Effect of Postoperative Hernia Truss Use on Complications Following Laparoscopic Inguinal Hernia Repair

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Abstract- Inguinal hernia repair is common, but postoperative complications such as pain, seroma, and recurrence remain concerns. Hernia belts have been proposed to provide external support and reduce these risks, though evidence is inconsistent. This study aimed to evaluate whether routine postoperative hernia belt use following laparoscopic transabdominal preperitoneal (TAPP) repair influences complication rates and recovery compared with standard care alone. This quasi-experimental study was conducted at Sina Hospital, Tehran University of Medical Sciences, between June 2023 and June 2024. Adult patients with primary inguinal hernia undergoing elective laparoscopic TAPP repair with mesh placement were enrolled and followed for 12 months. Participants were allocated to an intervention group (standard care plus hernia belt for six weeks) or a control group (standard care only). Primary outcomes included seroma, acute pain, hematoma, surgical site infection (SSI), chronic postoperative inguinal pain (CPIP), and recurrence. Secondary outcomes were length of hospital stay and time to return to normal activity. Statistical analyses included Fisher's exact test, Poisson regression, and Mann-Whitney U test, with significance set at $P<0.05$. A total of 82 patients were included (52 in the hernia belt group, 30 in the control group). Baseline demographic and clinical characteristics were comparable between groups. Rates of complications were not significantly different: seroma (23.1% vs. 20.0%, $P=0.790$), acute pain (23.1% vs. 10.0%, $P=0.235$), hematoma (17.3% vs. 3.3%, $P=0.084$), SSI (7.7% vs. 3.3%, $P=0.648$), CPIP (17.3% vs. 20.0%, $P=0.774$), and recurrence (7.7% vs. 20.0%, $P=0.159$). The hernia belt group had a significantly longer median hospital stay (2 vs. 1 days, $P=0.001$) and a non-significant delay in return to normal activity (5 vs. 4 days, $P=0.062$). Postoperative hernia belt use following laparoscopic TAPP inguinal hernia was not associated with a statistically significant difference in complication rates and was associated with prolonged hospital stay. Routine use of hernia belts is not supported by current findings, though selective use in high-risk patients may warrant further investigation. Selective application in subgroups such as obese patients or those with large hernia defects may warrant further evaluation in multicentric trials.

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Introduction

Inguinal hernia, defined as the protrusion of abdominal contents through the inguinal canal due to a weakness in the abdominal wall, represents one of the most common surgical conditions encountered in clinical practice (1). This condition predominantly affects males, with epidemiological data indicating that approximately one-third of men will be diagnosed with an inguinal hernia during their lifetime, contributing to over 700,000 hernia repairs annually in the United States alone (2). Prevalence rates vary by age and demographics, with higher incidence observed in older adults and those engaged in physically demanding activities, underscoring its significant public health impact (1). Common surgical treatments include open mesh repair, such as the

