

## Preperitoneal bilateral inguinal herniorrhaphy

### Evolution of a technique from conventional to laparoscopic

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Received: 10 March 1995/Accepted: 17 July 1995

#### Abstract

**Background:** Simultaneous repair of bilateral inguinal hernia remains controversial.

**Methods:** Seventy-two consecutive patients underwent a preperitoneal prosthetic repair of bilateral groin hernia; 25 via laparoscopy. ASA classification, Nyhus type, hospitalization, convalescence time, and cost were examined. Mean follow-up was 36 and 12 months for the conventional and laparoscopic group respectively.

**Results:** Sixty-nine patients were available for long-term follow-up. Average hospital stay, recurrence rate, perioperative urinary retention, transient thigh neuralgia, and return to normal activities were 48 hours, 5%, 9%, 6%, and 22 days as compared to 4 hours, 6%, 20%, 12%, and 9 days for the conventional and laparoscopic group respectively. The cost for laparoscopic repair was \$500 greater.

**Conclusions:** The preperitoneal approach to repair of bilateral hernias demonstrates an acceptable recurrence rate with low long-term morbidity. Experience with conventional preperitoneal technique greatly facilitates transition to laparoscopic repair.

**Key words:** Laparoscopy — Bilateral hernia — Preperitoneal approach

erally recognized that recovery times and short-term morbidity are increased with bilateral inguinal hernia repair via an anterior approach. In addition, the operative management of such patients has yet to be optimally defined. Insertion of prosthetic material through an anterior or preperitoneal route has been advocated and successfully employed for the treatment of difficult groin hernias with excellent results [8, 17, 22]. The advent of minimal-access surgery provides the opportunity to combine the principles of preperitoneal prosthetic hernia repair with the benefits of laparoscopic technique. Advantages of this approach for the treatment of bilateral inguinal hernias would be shorter hospital stay, quickened recovery time, and increased patient satisfaction while maintaining a similar if not lower recurrence rate.

Few reports in the literature specifically address the issue of laparoscopic bilateral inguinal hernia repair [21]. In general, results have to be extrapolated for the overall experience [9, 12, 14]. Conclusions concerning short- and long-term morbidity, convalescence, and economic data are scarce or lacking, and knowledge and experience gained with the open preperitoneal prosthetic repair of bilateral hernias should allow a successful transition to a similar repair using the laparoscopic technique [21].

#### Materials and methods

From January 1989 through 1991, a series of consecutive patients with a preoperative diagnosis of bilateral inguinal hernia underwent a conventional preperitoneal prosthetic repair through a vertical midline incision. Beginning in January 1992, 46 patients were offered, prospectively, a laparoscopic preperitoneal repair as an alternative. Of the 72 patients studied, 47 elected to be treated via the open midline approach, while 25 underwent a laparoscopic approach. Data examined included patient ASA classification, Nyhus-type hernia classification, perioperative complications, office follow-up at 1 week for all patients, and long-term follow-up by telephone in 69 of 72 patients to determine recurrence rates; return to work times; return to normal activity times, as defined by ability to

The management of bilateral inguinal hernia still is a problematic area of hernia surgery. Although recent studies may contradict previous reports of increased recurrence, morbidity, and convalescence rates for simultaneous bilateral hernia repair [6, 13, 19] it is gen-

Presented at the annual meeting of the Society of American Gastrointestinal Endoscopic Surgeons (SAGES), Orlando, Florida, USA, 11–14 March 1995

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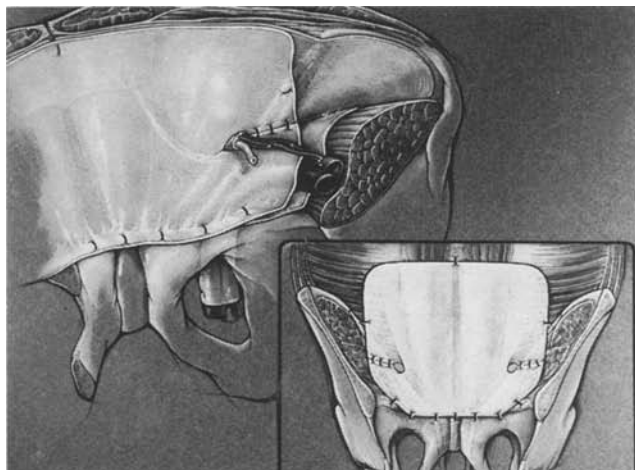


Fig. 1. Open hernia repair—preperitoneal view of prosthetic material placement.

