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## Rives-Stoppa procedure for repair of large incisional hernias: experience with 57 patients

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**Abstract** *Background.* The use of prosthetic materials in tension-free incisional hernia repairs has diminished re-herniation rates markedly; however, infection, intestinal fistulization, and seroma formation have been reported after repairs. Use of the Rives-Stoppa procedure for incisional hernia repair, in which the prosthesis is placed between the rectus abdominis muscle and the posterior sheath, may reduce occurrence of these problems.

*Methods and materials.* Over a 6-year period 57 open abdominal wall incisional hernia repairs were performed using the Rives-Stoppa technique; 15 (26.3%) had previously undergone incisional hernia repair. The prosthetic materials used were polypropylene, expanded polytetrafluoroethylene (ePTFE), and ePTFE with perforations. The prosthesis size ranged from 8×8 cm to 20×28 cm (mean area 199.6 cm<sup>2</sup>). Follow-up consisted of an office visit 12 months postoperatively and at least one subsequent office visit or telephone interview; mean follow-up time was 34.9 months (range 11.7–81.9).

*Results.* There were no hernia recurrences (except in one patient whose prosthesis was removed), gastrointestinal complications, fistulas, or deaths. Seromas occurred postoperatively in seven patients (12.3%). Two patients (3.5%) had wound infections that required removal of the prosthesis.

*Conclusions.* In this series the Rives-Stoppa technique had excellent long-term results, with minimal morbidity, in patients with large primary or recurrent incisional hernias. The absence of serious complications and hernia recurrences in patients with grafts in place suggests that the Rives-Stoppa procedure is the repair of choice in such patients.

**Keywords** Hernia, incisional · Rives-Stoppa · Prosthesis · Herniorrhaphy · Seroma

### Introduction

Incisional hernias develop in 2–11% of patients who undergo laparotomy [15]. After repair, these hernias recur in 30–60% of patients in whom a prosthetic mesh or patch is not used [7, 8, 13]. The development of tension-free incisional hernia repairs employing a prosthesis has decreased recurrence rates markedly [7], to about 6–10% [18], but these procedures are not without complications, which include seroma formation, mesh or patch infection, and intestinal fistulization. As a result some surgeons remain reluctant to use prostheses to repair incisional hernias, despite the lower recurrence rates. Modifications in surgical procedures and techniques for incisional hernia repair and the availability of newer prosthetic materials have allowed for improved surgical results with reduced complication rates.

