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Review Article

Prophylactic Use of Mesh during Laparoscopic Surgery to Prevent Parastomal Hernia: A Literature Review

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Abstract

Background: Different surgical techniques and types of mesh have been used in the prevention of parastomal hernia. However, the evidence in laparoscopic abdominoperineal resection with end colostomy has been analysed in few randomized clinical trials. The aim of this review article was to outline use of prophylactic mesh in laparoscopic surgery.

Methods: A literature search using electronic databases was performed to find articles that analysed prophylactic placement of mesh to prevent parastomal hernia. The search was limited to English-language, randomised controlled trials and laparoscopic abdominoperineal resection with a permanent colostomy for rectal cancer patients.

Results: Three randomized controlled trials were found and analyzed in our study. A total of 158 patients were included, with no significant difference in general characteristics and stoma-related complications across their study groups. A significant reduction in radiologically-defined parastomal hernia was demonstrated in two trials (P=0.008, P=0.005), whilst prophylactic mesh reduced clinically-diagnosed parastomal hernia in one trial (P=0.049).

Conclusion: The use of prophylactic mesh to prevent parastomal hernia during laparoscopic surgery is safe and appears to be effective. Further trials to clarify the effectiveness of prophylactic parastomal hernia mesh are required with tighter definition of what constitutes a parastomal hernia.

Introduction

Parastomal Hernia (PSH) occurs in 57% of end colostomies, and is a significant health problem that impairs quality of life in these patients [1].

The increasing age of the patients and the size of colostomy aperture are independent risk parameters; nevertheless, there are many patient-related predictors for development of PSH, such as obesity, malnutrition, steroid use and chronic lung disorders [2,3].

The majority of patients with PSH following laparoscopic surgery have symptoms (80%), and surgery is required for 30% of patients because of pain, incarceration or fitting-appliance problems [4]. Pain and leakage related to improper stomal-bag placement with resultant skin irritation around the stoma site are the most common complications of PSH and are responsible for 63% of overall problems [5].

A high recurrence rate and controversial results of PSH repair, whether open or laparoscopic, has drawn attention to PSH and the development of potential preventive strategies [6]. The development of PSH is driven by a continuous stretch of the stomal aperture in the abdominal wall by tension tangential to its circumferences [3].

Certain prophylactic approaches of mesh placement via different techniques have been proposed to reduce parastomal hernia, yet there is no clear consensus on which method is most effective.

Few Randomized Controlled Trials (RCTs) that support the evidence of prevention using only laparoscopic Abdomino Perineal Resection (APR) are reported [6-8]. In addition, many patients complain of recurrent PSH and its negative consequences despite having undergone surgery to treat it [9]. A literature review was conducted on the current trend of mesh use to prevent PSH in rectal cancer patients during laparoscopic APR and end colostomy with a discussion of recent surgical techniques and their outcome.

Method

An electronic search (using Scopus, Medline and Embase databases) was conducted using text terms and Medical Subject Headings "Prevention", "End Colostomy", Permanent

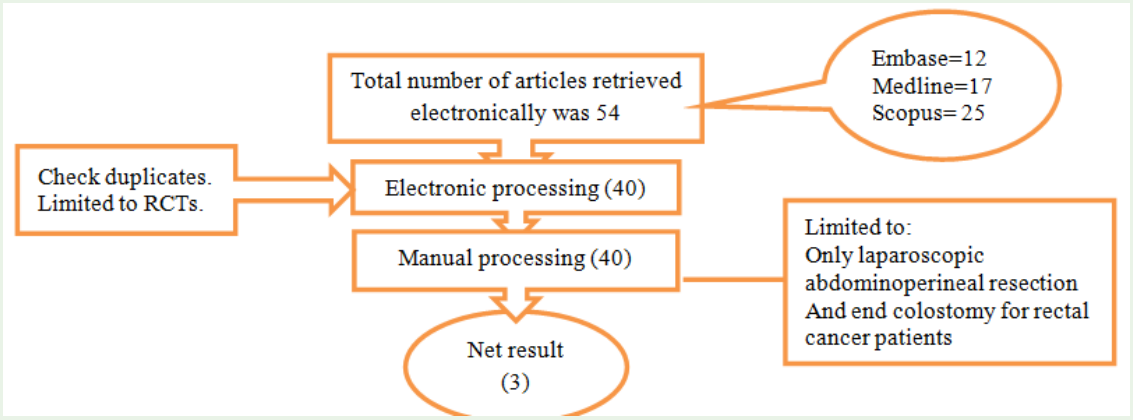

Figure 1: Study flow chart.

