Preperitoneal versus Lichtenstein tension-free hernioplasty for the treatment of bilateral inguinal hernia

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Background
Inguinal hernia is one of the most common diseases in the surgical setting. Bilateral inguinal hernia is present in 12% of patients and its treatment has been debated for long, sequential or simultaneous repair especially after tension-free repairs. We carried out this study to compare the Stoppa procedure with bilateral Lichtenstein hernioplasty for the treatment of bilateral inguinal hernia.

Materials and Methods
The study included 40 patients with bilateral inguinal hernias who were allocated randomly to two groups. Group A included 20 patients who were operated by bilateral Lichtenstein hernioplasty. Group B also included 20 patients who were operated by Stoppa repair. Recording of preoperative data (age, sex, BMI, comorbidity, smoking, and type of hernia), operative data (operative time and operative complications) and postoperative data (complications, pain, hospital stay, return to normal daily activities, chronic groin pain, and recurrence) was performed for each patient in the study. Patients were assessed at 7 days, and 1, 6, and 12 months after the procedure at the outpatient clinic.

Results
All patients were men. There was no statistically significant difference between both groups in preoperative data. The Stoppa procedure took a significantly shorter time than bilateral Lichtenstein repair; the mean operative time for Stoppa and bilateral Lichtenstein was 39.0 ± 5.15 and 62.25 ± 7.95 min, respectively. Postoperative pain scoring using the visual analogue score at 12 h postoperatively was significantly lower with the use of the Stoppa procedure than bilateral Lichtenstein repair, but there was no statistically significant difference between both groups in postoperative pain scoring at 24 h and 7 days postoperatively. No significant difference was detected between both groups in operative complications, postoperative complications, hospital stay, return to normal daily activities, and chronic groin pain. No recurrence was detected in any of the patients after 1 year of follow-up.

Conclusion
Bilateral inguinal hernias can be repaired simultaneously in the same setting safely and effectively without an increase in morbidity or recurrence rate. The Stoppa procedure can be a good alternative to bilateral Lichtenstein repair for the treatment of bilateral inguinal hernia, with comparable outcome.

Keywords:
bilateral, hernia repair, inguinal hernia, Lichtenstein, Stoppa

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Introduction

Inguinal hernia is one of the most frequently performed operations in general surgery [1,2]. It occurs in ~1.5% of the general population [3]. Most inguinal hernias are unilateral and at the right side and only 12% of patients have bilateral inguinal hernias [4]. Simultaneous or sequential repair of bilateral hernias is still debatable [5,6]. For many years, it was believed that simultaneous repair of bilateral inguinal hernias could not be done because this approach may result in a high recurrence rate [7]. This idea is now being questioned with the emergence of the 'tension-free' techniques. Authors have described about 80 operative techniques for inguinal hernia repair since Bassini reported his procedure in 1887 [8]. Surgeons continue to search for the optimum repair method with the least recurrence and least complications. The development of tension-free repairs made a huge breakthrough in hernia surgery. Placement of a mesh is required in all types of tension-free repair; the mesh may be placed through an open anterior, open posterior, or laparoscopic route. Multiple tension-free techniques are available now, which include the open anterior approach (onlay Lichtenstein patch, plug and patch), the open posterior approach (Stoppa, Kugel), and the closed posterior approach (laparoscopic) [8]. Simultaneous repair of bilateral inguinal hernias may have the advantages of patient satisfaction and lower costs because the patient is subjected to only one hospital admission, one anesthesia, and only one period of recovery is required [9]. This debate on the management of bilateral inguinal hernias led us to carry out our

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present study with the aim of comparing the Stoppa procedure with Lichtenstein tension-free hernioplasty for the management of bilateral inguinal hernia in terms of operative time, intraoperative complications, postoperative complications, postoperative pain, hospital stay, return to normal daily activities, chronic groin pain, and recurrence.

Study design

This is a prospective, randomized, controlled trial. The design involved 40 male patients with bilateral inguinal hernia scheduled for simultaneous repair of their bilateral hernias at the Department of Surgery, Medical Research Institute Hospital, Alexandria University. Patients were considered eligible after evaluation of clinical history, a thorough physical examination, blood chemistry, and radiological evaluation (ultrasonography of the abdomen and pelvis). Patients included in the study were divided into two groups: group A (underwent bilateral Lichtenstein tension-free hernioplasty) and group B (underwent Stoppa repair); patients with recurrent inguinal hernias and those undergoing emergency hernia repairs were excluded.

