Research Article

ChavrelTechnique Prefascial meshplasty for Incisional Hernias

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ABSTRACT: Background: The objective of the study was to reassess the efficacy of the open onlay technique for repair of incision hernia, utilizing the modern adjuncts of components separation and fibrin sealant to reduce the principal complications of seroma and recurrence. Incisional hernia was defined as <10 cm transverse diameter.

Methods: A retrospective audit was applied to 116 patients undergoing open onlay incisional hernia repair during a 2-year period at a single institution. Information was collected concerning operative details, postoperative complications, and recurrence. Clinical review at a median 15.2 months postoperatively was followed in OPD with structured questionnaire to assess quality of life. All patients with pain or suspected recurrence were recalled for examination.

Results: Fascial closure required components separation in 21 (18.1%) patients when tension-free fascia reconstruction was not possible, and fibrin sealant was applied in 22 (18.9%) in whom extensive skin flaps were dissected beyond the semilunar line. Postoperatively, there were 11 (9.5%) seromas and 2 (1.7%) deep wound infections. At 15.2 months' follow-up there were 4 (3.4%) recurrences.

Conclusions: Open onlay mesh repair for ventral hernia is a versatile operation applicable to all quadrants of the abdominal wall and gives excellent results when used in association with components separation and fibrin sealant.

INTRODUCTION

In the United States, more than 50,000 incisional hernias become symptomatic annually, but there is a lack of consensus regarding their optimal management [1, 2]. Open techniques include the sublay or retromuscular/ preperitoneal (Rives-Stoppa) operation, the onlay or prefascial (Chevrel) operation, and the infrequently used inlay operation (fascial closure cannot be achieved, and the mesh bridges the defect) [3]. Most surgeons reserve the laparoscopic operation for incisional hernias up to a maximum size of 10 cm transverse diameter or in some cases 15 cm [4]. Therefore, most hernias >10 cm Incisional hernia are repaired by an open technique, which represents one of the commonest general surgical operations.

An expert review in 2001 concluded that the results of the onlay technique and sublay technique were similar with regard to recurrence, with failure rates of 2.5% to 15.0% [5]. Sublay has been strongly advocated as being the ideal position for the mesh, and a recent trial using onlay was abandoned because of a high incidence of infectious complications [6, 7]. A trial currently ongoing in the United States comparing open and laparoscopic techniques for l incisional hernia utilizes the open onlay repair as comparator [8]. Optimum results with the onlay technique may be achieved by augmenting the repair with relaxing incisions and fibrin glue in selected cases, as originally described by Chevrel and Rath [9].

The purpose of this study was to reassess the results of the Chevrel onlay technique in Incisional hernia utilizing the modern adjuncts of components separation and fibrin sealant.

Methods

A retrospective analysis was conducted on a prospective database of all patients recorded as having an incisional hernia repair in our Hospital between June 2008 and June 2010. The follow-up period was 6 to 30 months (median 15.2 months). In our institution, audit projects require formal application to the Local Research Ethics Commit-tee. to safeguard patient confidentiality were implemented. They comprised the use of a secure non networked personal computer and password for protection of patient databases. Furthermore, all names and patient identities were removed from the database, and patients were entered using identification numbers.

Patients with minor hernias <10 cm transverse diameter were considered for laparoscopic repair. If they were deemed unsuitable for this technique, they underwent an open operation and were included in this analysis.

Obese patients and patients with significant loss of domain were encouraged to lose weight prior to surgery and had their cardiorespiratory status optimized. Trophic skin ulcers were treated with local wound dressings and antibiotic cream until infection had been eliminated [10]. Large and complex hernias, particularly in obese patients, were assessed with computed tomography (CT) to identify the site of the fascial defect, the contents of the sac, and any occult hernias not identified on clinical examination [11].

One intravenous dose of antibiotics was administered preoperatively and one postoperatively [12]. Scar tissue and the previous incision were removed with an ellipse of skin, and lateral skin flaps were raised as far as the semilunar line or into the flanks for components separation. Hernial sacs were dissected out completely; the neck was defined; and after opening adhesions were lysed and the sac excised. In patients in whom full-thickness bowel injury had occurred (without contamination), it was considered safe to proceed with prosthetic repair but with a more prolonged course of antibiotics [13].

Figure 1) *Onlay mesh covering the midline fascial closure (upper mesh: oblong-shaped) with a 5 cm overlap in all directions and an inlay mesh covering the gap between the divided edges of the external oblique aponeurosis (lower mesh: crescent shaped)*

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In cases where tension-free fascial closure could not be achieved, components separation was employed, with the addition of posterior rectus sheath release if necessary [14]. The fascial closure was supplemented by a polypropylene mesh in the onlay position extending beyond the line of closure by at least 5 cm in all directions—i.e., with a minimum width of 10 cm and 5 cm longer than the fascial closure superiorly (or to the xiphisternum and inferiorly or to the pubic bone). The gap created by components separation between the divided edges of the external oblique aponeurosis had a mesh tailored to the size of the gap (Fig. 1). Meshes were fixed with a interrupted suture around the periphery using a heavy gauge nonabsorbable suture. Before skin closure, skin flaps that had been raised beyond the semilunar line were treated with aerosolized fibrin sealant [15]. Closed suction drains were applied underneath each skin flap and removed when drainage was less than 15 ml/24 hr or at 5 days, whichever was earlier.

