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Tissucol Application in Dermolipectomy and Incisional Hernia Repair

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Biological adhesives have a lot of applications in surgical procedures. Here we present a prospective study with the aim of analyzing results of the application of Tissucol between the muscle layers and subcutaneous tissue after incisional hernia repair with polypropylene mesh and associated dermolipectomy. We assess clinical and technical parameters, local morbidity, and hospital stay. Fifty-six patients were divided into two groups. Patients with whom we used fibrin glue were older, with more obesity ($P < 0.005$) with associated diseases, and their incisional hernias were larger and more complicated to repair. Patients in the Tissucol group developed less local morbidity (hematomas or abscesses; $P < 0.01$), had a shorter mean hospital stay ($P < 0.01$), and required less wound care. The use of Tissucol improves the results of surgical repair of large abdominal incisional hernias repaired by mesh placement and dermolipectomy, and it decreases global morbidity and hospital stay are reduced.

Key words: Tissucol – Fibrin glue – Tissue adhesive – Incisional hernia – Mesh repair – Prosthesis – Dermolipectomy

Biological adhesives have been introduced as substitutes for sutures in ophthalmology,[1] vascular surgery,[2] gastrointestinal surgery,[3] and plastic surgery.[4] Other authors[5] have described the use of fibrin glue as an adhesive in incisional hernia repair. In 1997, Chevrel and Rath[6] published a study demonstrating that the application of fibrin glue improved the consolidation between the deep muscle layer, where the mesh is placed, and the subcutaneous tissue. Persistence of cavities within the muscle layer encourages fluid collection, which in turn causes hematomas, seromas, and abscesses in up to 23% of cases;[7] therefore, any procedure that prevents free spaces would partially eliminate these complications.

We performed a prospective randomized study with cost benefit analysis to evaluate the clinical and economic advantages of using fibrin glue (Tissucol) in incisional hernia repair with associated dermolipectomy. We assessed the role of Tissucol in reduc-

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tion of local complications, hospital stay, and postoperative wound cure.

Patients and Methods

From March 1996 through June 2001, 60 patients with incisional hernia repair and associated dermolipectomy were included in the prospective and randomized study. Patients were included if they had a large incisional hernia (transverse diameter over 10 cm) along the midline or lateral abdominal wall (Fig. 1), surgical repair with a polypropylene mesh placed in a retromuscular-prefascial location according to the technique of Rives *et al*,[8] and associated dermolipectomy for proper cosmetic wall repair, with umbilicus restoration or reconstruction if it was necessary.

Sixty patients were divided into two groups: the first group of 30 cases did not use Tissucol (group I), and the second group of 30 cases used Tissucol (group II). The technique used for incisional hernia repair was the same in all 60 cases. In all but four cases, we performed a transverse suprapubic incision, in which the incision was supra-infraumbilical, and dermolipectomy. The incisional hernia and aponeurotic defect were repaired by retromuscular-prefascial placement of polypropylene mesh fixed by stitches of the same material or stapler, according to the technique of Rives *et al* (Fig. 2).[8] Transdermal sutures were not used. The anterior rectus fascia was closed with absorbable sutures, using the principle of tension-free repair. In some cases, Clotteau-Prémont–relaxing incisions were required. When the aponeurotic defect was very large, the free edge was loosely sutured to the mesh.

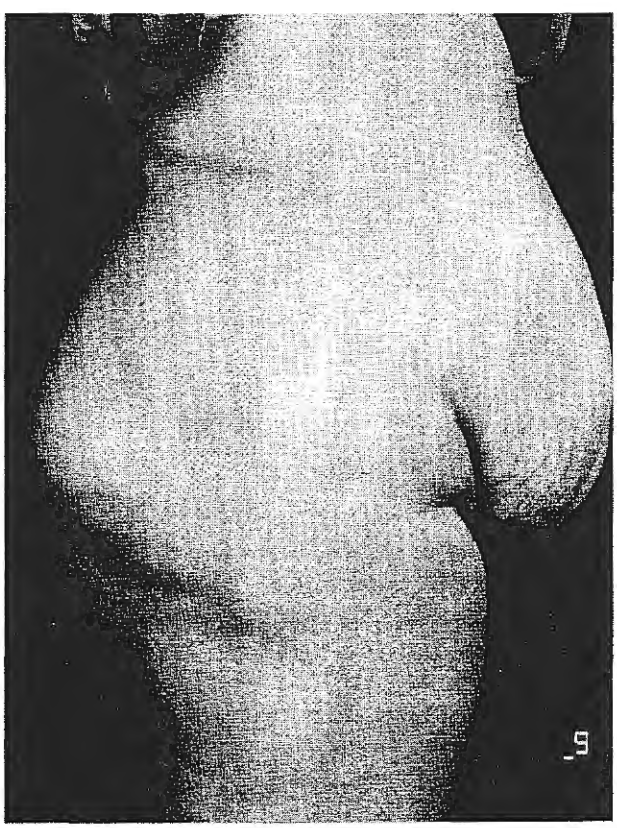

Fig. 1 Female patient with a large abdominal incisional hernia.