Colostomy","Colostomy", "Parastomal hernia", and "Surgical mesh". Data was gathered, processed and evaluated. Searches were limited to English languages. RCTs on prevention of parastomal hernia during laparoscopic APR and end colostomy for rectal cancer patients were included and reviewed. The last date for this search was 27 May 2016. The search strategy was developed in accordance with CONSORT (Consolidated Standards of Reporting Trials) [10].

Primary (occurrence of PSH) and secondary (peristomal complications) outcome measures of the RCTs were analysed. A diagnosis of PSH was based on clinical and or radiological findings. In addition, complications of stomal construction were evaluated as infection, erosion of the stoma, fistula, necrosis or stenosis. Other data were also retrieved, such as site and type of mesh used, follow-up duration and perioperative morbidity and mortality.

Results

Three randomized controlled studies were critically analyzed [6-8].

Search Results

A total of 54 articles were retrieved and evaluated. After removing duplicates and limiting results to RCTs, 40 articles remained. Articles were further limited to include only laparoscopic APR with end colostomy for rectal cancer patients; therefore, three RCTs were included in this literature review (Figure 1).

These investigated articles are:

Table 1: Summary of general characteristics.

Study		Study I	Study II	Study III
Mesh	Number	19	35	24
	Age(mean)	72.2	67.1	70.5
	Gender(male to female ratio)	11:08	18:17	21:03
	BMI in kg/m^2(mean)	26.3	26.2	25.3
No mesh	Number	17	35	28
	Age(mean)	65.9	65.1	67.3
	Gender(male to female ratio)	7:10	19:16	16:08
	BMI in kg/m^2 (mean)	27.5	25.4	26.9

Study I: Lopez-Cano, 2012 [6].

Study II: Vierima, 2015 [7].

Study III: Lopez-Cano, 2016 [8].

Study characteristics

A total of 158 patients were assessed in these three studies, with 36, 70 and 52 participants in three trials respectively. A total of 78 patients were in the intervention group (mesh) as compared to 80 patients in the control group (no mesh). There is no significant difference in general characteristics of all studies in terms of age, gender, and Body Mass Index (BMI) (Table 1).

Surgical technique

Two studies used a keyhole mesh technique intraperitoneally using different mesh types [6,7], while a third trial used a modified Sugarbaker technique [8]. The duration of follow-up was the same in study I and II (12 months), while it ranged 12 -26 months in study III (Table 2).

Outcome measures

Definition of parastomal hernia was different among these trials; two of them relied on radiological diagnoses based on CT (Computed tomography), while both clinical and CT diagnoses were used in one study. Study I applied a broad description for PSH as a CT finding of protrusion of any intra-abdominal viscus including fat through the stomal defect [6].This is in comparison to study II [7] that used both clinical and CT index of European Hernia Society criteria [11]. Study III applied CT criteria of Moreno-Matias et al [12] to evaluate PSH [8] (Table 3).

A statistically-significant reduction in radiologically-defined PSH following prophylactic placement of mesh was evident in study I and III, but not study II. Nevertheless, in study III the overall PSH

Table 2: Summary of surgical procedures.

Mesh source	Proceed®	DynaMesh®	Ethicon Physiomesh®
Location of mesh	Intraperitoneal/ keyhole	Intraperitoneal/keyhole	Intraperitoneal/modified Sugarbaker technique
Follow- up	12 months	12 months	12-26 months

Table 3: Comparison of diagnostic definition of PSH.

