

## Chevrel technique for midline incisional hernia: still an effective procedure

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Received: 19 April 2007 / Accepted: 24 September 2007 / Published online: 31 October 2007  
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### Abstract

**Background** Prosthesis use in the treatment of incisional abdominal hernia is today an accepted concept worldwide. However, there is no agreement as to the most appropriate site of prosthesis insertion. The aim of this report was to analyse the operative steps of the premuscolo-aponeurotic repair and to present the results of our experience.

**Methods** Between May 1996 and December 2006, 64 patients (52 women and 12 men, mean age 64 years) underwent a Chevrel repair for midline incisional hernia. They represented 52% of plasties performed for incisional hernia. Patients were subdivided according with Chevrel and Rath classification. Nineteen were operated on in emergency and 45 electively. Associated diseases, mainly cardiopathy, obesity, chronic pulmonary disease and diabetes, were recorded in 83% of the patients. Cholecystectomy and wide dermolipectomy were the more frequent procedures associated with plasty. Prosthetic material was polypropylene

(53%), polyester (42%) and polypropylene + polyglactin 910 (5%).

**Results** The mortality rate was 1.6%. Postoperative complications were exclusively parietal in 17 patients (26.5%), i.e. seroma, skin necrosis and superficial wound infection. No deep infection or intra-abdominal complications were observed. Mean postoperative hospital stay was 10 days, closely related to being elderly, associated operations and emergency admission. Two recurrences were registered, and chronic abdominal pain or late infections were not observed.

**Conclusions** Our experience shows that the Chevrel technique is a safe and effective procedure, easy to perform and reliable even in cases of septic risk.

**Keywords** Incisional hernia · Onlay technique · Chevrel technique · Prosthesis · Abdominal wall

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The results of this work were presented at the Tenth Anniversary Hernia Congress of the American Hernia Society in Hollywood (FL, USA), 7–11 March 2007.

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### Introduction

Incisional hernia still represents the most frequent late complication of abdominal surgery, occurring in 2–23% of all laparotomies and about 10% of all abdominal hernias [1, 2]. This rate increases in the presence of systemic or local risk factors, and even the laparoscopic approach is not free from this event (0.8–1.2%) [1–4]. Incisional hernia is detected within 12–24 months after surgery in 66–90% of cases [5, 6]. In the majority of cases, incisional hernia (60–90%) occurred at the midline with the following rates: supraumbilical (27–42%), infraumbilical (30–34%), juxtaumbilical (17%) and xiphopubic (10–33%). Lateral sites were less frequently represented (10–17%) [1, 7–11]. Complications such as bowel incarceration or obstruction were reported in 6–15% and 2%, respectively [12, 13].

After direct repair, wound complications (skin necrosis, infection and haematoma) were observed in 10–44% of the cases, and recurrence rate was reported in 31–49%. After prosthetic repair, such values were much lower, with a recurrence rate of 0–10% and wound complication ranging between 3% and 27% [10, 14, 15].

According to the different techniques, common sites of prosthetic placement are premusculo-aponeurotic (onlay, or Chevrel technique) [4, 6, 8, 15–19], retromuscular-prefascial and preperitoneal (Rives technique, Stoppa technique) [4, 13, 15, 20–25], whereas intraperitoneal insertion can be done with open or laparoscopic surgery [2, 4, 9, 10, 15, 26–28].

The purpose of this study was to analyse the operative steps of the premuscular prosthetic repair and evaluate our immediate and late results with such technique. We also performed a review of the literature to assess the value of the Chevrel repair in the international experience.