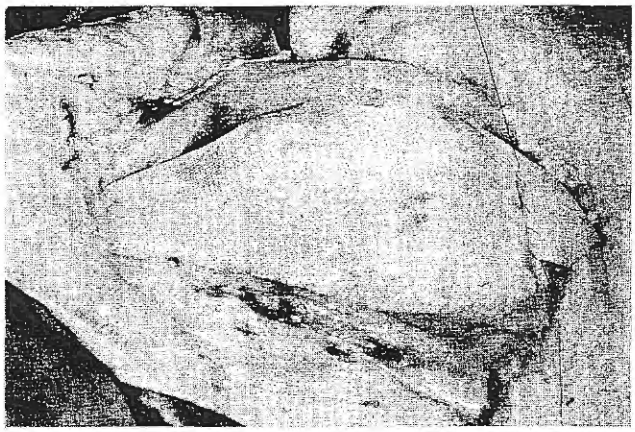

Fig. 2 Hernia repair with the technique of Rives *et al*[8] (polypropylene mesh).

Suction drains were placed on the mesh and in the subcutaneous tissue and were removed when their output was less than 40 ml per 24 hours. After careful hemostasis, subcutaneous tissue was closed with absorbable suture, and the skin was closed with nonabsorbable ones. The umbilicus was restored or reconstructed as determined by cosmetic requirements. For the first 24 hours the surgical wound was covered with a pressure abdominal bandage, after which it was covered with a tubular elastic wrap for 3 months.

Antibiotic prophylactics with first-generation cephalosporin were administered and were continued from 24 to 48 hours if a contaminated procedure was associated. Antithrombotic prophylactics with subcutaneous enoxaparin (20–40 mg/day depending on the weight of the patient) were also administered.

In group II, a vaporization of Tissucol with a Tissomat mechanism and Duplojet system was applied over the subcutaneous tissue and the muscle layer after hemostasis was achieved (Fig. 3). It is

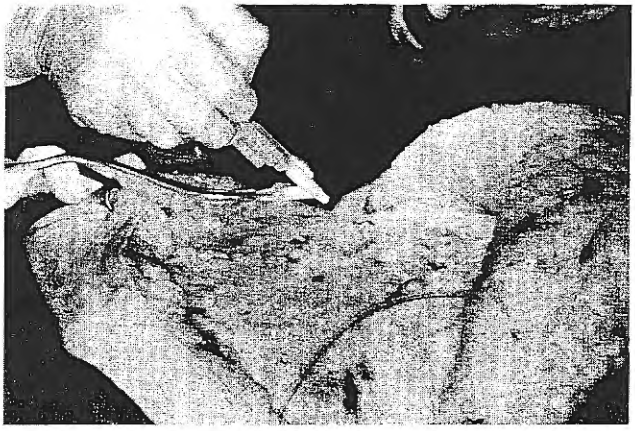

Fig. 3 Spray Tissucol application in the subcutaneous tissue over the mesh after dermolipectomy.

important to apply abdominal pressure to help them to adhere.

In this study, we analyzed sex, age, associated diseases, obesity (BMI), number of previous surgeries, number of surgical reparations of the hernia in the past, and number of treatments with mesh. The dermolipectomy weight, size of the placed mesh, anatomical position, associated surgical procedures, morbidity, blood transfusion, hospital stay, hernia recurrence, the amount of fibrin glue used, and cost of the fibrin glue were also analyzed. The costs were as follows: 1 ml of Tissucol, US$51 (E60); 2 ml of Tissucol US$90 (E105); daytime hospital stay in a surgical bed, US$256 (E301); and one unit of blood transfusion, US$61 (E72).

A statistical study was performed using the SPSS program. Quantitative variables were expressed by mean ± SD (Student *t*-test), qualitative variables were analyzed by using the chi-square test, and $P < 0.05$ was considered significant.

