

# A retrospective study on mesh repair alone vs. mesh repair plus pedicle flap for large incisional hernias

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**Abstract. – OBJECTIVE:** Our experience with the treatment of large incisional hernias (IH) was reviewed comparing mesh repair alone vs. mesh repair plus pedicle flaps.

**MATERIALS AND METHODS:** A retrospective study was performed on patients treated between 2001 and 2005 that underwent component separation technique (CST) repair with polypropylene mesh alone or with polypropylene mesh and local “pedicle” dermal flaps. The primary outcome evaluated was the recurrence rate, secondary outcomes the complication rate, hospital stay and reoperation rate.

**RESULTS:** Forty-eight patients were reviewed. Six patients (13%) developed an IH recurrence, two of them (4%) required secondary repair. CST combined with prosthetic mesh repair and pedicle flap was performed in 19 patients (39.6%) while CST combined with mesh repair alone in 29 patients (60.4%). The duration of surgery, hospitalization, postoperative complications as well as long-term results were similar.

**CONCLUSIONS:** Dermal pedicled flaps obtained through deepithelization of redundant skin following corrections of large incisional hernias are a safe, relatively easy and effective technique that allows reliable soft tissue coverage of the abdominal submuscular mesh.

*Key Words:*

Incisional hernia, Component separation technique, Polypropylene mesh, Pedicle flap.

## Introduction

Large Incisional Hernias (IHs) are defined as eviscerations greater than 15-20% of the abdominal content<sup>1</sup>. Risk factors include abdominal wall neoplasms, Crohn’s disease, cutaneous wounds, history of orthotopic liver transplantation (OLTx), previous radiotherapy<sup>2</sup>, repeated abdominal operations and immunosuppressive drugs

(especially steroids). Their repair is usually challenging for both the general and the plastic surgeon and preoperative choices of specific repair techniques made according to the patient’s clinical conditions must be re-evaluated intraoperatively after the reduction of the hernia content and the evaluation of the local tissues.

Some guidelines exist with basic indications regarding the techniques to be adopted<sup>3,4</sup>. When enough healthy tissue is available, an autologous open suture repair (approximation of the muscular wall edges – primary suture of the anterior rectus abdominis fascia or Da Silva technique) should be preferred for its simplicity compared to the other techniques<sup>5</sup>. Furthermore, specific indications involve defects which are not large enough to prevent tension-free closures, the preservation of the abdominal wall structures and definitive contraindications to the use of prosthetic mesh (i.e. contamination of the operative field or further operations anticipated)<sup>6</sup> although the recent use of combined biologic/synthetic meshes has increased their use<sup>7</sup>. The Component Separation Technique (CST) partially overcome the limitations for the autologous repair as it repairs defects up to 20 cm wide by producing greater amount of muscular tissues<sup>8,9</sup>. However, the technical difficulty and the considerable morbidity are still limiting its widespread use<sup>8,9</sup>. Finally, a third common type of repair involve the use of prosthetic meshes especially in cases of muscular deficits that are greater than 6 cm. Polypropylene meshes are common but polytetrafluoroethylene meshes are still preferred when the remaining peritoneum cannot prevent the direct contact between the mesh and the intrabdominal contents. Meshes can be placed with an onlay (Chevrel)<sup>10</sup>, inlay<sup>11</sup> or sublay (Rives-Stoppa) technique<sup>12</sup>. The retromuscular sublay tech-

nique gives the best results in terms of recurrences rates<sup>1,13</sup> but is technically more challenging and produces higher complication rates due to the muscular gap over the uncovered mesh. To obviate this issue the prosthetic mesh may still be covered by free fascial transplants, autodermal grafts and pedicle or free vascularized myofasciocutaneous flaps (tensor fasciae latae, rectus femoris and latissimus dorsi)<sup>4,14</sup>. Dermofat pedicled flap, derived from the naturally expanded cutaneous mantle covering the hernia, represents another option for covering the mesh<sup>15</sup>. To the Authors' best knowledge there is no mention in the literature on the use of local adipodermal flaps for this indication.

In this retrospective study we reviewed our caseload with the treatment of large IHs comparing mesh repair alone vs. mesh repair plus pedicle flaps to evaluate if this addition conferred significant advantages in terms of recurrence rates, complications, hospital stay and reoperations rates.

## Materials and Methods

A retrospective study was performed on patients treated for large IHs at the Department of Plastic, Reconstructive and Aesthetic Surgery of the University Hospital of Turin between 2001 and 2005. The inclusion criteria consisted in the repair of large IHs using CST with polypropylene mesh alone or CST with polypropylene mesh and local "pedicle" dermal flaps. Patients who required surgery to treat a recurrence or those that used different techniques from those considered (i.e. pedicle flaps alone) were excluded.