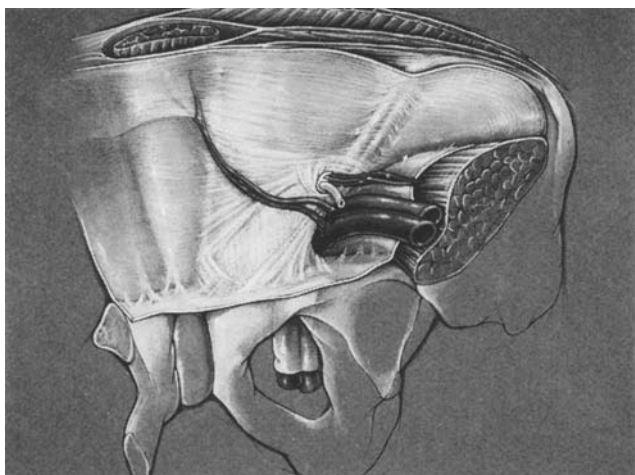


Fig. 2. Preperitoneal anatomy.

Table 1. ASA classification

ASA classification	Open (n = 47)	Laparoscopic (n = 25)
I	6 (13%)	14 (56%)
II	25 (53%)	7 (28%)
III	16 (34%)	4 (16%)

drive a car, ambulation, stair climbing, and resumption of regular daily activities; and procedural cost. Long-term follow-up ranged from 6 years for those patients treated at the start of the study to 1 year for those treated at the end of the study period. Long-term follow-up was accomplished by telephone in 60% of the cases and by primary-care physician examination in the remaining 40%.

In the conventional hernia repair group, general anesthesia was used in 23 patients and spinal or epidural anesthesia in 24 patients. Preoperative antibiotic coverage was provided to all patients. With the patient in the supine position, the preperitoneal space was entered through an intraumbilical midline incision in the manner initially described by Cheattle [1] and Henry [5]. The recti abdominus were retracted laterally and the preperitoneal space was defined and extended bilaterally past the internal inguinal ring to the psoas muscle. The hernia sac on each side was reduced and dissected free from the spermatic cord, if applicable. Using the general principles of