	Definition	Description
Study I	Radiological	CT finding of protrusion of any intra-abdominal viscus including fat through the stomal defect was PSH [6].
Study II	Clinical	Leakage and stoma appliance problems poorly respond to non-operative measures along with skin irritation with or without repeated partial intestinal obstruction, ischemic necrosis of skin around the colostomy aperture [7].
Study III	Radiological	Moreno-Matias et al [8].

Table 4: Summary of outcome measures.

Study	Study I	Study II	Study III
PSH diagnosis	Radiological(CT)	Clinical (examination) and radiological (CT)	Radiological (CT)
PSH incidence	(50%)-(93.8%)	Clinical (14.3%)-(32.3%)	(25%)-(64.3%)
(mesh)-(no mesh)		Radiological (51.4%)-(53.1%)	
PSH incidence (significance)	Significant (P=0.008)	Clinical (significant) (P=0.049)	Significant (P=0.005)
		Radiological (not significant) (P=1.00)	

(clinically plus radiologically defined) and clinically evident PSH were statistically significant. Mortality and morbidity between a mesh and no mesh group were analyzed among these trials and found to be not statistically significant in study II and study III but were not mentioned in study I.

Stoma-related complications such as prolapse or general complications including intestinal dysfunction were not significant across all these studies (Table 4).

Discussion

The majority of patients (76%) with permanent stomas ultimately reported PSH especially during the first three years following the primary operation; hence, many health professionals consider it to be an inevitable complication [13]. PSH has been assessed by a wide spectrum of clinical and radiological means such as Valsalva maneuver, ultrasound and CT; however, there is no standardised method for precise diagnosis [14]. Similarly, in this review, the three RCTs used different assessment criteria to define PSH.

The quality of life following stoma formation was inadequately assessed [2]; however, most patients suffer negative outcomes [15-21]. This poor assessment probably made surgeons unaware of PSH effects on patients and might explain the paucity in the number of trials that have been performed to evaluate outcome, especially in the long-term following stoma formation [2]. In addition, the economic effect of PSH for the patients in their community was not thoroughly assessed in spite of an increasing trend to consult health services, especially those patients who have symptoms such as stoma-bag problems [22].

Laparoscopic surgery has become a recognized treatment for PSH over the last years [23-36]. In addition, a laparoscopic technique in PSH repair can offer a better view of the defect, cause a minimal trauma to the abdominal wall and facilitate proper mesh placement [25,26]. Prophylactic mesh use for PSH has been analyzed adequately in respect to open procedures and combined open and laparoscopic procedures were seen in several articles; however, there is poor evidence for using only a laparoscopic technique. This paucity of evidence might be explained by the technical challenges of laparoscopic surgery for PSH. Another possible reason is a concern for some surgeons about the safety of mesh, with respect to mesh erosion [37]. Thus, mesh use has been more adequately adopted in repair compared to prevention [38].

Different positions for prophylactic use of mesh have been adopted in open surgery as compared to a laparoscopic counterpart. The three RCTs using a laparoscopic approach have described intraperitoneal placement of mesh; two of them with keyhole technique [6,7] and one with modified Sugar baker [8]. In addition, a pilot study has shown a clinically safe technique with keyhole mesh placement used to prevent PSH, called SMART (Stapled Mesh stom A Reinforcement Technique [39].

There are limitations of the analysed RCTs [6-8] including; small sample size and relative short period of follow-up (1 year). The majority of PSH in the first two years after stoma formation and the number of PSH increases with longer follow-up [40]. However, some consider a minimal duration for a follow-up to be one year [41]. Another limitation is a lack of comparison of different types of mesh and the different techniques for mesh placement. A clear definition of PSH needs to be standardised for future trials to make further comparative analyses.

Conclusion

Based on the above studies presented, the prophylactic placement of mesh in laparoscopic surgery to prevent parastomal hernia appears feasible and safe. More trials are required to define a true effectiveness through standardized radiological and clinical diagnostic criteria. In addition, mesh location and type still need further investigations with large trials.

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