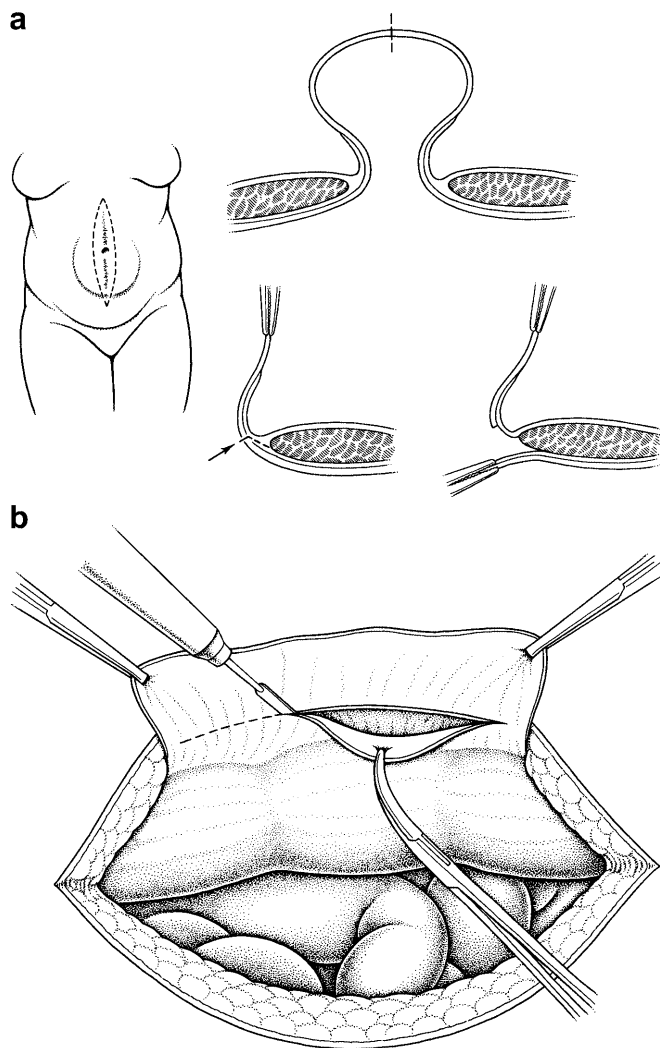
### Patients and methods

Over a 6-year period 57 large midline incisional hernia repairs were performed within a single surgical practice using a modified Rives-Stoppa technique [6, 17, 19]. There were 29 men and 28 women (mean age 58 years, range 33–79). Fifteen patients (26.3%) had previously undergone an incisional hernia repair. A polypropylene prosthesis was used in 29 patients (50.9%), expanded polytetrafluoroethylene (ePTFE) in 13 (22.8%), and ePTFE with perforations (MycroMesh Biomaterial, W.L. Gore & Associates, Flagstaff, Ariz., USA) in 15 (26.3%). The choice of prosthetic material was based upon availability and surgeon's preference. Prosthesis size ranged from 8×8 cm to 20×28 cm (mean area 199.6 cm<sup>2</sup>).

The operative technique used is shown in Figures 1, 2, 3, 4, 5. The procedure differs from the classic Rives-Stoppa technique [17] in that rather than creating "clock-face" counterincisions or tying sutures on the skin the plane between the subcutaneous fat and anterior rectus sheath is developed for a distance of approximately two to three cm on all sides. In this way all sutures can be tied from within the midline incision, superficial to the anterior rectus sheath (Fig. 4).

All patients were given prophylactic broad-spectrum intravenous antibiotics prior to induction of anesthesia. Two to six

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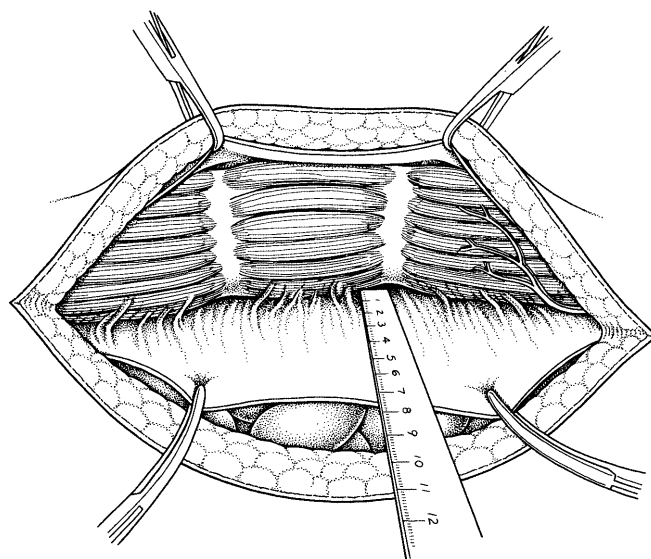
**Fig. 1a, b.** The peritoneum is incised in the midline. Dissection begins between the posterior sheath and the rectus abdominis muscle

postoperative doses were routinely administered. Antibiotics were continued in several patients who developed wound erythema in the early postoperative period. Twenty patients had one or two closed suction drains placed in the subcutaneous space for 2–4 days following the procedure. In addition, all patients received deep venous thrombosis prophylaxis with intermittent compression boots, which were applied immediately prior to induction of anesthesia. The boots were discontinued when patients were independently ambulating postoperatively.

