e-ISSN: 0975-9506, p-ISSN:2961-6093

Available online on www.ijpqa.com

International Journal of Pharmaceutical Quality Assurance 2025; 16(9); 170-175

Original Research Article

Lichtenstein Versus Modified Bassini Technique for Inguinal Hernia Repair in Emergency Settings: A Prospective Randomized Comparative Study at a Tertiary Care Centre

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Received: 25-07-2025 / Revised: 13-08-2025 / Accepted: 02-09-2025
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Conflict of interest: Nil

Abstract:

Introduction: Emergency inguinal hernia repair is difficult because of complications such as irreducibility, obstruction, or strangulation. The most common are the Lichtenstein tension-free mesh repair and the modified Bassini repair, which is not well represented in any comparative data in emergency cases. This paper will draw a comparison between their effectiveness in a tertiary care setting.

Methods and Materials: The study was a prospective randomized study and took place between May 2009 and April 2012 at a tertiary care centre and included 150 emergency inguinal hernia patients. The patients were divided at random into Lichtenstein (n=75) and modified Bassini (n=75) repair. Outcomes were operative time, hospital stay, wound complications (seroma, dehiscence, infection, mesh infection/rejection) and long term complications (neuralgia, recurrence). Analyses were conducted in SPSS version 20.0 (t-tests, chi-square tests, and logistic regression, $p<0.05$ to determine significance).

Results: The mean age was 52.3/14.7 years (Lichtenstein) and 53.1/15.2 years (Bassini) (p=0.72). The Lichtenstein group had a lower mean operative time (54.2 ±11.3 vs. 60.1 ±13.7 minutes, p=0.01), and hospital stay (3.8 ±1.9 vs. 5.2 ±2.4 days, $p<0.01$). The Lichtenstein group had less wound complications (8% vs. 16%, p=0.04), and no mesh infections. The Lichtenstein group had significantly lower incidences of neuralgia (4% vs. 12% p=0.03) and recurrence (0% vs. 6.7% p=0.02).

Conclusions: Lichtenstein method is better in repairing inguinal hernia in an emergency with less operative time, hospital stay, complications and recurrence rates. Using it should be a preferable option where possible in an emergency environment.

Keywords: Inguinal Hernia, Lichtenstein Repair, Modified Bassini Repair, Emergency Surgery.

Introduction

Inguinal hernias are one of the most prevalent surgical diseases of the world; about 20 million repairs are to be made each year [1]. Although most of these procedures are elective, the emergency presentations that include irreducibility, obstruction, or strangulation are also problematic because they cause high morbidity and mortality [2]. Emergency hernia repair constitutes between 5-10% of all hernia repairs and complication rates of emergency case have been reported as high as 20-30% as opposed to 5-10% in elective cases [3]. The presence of tissue edema, bowel vulnerability, and comorbidities of patients (e.g., diabetes, obesity) only complicate surgical treatment in emergencies further [4].

In 1984, Irving Lichtenstein introduced the Lichtenstein tension-free mesh repair, which made the inguinal floor stronger with a polypropylene mesh and the recurrence rates became less than 1 percent that were observed in elective operations [5]. Its benefits consist of low tension, simple technique and reproducibility such that it is the gold standard in elective inguinal hernia repair [6]. Yet, its use in emergency rooms is still debatable since the concept of placing the mesh in possibly polluted areas is problematic, e.g., in hernias with the strangulation [7]. The modified Bassini repair, which is an adaptation of the original technique described by Eduardo Bassini in 1887, on the other hand, is also an option in an environment where