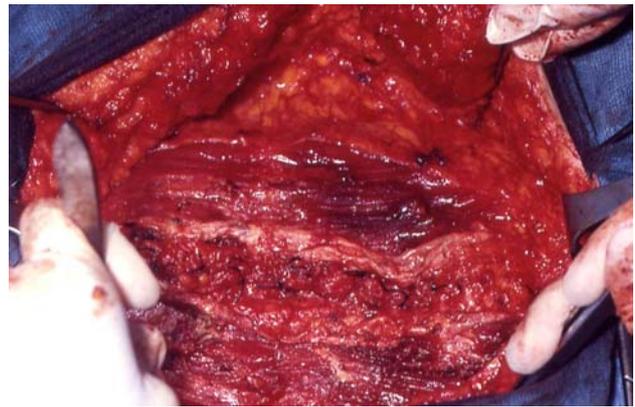
## Materials and methods

### Surgical technique

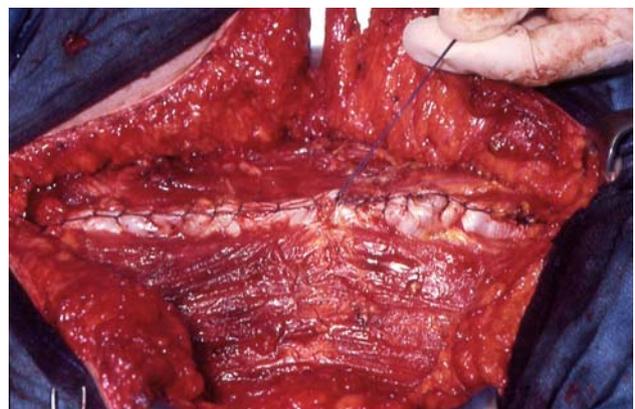
The operation, herein described step by step, follows the technical details suggested by Chevrel [16, 17]. It begins with the excision of the previous operative scar. The hernial sac is dissected from subcutaneous tissue and the aponeurotic plane and is then opened and adhesiolysis performed, as necessary. Wide mobilisation of the myoaponeurotic layer from the subcutaneous plane is extended laterally as far as the mid axillary line; it depends on defect width and extension of the previous laparotomy. In case of large incisional hernia, exposing the subcostal margin, the pubis and inguinal region may be required. During this mobilisation, attention is paid to the perforating neurovascular pedicles: they must be ligated and divided. The wide exposure of the aponeurotic borders makes their approximation at the median line easy, so they can be sutured together with the peritoneum without tension. Sutures are made with polyglactin 910.

At this point, both the anterior sheaths of the rectus muscle are longitudinally opened 2 cm laterally to the linea alba; the same incision is extended upwards and downwards 3 cm beyond the edges of the parietal defect (Gibson-type incision) in order to obtain bilateral release (Fig. 1).

The linea alba is then refashioned and reinforced with a plasty of the anterior layers resulting from the incision of the rectus fascia, which are flapped medially, as described by Welti-Eudel [16, 17], with a continuous 2/0 polyglactin 910 suture (Fig. 2).



**Fig. 1** The anterior sheath of the rectus muscle is opened 2 cm lateral to the linea alba, achieving an optimal-release incision (Gibson type)



**Fig. 2** Overcoat plasty of the anterior rectus sheath by absorbable running suture

In this manner, the anterior sheaths of the flat muscles and the rectus fibres are exposed. Meticulous haemostasis and saline irrigation of the operative field precedes insertion of a nonabsorbable prosthesis. The mesh is placed to overlap by 4–5 cm the distal and proximal midline edges of the preexisting defect and is then anchored to the aponeurosis at the four cardinal points by 0 polypropylene stitches. The mesh, opportunely spread, is then fixed all around the four quadrants by 2/0 polyglactin 910 interrupted stitches. Similar stitches are placed on the midline to obliterate any empty space (Fig. 3).

To complete prosthetic adhesion to the rectus muscle, large muscle sheaths and subcutaneous tissue, 2 ml of human fibrin glue (Tissucol®) are vaporised under the mesh using a spraying device. Two suction drains (Redon-15 Ch) are left in the subcutaneous space. Suture of the dermis by 4/0 absorbable stitches and skin closure are achieved with metal staples. A compressive dressing is fashioned at the end of surgery, and an elastic containment of the abdominal wall is suggested for 30 days continuously.



**Fig. 3** The mesh, properly shaped, is anchored to the four cardinal points and fixed all around and at midline by interrupted absorbable stitches

**Table 1** Chevrel and Rath classification

Site		Width		Recurrences	
M <sub>1</sub>	Supraumbilical	W <sub>1</sub>	<5 cm	R <sub>0</sub>	No Recurrence
M <sub>2</sub>	Iuxtaumbilical	W <sub>2</sub>	5–10 cm	R <sub>1</sub>	1st Recurrence
M <sub>3</sub>	Subumbilical	W <sub>3</sub>	10–15 cm	R <sub>2</sub>	2nd Recurrence
M <sub>4</sub>	Xiphopubic	W <sub>4</sub>	>15 cm	R <sub>n</sub>	n <sup>th</sup> Recurrence
L <sub>1</sub>	Subcostal				
L <sub>2</sub>	Transverse				
L <sub>3</sub>	Iliac				
L <sub>4</sub>	Lumbar				