Information was collected about perioperative complications any bowel injury, postoperative complications (seroma, wound infection, wound hematoma), and recurrence. In December 2010 (median 15.2 months after operation), all patients received a telephone call and were asked to give answers to a structured questionnaire assessing quality of life (including performance of activities of daily living), pain, and the sensation of any bulging of the wound. Patients who answered positively concerning pain or bulging were recalled for physical examination.

Results

During the study period 123 patients underwent open repair of an incisional hernia. Seven patients were excluded from the analysis because they had undergone sutured repair, other (n = 3): one patient with a previous mesh infection, one with undiagnosed Crohn's disease requiring evaluation and possible further laparotomy, and one premenopausal female considering future pregnancy sublay repair done. In the early part of the study(n-3) hernias limited to the upper midline received this technique as the operation of choice but excluded and 10cases underwent emergency surgery.. The remaining 100 patients comprised 80 (80%) with a primary incisional hernia and 20 (20%) with a recurrent incisional hernia,

TABLE 1

outlines the patient characteristics.

Variable	
Sex (F:M)	1.4:1.0
Age (years)	
Median	59
Range	32–89
Weight (kg)	
Mean	86
Median	85
Duration of hernia (weeks)	
Mean	124
Range	2–1560
Episodes of obstruction preoperatively	16 (14%)

Hernias were repaired selectively at a number of sites on the anterior abdominal wall (Table 2). A total of 59 patients had at least one comorbidity, obesity being the commonest (Table 3). Episodes of subacute intestinal obstruction had occurred in 14 (12%) patients prior to operation. Preoperative full-thickness bowel injury occurred in 3 (2.6%) patients, but it did not preclude the use of prosthetic mesh or result in the development of postoperative intestinal fistula. The fascial gap was too large to close without tension in 21 (21%) patients, who underwent a components separation. Fibrin sealant was used in 22 patients (22%), where the lateral skin flaps had been raised beyond the semilunar line, creating a large potential space for collection of a seroma. The mean area of the fascial defect measured intraoperatively was 30 x 10 cm for which a mean area of mesh of 525 sq cms was used to cover the incisional hernia defect. Mesh from previous hernia repairs was removed from 11 patients. The mean length of hospital stay was 6.0 days (range 2–44 days).

TABLE 2

HERNIAL SITES

HERNIA	SITE	NO (TOTAL -100)
1.	Midline (Upper+Lower)	72
2.	Transverse(Kochers+Macburneys)	8
3.	Pfannensteil	8
4.	Paraumbilical	2
5.	Epigastric	1
6.	Inguinal	1

TABLE 3

Co-morbiditv

Co-morbidity	No.[a]
Body mass index ≥30	59 (50.9%)
Diabetes mellitus	5 (4.3%)
Coronary heart disease	16 (13.8%)
Deep vein thrombosis	2 (1.7%)
Other	8 (6.9%)

Complications

Postoperative complications occurred in 29 (29%) patients. Most of these complications were minor wound problems and did not require intervention or prolong the hospital stay. Seromas, which occurred in 11 (11%) patients, delayed the hospital discharge of 4 patients who subsequently required up to three aspirations in the outpatient clinic, none of which became infected. Ten (10%) patients experienced postoperative wound infections: eight were superficial infections and were treated conservatively with antibiotics; two (2%) comprised deep infections requiring open surgical drainage without mesh removal and subsequent resolution of the infection occured at 3 and 4 months, respectively. No patient experienced chronic mesh infection or sinus tracts. There were no postoperative deaths, and all patients were alive at the time of telephone follow-up.

Pain and quality of life

In total, 95 (95%) patients were pain-free after a median 15.2 months' follow-up. Of the remainder, 11 (5%) were experiencing occasional pain that did not limit activity and 10 (10%) had pain that sometimes limited activities of daily living or social activities, such as gardening and carrying home the weekly shopping. Global quality of life was greatly improved in most of the patients.

Recurrence

At the 6-month follow-up in the outpatient clinic, there were no recurrences. At the telephone follow-up (median 15.2 months), 25 patients who were experiencing pain or wound bulging were recalled for outpatient examination. Four (4%) patients had a minor clinical recurrence <3 cm, but none of them required further surgery.

