

Surgical Mesh Placement for Prevention of Hernia after Bariatric Open Surgery

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Abstract: The aim of this review was to assess the safety and efficacy and evaluate the effectiveness of incisional hernia prevention during open bariatric surgery by using mesh replacing procedures.

A computerized search was performed using following databases (Embase, Medline, Web-of- Cochrane, CINAHL) on March, 2017. Searching evidence concerning with mesh placement for prevention of hernia after bariatric open surgery, we consider only English language articles, with human subjects on our review. Furthermore, we reviewed the references list of each identified article for more evidence to be included in present review. Hernia formation after surgical procedures remains to be an essential source of medical morbidity. Incisional reinforcement at the time of the initial procedure has been utilized in some patient populations to minimize the risk of succeeding rupture formation. Proof sustain the prophylactic prosthetic injury enforcement in open bariatric surgical treatment that defend against incisional hernia development without considerable difference in mean operative time, wound-related issues, or health center keep. Also, the preperitoneal level is the most effective and most physiological site for its placement with no demand for drain and not impeding any type of aesthetic stomach surgical procedure prepared later on after maximum weight decrease.

Keywords: Embase, Medline, Web-of- Cochrane, CINAHL, prevention of hernia.

1. INTRODUCTION

Incisional hernia (IH) is one of the most regularly seen long-term problem in surgery causing much morbidity and even mortality in patients (1,2,3,4). Despite researches on the optimal closing technique for laparotomies, the risk for IH after midline cut stays concerning 11-20% (5,6). Morbid obesity is the significant patient-related risk factor for the growth of incisional hernias, with an occurrence ranging from 25 to 50 % in large testimonials (7, 8). Incisional rupture is just one of one of the most usual late issues of open bariatric surgical procedure and also often needs medical repair service. It is a trouble of economic and medical significance (9). Laparoscopic bariatric surgical procedure has considerably decreased the risk for incisional ruptures in randomized studies (6,10) but the occurrence of complications such as digestive tract blockage, stomach hemorrhage, and also stomal stenosis were enhanced in a review of a number of researches consisting of 3,464 patients (11). Abdominal wall surface closure after midline cut is among the significant issues in open bariatric surgical treatment. Wound failing through postoperative hernia stays a significant problem causing serious issues (12). Some research studies show that particular laparotomy closure methods can decrease the probability of incisional rupture. Nevertheless, also in the very best results, frequency of this incident ranges 5 as well as 15 %, and that frequency raises considerably when patients are checked for a number of years or when factors associated with the laparotomy substantially boost the risk of incisional rupture (13,14). There are couple of released research studies reporting successful use prophylactic mesh for the primary closure of laparotomies in risky patients (15,16). Others utilized it in closure of midline laparotomies in open bariatric surgical procedure in morbidly obese patients with reliable avoidance of incisional rupture development (17).

The aim of this review was to assess the safety and efficacy and evaluate the effectiveness of incisional hernia prevention during open bariatric surgery by using mesh replacing procedures.

2. METHODOLOGY

A computerized search was performed using following databases (Embase, Medline, Web-of- Cochrane, CINAHL) on March, 2017. Searching evidence concerning with mesh placement for prevention of hernia after bariatric open surgery, we consider only English language articles, with human subjects on our review. Furthermore, we reviewed the references list of each identified article for more evidence to be included in present review.

3. RESULTS

○ Evidence based on Mesh placement preventing the hernia:

Strzelczyk et al. (12, 17) and Currò et al. (18,19) that the use of prophylactic mesh during wound closure in open bariatric surgical treatment considerably decreases the occurrence of incisional hernia growth. In this research study, incisional hernia took place in 28.1 % in the conventionally closed team versus 3.1 % in the mesh team (P value < 1) over a mean follow-up duration of 4 years. Strzelczyk et al. in their very first research study (17) reported incisional rupture occurrence of 18.75 % in the non-mesh group versus 0 in the mesh team after follow-up of 12-- 14 months and an incidence of 21 % versus 0 in their second research study (12) with a mean follow-up of 28 months. Currò et al. in their preliminary study (18) on 50 morbidly overweight patients underwent BPD reported incisional rupture occurrence of 32 % in the traditionally closed group versus 4 % in the mesh team at 1 year follow-up. The very same authors expanded their research study to consist of 95 patients reporting 30 % incidence of incisional rupture in 50 traditionally closed patients versus 4.4 % in 45 mesh-closed patients at a minimal follow-up of 2 years (19). The new point in this research study is the level in which the prophylactic mesh was placed during wound closure that was the preperitoneal room (Figure 1).