Ethics

A specific informed consent form approved by our Institution's Ethics Committee had to be signed by the candidates before inclusion in the trial; this form included detailed information about the surgery, the expected complications, and possible recurrence.

Endpoints

Primary endpoint

To evaluate the incidence of recurrence and chronic groin pain in the two groups of patients.

Secondary endpoints

(a) Perioperative parameters (operative time, intraoperative, and postoperative complications),
(b) Hospital stay,
(c) Postoperative pain scoring,
(d) Timing of return to normal daily activity, and
(e) Follow-up details.

Randomization method

Eligible patients were randomized into two groups: group A (underwent bilateral Lichtenstein tension-free hernioplasty) and group B (underwent Stoppa repair) using sealed opaque envelopes containing computer-generated random numbers. The randomization was performed 1 week before surgery during the preoperative assessment.

Surgical technique

Spinal anesthesia was used routinely for all patients. Immediately preoperatively, every patient received 2 g cefatriaxone.

Lichtenstein tension-free hernioplasty [10]

A skin incision was made parallel to the inguinal ligament extending from about 1/2 inch above and lateral to the pubic tubercle to just below and medial to the anterior superior iliac spine. The indirect hernia sac was dissected, ligated, and sectioned using Vicryl 0 (Ethicon; Johnson & Johnson International, Sint-Stevens-Woluwe, Belgium). The large direct sacs were invaginated and plicated using Vicryl 2/0 (Ethicon; Johnson & Johnson International). A heavy prolene mesh of 6 × 11 cm (PMH, prolene mesh, polypropylene nonabsorbable synthetic mesh 6 × 11 cm, Ethicon; Johnson & Johnson International) was used in all cases. The mesh was fixed in place using interrupted polypropylene 2/0 (Ethicon Sutures, Cincinnati, Ohio, USA). The mesh was fixed to the inguinal ligament and the conjoint tendon starting from the pubic tubercle extending beyond the orifice of the internal ring.

Stoppa procedure

The technique developed by Stoppa was used, with some modifications [11–14]. For all patients, a pfenestiel incision was used as a standard, followed by vertical separation of both recti to enter the preperitoneal space. Blunt dissection of the preperitoneal space was performed. Dissection involved the retropubic space of Retzius, and reached the rectus abdominis muscle and epigastric vessels laterally, extending to the retroinguinal space. The spermatic cord and gonadal vessels were visualized. The superior pubic ramus, the obturator foramen, and iliac vessels were exposed. Direct hernias were identified and reduced. Large sacs were removed and ligated with a purse-string suture. Indirect sacs were divided, the proximal peritoneum was sutured, and the distal peritoneum was left in place attached to the cord. If indirect hernia was sliding, dissection of the sac from the cord structures was performed. Parietalization of the spermatic cord and gonadal vessels was performed by dissection of their peritoneal attachment. A prolene mesh (PMH, prolene mesh, polypropylene nonabsorbable synthetic mesh 30×30 cm; Ethicon; Johnson & Johnson International) was placed in the preperitoneal space. Fixation of the mesh was not required as the intra-abdominal pressure forces the mesh to lay flat between the peritoneum and the fascial layers.

Postoperative course

Operative data of each patient were recorded with a focus on operative time and intraoperative

complications. Postoperative data recording included assessment of postoperative pain, postoperative complications, hospital stay, time of returning to normal daily activities, chronic groin pain, and recurrence. For each patient, postoperative pain was assessed at 12, 24 h, and 7 days postoperatively using the visual analogue scale [15].

Follow-up

All patients were followed at 7 days, and 1, 6, and 12 months after the operation at the outpatient clinic for assessment complications, pain, return to normal daily activities, chronic groin pain, and recurrence.

Statistical considerations

Statistical analysis was carried out using the statistical package for the social sciences, version 20 software (SPSS Inc., Chicago, Illinois, USA). Significance level was set at $\alpha = 0.05$. Qualitative data were described using number and percent. Quantitative data were described using range (minimum and maximum), mean, SD, and median. Comparison between different groups in terms of categorical variables was performed using the χ^2-test. When more than 20% of the cells had an expected count lower than 5, correction for χ^2 was performed using the Fisher's Exact test or Monte Carlo correction. For normally distributed data, comparisons between two independent population were performed using an independent *t*-test; comparisons between different periods using analysis of variance with repeated measures and post-hoc test were performed using Bonferroni adjustment. For abnormally distributed data, comparisons between two independent populations were performed using the Mann–Whitney test.