Table 2 Surgical history of the patients

	Group I	Group II
Bariatric surgery	18	2
Gynecologic surgery	10	16
Cholecystectomy	6	3
Appendectomy		2
Gastric surgery	2	1
Colorectal surgery		8
Abdominal wall surgery	2	7
Hepatic resection		1
Total	38 (1.2 procedures/ patient)	39 (1.3 procedures/ patient)

Results

Clinical data are shown in Table 1, and the surgical history of the patients is shown in Table 2. Fifteen subjects (50%) in group I had associated surgical procedures, including cholecystectomy[7] and hepatic biopsy,[8] and 11 subjects (36.6%) in group II had associated surgical procedures, including adhesiolysis,[6] cholecystectomy,[1] left colectomy,[3] and mammary reconstruction.[1] There were significant differences between the two groups with respect to the degree of contamination associated with the procedure, because in group II, three colon resections were performed.

In group I, the umbilicus was restored to its position in 9 patients, reconstructed in 2 patients, and not modified in 15 patients; it was necessary to perform two omphalectomies. In group II, the umbilicus was restored to its position in 10 patients, reconstructed in 5 patients, and not modified in 10 patients; it was necessary to perform three omphalectomies.

The average amount of Tissucol applied was 1.9 ml/patient (range, 1–4 ml/patient); a total of 55 ml

Table 1 Clinical data of the patients

	Group I	Group II	*P*
Patients	30	30	
Average age (range)	49.6 years (32–72)	56.9 years (28–74)	<0.005
Sex	28 women/2 men	28 women/2 men	
Associated Diseases	20 (66.6%)	23 (76.6%)	1
Arterial hypertension	7	11	
Morbid obesity (BMI > 30%)	6	16	<0.005
Diabetes mellitus	4	4	
Hypothyroidism	2	3	
Pulmonary disease	3	4	
Cardiac disease	2	2	
Anticoagulant therapy	1	1	
Neoplasm	1	6 (20%)	<0.1
Others	8	8	

Table 3 Parameters of the technical complexity about hernioplasty

	Group I	Group II	*P*
Dermolipectomy weight (g; range)	2.310 ± 1.190 (650–5.500)	1.110 ± 850 (450–3.000)	<0.001
Recidivated	6.6%	33.3%	<0.001
Previous mesh	0	26.6%	<0.001
Supra-infraumbilical hernia	13%	80%	<0.001
Prefascial mesh	0	36.6%	<0.0001
Mesh size (cm^2)	538	946	<0.05

was used in all patients. Technical results, including the weight of the tissue removed during dermolipectomy, are shown in the Table 3.

Postoperative morbidity was 46.6% in group I and 20% in group II (Table 4). In terms of local morbidity, there was a significant difference in the presence of wound infection and hematomas between the two groups. Four patients in group I needed blood transfusions because of hematomas; no blood transfusions were needed in group II ($P < 0.001$). The average transfusion was 2.7 units/patient (range, 2–4 units/patient). Seven patients in group I (23.3%) required wound care for 3–9 months until their wounds were completely healed, and 1 patient had to be readmitted for 23 days because of wall infection. In group II, 2 patients required wound care for 1 month. One patient developed an abscess and was readmitted for 1 month because the symptoms persisted. It was not necessary to remove any of the mesh implants.

General morbidity was similar in both groups; 2 patients (6.6%) had complications. There was one case of phlebitis and one case of urinary infection in group I and one case of postspinal headache and one case of respiratory infection in group II. Total morbidity occurred in 16 patients (53.3%) in group I and in 8 patients (26.6%) in group II. There was no postoperative mortality.

The average hospital stay was 12.6 days in group I (range, 4–27 days) and 7.1 days in group II (range, 2–30 days), with a statistically significant difference ($P < 0.01$). Follow-up of 93.3% of the patients was 3 to 48 months (average, 24.6 months). There have been two hernia recurrences in group I at 30 and 42 months and one recurrence in group II at 20 months. There has been no morbidity or secondary effects attributable to Tissucol in group II patients.

Economical aspects are shown in Table 5. We used the same cost for the technical requirements of incisional hernia repair (mesh, time of surgery, drains, cost for personnel and surgeons, etc.) in both groups; the only differences are Tissucol application, blood transfusion, and hospital stay.

Discussion

Hematomas secondary to the detachment of the superficial layers are common in incisional hernia repair, with rates up to 18%[9] or 23%,[7] depending on the study. The incidence increases when dermolipectomy is also performed, because the area of dissection is greater. Although hematoma occurrence rate decreases to 5.3% when mesh is not employed, recurrence rate increases.[10] For this reason, the placement of suction drains on the mesh and in the subcutaneous tissue is recommended to avoid fluid collection.[11] Needle aspiration is also very useful in the management of large seromas or hematomas, but tissue manipulation promotes infection. The development of hematomas or seromas delays the adhesion of the mesh to the tissues and produces fibroblast colonization, which can lead to rejection.[12]

The application of fibrin glue to enhance mesh adhesion to subcutaneous tissue[5,6] reduces local