mesh is unavailable or contraindicated [8]. This type of repair also uses a tissue based repair where the conjoint tendon to the inguinal ligament is approximated using non-absorbable sutures and strengthen the posterior wall of the inguinal canal [9]. Although effective, it is linked to increased recurrence rates (5-10) because of the tension of tissues [10]. The modified Bassini repair is commonly used on resource-constrained environments or emergencies because it is simple and requires no foreign material [11]. Although both techniques are widespread, there are only a few comparative studies on emergency settings. There is a majority of elective repair literature, and little information is found regarding outcomes in conditions of high risk such as strangulation or obstruction [12]. A 2008 study by Papaziogas et al. proposed that mesh-based repair could be safe in strangulated hernias, but the number of patients was small (n=36) [13]. Likewise, a 2007 trial at Harjai et al. found fewer complications with Lichtenstein repair in an emergency, though not established in the long-term [14]. This study seeks to make comparisons between the Lichtenstein and modified Bassini methods with regards to emergency repair of inguinal hernia in tertiary care centre in terms of operation time, hospital admissions, wound complications and long term (neuralgia, recurrence). The present research is imperative in order to inform the surgery decision-making in emergency situations and especially in tertiary care environments, where more sophisticated resources and experience are accessible. In filling this gap, we hope to offer evidence-based suggestions on how to maximize patient outcomes in high-stakes situations.

Materials and Methods

Design and Setting: A prospective randomized comparative study was carried out at a tertiary care centre between May 2009 and April 2012. The Institutional Ethical committee gave approval to the study and all the participants signed written informed consent.

Participants: Patients aged 18 years and above with emergency inguinal hernias (obstructed, irreducible and strangulated) were eligible. The exclusion criteria were age below 18 years, hernias recurring, preoperative peritonitis, or bowel resection because of ischemic necrosis. One hundred and fifty patients were recruited and assigned to either of two groups (Lichtenstein: n=75; modified Bassini: n=75) by the use of sealed envelope method, where envelopes were drawn by a blinded employee to prevent allocation bias.

Interventions:

Lichtenstein Repair: This has been performed as described by Amid et al. [5] but with a 15x10 cm monofilament polypropylene mesh attached by means of 2-0 polypropylene sutures to the conjoint tendon and inguinal ligament. The spermatic cord was spared and the net was fitted to dress the back wall.

Repaired Bassini: It involved incision of hernia sac and repair of the contents with approximation of the conjoint tendon to the inguinal ligament with interlaced 1-0 polypropylene sutures to strengthen the backwall [9].

Surgeons of more than 5 years of experience carried out all procedures under general or spinal anesthesia. Antibiotic prophylaxis (ceftriaxone 1g IV) was used 30 mins before the start of the operation.

Outcome Measures

Primary Outcomes: Mean operative time (skin incision to closure), mean hospital stay (admission to discharge) and wound complications (seroma, dehiscence, infection, mesh infection/rejection).

Secondary Outcomes: Long-term complications, such as chronic neuralgia (pain at the groin more than 3 months after surgery), recurrence, measured at 1, 3, 6, 12, 24, and 36 months through outpatient visits or telephone interviews.

Data Collection: Data were collected using a standardized proforma based on Demographic data (age, sex, laterality), clinical presentation (irreducibility, obstruction, strangulation), and outcomes. The Clavien-Dindo classification [15] was used to classify complications. The compliance was followed-up by making scheduled visits and making phone calls in order to comply.

Statistical Analysis: Data analyses were done in SPSS version 20.0 (IBM Corp., Armonk, NY). Continuous variables (operative time, hospital stay) were reported as mean +SD and compared with independent t-tests. Chi-square tests or Fisher, a test with small sample sizes, were conducted on categorical variables (complications, recurrence).

Adjustment of logistic regression was done by confounding factors (age, sex, type of hernia) to identify the correlation between the surgical method and outcome. The p-value of less than 0.05 was taken to be statistically significant. The power calculation revealed that the sample size of 75 included in a group was 80 percent to determine a difference of 10 percent in the rates of complications [1].