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Lichtenstein technique, and minimally invasive approaches like laparoscopic totally extraperitoneal (TEP) or transabdominal preperitoneal (TAPP) hernioplasty, both aimed at reinforcing the abdominal wall to prevent recurrence (3). Despite advancements in surgical techniques, postoperative complications remain a concern, including acute pain, localized swelling, seroma formation, and hernia recurrence, which can affect patient recovery and quality of life (4). Chronic groin pain, reported in up to 10-12% of cases, is a particularly debilitating complication, often linked to nerve irritation or mesh-related inflammation, while seroma and swelling may arise from tissue disruption and fluid accumulation in the surgical site (5). Recurrence rates, though reduced with mesh use to approximately 1-3%, can still occur due to technical factors or patient-related risks such as obesity or smoking (3). Supportive devices, such as hernia belts or trusses, have been introduced as adjuncts in postoperative care, intended to provide external compression to the surgical area, thereby minimizing strain, promoting wound stability, and potentially alleviating symptoms during the early recovery phase (6). Current postoperative care strategies for inguinal hernia repair typically involve a combination of pain management, activity restrictions, and wound monitoring, with variations influenced by institutional protocols, surgeon preferences, and patient factors (2). In some clinical settings, routine use of compressive garments like abdominal binders is advocated, particularly after laparoscopic procedures, to support abdominal wall integrity and reduce fluid collections, while others rely solely on pharmacological interventions and patient education (7). Diverging opinions exist regarding the utility of hernia belts postoperatively; proponents argue they offer mechanical support akin to historical trusses, which were once standard for non-surgical management, potentially decreasing early complications by limiting intra-abdominal pressure on the repair site (8). Skeptics, however, question their necessity in modern mesh-based repairs, citing potential over-reliance on external aids that may not align with evidence from minimally invasive techniques (6). Available evidence presents a mixed picture: some studies on analogous abdominal binders in ventral hernia repairs report subjective benefits, such as improved patient comfort and reduced movement limitation, without significant increases in adverse events (7). Supportive views are bolstered by findings showing lower early postoperative pain scores and faster return to work with external fixation devices like trusses in inguinal cases, suggesting a role in enhancing recovery (8). Conversely, skeptical perspectives highlight no substantial differences in objective outcomes like seroma or recurrence rates, with some data indicating potential increases in seroma formation, albeit non-significant, in binder users after incisional hernia repairs (9). These controversies are amplified by the extrapolation of data from non-inguinal hernia contexts, where binders have shown variable effects on pain and physical function (7). The rationale for investigating hernia belt use stems from the pressing need for clear, evidence-based guidance to optimize postoperative outcomes in inguinal hernia surgery, where standardized protocols remain elusive (3). Potential benefits include reduced mechanical strain on the surgical site through external compression, which may enhance patient comfort, minimize swelling, and lower the incidence of complications such as seroma or early recurrence by supporting tissue healing (8). Furthermore, improved pain control in the initial postoperative period could facilitate earlier mobilization and return to daily activities, addressing a key patient-centered outcome (9). However, potential drawbacks must be considered, including patient discomfort from prolonged wear, restricted movement that might hinder rehabilitation, and risks of skin irritation or pressure-related issues, particularly in obese or sensitive individuals (7). Balancing these factors is crucial, as unnecessary interventions could increase healthcare costs without commensurate benefits, while underutilization might expose patients to avoidable morbidity (6). A notable gap in knowledge persists regarding the specific impact of hernia belts after inguinal hernia surgery, exacerbated by limitations in existing studies such as small sample sizes and heterogeneous methodologies (4). For instance, much of the literature draws from ventral or incisional hernia cohorts, where binders have been evaluated in randomized trials, but direct applicability to inguinal repairs is uncertain due to anatomical differences (9). Inconsistent definitions of complications, varying durations of device use, and lack of long-term follow-up further confound interpretations, with few studies comparing belt use directly against non-use in inguinal contexts (8). Moreover, there is a dearth of standardized guidelines from professional societies on postoperative supportive devices, leading to practice variations that may contribute to suboptimal outcomes (5). The aim of this study is to compare the incidence of postoperative complications in patients who use a hernia belt versus those who do not follow inguinal hernia surgery. We hypothesize that hernia belt use may reduce certain complications, such as pain and swelling, but could also introduce potential risks like discomfort or seroma

formation.

Materials and Methods

This study was conducted at Sina Hospital, affiliated with Tehran University of Medical Sciences, from June 2023 to June 2024, with a 12-month follow-up period for all participants. The study evaluated the impact of postoperative hernia belt use on clinical outcomes in patients undergoing laparoscopic transabdominal preperitoneal (TAPP) inguinal hernia repair, a minimally invasive approach associated with reduced recurrence and complications in appropriate cases. The study protocol received approval from the institutional ethics committee, and all participants provided informed consent in compliance with the Declaration of Helsinki.

Adult patients (aged ≥18 years) with primary inguinal hernia (direct, indirect, or pantaloon types) scheduled for elective laparoscopic TAPP repair with mesh implantation were eligible for inclusion. Diagnosis was established via clinical examination and, when required, ultrasonography, adhering to standard criteria for groin hernias. Consecutive recruitment occurred from the surgical outpatient clinic, with inclusion dependent on patients' ability to understand and follow study protocols.

Exclusion criteria were applied to reduce bias and ensure safety, encompassing concurrent groin or abdominal wall hernias beyond the primary inguinal type; anatomical anomalies impeding repair (e.g., extensive scrotal involvement or irreducibility); comorbidities affecting wound healing (e.g., diabetes mellitus, immunosuppression, or chronic corticosteroid use); inability to attend follow-up; and anticipated non-compliance with postoperative instructions, assessed during preoperative evaluation. These factors were screened through medical history, physical examination, and laboratory tests to promote cohort homogeneity.

All patients underwent standardized laparoscopic TAPP inguinal hernia repair under general anesthesia, performed by surgeons with ≥5 years of experience in minimally invasive techniques. The procedure followed established protocols, including preperitoneal dissection, hernia sac reduction, and placement of a lightweight polypropylene mesh for inguinal floor reinforcement, with secure fixation to avert displacement. Intraoperative CO2 insufflation pressure was limited to ≤12 mmHg to mitigate physiological impact.