Table 4 Local morbidity

	Group I	Group II	*P*
Abscess wall/cellulitis	6 (20%)	1 (3.3%)	<0.01
Seroma	2 (6.6%)	3 (10%)	1
Hematoma	6 (20%)	2 (6.6%)	<0.01
Blood transfusion	4		<0.001
Total	14 (46.6%)	6 (20%)	<0.01

Table 5 Economical study

	Group I	Group II
Hospital stay	US$81,334 (E97,524)	US$65,536 (E77,056)
Blood transfusion	US$671 (E792)	—
Tissucol spray	—	US$2,646 (E3,090)
Total cost	US$82,005 (E98,316)	US$68,182 (E80,146)

morbidity to 10.9%. However, the latter study does not specify the percentage of patients with morbid obesity and technical characteristics.

Cyanoacrylate adhesives have been applied in fixation of the mesh in laparoscopic hernia repair.[13]

Follow-up studies have not identified any secondary effect or morbidity attributable to the adhesives. Chevrel and Rath[6] have observed a development of seromas when more than 4 ml of fibrin glue is applied and therefore they advise the application be 2 ml or less.

In our series, the rate of local infection in group I was 20%, similar to that reported in the literature when the degree of obesity is taken into account.[14] Obesity is considered a high-risk factor for wall infection.[15] In fact, the only case of abscess in group II (3.5%) occurred in a patient with contaminated surgery. In this patient, we performed jejunoileal bypass to convert Salmon's technique to Scopinaro's procedure after partial failure of the former in the treatment of morbid obesity.

Although dermolipectomy has inherent morbidity, we believe it is necessary to get the best possible cosmetic results. Many of these have lost weight after bariatric surgery, and dermolipectomy weight is larger in patients without fibrin glue. Others patients are obese, as in group II, and have a large layer of fat that hinders eventrations repair.

Antibiotic prophylactics were routinely used because the combination of obesity and dermolipectomy involving prosthesis placement is considered an indication for its administration.[16] When potentially contaminated surgery (intestinal suture, appendectomy, colectomy, etc.) was simultaneously carried out, the antibiotics were maintained for 24 to 48 hours.

As with other authors,[17] we consider that infections associated with mesh repair must be primarily managed by local wound care and antibiotics rather than with the immediate prosthesis removal.

There was also a reduction in the drainage amount and the number of days of drainage in group II. These factors facilitated early hospital discharge. In the future, the number of drains could be reduced or eliminated, although Chevrel and Rath[6] observed a correlation between complications and the absence of drainage when using Tissucol. The mean hospital stay was 12.6 days (range, 2–67 days) in group I and 7.1 days (range, 2–30 days) in group II with a significant difference ($P < 0.001$). The number of ambulatory visits for wound care was also reduced in group II (6.6%) compared with group I (23.3%). This reduction is a direct consequence of the lower rate of local complications, and this difference is important from a clinical point of view and is statistically significant.

Fixation of the prosthesis and subcutaneous tissue with Tissucol during incisional hernias improves results because fibrin glue allows immediate fixation, which prevents hematomas and infections.

Patients in the Tissucol group were older, with more previous neoplasm. Obesity was an important factor in the group because more than 50% of the patients in group II had a BMI > 30 kg/m^2 ($P < 0.05$). This group had many cases of recurrent abdominal hernias with previous mesh and supra-infraumbilical extension ($P < 0.001$). Hernias in patients in group II were more difficult to repair because 34% were recurrences, and a prefascial mesh was placed ($P < 0.0001$) and its size was bigger ($P < 0.05$). We consider prefascial location to be worse than retromuscular prefascial location because the mesh is near subcutaneous tissue, and the possibility of infection is increased.

For these reasons, patients in group II were more prone to complications; however, the rate of local morbidity was smaller (20% versus 46.6%), and hospital stay was reduced from 12.6 days to 7.1 days ($P < 0.01$).

Conclusions

This study proves the efficiency of Tissucol in the prevention of hemorrhagic collections and abscesses in incisional hernia repair with associated dermolipectomy. We conclude that Tissucol application can be recommended because it has several benefits that result in health care savings. Tissucol application reduces the incidence of local morbidity by 50%, lessens the severity of complications, shortens hospital stay by 50%, and lessens the amount of postoperative wound care needed. This procedure reduced the cost of the surgery, and 80% of the patients in the Tissucol group were discharged from the hospital without any complications compared with only 54% of the patients in the group without Tissucol.

The total cost of fibrin glue was US$2646 (E3090) without any additional costs. The financial saving were US$13,823 (E18,170) in our total patient population and US$460 (E605) per patient, without taking into account the number of ambulatory visits for wound care, material for this care, antibiotics, sick leave, etc.

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