M medial incisional hernia, L lateral incisional hernia, W width, R recurrences

### Patients and materials

Between May 1996 and December 2006, 143 patients were operated on for an incisional hernia. Direct suture was performed in 20 patients (14%), whereas the remaining 123 (86%) underwent a prosthetic repair. The Chevrel technique was performed in 64 cases (52%) and the Rives technique in 37 (30%); in 22 cases (18%), the mesh was inserted intraperitoneally with either the open (four cases) or laparoscopic (18 cases) approach. Indications to Chevrel started in 1996 in cases treated in emergency and high-risk patients. Since then, the operation has become the procedure of choice for all midline hernias.

In our study, the Chevrel technique was performed in 52 women and 12 men, whose mean age was 64 (range 36–86) years. Incisional hernias were subdivided according to Chevrel and Rath classification [8] upon site, width and recurrence (Table 1). The procedure was performed only on midline incisional hernias, both primary and recurrent (Table 2).

Forty-seven percent of patients were older than 70 years. Associated diseases were observed in 83% of patients and

**Table 2** Patients subdivided according with Chevrel and Rath classification

Site	No. of cases	Width	No. of cases	Recurrences	No. of cases
M <sub>1</sub>	14	W <sub>1</sub>	3	R <sub>0</sub>	51
M <sub>2</sub>	23	W <sub>2</sub>	32	R <sub>1</sub>	10
M <sub>3</sub>	25	W <sub>3</sub>	26	R <sub>2</sub>	3
M <sub>4</sub>	2	W <sub>4</sub>	3	R <sub>&gt;2</sub>	–

were mainly represented by cardiopathy, chronic lung disease, obesity, diabetes, liver cirrhosis and coagulation disorders. Nineteen patients were operated on in emergency and 45 in elective conditions. The type of prosthetic material was polypropylene (53%), polyester (42%) and partially absorbable, low-weight polypropylene–polyglactin 910 mesh (5%). Human fibrin glue (Tissucol®) was utilised in the last 54 patients. All patients received antithrombotic prophylaxis with low molecular weight heparin and short-term antibiotic prophylaxis with teicoplanin or ceftazidime. Associated abdominal surgery was performed in 41% of the cases: cholecystectomy (9) and wide cosmetic dermolipectomy (12) were the more frequent interventions associated with prosthetic repair. Dermolipectomy was the first step of the procedure and was accomplished through a Dufourmentel–Mouly incision before peritoneal sac dissection. Less frequent operations were small bowel resection (3), appendectomy (1) and salpingo-ovariectomy (1). The repair was therefore associated with clean-contaminated surgery in 22% of the cases.

### Results

Postoperative mortality was 1.6%: a 64 years old woman, fourth degree of classification of the American Society of Anesthesiology (ASA IV) (incisional hernia M<sub>2</sub>W<sub>3</sub>R<sub>2</sub>), who died 3 days after surgery for multiple organ failure. Early postoperative complications occurred in 17 patients (26.5%), sometimes in association, and were exclusively represented by parietal complications. They were seroma (11%), localised skin necrosis and wound dehiscence (8%), subcutaneous haematoma (3%) and superficial wound infection (5%). In three cases, mild anaemia developed, but no transfusion was necessary. No complications occurred in patients younger than 65 years. Seromas were successfully treated by aspiration except in one case, where a persistent large fluid collection required surgical drainage 5 months after surgery. Skin necrosis and wound dehiscence underwent conservative treatment: these cases were treated with dressing on an outpatient basis so that healing was obtained by secondary intention within an average of 3 months. Haematomas occurred only in patients under anticoagulant

therapy; all recovered spontaneously. In case of superficial infection, wide drainage and irrigation of the wound was performed as well as systemic antibiotic therapy. The infection healed easily, and the prosthesis was never removed. Mean postoperative hospital stay was 10 (range 2–21) days and showed a close relationship to patient's age, associated operations and type of hospital admission (Table 3).

Long-term control included 58 patients over 63 (92%), five patients were lost to follow-up. Length of follow-up ranged from 4 to 120 months, with an average of 54 months. Transitory parietal pain, less than 6 months after surgery, was registered in five patients (9%) and the corsage feeling in four (7%). Recurrences were detected in two cases (3%); one, a  $M_2W_2R_0$  hernia, was found 3 years after surgery and the other, a  $M_3W_3R_0$  hernia, 8 months after surgery. No further surgery was performed in either case according to the patients' decisions.