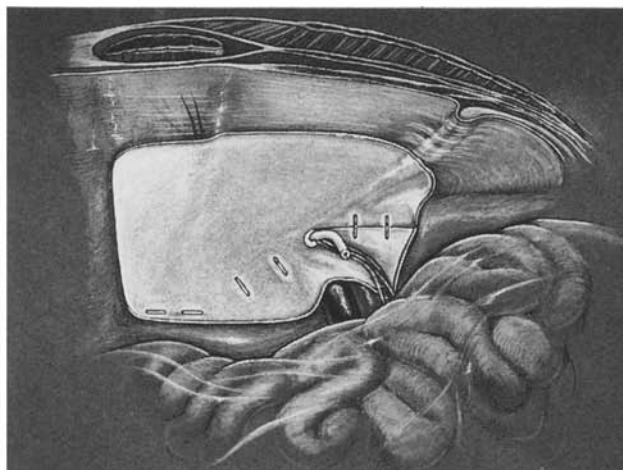


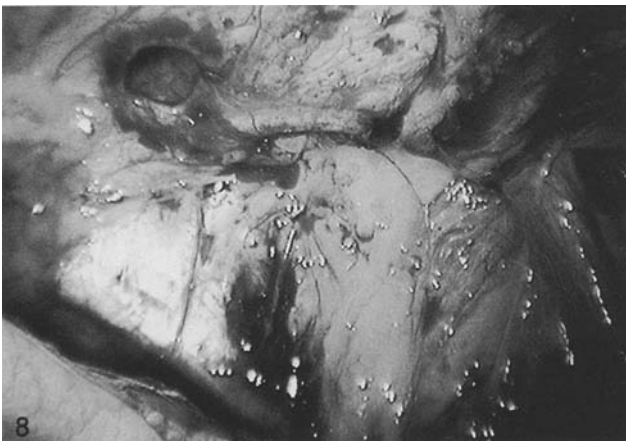
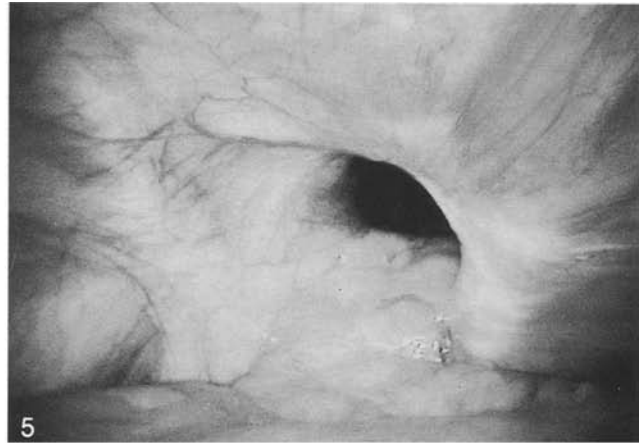
Fig. 3. Laparoscopic preperitoneal hernia repair mesh in place.

Table 2. Nyhus type hernia classification

Nyhus hernia classification	Open (n = 47)	Laparoscopic (n = 25)
I	0	0
II	28 (30%)	18 (36%)
III A	23 (24%)	16 (32%)
III B	15 (16%)	9 (18%)
III C	2 (2%)	0
IV	26 (28%)	7 (14%)

giant prosthetic mesh placement, championed by Stoppa [8], a 15 × 20 cm, or larger as needed, single sheet of prosthetic material with a slit for accommodation of the cord, if required, was interposed between the peritoneum and the musculopectineal orifice of Fruchard overlapping both spaces in all directions (Fig. 1). A slit to accommodate the cord was created variably and at the surgeon's discretion as to its necessity. The prosthesis was anchored to Cooper's ligaments using nonabsorbable sutures. The prosthesis can also be additionally anchored laterally and superiorly prior to closure of the recti abdominus aponeuroses. The recti abdominus aponeuroses was reapproximated using a running closure and the skin was closed. Mean operative time for patients in this group was 69 min with a mean hospital stay of 48 h.

General anesthesia was used in all patients undergoing laparoscopic hernia repair after preoperative placement of an orogastric tube and a urinary drainage catheter. Preoperative antibiotic coverage was provided to all patients. Carbon dioxide pneumoperitoneum to a limiting pressure of 15 mmHg was induced. Diagnostic laparoscopy was performed via a 10/11-mm trochar placed through the umbilicus. Left- and right-sided midlower abdominal trochars were additionally placed, using either a 5-mm trochar on one side and a 10/11-mm trochar on the other or 10/11-mm trochars on both sides. Hernia repairs were carried out by first reducing the hernia sac with traction and then incising the peritoneum above the defect. Complete visualization of the hernia defects, Cooper's ligaments, transversus abdominis aponeurotic arches, the iliopubic tract, and iliac vessels were routinely accomplished (Fig. 2). Also visualized but not demonstrated were the appropriate nerves of the inguinal floor. A sheet of Prolene mesh approximately 2.5 × 4 inches, with additional mesh if needed, was placed and covered the entire musculopectineal orifice and anchored by using a laparoscopic stapling device. Once again, a slit to accommodate the cord was created variably and at the surgeon's discretion as to its necessity, usually for a large indirect hernia. No staples were placed inferiorly or laterally to the iliopubic tract and spermatic cord or round ligament, respectively (Fig. 3). The opposite hernia was repaired similarly. The peritoneum was closed over the prosthesis using laparoscopic



**Fig. 4.** Laparoscopic view: Nyhus type II hernia. Right indirect with dilated ring but posterior wall intact.

**Fig. 5.** Laparoscopic view: Nyhus type IIIA hernia. Left direct hernia.

**Fig. 6.** Laparoscopic view: Nyhus type IIIB hernia. Right indirect hernia with displacement of epigastric vessels and weakening of posterior floor.

