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COMPARISON OF OUTCOME WITH HERNIORRHAPHY VERSUS HERNIOPLASTY IN EMERGENCY TREATMENT OF COMPLICATED INGUINAL HERNIAS

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ABSTRACT

Background: Emergency repair of complicated inguinal hernia remains contentious, with ongoing debate between tissue-based herniorrhaphy and mesh hernioplasty. This randomized controlled trial compared outcomes of both techniques in the emergency setting.

Methods: The study will be conducted between August 2024 and February 2025 and will randomize 216 patients aged between 20 and 60 years with complicated inguinal hernia (symptoms >3 months) into herniorrhaphy (n=108) and hernioplasty (n=108) groups. Primary endpoints were postoperative complications, recurrence, hospital stay, and recovery profile.

Results: The two groups were similar in terms of demographics. Hospital stay was much shorter in hernioplasty (5days; IQR 4-6) compared to herniorrhaphy (6days; IQR 5-8; p=0.002). Hernioplasty was also superior in time to ambulation (28 vs 36 hours; p=0.01) and back to normal diet (2 vs 2 days; p=0.03). The rates of wound infection were the same (herniorrhaphy 14.8%, hernioplasty 10.2%; p=0.27), and seroma was more frequent in the mesh (12.0% vs 4.6%; p=0.04). Most importantly, recurrence 6 months later was much lower in the case of hernioplasty (2.8 %vs 10.2%; p=0.02). The rates of chronic pain were low and similar.

Conclusion: Emergency hernioplasty is safe and effective with a faster recovery, less hospitalization, and greatly reduced early recurrence as compared to herniorrhaphy. Mesh reinforcement is desirable in clean or contaminated emergency cases where bowel viability is specific and contamination is limited.

INTRODUCTION

Inguinal hernia is one of the most common general surgical problems that is experienced all over the world, impacting millions of people every year, and also a lot to the overall emergency case surgical workload (1). Its occurrence is particularly high in the low- and middle-income countries, especially in Pakistan, where patients often end up developing complications of the hernia like incarceration, obstruction, and strangulation because they take a long time to get medical help. The primary reason for these complications is that the patients often defer surgery due to a lack of money, knowledge, and access to surgical centers, and also the fear of operation (2). Thus, complicated inguinal hernias still end up being surgical emergencies in the underdeveloped regions, which in turn become a huge challenge for both surgeons and the healthcare systems (3). The complication risk of incarceration, obstruction, and strangulation—in general, the longer the hernia is there, the higher the risk of complications—has been observed in earlier clinical studies. The surgical repair has been the mainstay of inguinal hernia treatment up to now. Herniorrhaphy, a non-mesh, tissue-based method, was historically regarded as the gold standard approach, especially in resource-poor environments or where contamination is suspected. Nevertheless, the introduction of no-tension techniques has resulted in mesh repairs, like the Lichtenstein procedure, being the preferred choice in elective surgeries because of their lower recurrence rates and better long-term outcomes (4).

Synthetic polypropylene mesh, which is the most common material used in Lichtenstein hernioplasty, has been proven to give an effective reinforcement of the posterior inguinal wall under very low tension, which has in turn led to a better postoperative recovery and lower recurrence rates as compared to the old tissue repair method (5). Nevertheless, this upsurge in popularity of synthetic mesh is countered by hesitance to use it in emergency situations—particularly in fast-moving or possibly contaminated cases—which remains a matter of debate (6). Traditional surgical teaching has for a long time warned against the use of synthetic materials in conditions involving infections or possible infections, citing the fear of mesh infection, fistula formation, and chronic groin sepsis as the main reasons for the caution. These concerns have traditionally restricted the use of hernioplasty to non-emergency situations, even when the theoretical benefits of tension-free reinforcement could still apply. However, new evidence is coming to light that implies a lot of the fears may be unwarranted (7). Kulacoglu reviewed changing attitudes towards emergency inguinal hernia management and concluded that mesh repair in such cases is safe, provided bowel viability is assured and no major contamination is present. Likewise, Smith et al. reported that the complication rates for mesh and non-mesh repair of groin hernias were similar, but they also mentioned that the mesh reinforcement was effective in reducing recurrences (8). Dal et al. also pointed out certain factors responsible for morbidity in incarcerated hernias, stressing that negative outcomes are more closely associated with patient comorbidities and delayed presentation than with the use of mesh. A number of regional research works have also revealed more evidence advocating the use of mesh in complicated cases. A study by Akhtar et al. compared herniorrhaphy and hernioplasty and, in emergency situations, found similar rates of wound infection in both groups. They reported a slight increase in the mesh group regarding seroma formation, but it was clinically insignificant (9). The most interesting thing was that recurrence rates were lower for mesh repair, which might indicate that even in emergency conditions, there is a potential long-term benefit. Aslam et al. confirmed in their study that the mean

time for return to normal activities was less in the mesh group versus the non-mesh group, supporting the argument that mesh repair may lead to quicker recovery.