Discussion

Symptomatic incisional hernias continue to enlarge owing to positive intra-abdominal pressure, diaphragmatic con-tractions, increases in pressure that occur with coughing and straining (up to 80 cm H 2 O), and myofascial retraction of the lateral abdominal wall muscles resulting in decreased abdominal wall compliance and atrophy of the oblique muscles with fibrosis [16]. Early surgery should therefore be advised in patients fit for anesthesia. The operation to repair an incisional hernia should be tailored to the characteristics of the hernia and the patient. Careful case selection

is required to minimize major complications, such as mesh infection or an enterocutaneous fistula, which may result in prolonged morbidity and require reoperation. Small hernias < 3 cm in size can be repaired using primary tissue approximation with sutures [17]. For the competent but not expert laparoscopic surgeon, the upper limit for the transverse diameter of an incisional hernia suitable for laparoscopic repair is 10 cm [4]. For ventral hernia with a larger diameter, most surgeons select an open technique. The most challenging hernias are giant abdominal wall defects coming to definitive reconstruction at 6 to 12 months after laparotomy previously performed for abdominal trauma or abdominal sepsis [18].

Currently, there is no rationale for the use of either the open sublay or onlay technique. A national survey in Sweden showed that surgeons are evenly divided between those adopting the onlay or the sublay operation for open mesh repair of incisional hernias [19].

To achieve good results, a protocol-driven approach is required using techniques previously shown to improve outcomes. Little information is available from randomized controlled trials because of the heterogeneity of the hernia types and differing co-morbidities of patients studied. In addition, the length of time the hernia has been present increases the difficulty of reconstruction due to lateral migration of the rectus abdominis muscles, suboptimal skin quality and availability, need for enterolysis, possible ostomy reversal, and poor pulmonary reserve [20].

The components separation method for abdominal wall closure was originally described to avoid the use of prosthetic mesh in situations where the full-thickness abdominal wall defect had become [6 cm in diameter [14, 21]. In selected patients, the use of prosthetic mesh in conjunction with a modified components separation reduces the rate of recurrent hernias from 33% to 11% in patients with moderate-sized defects [22]. Without supplementary mesh, a recurrence rate of 32% has been reported at 15.6 months' follow-up in a series of 43 patients [23]. Our technique to optimize the benefits of mesh was to apply an onlay mesh to the main abdominal wound (with a minimum 5-cm overlap) and to cover the gap created by the components separation by applying an inlay mesh between the cut edges of the separated margins of the external oblique aponeurosis. With this approach, we have demonstrated good short-term results in terms of recurrence and quality of life, indicating a return to normal functional activity of the anterior abdominal wall.

Meshes shrink and reach a maximum reduction of 25% to 30% in their cross-sectional area by about 6 to 12 months after implantation [24]. Shrinkage is similar for meshes placed in sublay and onlay positions. A 30% reduction in cross-sectional area in a 100 sq cms (10 x 10 cm) mesh results in a reduction in size to 70 sq cms (approximately 8 x 8 cm) or an approximate 2-cms reduction in length and width. As a consequence, a 2-cms overlap of mesh results in an unacceptably high cumulative recurrence rate of 32% at 10 years after repair of single, small (6 cm), midline incisional hernias [25]. With 3-cm overlap in all directions and the periphery of the mesh tacked with a inerrepted/ running suture around the edges with a nonabsorbable suture, no recurrences were reported in 50 consecutive morbidly obese patients with an onlay mesh [26]. We are therefore confident that a 5-cm overlap in all directions used in our patients does not result in long-term recurrences.

In the present series of patients, we utilized polypropylene mesh. In the latter half of Chevrel's experience with his onlay technique, he switched to the use of polypropylene mesh from polyethylene because of the stronger mechanical parameters of polypropylene, its elasticity, and its mechanical response to deformation [27]. A randomized trial comparing lightweight meshes with polypropylene meshes reported a nearly three times higher recurrence rate with the lightweight mesh [28]. Improved materials for incisional hernia repair are therefore required to be strong yet provide good functional results. The surgeon is required to under-stand costs, applications,(Indications/ contraindications), and the incidence of complications for each prosthetic material that is available for abdominal wall reconstruction [29]. In an experimental study, it was shown that strong tissue in-growth prevents contraction and that contraction was greatest in situations where the mesh had become detached from its fixation points [30]. This reinforces the need for fixation sutures to be placed frequently, at 2-cm intervals, around the periphery of the mesh or as a continuous peripheral suture to hold the mesh in place while it integrates into the tissues.

Chevrel used fibrin glue in selected patients to achieve fixation of the mesh to underlying tissues. More recent concepts of the role of fibrin sealant are in keeping with the theory that its application to the subcutaneous tissues and skin flaps seals small blood and lymphatic vessels resulting in a lower incidence of seromas, shorter hospital stay, and less wound care [15]. Our low seroma rate lends support to this speculative theory, which needs to be put to the test in a randomized trial.

Three studies have compared groups of nonrandomized patients receiving onlay or sublay for repair of major incisional hernias with inconclusive results [5, 31, 32]. Our results indicate that the onlay method is simple, versatile, applicable to all quadrants of the abdominal wall, and achieves excellent short-term results when applied selectively with a components separation operation and fibrin sealant.

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