### Preoperative Care

All patients underwent an ultrasound scan of the abdominal wall or a computed tomography (CT) scan in case of significant substance loss. Pre-operative lung function tests and respiratory physiotherapy were also performed in patients with one or a combination of the following criteria: diagnosis of large incisional hernia, BMI greater than 23.9 in female and 25 in male and history of chronic obstructive pulmonary disease (COPD). A single intravenous dose of broad-spectrum antibiotic (Cefazoline 1 g intravenous) was administered 30 minutes before surgery as antibiotic prophylaxis and low molecular weight heparin (4000 to 6000 IU

subcutaneous, depending on the patient's weight) as antithrombotic prophylaxis 12 hours preoperatively.

### Surgical Techniques

The abdominal wall reconstruction was performed with CST with polypropylene mesh and local "pedicle" dermal flap or CST with polypropylene mesh alone. Areas of the hernia defects were calculated by the intraoperative measuring of the long and short diameters and using the formula of an ellipsoid area.

The skin incision was carried out through either the previous scar or with a classical abdominoplasty incision. Anatomic preparation of the layers started with a superficial dissection of the skin and subcutaneous tissue to expose the recti abdominis and the external oblique muscles. The dissection was extended up to the anterior axillary lines laterally and to the costal arches and the xiphoid process cranially. In cases where the abdominal wall gap was less than 6 cm wide a retromuscular dissection was conducted anteriorly the posterior rectus abdominis fascia. In those patients where greater gaps were present then the external oblique muscles were separated from the rectus abdominis and detached from the internal oblique muscles too. This last procedure produced an additional advancement of approximately 4 cm in the upper abdomen, 8 cm at the waist and 3 cm in the lower abdomen (CST technique)<sup>9</sup>. When not contraindicated for the high risk of infections or expected further laparotomies (i.e. Crohn's disease) a polypropylene mesh (Premilene<sup>®</sup> Mesh, Aesculap AG Am Aesculap-Platz 78352 Tuttlingen, Germany) was positioned using the retromuscular sublay technique<sup>12</sup>.

If a complete approximation of the muscular edges was still not feasible despite the CST and an excessive cutaneous mantle was available, a local dermal flap was performed. Depending on the localisation of the excessive cutaneous mantle a cranially, caudally or laterally pedicle dermal flaps were obtained by marking out an appropriate strip of skin at the margin of the defect, de-epitheliasing it and suturing it to the anterior fascia of recti abdominis muscles with 2/0 slowly-absorbable suture (Figures 1 to 3). If the cutaneous mantle was either not available, in poor conditions (scar tissue, radiotherapy) or the gap was still too large a pedicle or free muscular flap was performed. The navel was sacrificed in cases of interferences with the muscle approximation.

An elastic-compressive dressing with a retentive garment was finally placed.

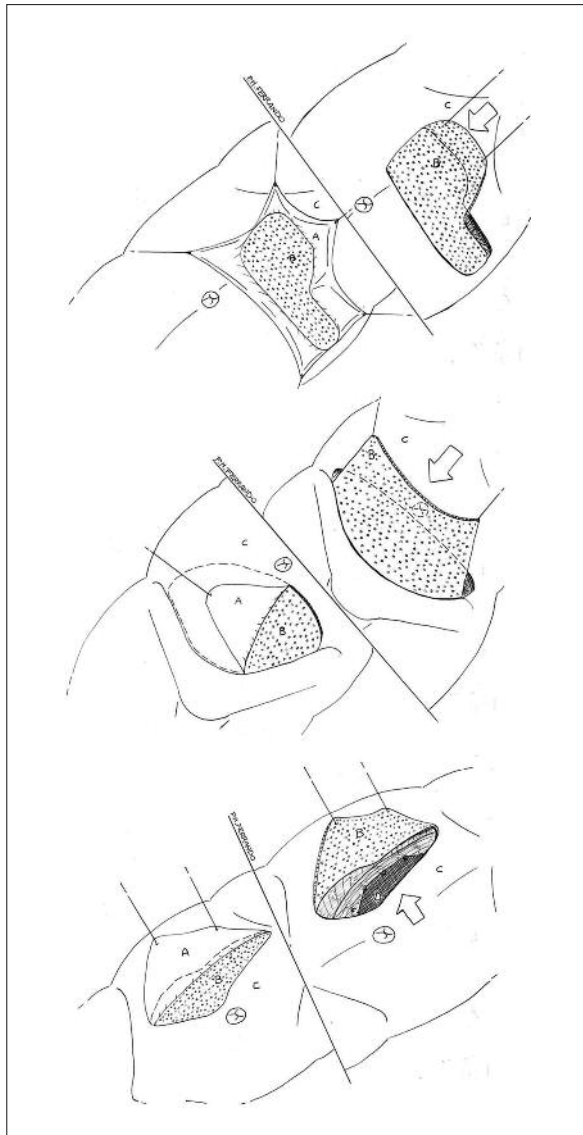
The primary outcome evaluated in the study consisted of the recurrence rates. Secondary outcomes were the complication rate, the hospital stay and the reoperation rate and any eventual differences among groups.