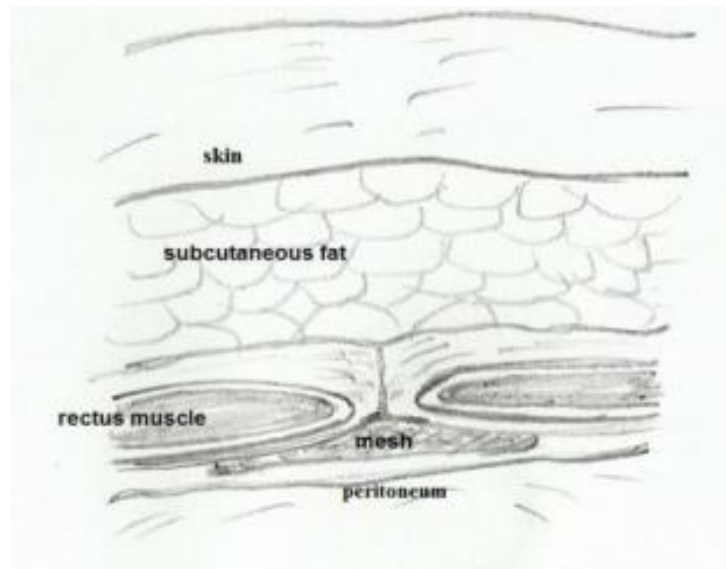


Figure 1: positioning of the mesh in the preperitoneal space

This space was dissected throughout making the cut while the abdominal muscle is still intact, a simpler technique that stays clear of peritoneal lacerations. In their first research, Strzelczyk et al. (17) placed the mesh subcutaneously, but in their later research (12), they put it in the plain in between the rectus muscle mass as well as the posterior rectus sheath and so did Currò et al. in their studies (18,19). The benefits of the preperitoneal area include the following: it is nearly avascular plain so no risk of developing hematoma or mesh-related seroma and also consecutively no need for mesh drain as were performed in the other research studies (12,17, 18,19). It adheres to the concept of Pascal regulation through buttressing the fascial problem from within: the mesh in this plain is not touching sensory nerve terminals so pain is not intensified and also finally it will certainly not impede any esthetic stomach surgery intended later after optimum weight decrease. Utilizing the prophylactic mesh did not boost the injury morbidity in this research where the very early wound-related complications (infection, dehiscence as well as seroma) revealed no statistically substantial distinction in between the mesh as well as the nonmesh groups. Likewise, its positioning did not dramatically prolong the personnel time or the hospital keep as both were nearly comparable in either team as it was reported by Strzelczyk et al. (12,17) as well as Currò et al. (18,19).

○ **Mesh Options availability:**

The Introduction of tissue reinforcement using mesh in hernia repairs has revolutionized the treatment of inguinal, ventral, and incisional hernias, and now repairs utilizing mesh have become the gold standard for parastomal hernias. Mesh options now include many different types of biologic and prosthetic variations (Table 1) (20).