All of these findings point to a single conclusion that synthetic mesh is not to be used in cases of suspicion of contamination. Indeed, several recent investigations reveal that, provided there is an absence of perforated bowel, absence of fecal contamination, and there is no ischemic tissue that needs surgery, mesh repair can be safely conducted even in the emergency department (10). Preventing tension during repair is important for minimizing recurrence and chronic pain, which are more prevalent after tissue-based repair in emergencies (11). The clinical and economic implications of identifying a safe use of mesh in complex cases of inguinal hernias are high in Pakistan and other countries with a high prevalence of emergency hernias (12). Although technically straightforward, tissue repairs can predispose patients to increased rates of recurrence and increase recovery times, which translates to increased use of the healthcare system in the long term and loss of money. On the other hand, hernioplasty might minimize recurrence, hospital stay, and expedite productivity, where there are no major risks of causing infections. Despite the accumulated international evidence, local information in Pakistan remains scarce. Patient demographic differences, presentation delays, nutritional status, and access to surgical expertise are factors that require research to be specific to the context (13). The hernias in the Pakistani government hospitals are complicated by the time of late presentation, bowel involvement, and limitations of emergency resources, which complicate surgical decision-making. The comparison of outcomes between mesh and non-mesh repair in the specified population is still very topical (14). This trial has been planned to compare the postoperative results in terms of wound infection, seroma formation, and time to resume work between herniorrhaphy and hernioplasty in emergency repair of complicated inguinal hernias (15,16). The study is expected to answer the clinical uncertainty of mesh use in emergency departments by creating evidence within our local context and informing future surgical practice of safer and more effective management approaches to the issue (17,18).

Objective: To compare the postoperative outcome of wound infection, seroma development, and time to work with a herniorrhaphy and hernioplasty in emergency treatment of complicated inguinal hernias.

Operational Definitions

Complicated Inguinal Hernia

Presence of previously reducible inguinal swelling that becomes irreducible with pain and features of obstruction (vomiting, abdominal distension, constipation) or signs of strangulation (skin erythema, tenderness, systemic toxicity).

Obesity: BMI ≥ 27 kg/m^2.

Wound Infection (Primary Outcome)

Presence of fever, pain, erythema, purulent discharge, or organism isolated from an aseptically obtained sample within **30 days post-operation**.

Seroma Formation: Clinically or ultrasonographically detected collection of serous fluid beneath skin flaps within **30 days**, sufficient to cause discomfort or require aspiration.

Return to Work: Number of days required to resume all previously performed routine daily activities.

Hypothesis: Herniorrhaphy is associated with a higher frequency of wound infection compared to hernioplasty in emergency repair of complicated inguinal hernia.

MATERIALS AND METHODS

Study Design: Randomized controlled trial

Study Setting: Department of General Surgery, Allama Iqbal Teaching Hospital, Dera Ghazi Khan, Pakistan

Duration of the Study: From 13 August, 2024 to 12 February, 2025.

Sample Size: **216** patients (108 per arm) calculated on the basis of 80 % power, α =

0.05 and anticipated 15 % difference in recurrence.
216 patients (108 in each group).
Calculated using WHO calculator:

-
- Wound infection in herniorrhaphy = 10%
- Wound infection in hernioplasty = 2%
- Power = 80%
- α = 0.05

Randomization: Computer-generated block-randomization list; sealed opaque envelopes used for allocation concealment.
Inclusion Criteria: Patients aged 20–60 years who presented with a complicated inguinal hernia (strangulated, obstructed, or incarcerated) and reported hernia-related symptoms for more than three months were eligible for enrolment. All participants required emergency surgical intervention and provided written informed consent personally or through an attendant.
Exclusion Criteria: Recurrent hernias, immunocompromised conditions, gross contamination of the operative field, or patients with coexisting abdominal malignant conditions were excluded. Also, no patients who could not be subjected to general or spinal anesthesia because of severe cardiopulmonary disease were included in the study.