**Statistical Analysis**

All data analysis was performed using the Statistical Package for the Social Sciences Windows, version 13.0 (SPSS Inc., Chicago, IL, USA). Descriptive statistics consisted of the mean ± standard deviation for parametric distributions after



**Figure 2.** Sixty-five years old patient with large incisional hernia after abdominal aorta aneurism surgery: reconstruction with CST, prosthetic repair and caudally pedicle dermal flap. Preoperative (upper panel) and 1-year postoperative view (lower panel).



**Figure 1.** Types of flaps used: subcostal transverse dermal flap: suprapubic dermal flap: paramedian dermal flap.

confirmation with histograms and the Kolmogorov-Smirnov test and frequencies for categorical variables. Comparisons for groups homogeneity has been verified with Student's *t* test for parametric variables and with the Chi-Square or Fisher's exact test when counts in cells were inferior to 5 for categorical variables. A *p* value of < 0.05 was considered statistically significant.

**Results**

Forty-eight patients were reviewed in the study period. Demographic and clinical charac-



**Figure 3.** Fifty-four years old patient with large incisional hernia after bowel resection for abdominal trauma: reconstruction with CST and prosthetic repair. Preoperative (upper panel) and 2-years postoperative view (lower panel).

teristics are reported in Table I. The follow-up period ranged between 4 and 9 years after IH repair. Six patients (13%) developed an IH recurrence, two of them (4%) required secondary repair. Eight patients complained about some discomfort related to the postoperative complications that settled within few months. There was no significant long-term morbidity. No significant differences were observed in terms of complications and recurrences among patients receiving immunosuppression versus those that did not.

### Subgroup Analysis

CST combined with prosthetic mesh repair and pedicle flap was performed in 19 patients

(39.6%) while CST combined with mesh repair alone in 29 patients (60.4%). No significant differences were found among groups regarding age, sex, BMI, causes and localization of the IH and the area repaired (Table I). The duration of surgery, hospitalization, postoperative complications as well as long-term results were also similar (Chi-Square and Fisher's exact test,  $p = NS$ ). After surgery one patient of the mesh alone repair group was admitted to the intensive care unit (ICU) for 5 days due to pulmonary atelectasis. In the group of prosthetic mesh repair and pedicle flap two seromas (11%) occurred on the 11<sup>th</sup> and 12<sup>th</sup> day postoperative day and were treated with drainage puncture and specific an-

**Table I.** Demographics and clinical characteristics of patients analyzed.

	All patients (n = 48)	Mesh and pedicle flap (n = 19)	Mesh alone (n = 29)	p
Age (years)	47 ± 5	48 ± 4	46 ± 6	NS
Sex (males)	36 (75%)	15 (79%)	21 (72.4%)	NS
BMI (kg/m <sup>2</sup> )	27.0 ± 2.7	27.0 ± 2.8	27.0 ± 2.7	NS
<b>Comorbidities:</b>				
Diabetes	23 (48%)	10 (53%)	13 (45%)	NS
Obesity	15 (31%)	7 (37%)	8 (28%)	
<b>Initial surgery:</b>				
OLTx	21 (44%)	8 (42%)	13 (45%)	NS
Hemicolectomy	4 (8%)	2 (11%)	2 (7%)	
Repair of abdominal aortic aneurysm	4 (8%)	1 (5%)	3 (10%)	
Hysterectomy	3 (6%)	2 (11%)	1 (3%)	
Trauma	3 (6%)	1 (5%)	2 (7%)	
Crohn's disease (multiple operations)	1 (2%)	1 (5%)	0	
Prostatectomy	2 (4%)	1 (5%)	1 (3%)	
Cholecistectomy	2 (4%)	1 (5%)	1 (3%)	
Gastrectomy	2 (4%)	1 (5%)	1 (3%)	
Peritonitis	2 (4%)	0	2 (7%)	
Hepatectomy	2 (4%)	1 (5%)	1 (3%)	
Cystectomy	1 (2%)	0	1 (3%)	
Oophorectomy	1 (2%)	0	1 (3%)	
<b>Immunosuppressive therapy:</b>				
Cyclosporine/Mycophenolate/Prednisolone	21 (44%)	8 (42%)	13 (45%)	NS
Azatyoprine/Prednisolone	1 (2%)	1 (5%)	0	
<b>Localization of the incision/hernia:</b>				
Subcostal	24 (50%)	10 (53%)	14 (48%)	NS
Midline	15 (31%)	5 (26%)	10 (35%)	
Paramedian	9 (19%)	4 (21%)	5 (17%)	
Incisional hernia area (cm <sup>2</sup> )	274 ± 104	279 ± 118	270 ± 96	NS
Duration of surgery (min)	217 ± 34	212 ± 40	220 ± 30	NS
Hospitalization	11 ± 3	10 ± 3	11 ± 3	NS
<b>Complications:</b>				
Hematoma	4 (8.0%)	2 (11%)	2 (7%)	NS
Seroma	2 (4.0%)	0	0	
Dehiscence	2 (4.0%)	0	2 (7%)	
Recurrence (requiring surgery)	2 (4.0%)	0	2 (7%)	NS