## Discussion

Incisional hernia may be a very serious and disabling disease, and even its treatment is very challenging, because improper surgery may imply a high recurrence rate (up to 50%) with unacceptable morbidity and mortality [6, 14, 15]. For these reasons, surgical therapy should be left to surgeons with specific experience in abdominal-wall surgery. Today, plasty with nonabsorbable prosthesis represents the gold standard in the treatment of incisional abdominal hernia. Consensus about this concept is well accepted worldwide; however, disagreement exists about the choice of material and the site of mesh placement.

The study reported here does not intend to compare early and late results of all the different procedures in incisional hernia repair but, rather, analyses some points of the Chevrel technique, which are criticised by other authors [15, 19, 29–33]. Most of the objections to the Chevrel procedure focus on the parietal complications and risk of infection due to the close proximity of the prosthetic material to the subcutaneous tissue [14, 15]. We cannot deny such objections,

**Table 3** Length of postoperative hospital stay matched with age, complexity of the surgical procedure and admission setting

Examined parameters	Mean postoperative hospital stay (days)
Age <65 years	6
Age $\geq$ 65 years	11
Chevrel procedure only	7
Chevrel procedure + other abdominal surgery	10
Ordinary setting	6
Emergency setting	12

but we believe that parietal complications can be minimised with some expedients. For instance, seroma and haematoma can be reduced by using human fibrin glue vaporisation (Tissucol®). As regards the high rate of infection associated with the Chevrel repair, its incidence is not as frequent or severe, as some authors assert [4, 14, 15, 28]. Wound infection can be easily handled on an outpatient basis, with complete healing and little patient discomfort. Only a few cases are reported in which prosthetic removal was necessary [15]. Chronic parietal pain can be prevented through peripheral prosthetic fixation with absorbable sutures and at the same time with proper treatment of neurovascular perforating pedicle. Division of these small branches causes their retraction beneath the aponeurosis, thus avoiding the source of possible neuromas. To relieve the corsage feeling and pain, polyester or light mesh is preferable to heavier material.

In our experience, parietal disorders are comparable with the results reported with the Rives-Stoppa technique [14, 15, 22, 34–36]. Early complications and length of hospital stay showed a close relationship with patient age, associated operations (mainly wide dermolipectomy) and type of hospital admission (emergency or routine). No relationship was registered between wound complications and associated clean-contaminated surgery.

Our indication of surgical technique is related to the site of the parietal defect, patient's clinical conditions and the need for associated surgery, especially in cases of clean-contaminated surgery. Simple direct suture is confined to emergency surgery, in contaminated or dirty surgery or in high-risk patients.

In our experience, the intraperitoneal prosthetic insertion through an open approach was reserved to cases in which a real loss of wall tissue was present. Intraperitoneal laparoscopic insertion was confined to the following conditions: small and medium lateral hernias, recurrent to extraperitoneal prosthetic repair and small hernia on a long scar. Considering that the laparoscopic approach needs specific surgical experience and training, not all surgeons in our team had sufficient laparoscopic skill, whereas all surgeons were capable of performing extraperitoneal treatment. Moreover, the extraperitoneal technique is our preferred procedure because it solves the problems related to pathophysiology of incisional hernia: closure of the abdominal defect, reinsertion of the lateral muscles to the midline and restoration of normal abdominal pressure [34, 35]. Such objectives can be obtained not only with the Chevrel repair but also with the Rives-Stoppa technique, whereas they are not entirely fulfilled by an intraperitoneal approach [37, 38].

In the review of the literature, the Chevrel technique did not enjoy the same acceptance as the Rives-Stoppa procedure, whereas in our experience, it proved to be very effective and safe. We began performing the Chevrel technique

in 1996 when it was initially reserved to high-risk patients operated in emergency situations. It was later adopted routinely for midline hernias, both primary and recurrent. The choice of the Chevrel technique was based upon the following parameters: easier parietal dissection compared with the Rives-Stoppa procedure, which is performed on a deeper plane, and less operative time. Nowadays, in our experience, the Rives-Stoppa technique is performed in cases of lateral incisional hernia or in patients with thin subcutaneous tissue.

In conclusion, the Chevrel procedure cannot be considered an obsolete intervention: in our series, it showed very satisfactory results, both immediate and late; such a technique is safe, easy to perform and reliable, even in cases of septic risk.

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