Table 1: Types of mesh available for parastomal hernia repairs

Type of mesh	Material
Vicryl (Ethicon Endo-Surgery, Inc. Cincinnati, OH)	Polyglactin
Gore-Tex (W.L. Gore & Associates, Inc. Newark, DE)	e-PTFE
Marlex (C.R. Bard, Inc. Murray Hill, NJ)	Polypropylene
3D Max (Davol, A BARD Company, Warwick, RI)	Polypropylene
Polysoft (Davol)	Polypropylene
Prolene (Ethicon)	Polypropylene
Surgipro (Covidien, Mansfield, MA)	Polypropylene
Prolite (Atrium Medical Corp. Hudson, NH)	Polypropylene
Trelex (Meadox Medicals Inc. Oakland, NJ)	Polypropylene
Atrium (Atrium)	Polypropylene
Premilene (B. Braun Medical Inc. Bethlehem, PA)	Polypropylene
Parietene (Covidien)	Polypropylene
Parietene Light (Covidien)	Polypropylene
Optilene (B-Braun)	Polypropylene
Mersilene (Ethicon)	Polyester
Safil (B-Braun)	Polyglycolic
Dexon (Syneture (Covidien), Norwalk CT)	Polyglycolic
Composite mesh	
Parietex (Covidien)	Polyester/collagen
Gore-tex Dual Mesh & Dual Mesh Plus (WL Gore)	e-PTFE
Vypro, Vypro II (Ethicon)	Polypropylene/P910
Composix EX, Dulex (Davol)	Polypropylene/e-PTFE
Proceed (Ethicon)	Polypropylene/cellulose (ORC)
Dynamesh IPOM (FEG Textiltechnik, Aachen, Germany)	Polypropylene/PVDF
Sepramesh (Genzyme Corp. Cambridge, MA)	Polypropylene/sodium hyaluronate
Ultrapro (Ethicon)	Polypropylene/polyglecaprone (Monocryl)
Ti-mesh (Pfm Medical, Inc. Cologne, Germany)	Polypropylene/titanium
C-Qur (Atrium)	Polypropylene/omega 3
Biologic meshes	Source tissue
Surgisis (Cook Biotech, West Lafayette, IN)	Porcine (small intestine submucosa)
Fortagen (Organogenesis Inc. Canton, MA)	Porcine (small intestine submucosa)
Alloderm (Lifecell Corp. Bridgewater, NJ)	Human acellular dermis
Flex HD (J&J New Brunswick, NJ)	Human acellular dermis
AlloMax (Davol)	Human acellular dermis
Collamend (Davol)	Xenogenic acellular dermis (porcine/bovine)
Strattice (LifeCell)	Xenogenic acellular dermis (porcine/bovine)
Permacol (Tissue Science Laboratories (Covidien) Hampshire, UK)	Xenogenic acellular dermis (porcine/bovine)
XenMatriX (Davol)	Xenogenic acellular dermis (porcine/bovine)

A. Synthetic Mesh:

The most typical kind of mesh at first utilized was polypropylene. Polypropylene is a completely artificial mesh, whose macroporous structure enables it to affix well to the adjacent cells because of the ingrowth of fibrocollagenous tissue (21). It has the capability to be incorporated right into the indigenous cells, is permanent, as well as has high tensile toughness, thus reducing the reappearance of the hernia. Nonetheless, this ingrowth can additionally cause a considerable inflammatory response triggering extreme attachments and also feasible erosion that might create problems in future operations (22). This kind of mesh is affordable and strong; however, the magnitude of the potential problems has actually restricted its usage (23,24). Expanded polytetrafluoroethylene (e-PTFE) is an alternative synthetic that has also been frequently utilized for parastomal hernia repair service. Unlike polypropylene, e-PTFE has a microporous make-up that does not enable cells ingrowth right into the prosthesis. While this particular assists to decrease the formation of attachments, it could likewise lead to the increase in risk of re-herniation, due to the fact that the mesh will certainly be anchored to the abdominal wall entirely by the stitches placed by the cosmetic surgeon and encapsulation (25,26). Additionally, the microporous structure makes it a lot more vulnerable to infection and also if it becomes contaminated it needs to be eliminated (26). E-PTFE is extremely soft, allowing it to be far better endured in the stomach wall surface and less likely to wear down right into bordering organs (21).

There are currently numerous types of composite mesh typically made from polypropylene as well as e-PTFE, although polyvinylidene cellulose, omega-3, as well as fluoride fatty acid-- covered artificial meshes have also been made use of. Composite mesh incorporates the advantages of the durability of the polypropylene with the safety and security of the e-PTFE. The mesh surface versus the abdominal wall is the nonabsorbable polypropylene mesh that promotes ingrowth and also consolidation, as well as the mesh surface area containing e-PTFE, or comparable material that is nonreactive as well as therefore triggers less attachments, encounters the abdominal components. These composite meshes are not without possible troubles. There are records that attachments may be protected against in the short-term, however not always in the long term (27). It has actually been well recognized in the recent hernia literature that transmittable problems can be devastating. Mesh infection with artificial mesh usually needs mesh explantation, a tough and also potentially extremely morbid treatment. In addition, erosion of mesh right into digestive tract can be disastrous, creating enterocutaneous fistulas as well as risk of sepsis or even worse. When thinking about parastomal rupture repair work, we are, almost by definition, positioning the mesh in contact with bowel, and therefore, for these repairs, the option of a completely synthetic mesh might be hazardous (26,28,29). Among the additional dangers associated with artificial mesh associates with morphologic change with time. Artificial mesh has the tendency to contract over time. This leads to "pulling away" from the periphery, thus lowering the efficient area of reinforcement. In parastomal repair work, where the bowel passes through an opening puncture the mesh, this trephine might also expand, therefore broadening the hole as well as leaving the bowel at risk to reoccurring herniation against a fairly inflexible barrier and producing a "buttonhole" hernia, putting herniated digestive tract in jeopardy for obstruction or disintegration (30,31).