Results

The present study included 40 male patients with bilateral inguinal hernias who were allocated randomly to two groups. Group A included 20 patients who were operated by bilateral Lichtenstein tension-free hernioplasty. Group B also included 20 patients who were operated by Stoppa repair. All patients in the present study were men. There was no statistically significant difference between both groups in preoperative data (age, BMI, comorbidities, smoking, and type of hernia) (Table 1).

The operative time was significantly shorter in group B patients; it ranged between 30 and 50 min, with a mean of 39.0 ± 5.15 min, whereas in group A, it ranged between 50 and 75 min, with a mean of 62.25 ± 7.95 min, as shown in Table 2. There were no intraoperative complications (vascular or visceral injury) in either group.

Postoperative pain scoring measured by the visual analogue scale at 12 h postoperatively was significantly lower in group B patients, but there was no statistically significant difference between both groups in pain at 24 h and 7 days postoperatively (Table 3).

There was no statistically significant difference between both groups in postoperative complications, postoperative hospital stay, return to normal daily activities, and chronic groin pain (Table 2). No recurrence occurred in any patient after 1 year of follow-up in either group.

Discussion

For many years, it was believed that simultaneous repair of bilateral inguinal hernias should not be

Table 1 Preoperative assessment of both groups

Preoperative data	Group A (*n* = 20)	Group B (*n* = 20)	Test of significance	*P*-value
Age				
Minimum–maximum	20.0–62.0	22.0–62.0	*t* = 0.569	0.573
Mean ± SD	47.95 ± 9.0	49.60 ± 9.35		
BMI				
Minimum–maximum	25.0–38.20	25.20–37.40	*t* = 0.596	0.555
Mean ± SD	29.40 ± 3.97	30.14 ± 3.88		
Type of hernia [*n* (%)]				
Direct	18 (90)	17 (85)	χ^2 = 1.447	P_{MC} = 1.000
Indirect	1 (5)	1 (5)		
Combined (bilateral)	1 (5)	1 (5)		
Direct (unilateral)+combined (unilateral)	0 (0)	1 (5)		
Comorbidities [*n* (%)]				
Hypertension	2 (10)	3 (15)	χ^2 = 0.709	P_{MC} = 1.000
Diabetes	3 (15)	2 (10)		
COPD	3 (15)	2 (10)		
Smoking [*n* (%)]	5 (25)	6 (30)	χ^2 = 0.125	0.723

MC, monte carlo test; *t*, Student *t*-test; COPD, chronic obstructive pulmonary disease.

Table 2 Operative and postoperative parameters

Perioperative parameters	Group A (n = 20)	Group B (n = 20)	Test of significance	P-value
Operation time (min)				
Minimum–maximum	50.0–75.0	30.0–50.0	t = 11.310*	<0.001*
Mean ± SD	62.25 ± 7.95	39.0 ± 5.15		
Postoperative complications [n (%)]				
Wound seroma and hematoma	4 (20)	1 (5)	χ^2 = 3.544	P_{MC} = 0.571
Urine retention	1 (5)	2 (10)		
Wound infection	1 (5)	0 (0)		
Scrotal hematoma	1 (5)	1 (5)		
Chronic groin pain [n (%)]				
Absent	17 (85)	18 (90)	χ^2 = 0.229	P_{FE} = 1.000
Present	3 (15)	2 (10)		
Postoperative hospital stay (days)				
Minimum–maximum	1.0–3.0	1.0–2.0	Z = 0.622	0.534
Mean ± SD	1.15 ± 0.49	1.05 ± 0.22		
Median	1.0	1.0		
Return to work (days)				
Minimum–maximum	12.0–22.0	13.0–23.0	t = 0.119	0.906
Mean ± SD	16.90 ± 2.53	17.0 ± 2.79		

FE, fisher exact test; MC, monte carlo test; t, student t-test; Z, Mann–Whitney test, *Statistically significant at $P \leq 0.05$.