**Fig. 7.** Laparoscopic view: Nyhus type IV hernia—recurrent hernia. Right recurrent hernia.

**Fig. 8.** Laparoscopic view with peritoneum incised: Nyhus type IV hernia. Right recurrent hernia.

staples. The pneumoperitoneum was optionally reduced to facilitate peritoneal closure. The trocar sites were closed in layers. Mean operative time for patients in this group was 86 min with a mean hospital stay of less than 24 h. Preoperative antibiotic coverage was provided to all patients in both groups.

## Results

Analysis of patient stratification according to ASA and Nyhus-type hernia classifications showed for the group treated using the open approach: 6 (13%) were ASA I, 25 (53%) were ASA II, and 16 (34%) were ASA III. For the group treated using the laparoscopic ap-

proach: 14 (56%) were ASA I, 7 (28%) were ASA II, and 4 (16%) were ASA III (Table 1).

Direct inspection of hernia defects in those patients treated using the open technique revealed: 28 (30%) Nyhus type II, 23 (24%) Nyhus type IIIA, 15 (16%) Nyhus type IIIB, 2 (2%) Nyhus type IIIC hernias, and by patient history 26 (28%) Nyhus type IV (recurrent) hernias. The laparoscopic group included: 18 (36%) Nyhus type II, 16 (32%) Nyhus type IIIA, 9 (18%) Nyhus type IIIB, 0 Nyhus type IIIC hernias, and by patient history 7 (14%) Nyhus type IV hernias (Table 2) (Figs. 4–8).

Mean follow-up was 36 and 12 months for the open

**Table 3.** Complications and recurrences

Perioperative complications, No. (%)	Open (n = 47)	Laparoscopic (n = 25)
Urinary retention	4 (9)	5 (20)
Hematoma	2 (4)	2 (8)
Ileus	2 (4)	0
Urinary tract infection	1 (2)	0
Pneumonia	1 (2)	0
Seroma	13 (28)	2 (8)
Neuralgia	3 (6)	3 (12)
Testicular pain	3 (6)	1 (4)
Wound infection	1 (2)	0
Long-term complications, No. (%)	Open (n = 44)	Laparoscopic (n = 25)
Occasional neuralgia	1 (2)	5 (20)
Occasional testicular pain	0	6 (24)
Recurrent hernia	Open (n = 88)	Laparoscopic (n = 50)
No. (%)	4 (5)	3 (6)

and laparoscopic groups, respectively. Out of the 69 patients available for long-term follow-up, there were a total of 7 (5%) recurrent hernias; 4 (5%) recurrences in the open group and 3 (6%) recurrences in the laparoscopic group. Within the group of four patients who recurred after open repair, two had a previous recurrence on the same side. One of the three recurrences within the group treated laparoscopically also had a previous recurrence on the involved side. Perioperative complications for patients undergoing open repair consisted of: 4 (9%) cases of urinary retention, 2 (4%) hematomas, 2 (4%) cases of ileus, 1 (2%) urinary tract infection, and 1 (2%) case of pneumonia. For patients undergoing laparoscopic repair, there were 5 (20%) cases of urinary retention and 2 (8%) hematomas (Table 3).

At 1 week post hospital discharge, examination of patients in the open group revealed: 13 (28%) cases of seroma, 3 (6%) cases of neuralgia, 1 (2%) wound infection, and 3 (6%) cases of testicular pain. Additionally, two of the four patients who experienced perioperative urinary retention still complained of urinary symptoms. In the laparoscopic group, there were 2 (8%) cases of seroma, 3 (12%) cases of neuralgia, and 1 (4%) case of testicular pain at 1 week post discharge. There were also two patients with perioperative urinary retention in whom urinary symptoms persisted.