OLTx: Orthotopic liver transplant. Diabetes: type 2 diabetes mellitus. Immunosuppressive regimens: Cyclosporin 1 mg/kg/day, Mycophenolate 1000 mg/day and Prednisone 10 mg/day or Azathioprine 1 mg/kg/day and Prednisone 25 mg/day.

tibiotic therapy based on bacteriological assay of the serum aspirated. In the group of mesh repair alone two suture dehiscences (7%) occurred on the 7<sup>th</sup> and 9<sup>th</sup> postoperative day due to vascular necrosis of the wound edges and were treated with vacuum assisted closure (V.A.C.<sup>®</sup> therapy, Kinetic Concepts, Inc, P.O. Box 659508, San Antonio, TXs, USA) for approximately 15 days. Two hematomas occurred on the 8<sup>th</sup> and 9<sup>th</sup> postoperative day for the group of mesh with pedicle repair (11%) and on the 8<sup>th</sup> and 12<sup>th</sup> postoperative day for the mesh alone (7%). All of them were treated with aspiration. No prosthesis was removed. Four patients (8%) presented an IH recurrence during follow-up that consisted in a mild and asymptomatic IH on the median line. These did not require any further surgical treatment. Only two OLTx patients in the group of mesh alone repair (7%) developed recurrent hernias that required a reoperation. They presented a large recurrence on the paramedian line approximately 18 and 20 months after the reconstruction and a local pedicle dermal flap was necessary to cover the exposed mesh.

### Discussion

It is proven that the sublay positioning of the mesh is critical to obtain good results in the most complex cases of large incisional hernias, but unfortunately sometimes achieving a complete, healthy and possibly muscular coverage of the mesh may be challenging because of the paucity of local soft tissues. The Authors' technique with dermal flaps showed that a completion of mesh coverage could be obtained with dermal flaps from the cutaneous excessive tissue that would otherwise be resected. Large abdominal hernias often cause cutaneous redundancy, especially when the disease is long-standing and a skin-expansion-like effect is present. Based on the established ground of body contouring and abdominal plastic surgery it is common knowledge that wide dissections and subcutaneous underminings of the abdominal region are usually safe in terms of viability of the resulting flaps. This principle can be usefully applied to the challenging topic of abdominal wall reconstruction. Large, redundant flaps of skin, after hernias have been reduced, may represent robust adjuncts to the recreation of abdominal wall competence instead of being discarded. Their quick

and easy deepithelization contributes to the preservation of the vascular network that provides them with a reliable blood supply. No necrosis of flap occurred in our series and no wound dehiscence was noticed. The main outcome measure of recurrence showed to be similar in the two groups, CST repair with polypropylene mesh alone or with polypropylene mesh and local "pedicle" dermal flaps. The addition of a dermal flap to the polypropylene mesh technique proved to be safe and effective. With these dermal flaps, the necessity of complex muscular transfers, either pedicled or through free flaps is usually avoided as redundant skin is frequently available. The preservation of dermis makes these cutaneous flaps robust and solid enough even if no muscular tissue is present. The operation, hospitalization times and complications are obviously diminished when dermal flaps are used instead of complex muscular or myocutaneous transfers.

### Conclusions

Dermal pedicled flaps obtained through deepithelization of redundant skin following corrections of large IHs are a safe, relatively easy and effective technique that allows reliable soft tissue coverage of the abdominal submuscular mesh. In this situation dermal flaps may replace the far more complex muscular and myocutaneous transfers with obvious advantages in terms of simplicity, duration and risks of surgery and hospitalization.

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