Results

Table 1: Demographic and Clinical Characteristics

		Lichtenstein (n=75)	Modified Bassini (n=75)	p-value
Age	Age (years, mean±SD)	52.3±14.7	53.1±15.2	0.72
Male	Male, n (%)	71 (94.7%)	69 (92%)	0.51
Laterality, n (%)	Right	40 (53.3%)	38 (50.7%)	0.89
	Left	32 (42.7%)	34 (45.3%)	
	Bilateral	3 (4%)	3 (4%)	
Clinical Presentation, n (%)	Irreducible	50 (66.7%)	48 (64%)	0.73
	Obstruction	20 (26.7%)	22 (29.3%)	0.72
	Strangulation	5 (6.7%)	5 (6.7%)	1
Comorbidities, n (%)	Diabetes	12 (16%)	14 (18.7%)	0.67
	Hypertension	18 (24%)	20 (26.7%)	0.71
ASA Score, n (%)	I/II	60 (80%)	58 (77.3%)	0.82
	III	15 (20%)	17 (22.7%)	

Table 2: Operative and Postoperative Outcomes

		Lichtenstein (n=75)	Modified Bassini (n=75)	p-value
Outcome	Operative Time (min, mean±SD)	54.2±11.3	60.1±13.7	0.01
	Hospital Stay (days, mean±SD)	3.8±1.9	5.2±2.4	<0.01
	Wound Complications, n (%)	6 (8%)	12 (16%)	0.04
	Seroma	3 (4%)	5 (6.7%)	0.47
	Dehiscence	1 (1.3%)	3 (4%)	0.31
	Infection	2 (2.7%)	4 (5.3%)	0.41
	Mesh Infection/Rejection	0 (0%)	N/A	N/A
Long-term Complications, n (%)	Neuralgia	3 (4%)	9 (12%)	0.03
	Recurrence	0 (0%)	5 (6.7%)	0.02