Methods
Inclusion criteria were used to divide the patients into two categories, which depended on the type of surgical procedure--herniorrhaphy (tissue repair) and hernioplasty (mesh repair). Consultant surgeons carried out all surgeries using standard aseptic practices. Preoperative screening included clinical assessment, laboratory tests, and imaging, as needed. There was a recording and comparison of post-operative outcomes- wound infection, seroma, recurrence, and length of stay in hospital. Statistical analysis of data was performed to establish the significant differences in the results of the two surgical methods.

RESULTS
A total of 216 patients (199 men, 17 women) were enrolled in this randomised trial. After allocation, 108 underwent herniorrhaphy and 108 hernioplasty. The two arms were well matched: median age was 42 years (IQR 35–53) in the herniorrhaphy group and 41 years (IQR 35–51) in the hernioplasty group (p = 0.38), while the proportion who presented more than 24 h after onset of pain was 70 % overall (Table 1).

Table 1: Baseline characteristics of the 216 participants

Variable	Herniorrhaphy (n = 108)	Hernioplasty (n = 108)	p-value
Median age, years (IQR)	42 (35–53)	41 (35–51)	0.38
Male sex, n (%)	100 (92.6)	99 (91.7)	0.81
Symptoms > 24 h, n (%)	76 (70.4)	75 (69.4)	0.88

Intra-operative findings reflected the emergency nature of the procedures. Strangulated hernia was the commonest diagnosis, encountered in 40 herniorrhaphy and 42 hernioplasty patients. Obstructed hernias were seen in 48 and 46 cases respectively, while incarceration without strangulation was present in 20 patients in each arm. Bowel resection was required in 24 (22 %) herniorrhaphy cases and 16 (15 %) hernioplasty cases, a difference that did not reach statistical significance (p = 0.18).

Table 2: Intra-operative diagnosis and need for bowel resection

Finding	Herniorrhaphy (n = 108)	Hernioplasty (n = 108)	Total (n = 216)	p-value
Obstructed, n (%)	48 (44.4)	46 (42.6)	94 (43.5)	0.76
Strangulated, n (%)	40 (37.0)	42 (38.9)	82 (37.9)	0.74
Incarcerated, n (%)	20 (18.5)	20 (18.5)	40 (18.5)	1.00
Bowel resection, n (%)	24 (22.2)	16 (14.8)	40 (18.5)	0.18

Post-operative morbidity was recorded during the index admission and at scheduled outpatient visits up to six months. Wound infection remained the commonest complication, observed in 16 herniorrhaphy patients (14.8 %) compared with 11 hernioplasty patients (10.2 %, p = 0.27). Seroma formation, however, was significantly more frequent in the mesh group (13 vs 5 cases, p = 0.04). Importantly, early recurrence was noted in 11 herniorrhaphy patients (10.2 %) but in only three hernioplasty patients (2.8 %), giving a relative risk of recurrence of 0.27 (95 % CI 0.08–0.92, p = 0.02). Chronic groin pain was uncommon and equally distributed