Table 3 Postoperative pain in both groups

Groups	Postoperative pain		
	12 h	24 h	7 days
Group A			
Minimum–maximum	5.0–9.0	2.0–7.0	0.0–4.0
Mean ± SD	6.95 ± 1.10	4.60 ± 1.35	1.75 ± 1.16
Significance between stages		<0.001*	<0.001*
Group B			
Minimum–maximum	5.0–8.0	3.0–6.0	1.0–3.0
Mean ± SD	6.25 ± 0.97	4.35 ± 0.99	1.70 ± 0.66
Significance between stages		<0.001*	<0.001*
t	2.139*	0.667	0.167
P-value	0.039*	0.509	0.868

ANOVA, analysis of variance; t, student t-test, significance between stages was performed using stands for adjusted bonferroni P-values for ANOVA with repeated measures for comparison between 12 h for stage, *Statistically significant at $P \leq 0.05$.

performed because this approach would cause increased postoperative complications (pain, wound complications, and recurrences) [16]. Today, it is known that the simultaneous repair of bilateral hernia is safe and effective.

The European Hernia Society elaborated guidelines for the treatment of bilateral inguinal hernias and recommended a one-stage procedure (Lichtenstein or laparoscopic) [17]. The Stoppa procedure can be another alternative for bilateral inguinal hernia treatment, but only for the surgeons familiar with it [18,19]. This led us to carry out this study to compare the Stoppa procedure with bilateral Lichtenstein hernioplasty for the treatment of bilateral inguinal hernias.

Malazgirt *et al*. [20] carried out a study on 45 patients with bilateral inguinal hernias (22 patients were operated by Stoppa and 23 patients were operated by bilateral Lichtenstein), and reported that Stoppa procedures took significantly shorter time than bilateral Lichtenstein repairs. They performed Stoppa repair under spinal anesthesia and Lichtenstein repair under either spinal or local anesthesia. In the present study, all procedures were performed under spinal anesthesia to avoid any bias in terms of postoperative pain scoring. Our results were comparable with those of Malazgirt *et al*. [20] in the operative time as the Stoppa procedure took a significantly shorter time than bilateral Lichtenstein repair. Gustavo *et al*. [21] carried out a study to evaluate simultaneous bilateral inguinal hernia repair by the Lichtenstein technique and reported a mean operative time of 113 ± 19.33 min, which was significantly longer than the mean operative time of bilateral Lichtenstein repair in the present study (62.25 ± 7.95 min). Gustavo *et al*. [21] did not exclude recurrent and complicated hernias; this may be an explanation for the prolonged operative time found in their study. Fernandez-Lobato *et al*. [22] carried out a large-scale study to evaluate Stoppa repair in bilateral inguinal hernia that involved 210 patients who underwent surgery for bilateral inguinal hernia from January 1995 to December 2003. They recorded that the operative time decreased significantly from 105 min in the first year to less than 61 min in 2001, with 73% of the cases operated in less than 60 min (P < 0.0001) and 62% in 2003. Stoppa *et al*. [13] described a mean operative time of 51 min. This duration is also shorter than that required in the bilateral Lichtenstein technique [13,23]. In the present study, the mean operative time for Stoppa repair was

39.0 ± 5.15 min, which is about 10 min less than what was reported by Stoppa because Stoppa and colleagues focused their study on complex and recurrent hernias and we excluded these cases from our study.

In our study, there was no significant difference between both groups in postoperative hospital stay, which was in agreement with the study by Malazgirt *et al.* [20]. Sasso *et al.* [21] reported a mean postoperative hospital stay of 1.55 ± 0.83 days for bilateral Lichtenstein repair (most of their patients were admitted for 1 day). Miller *et al.* [4] reported a mean hospital stay of 6.4 days and Serpell *et al.* [24] reported a hospital stay ranging from 2 to 12 days for bilateral Lichtenstein repair. We could not find a proper explanation for the relatively long postoperative hospital stay after bilateral Lichtenstein repair in these two studies [4,24]. Our results for postoperative hospital stay following bilateral Lichtenstein (1.15 ± 0.49 days) was close to that reported in the literature (1.3 ± 0.3 days) [25]. Fernandez-Lobato *et al.* [22] reported that the mean postoperative hospital stay following Stoppa repair was 1.2 days in 2003 during their study; this result was close to that of our study (1.05 ± 0.22 days). Carmen *et al.* [26], in their study of complex and recurrent bilateral inguinal hernias, reported a longer hospital stay following the Stoppa procedure (mean: 3 ± 0.3 days); this actually may have been because of associated comorbidities.