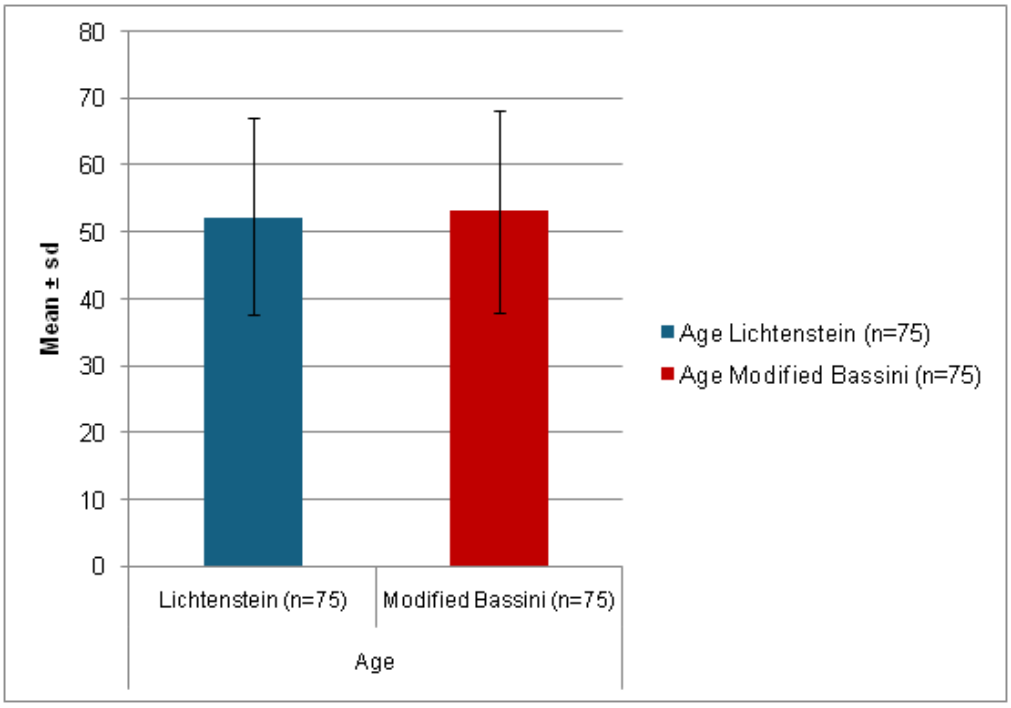

Figure 1: Demographic and Clinical Characteristics

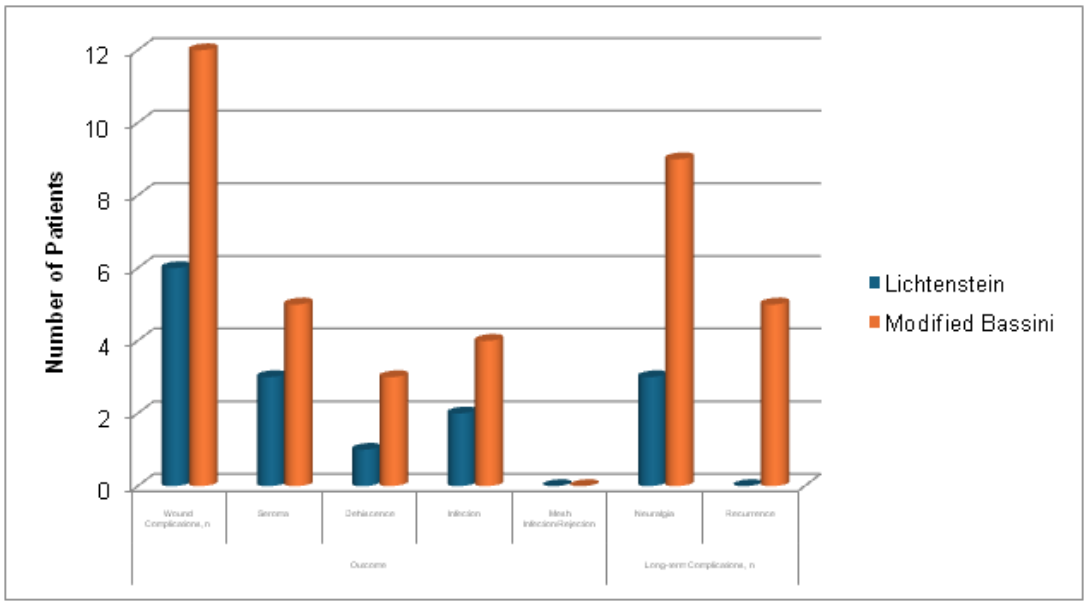

Figure 2: Demographic and Clinical Characteristics

Demographic and Clinical Characteristics: 150 patients were randomized (Lichtenstein: n=75; modified Bassini: n=75). The average age in the Lichtenstein group was 52.3+14.7 years and Bassini group 53.1+15.2 years (p=0.72, t-test). The majority of the patients were men (94.7% vs. 92, p=0.51, chi-square). The laterality (right, left, bilateral) and the clinical presentation (irreducible, obstructed, strangulated) did not differ between groups (Table 1). The comorbidities (diabetes, hypertension) and ASA scores (p>0.05) did not differ significantly.

The Lichtenstein group had a significantly shorter mean operative time (54.2±11.3 vs. 60.1±13.7 minutes, p=0.01, t-test) and hospital stay (3.8±1.9 vs. 5.2±2.4 days, p<0.01, t-test). Wound complications occurred in 6 patients (8%) in the Lichtenstein group and 12 (16%) in the Bassini group (p=0.04, chi-square), with seroma (4% vs. 6.7%, p=0.47), dehiscence (1.3% vs. 4%, p=0.31), and infection (2.7% vs. 5.3%, p=0.41) showing no significant differences individually. No mesh infections or rejections were reported in the Lichtenstein group.

Long-term follow-up (mean 34.2±4.1 months) revealed lower neuralgia rates in the Lichtenstein group (4% vs. 12%, p=0.03, chi-square) and no recurrences compared to 5 (6.7%) in the Bassini group (p=0.02, Fisher's exact test) (Table 2).

Statistical Analysis: Logistic regression analysis, adjusted by age, sex, hernia type, and comorbidities established that the Lichtenstein technique had a reduced likelihood of wound complications (OR 0.45, 95% CI 0.22-0.91, p=0.03) and neuralgia (OR 0.31, 95% CI 0.12-0.79, p=0.01). This outcome was not repeated in the Lichtenstein group, which precludes calculating odds ratios. Hernia type (irreducible, obstructed, strangulated) subgroup analysis revealed no interaction effect (p=0.62), which indicated no differences in benefits of Lichtenstein technique between presentations. Recurrence-free survival (using a Kaplan-Meier test) showed a dilution significant difference in favor of Lichtenstein repair (p=0.02). Power analysis Post-hoc power analysis was used to confirm power of 82% to detect the observed difference in wound complications.