Long-term follow-up in 44 of the 47 patients who underwent open repair revealed 1 (2%) case of occasional anterior medial thigh pain. In patients treated laparoscopically, long-term follow-up revealed 5 (20%) reports of occasional testicular pain (2 Nyhus type II, 2 type III, and 1 type IV hernias) and 5 (20%) reports of occasional thigh pain. For both open and laparoscopic bilateral hernia repair, the average operative time was 80 min. The average hospital stay for those patients undergoing open repair was 2 days. All patients treated via laparoscopy went home the same day of surgery. The average time it took for patients to

return to regular ambulation, normal daily activity, and to work was 2, 9, and 22 days, respectively, for those who underwent open repair, and 1, 5, and 9 days, respectively, for those patients who underwent laparoscopic repair. Return-to-work data is subject to vagaries of insurance and workman's compensation, unrecorded in this series, which is why return to normal activity was included.

Evaluation of the total procedural cost of bilateral inguinal hernia repair at our institution included the operating room cost and cost of supplies. The average cost of repair for bilateral inguinal hernias was \$1,813 and \$2,366 for the open and the laparoscopic procedures, respectively.

## Discussion

Historically, there has been controversy as to the optimum management of bilateral inguinal hernia with regard to timing and surgical technique. Factors that have contributed to the controversy include questions of higher recurrence rate, prolonged recovery times, use of prosthetic material, and impressions of increased complication rates for simultaneous bilateral repair as well as increased cost and total recovery time for staged repairs [6, 19].

The preperitoneal approach to the repair of bilateral inguinal hernias with the placement of prosthetic material has many theoretical advantages over classical repairs [8, 17, 22]. The use of this technique has resulted in a varied recurrence rate ranging from 0 to 50% [15, 17, 22]. This approach allows simultaneous access to both sides through a single incision and should not disrupt tissue planes overlying the musculopectineal orifice. Additionally, the use of prosthetic material allows for a tension-free repair that preserves normal dynamic musculofascial relationships. When the connective-tissue theories of hernia etiology are considered, the potential benefits of preperitoneal prosthetic material placement are even more convincing [11]. We believe the above-described factors to be responsible for the success of this approach especially in more complicated cases such as recurrent and bilateral hernias [8, 17, 22]. Our recurrence rate of 5% is similar to that of other large series [22]; higher reported recurrence rates (50%) have been deemed secondary to technical error [15]. The preperitoneal approach with tension-free prosthetic material placement has thus been our procedure of choice for the repair of bilateral inguinal hernias [21].

In spite of these reports of excellent results utilizing a giant prosthetic preperitoneal repair of bilateral and recurrent hernias, this procedure has not gained overwhelming acceptance. Paradoxically, the acceptance of the laparoscopic preperitoneal prosthetic repair of inguinal hernias appears to be increasing in a relatively short time since its inception [3, 7, 9]. Although the technique itself has evolved directly from the precepts of the open preperitoneal prosthetic repair, already a laparoscopic series greater than 3,000 patients has been reported compared to Stoppa's orig-

inal series of only 604 patients [12, 17]. Extensive experience with the open preperitoneal technique has maximized our familiarity with the preperitoneal anatomy and associated hernia defects and allowed for a smooth evolution to a similar repair using laparoscopic innovations. No conversion to open repair or a major complication occurred in any of the laparoscopic repairs, unilateral or bilateral, and this, in part, is attributable to the described familiarity gained via the open technique.