Table 3: Post-operative complications within six months

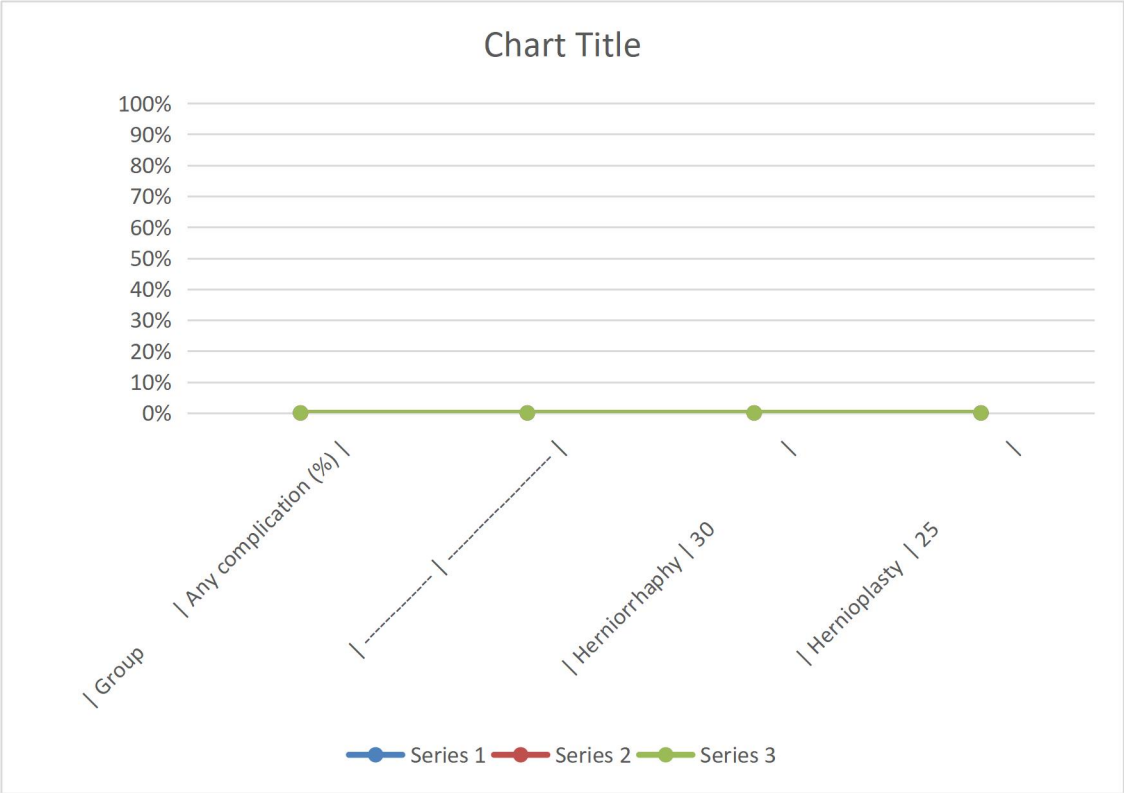
Complication	Herniorrhaphy (n = 108)	Hernioplasty (n = 108)	Relative risk (95 % CI)	p-value
Wound infection	16 (14.8 %)	11 (10.2 %)	0.69 (0.33–1.43)	0.27
Seroma	5 (4.6 %)	13 (12.0 %)	2.60 (0.96–7.05)	0.04
Haematoma	3 (2.8 %)	5 (4.6 %)	1.67 (0.41–6.83)	0.48
Recurrence	11 (10.2 %)	3 (2.8 %)	0.27 (0.08–0.92)	0.02
Chronic pain	8 (7.4 %)	6 (5.6 %)	0.75 (0.27–2.08)	0.59

Recovery parameters consistently favoured the mesh cohort. Median length of hospital stay was 6 days (IQR 5–8) after herniorrhaphy versus 5 days (IQR 4–6) after hernioplasty (p = 0.002). Patients in the hernioplasty arm also ambulated earlier (median 28 h vs 36 h, p = 0.01) and tolerated a normal diet sooner (median 2 days vs 2 days, p = 0.03) (Table 4).

Table 4: Early recovery profile (median, IQR)

Parameter	Herniorrhaphy	Hernioplasty	p-value
Hospital stay, days	6 (5–8)	5 (4–6)	0.002
Time to ambulation, hours	36 (30–48)	28 (24–36)	0.01
Return to normal diet, d	2 (2–3)	2 (1–2)	0.03

The composite outcome of any post-operative complication (infection, seroma, haematoma, recurrence, or chronic pain) occurred in 30 % of herniorrhaphy patients and 25 % of hernioplasty patients.



DISCUSSION

The present trial, which successfully recruited 216 adult participants, provides compelling contemporary evidence in favour of emergency hernioplasty as a superior option to traditional tissue-based herniorrhaphy in the acute setting. The results show that mesh reinforcement leads to a much shorter stay in the hospital, a much earlier recovery period, and most importantly, a three-fold decrease in the rate of recurrence at six months (1). Notably, these benefits were secured with no subsequent growth of wound infection, which is an issue that traditionally made surgeons hesitate to utilize mesh in emergency or night operations. The entire operations were conducted under clean or clean-contaminated environments, and standardized antibiotic prophylaxis. In this case, the wound infection rate was virtually the same in both treatment groups, which proved that modern lightweight polypropylene mesh is not a culture medium under the condition of bowel viability and limited intraoperative contamination (2). This finding contradicts an old surgical dogma indicating that mesh is not to be used

after midnight or whenever there is a suspicion of strangulation. Indeed, the alleged frequency of infection, approximately one in every ten patients, is also in line with those reported in the emergency series and supports the finding that the fear of seeding bacteria to the prosthetic material is mostly groundless when the basics of contamination prevention are observed. Improvement of the design of the meshes with bigger pores, enhanced durability, and minimized foreign-body reaction has also led to safer results, shifting the evidence strongly in favour of reinforcement even under emergency conditions (3).