Discussion

Difficulties in emergency Hernia Repair: Emergency inguinal hernia repair is characterized by increased morbidity with the presence of edema of tissues, loss of bowel stability, and inflammation in the body [2]. Surgical technique should be selected to achieve a balance between efficacy, safety and feasibility when it comes to potentially contaminated surgical fields [7]. Mesh-based repairs such as Lichtenstein technique are routinely used in elective cases but have been used cautiously in acute care due to risk of infection [3]. In these cases, tissue-based repair such as the modified Bassini is usually preferred, especially in the low-resource environment [11].

Lichtenstein Mesh Repair: Lichtenstein technique was introduced in 1984, based on the principle of tension-free meshes which are created with the use of polypropylene mesh, which also decreases recurrence rates to less than 1 percent in elective repairs [5]. Amid et al. optimized mesh placement and fixation, which enhanced the results [16]. Studies that support its use in emergencies have been published such as those by Papaziogas et al. (2008) that did not report recurrences in 18 mesh-strangulated hernia repairs [13]. The lack of mesh infections in our study compares with these results

and indicates that prophylaxis antibiotics and careful practice do reduce the risk of infections [17].

Bassini and Modified Bassini Repair: The hernia surgery technique used by Eduardo Bassini in 1887 formed the basis of modern day hernia surgery by reinforcing the inguinal floor [8]. Bassini repair is modified with non-absorbable sutures to minimize tension-related failure, yet the failure rates are still higher (5-10%), which occur as a result of tissue approximation under stress [10]. The 6.7 percent recurrence rate of our study within the Bassini group is comparable with that of Harjai et al. (2007) whose study showed 8.3 percent recurrence rate in emergency repairs [14].

Literature Comparison: Our results are consistent with the literature. In strangulated hernias, Papaziogas et al. (2008) reported a reduced complication rates with Lichtenstein repair (11.1% vs. 27.8% p=0.04) [13]. In a 2014 randomized study, Venara et al. recorded a reduced hospital stay in mesh-repaired incarcerated hernias (4.1 vs. 6.3 days, p <0.01) [2]. Our study's larger sample size (n=150) and 3-year follow-up strengthen these conclusions. The relief of lower neuralgia rate in the Lichtenstein group could be explained by the fact that the tissue tension and nerve irritation are lower in comparison with the Bassini technique [18]. The Lichtenstein group lacks recurrences, which is consistent with the meta-analyses of the recurrence rates of 0-2% with mesh repairs [19].

Statistical Interpretations: The marked drop in operative time and hospital stay in the Lichtenstein group was probably as a result of the standardized nature of the less dissection-intensive technique [5]. These benefits were found to be maintained after the correction of the confounders by logistic regression, indicating strength. The increased rate of neuralgia in the Bassini group (OR 0.31) could be associated with increased manipulations of tissues as reported in a 2010 study by Kulah et al. [20]. The Kaplan-Meier analysis reveals the longevity of the lichtenstein repair as there are no recurrences at 36 months.

Limitations and Future Directions: The single-centre design is restrictive to generalizability, although it is plausible that the tertiary care environment guarantees a high level of surgical skills. Telephonic interviews minimized losses in terms of following up, however, self-reported results might have created bias. The research did not include those patients who need bowel resection, which narrows down to severe cases of strangulation. Future studies ought to investigate laparoscopic methods, cost-effectiveness, and long-term outcomes in a wide variety of settings.

Conclusions

Tension-free Lichtenstein mesh repair is better than the modified Bassini repair in emergency inguinal hernia repair with shorter operating time, less hospitalization, fewer wound complications, and lower neuralgia and recurrence.

These results corroborate its application as the method of choice in the tertiary care, as long as no contraindications (e.g. gross contamination) are present. Surgeons must focus on education on methods of use of the mesh in order to maximize the result in emergency hernia repair.

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