B. Biologic Mesh:

Biologic meshes have become an alternative to artificial support product. Collagen-based biologic grafts were initially presented in the 1980s (32). They are usually made up of an acellular collagen matrix that is gradually degraded and replaced by the cells of the host (33). These are based on the property that healing augmented by a biologic mesh will certainly be a lot more long lasting than primary repair work alone, in addition to avoiding the security challenges associated with synthetic mesh and also the threats of disintegration. Examples of these grafts are originated from human dermis, porcine dermis, porcine tiny intestinal submucosa, as well as bovine pericardium. Various kinds of treatments of the mesh, such as repairing or cross-linking, are created to increase stamina, and also longevity could impact their strength and also rate of bioactivity. Theoretically, because of their biocompatibility, when implanted they are vascularized and result in movement of host cells, consequently in theory making them much less prone to infection (33). Biologic mesh was anticipated to have reduced infection rates, it appears that rates of complications have actually been comparable to artificial mesh. It has actually been located that cross-linking as well as chemical treatments that strengthen these biologic meshes additionally reduce their bioactivity. A retrospective testimonial, consisting of four research studies with a combined enrollment of 57 patients who went through parastomal hernia repair using biologic mesh, discovered a recurrence rate of 15.7% and a wound-related difficulty price of 26.2% without graft infections reported (33). In general, biologics are soft and also pliable which may decrease the opportunity of discomfort as well as disintegration. Among the most considerable barriers to bigger use the biologics is expense: one item can cost several countless bucks (33).

○ **Mesh Placement Options:**

There are different alternatives for positioning of the mesh about the stomach wall fascia. These consist of positioning over the fascia (onlay technique), listed below the anterior fascia and also muscular levels, however over the posterior sheath/peritoneum, referred to as a sublay, or underlay, or the intraperitoneal technique in which the mesh is put listed below all fascial degrees. In all situations of parastomal hernia repair work, the fundamental tenets entail decrease of the hernia, excision of the rupture cavity, reapproximation of the hernia problem around the bowel, and positioning of mesh to sustain the repair (20,21). The onlay repair includes the placement of mesh over a primary fascial fixing. The academic benefit of this method is that it is a regional fixing that might prevent the morbidity of a prolonged open abdominal surgery. Patients do not have to go through the extensive abdominal wall surface dissection to develop airplanes where to put the mesh that are needed for the other strategies. On top of that, patients have a quicker recuperation as well as, because there may be no demand for one more stomach cut, they are not in jeopardy of an incisional rupture. A negative aspect is that intra-abdominal stress may displace the mesh potentially clarifying its higher reappearance rates, reported as high as 18.6% (21). One more negative aspect of this repair service is that it in theory has actually an increased risk of infection as it remains in close distance to the polluted ostomy opening; nonetheless, information suggest that its infection prices resemble various other mesh fixings (21).

One of the most usual mesh repair works are performed in the sublay and intraperitoneal positions that place the mesh below the anterior fascia. The advantage of a sublay fixing is that it is executed in a sterilized environment with a reduced risk of wound infection. Sublay and intraperitoneal placement of the mesh gives a lot more biomechanical support due to the stomach pressure better protecting the mesh to the stomach wall. While the sublay repair safeguards the mesh from communication with stomach organs, the intraperitoneal setting poses a boosted risk for digestive tract disintegration and also adhesion development. In the intraperitoneal repair, care must be required to take full advantage of cells apposition in between the mesh and the abdominal wall to reduce the formation of seroma. This consists of liberal use of closed suction drains placed between the mesh as well as the stomach wall. Hansson as well as associates performed a methodical review of surgical techniques for parastomal hernia repair work that entailed an overall of 35 research studies, where they found that, although not statistically significant, the onlay strategy had the greatest recurrence price and also the intraperitoneal had the most affordable (21).

4. CONCLUSION

Hernia formation after surgical procedures remains to be an essential source of medical morbidity. Incisional reinforcement at the time of the initial procedure has been utilized in some patient populations to minimize the risk of succeeding rupture formation. Proof sustain the prophylactic prosthetic injury enforcement in open bariatric surgical treatment that defend against incisional hernia development without considerable difference in mean operative time, wound-related issues, or health center keep. Also, the preperitoneal level is the most effective and most physiological site for its placement with no demand for drain and not impeding any type of aesthetic stomach surgical procedure prepared later on after maximum weight decrease, so broadening the schedule and extending the quantity of bariatric surgery.

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