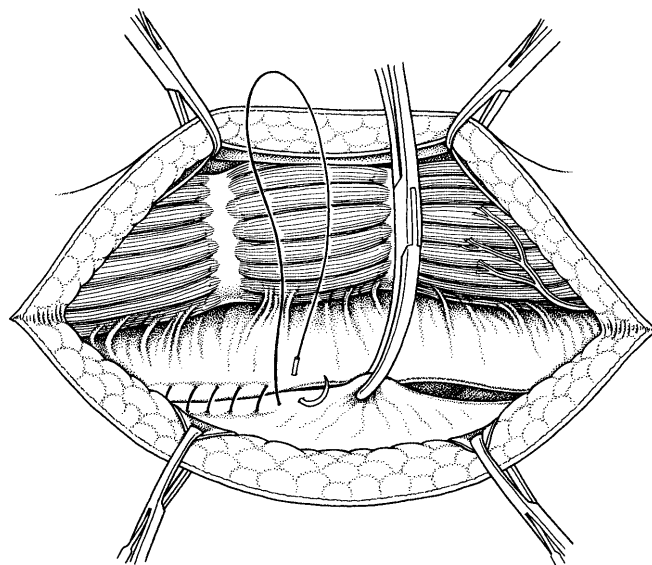
Follow-up consisted of an office visit 12 months postoperatively and at least one subsequent office visit or telephone interview. Mean follow-up time was 34.9 months (median 29.6; range 11.7–81.9).

## Results

There were no perioperative complications. There were no hernia recurrences (except in one patient whose prosthesis had been removed), gastrointestinal complications, fistulas, cases of chronic postoperative pain, or deaths. Seven patients (12.3%) had postoperative seromas; none became infected or required intervention.



**Fig. 2.** Dissection continues laterally until the perforating vessels are clearly seen. Care is taken to preserve this blood supply to the rectus muscle

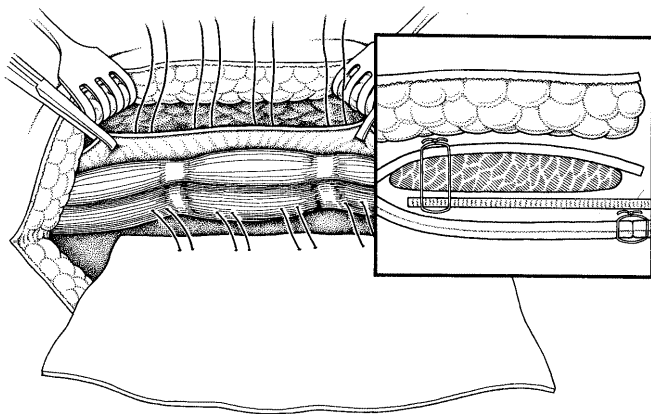


**Fig. 3.** The posterior sheath is closed primarily (this can almost always be accomplished). Any gaps in coverage can be sutured or covered with vicryl mesh to prevent contact between the prosthesis and the intra-abdominal contents

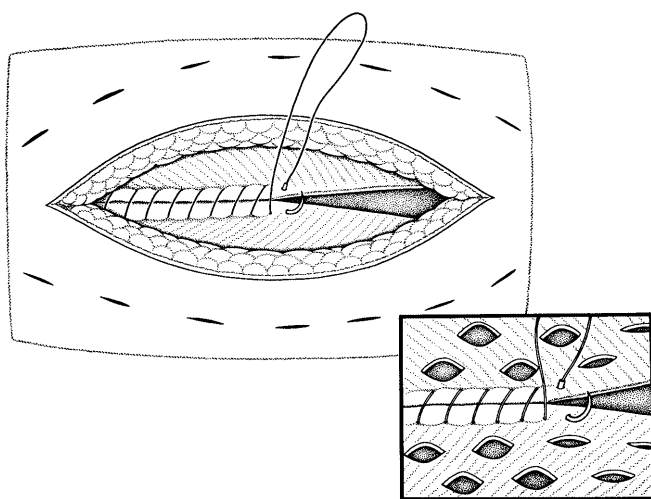
Two patients (3.5%) had infections that required removal of the prosthesis. In both patients cultures grew *Staphylococcus aureus*. In only one of these patients did reherniation occur after the prosthesis was removed. The presence of subcutaneous drains did not impact the rate of seroma formation or graft infection.

## Discussion

Use of a prosthetic material in incisional hernia repairs continues to increase. In our practice, for example,



**Fig. 4.** The prosthesis is secured in the retromuscular space as shown. *Inset* Final position of the mesh and sutures



**Fig. 5.** The anterior sheath is closed. If tension is present, relaxing incisions may be used (*inset*)

prostheses were used in only 22.5% of patients (39 of 173) operated on before 1991 but in 87.6% of patients (78 of 89) operated on between 1991 and 1997. Three principal types of open incisional hernia repairs using prostheses have been described: (a) full-thickness replacement of the abdominal wall, in which the prosthesis is sutured to the edges of the fascial defect (and the prosthesis is in contact with intra-abdominal viscera); (b) onlay repair, in which the prosthesis is placed above a primary fascial closure; and (c) the Rives-Stoppa repair.