Malazgirt *et al.* [20] reported that there was no significant difference between bilateral Lichtenstein repair and Stoppa repair in the incidence of postoperative complications. A meta-analysis was carried out by Li *et al.* [27]. This meta-analysis pooled the effects of outcomes of a total of 2860 patients enrolled into 10 randomized-controlled trials and two comparative studies for comparison between preperitoneal and Lichtenstein repair for unilateral inguinal hernia and recorded that there was no significant difference between both groups in postoperative complications. Our results were comparable with those of Malazgirt *et al.* [20] and Junsheng *et al.* [27] as we did not find any significant difference between both groups in postoperative complications.

In the present study, there was no significant difference between both groups in return to normal daily activities; the mean was 16.90 ± 2.53 and 17.0 ± 2.79 days for group A and group B, respectively. Our results were close to those of Malazgirt *et al.* [20], who reported that the time required for return to normal daily activities was 18, 17, and 15 days following Stoppa, Lichtenstein under spinal anesthesia, and Lichtenstein under local anesthesia, respectively.

Malazgirt *et al.* [20] did not find any significant difference between both groups in immediate postoperative pain and chronic groin pain. In the study by Gustavo *et al.* [21], chronic groin pain occurred in only 3% of cases of bilateral Lichtenstein repair; this was much less than our results and the results of Malazgirt *et al.* [20] of 15 and 13.04%, respectively. Unilateral inguinal hernia repair by the Lichtenstein technique may lead to chronic groin pain in about 20–30% of patients [28]. The same results were reported by Solorzano *et al.* [29]. This high percentage of chronic groin pain following Lichtenstein hernia repair may be because of consideration of discomfort as a type of pain, whereas in our study, we recorded only patients with precise pain. Carmen *et al.* [26] reported that the incidence of chronic groin pain following bilateral Stoppa was 6.25%; in our study and the Malazgirt *et al.* [20] study, it was 10 and 9.09%, respectively. Junsheng *et al.* [27], in their meta-analysis, failed to find any significant difference between Lichtenstein and preperitoneal repair of inguinal hernia in postoperative chronic groin pain. In the present study, postoperative pain scoring at 12 h was significantly lower with the Stoppa procedure than bilateral Lichtenstein repair, but there was no significant difference between both groups in pain scoring at 24 h and 7days postoperatively. Both groups in our study were comparable with in chronic groin pain.

Malazgirt *et al.* [20] reported one recurrent case after Stoppa (1/22 patient) and no recurrence after bilateral Lichtenstein repair. Gustavo *et al.* [21] reported one recurrent case out of 59 patients operated by bilateral Lichtenstein repair after 2 years of follow-up. Kark *et al.* [30] observed less than 1% recurrence after Lichtenstein repair in 199 patients. Amid *et al.* [7] reported 0.1% recurrence in 1000 individuals and Hidalgo *et al.* [31] found no hernia recurrences in a total of 55 patients after Lichtenstein repair. The result of our study on recurrence following Lichtenstein was in agreement with other studies [7,20,21,30,31] as we did not find any recurrence after 1 year of follow-up. Fernandez-Lobato *et al.* [22] reported three cases of recurrence out of 210 patients following Stoppa repair for bilateral inguinal hernias. Two recurrences occurred in the first 30 cases and one recurrence in the remaining 140 cases. The total recurrence rate was 3/210 patients (1.4%) and 3/420 hernias (0.7%) (P<0.001). They reported that recurrence in all cases was because of the use of a small mesh, which did not cover the inguinal area correctly. After a mean follow-up of 24 months, Carmen *et al.* [26] reported a recurrence rate of 1% (1 of 124) per inguinal hernia repaired or 2% (1 of 64) per patient following Stoppa repair. In the present study, there was no recurrence following Stoppa repair after 1 year of follow-up. Our results of recurrence

following Stoppa repair were similar to those of other studies [22,26].

Conclusion

Simultaneous repair of bilateral inguinal hernia is safe and effective, without an increase in morbidity or the recurrence rate. The Stoppa procedure could be a good alternative to bilateral Lichtenstein repair for the treatment of bilateral inguinal hernia, with comparable operative and postoperative complications.

Acknowledgements

Conflicts of interest

There is no conflicts of interest.

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