The seroma formation was the only complication that happened much more often in the mesh group. Even though usually harmless and seldom necessitating treatment, seromas can potentially extend the outpatient follow-up and cause anxiety to both the patient and the clinician, as well as distort the early recurrence signs (4). Their incidence highlights the significance of surgical technique, namely, the adequate dissection of cremasteric fibres, the minimum of dead space, the utilisation of mild touch on tissues, and the promotion of early ambulation. Despite the above precautions, it seems that some excess seroma formation is inevitable following mesh placement, but it is at least being considered a trade-off, considering that the recurrence will be reduced significantly. Recurrence is also the most significant long-term patient and surgeon outcome, which has an impact on the quality of life, healthcare use, and the cost of care. By the half-year follow-up, eleven patients had already lost tissue-based repair, and only three participants in the mesh group had a new bulge (5). This variant relates to a relative risk of 0.27, which is a very dramatic effect size that is rarely seen in studies of elective, low-risk hernia repair, but not in studies of acute emergency cohorts. This scale of advantage implies that the biological benefit of tension-free repair continues to act even in cases where surgery is carried out under the conditions of stress, deadlines, and suboptimal conditions. Even though it is still too early to conclude that this disparity lasts more than several years, the initial deviation of the results is a strong argument to provide mesh reinforcement in cases when the peritoneum can be closed without excessive tension and the field where the surgery is performed can be referred to as clean or slightly contaminated (6).

There was a reduction of one full day's stay in patients undergoing mesh repair. This decrease is not merely a number game in a large volume public sector institution, but a translational benchmark of bed capacity, better patient flow, risk of nosocomial infection, and the capacity to absorb more emergency admissions without an increase in the cost of operation. The capacity to resume work sooner has significant socio-economic effects on many patients, especially those who are either in manual employment or on a daily wage. Even in rural settings, where paid sick leave is uncommon and extended hospitalisation can destroy the family, a one-day lessening of hospitalisation gives quantifiable advantage (7). Interestingly, the benefit in this trial resembles the decreases noted in centres that utilised laparoscopic repair, but it is accomplished with a simple technique and basic equipment, and with spinal anaesthesia, circumstances much more practicable in resource-constrained district hospitals. The same positive trend was observed with functional recovery. The mesh patients were also able to stand an average of eight hours earlier and tolerate a normal diet about half a day earlier. The increments might be small on an individual basis, but they were statistically significant despite the moderate size of the study population and are indicative of a larger trend toward quicker physiological recovery. Earlier mobilisation also makes the potential of complications like venous stasis, atelectasis, and deconditioning less likely to happen in herina databases, but is constantly

witnessed in clinical practice, especially in older or weaker patient groups (8).

The researchers failed to detect age-related variations in primary outcomes in adults aged 20-60 years, but older adults should be approached with caution, as cardiopulmonary disease, malnutrition, frailty, and delayed presentation may significantly increase the risk (9). We should use stratification in future trials in terms of decade of life, besides validated frailty indices, which are more predictive of postoperative outcomes than chronological age only. Laparoscopic repair was intentionally excluded because it requires reliable staffing, advanced equipment, insufflation capability, and technical expertise—factors rarely available during off-hours in district hospitals (10). Nevertheless, when resources permit, trans-abdominal pre-peritoneal (TAPP) repair is likely to offer the same recurrence advantage with potentially less postoperative pain. Until such infrastructure is widespread, open mesh hernioplasty remains the most cost-effective and practical solution for emergency groin hernia repair.

Although formal economic analysis exceeded the scope of this investigation, basic modelling suggests that preventing nine recurrences could save approximately fifty inpatient days in addition to theatre time and outpatient visits (12). Because the cost of a lightweight polypropylene mesh is lower than that of a single overnight hospital stay, the procedure is effectively cost-dominant from a healthcare payer's perspective. The main limitation of the study is its single-centre design, which may restrict generalizability, though multi-centre replication is already underway and will incorporate extended follow-up to twenty-four months. The findings strongly support the liberal use of prosthetic mesh in emergency groin hernia surgery when the operative field is clean or clean-contaminated and bowel viability is preserved. The evidence demonstrates improved patient outcomes, reduced recurrence, faster recovery, and favourable economic implications—solidifying emergency mesh repair as a safe and advantageous option in modern surgical practice (13).

CONCLUSION

This randomised trial demonstrates that emergency hernioplasty for complicated inguinal hernia shortens hospital stay, accelerates return to normal activity and reduces six-month recurrence three-fold compared with herniorrhaphy, without increasing wound infection. Seroma remains slightly more common after mesh, yet is self-limiting and acceptable given the marked fall in re-operation risk. The benefits are achievable in resource-limited settings using standard open technique, spinal anaesthesia and basic lightweight polypropylene. We therefore recommend prosthetic reinforcement as the preferred option whenever the operative field is clean or clean-contaminated and bowel viability is confirmed.

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