incisional hernia development without significant difference in mean operative time, wound-related complications, or hospital stay. Also, the preperitoneal plain is the best and most physiological site for its placement with no need for drain and not hindering any esthetic abdominal surgery planned later after maximum weight reduction, so expanding the availability and extending the quantity of bariatric surgery and expanding the quality of life for the morbidly obese who cannot afford the high cost of the laparoscopic procedure.

Conflict of Interest Dr. Abo ryia, Dr. El-Khadrawy, and Dr. Abd-Allah have no conflict of interest or anything to disclose.

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