It has been postulated, based on early clinical experiences with laparoscopic repairs, that recurrence rates will be in the order of 1% or less [2]. Arregui et al. have reported in their series of 1,514 patients a recurrence rate of 2.2% [20]. While a slightly higher 6% hernia recurrence rate was observed in our relatively small group of patients treated laparoscopically for bilateral inguinal hernias, this was similar to the 5% hernia recurrence rate observed in our group of similar patients treated using the open approach. It is difficult to precisely determine actual complication rates from the studies reported due to variable follow-up periods and the intensity of the follow-up, e.g., direct interview technique vs passive observation. While direct patient examination is certainly the preferred method of follow-up, we utilized a combination of direct examination and written or verbal correspondence similar to that of the Mayo Clinic in their series of bilateral hernia repairs [6]. While the size of the prosthesis may be related to the recurrence rate, proper placement of the prosthesis to cover various hernia defects adequately is a more important parameter. Prostheses as small as 6 × 8 cm have been utilized, properly placed, with similar recurrence rates [3].

Persistent thigh and groin neuralgia has been estimated to occur in 1–2% of conventional hernia repairs and is usually a transient complication of groin hernias produced by entrapment of the genital branch of the genitofemoral nerve, the ilioinguinal nerve, or the iliohypogastric nerve. All of these structures lie medial to the internal ring, where repair sutures are routinely placed in conventional groin hernia repair [16]. Stapling techniques used with laparoscopic groin hernia repair—specifically, the placement of staples lateral to the internal ring as well as inferior to the iliopubic tract—pose risk to the femoral branch of the genitofemoral nerve, the lateral femoral cutaneous nerve, and the femoral nerve in addition to the already-mentioned nerves. Injury to iliohypogastric and ilioinguinal nerves can occur with laparoscopic technique in thin patients when staples penetrate the muscle layer and entrap the nerves anteriorly. These nerves are, therefore, at risk with laparoscopic repair [11]. There was an increased number of groin and thigh neuralgia cases, albeit transient, in our laparoscopic series compared to the open ones (Table 3). Thigh and groin neuralgias were all minor and temporary, and in all cases were only identified at follow-up when specially addressed by the questioner. The instances of testicular pain were unrelated to the Nyhus classification of the hernias. Unfortunately, data regarding slitting of the mesh to accommodate the cord were not

recorded prospectively. There were no persistent or severe cases of neuralgia which would be expected if there were actual nerve entrapment caused by staples. Careful laparoscopic placement of staples with attention to the anatomical course of these nerves should minimize the possibility of nerve entrapment [2].

The laparoscopic transabdominal preperitoneal approach to bilateral inguinal hernia allowed for shorter hospital stays and faster recovery times, while recurrences, at least in the short term, were comparable to those encountered using the open technique. The Nyhus-type hernia classification demonstrated similar types of hernia percentages in both groups. While this stratification is extremely important in comparing follow-up complications, recovery times, and recurrences, its usage has not been commonly applied in comparative studies. Successful laparoscopic preperitoneal bilateral inguinal hernia repair in Geis' small series, using giant preperitoneal mesh placement, showed similar observations with no complications [4]. Since our study is not randomized, and the ASA classifications for the two groups are dissimilar, differences in patient motivation and overall level of performance may at least in part contribute to some of the differences in recovery. To date, the only prospective randomized study comparing unilateral conventional repair to laparoscopic repair shows similar decrease in postoperative recovery times [10].

Operative times and costs were similar, although the procedural cost for laparoscopic repair was slightly higher than that of an open repair mainly due to the equipment required. Nevertheless, patients in the laparoscopic group were able to return to normal activities and to work sooner than those in the open group. These findings are similar to times observed in a recent report comparing open vs laparoscopic repair of unilateral inguinal hernias.

Although longer follow-up is always desirable to determine the optimum management of bilateral inguinal hernias, particularly concerning long-term recurrence rates, our experience with the laparoscopic transabdominal preperitoneal approach to bilateral hernia demonstrates acceptable recurrence and complication rates with shorter hospital stays and faster recovery times than the open technique. However, familiarity with the open preperitoneal technique is both desirable and useful to provide patients with an alternative to the management of these difficult groin hernias. Furthermore, education in laparoscopic hernia repair is greatly facilitated by the exposure to the open technique.

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