With the Rives-Stoppa repair the retromuscular position of the prosthesis assures that it will not be in direct contact with the abdominal viscera. Theoretically this should decrease the risk of complications that can arise from adhesion of the prosthetic material to viscera, such as bowel obstruction and fistula formation. It may also minimize problems resulting from placement of the prosthesis in the subcutaneous space, such as seroma and wound infection. In addition, the Rives-Stoppa repair makes use of intra-abdominal pressure to hold the

prosthetic material in place against the rectus muscle, and it provides a larger surface area for incorporation of tissue into the prosthesis: Our modification of the repair, that is, tying all sutures from the midline incision, superficial to the anterior rectus fascia (Fig. 4), has two potential advantages. Firstly, it avoids the need for multiple counterincisions, allowing for a more cosmetic result. In addition, in no place is the suture in contact with both the prosthesis and the skin, removing a potential avenue for bacterial seeding of the foreign body.

Recurrence rates in previous studies of Rives-Stoppa repairs range from zero to approximately 4% [5, 6, 11, 18, 19]. Postoperative infections occurred in 0–18% of patients. Our series had no recurrences (except in one patient whose prosthesis was removed) and an infection rate of 3.5%. These results are superior to those generally achieved with onlay repairs, for which the recurrence rate is about 4–6% and the infection rate approximately 7–10% [12]. Avoidance of onlay methods has been recommended because of minimal tissue incorporation of the prosthesis [1], excessive tension on the repair [14], and a possible increase in the risk of seroma and infection [11, 12].

Results with the Rives-Stoppa technique are also better than those usually achieved with full-thickness replacement and other methods in which the prosthesis is placed directly in contact with the abdominal viscera. Such placement may result in severe adhesions and erosion of the bowel, which may lead to sepsis, fistulization, or bowel obstruction. We previously reported three cases of fistula formation, and had an infection rate of 7.1% and a reherniation rate of 10.7% in our initial series of full-thickness repairs using ePTFE [2]. A similar study had an infection rate of 9.6% and a recurrence rate of 12.9% [4].

Our rate of seroma formation (12.3%) was similar to those in previous series of incisional hernia repairs using prostheses. Seroma is the most common complication of these procedures, occurring in 1–23% of cases [12]. In our experience, seromas are not a cause of major morbidity and generally require no treatment. Virtually all resorb within several weeks to 3 months. The use of subcutaneous drains at the time of surgery appears to have no effect on the complication rate, and therefore we have stopped their routine use. We believe that percutaneous drainage of uncomplicated seromas presents an unnecessary risk of introducing bacteria into the periprosthetic space.

Prosthetic material choice remains controversial. All available materials have been found to have disadvantages [14]. Polypropylene, the most commonly used material, has been associated with fistulization and extrusion [8], whereas ePTFE may produce less tissue ingrowth [18]. In our series about one-half the patients were given polypropylene prostheses, and one-half received ePTFE. Neither prosthesis was associated with recurrence, fistulization, or gastrointestinal complication. The two infections occurred in patients with ePTFE. One seroma occurred in a patient with

polypropylene, three with ePTFE, and three with ePTFE with perforations. The difference with regard to infection or seroma formation for these groups was not statistically significant. We continue to use both types of prosthetic materials, but see several advantages with the use of ePTFE (both with and without perforations). Early breakdown of any part of the posterior sheath/peritoneal closure may result in direct contact between the intra-abdominal viscera and the retromuscular prosthesis. Compared with polypropylene, less adhesion formation occurs with ePTFE [2, 3]. For the same reason we believe that ePTFE is easier to manage should any patient ever require an additional laparotomy, even for unrelated problems. There is also evidence to suggest that patient comfort is increased with the use of lighter and more flexible biomaterials [16].

In this series the Rives-Stoppa technique had excellent long-term results, with minimal morbidity, in patients with large primary or recurrent incisional hernias. The absence of hernia recurrences (in patients with intact prostheses) and serious complications suggests that the Rives-Stoppa procedure may be the repair of choice in such patients.

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