The intervention group received standard postoperative care augmented by a commercial hernia belt (truss-style inguinal support device), applied immediately post-anesthesia recovery and before ambulation, with instructions for continuous use over 6 weeks. Education on optimal fitting ensured supportive compression without undue pressure, complemented by advice to avoid lifting >5 kg during recovery. The control group received equivalent standard care, including non-opioid analgesia, wound management, and prophylactic antibiotics per institutional guidelines, but without the hernia belt. Both groups were given uniform guidance on early mobilization, diet, and complication surveillance.

Follow-up assessments were scheduled at 24 hours postoperatively (in-hospital), 1 week (outpatient), and 3-, 6-, and 12-months post-surgery. Each evaluation included groin physical examination, patient-reported symptoms, and adverse event documentation by the surgical team. Compliance was facilitated via reminders and flexible appointments, with telephone follow-up for absentees when possible.

Primary outcomes encompassed postoperative complications common to inguinal hernia repair. Seroma was defined as surgically site fluid accumulation within the first week, diagnosed clinically and confirmed ultrasonographically if needed. Acute pain was quantified as postoperative onset within 24 hours exceeding baseline, using a visual analog scale (VAS). Hematoma was identified as blood collection within the first week, evidenced by swelling or ecchymosis. Surgical site infection was diagnosed per Centers for Disease Control and Prevention criteria, based on local signs (e.g., erythema, purulence) within the first week. Chronic postoperative inguinal pain (CPIP) was denoted as pain persisting ≥3 months and affecting daily function. Recurrence was confirmed clinically as hernia re-emergence within 12 months, with imaging verification as indicated.

Secondary outcomes included hospital length of stay (days from surgery to discharge) and return to normal activity (self-reported days from discharge to resumption of routine tasks).

Data were collected prospectively using a standardized, researcher-developed checklist. Methods included in-hospital observation, structured interviews at follow-ups, and physical examinations. Entries were managed by trained assistants blinded to group assignment where feasible, to minimize bias. Recorded variables spanned demographics, operative details, and outcomes.

Analyses were performed with SPSS version 26. Categorical outcomes (e.g., complication rates) were compared using Fisher's exact test for low expected counts and Poisson regression for relative risks (RR) with 95% confidence intervals (CIs). Continuous data (e.g.,

VAS scores, hospital stay) were assessed via Mann-Whitney U test, reported as medians with interquartile ranges (IQR), given non-normality assumptions. Tests were two-sided, with significance at $P<0.05$. An intention-to-treat approach addressed missing data to enhance result reliability.

Results

Baseline characteristics

A total of 82 patients met the inclusion criteria and were randomized into two groups: 52 patients (63.4%) in the hernia belt group and 30 patients (36.6%) in the control group. The calculated sample size was 76, but additional participants were recruited to compensate for possible attrition. Baseline demographic and clinical characteristics were comparable between the two groups (Table 1).

Table 1. Baseline characteristics of study participants

Variable	Hernia belt group (n=52)	Control group (n=30)	*P*
Male sex, n (%)	41 (78.9)	21 (70.0)	0.428
Smoking, n (%)	22 (42.3)	15 (50.0)	0.645
Direct hernia, n (%)	14 (26.9)	6 (20.0)	0.597
Age, median (IQR)	61.5 (48–68)	62.5 (47–71)	0.416

In the hernia belt group, 78.9% of patients were male compared to 70.0% in the control group (P=0.428). The prevalence of smoking was also similar (42.3% vs. 50.0%, P=0.645). The distribution of hernia type showed no significant difference, with 26.9% having direct hernias in the hernia belt group compared to 20.0% in the control group (P=0.597). Median age was slightly lower in the intervention group (61.5 years; IQR 48-68) compared to the control group (62.5 years; IQR 47-71), but the difference was not significant (P=0.416). These results confirm that the two groups were balanced at baseline and suitable for comparison.

Postoperative complications

Postoperative complications were systematically evaluated and compared between groups (Table 2).

Seroma: Occurred in 12 patients (23.1%) in the hernia belt group and 6 patients (20.0%) in the control group. Although the relative risk suggested a slightly higher incidence with belt use (RR=1.15, 95% CI: 0.43-3.07), the difference was not statistically significant (P=0.790).

Acute pain: Reported by 12 patients (23.1%) in the hernia belt group compared with only 3 patients (10.0%) in the control group. The estimated risk was more than doubled with belt use (RR=2.31, 95% CI: 0.65-8.18), but this difference did not reach statistical significance (P=0.235).

Hematoma: The incidence was 17.3% in the hernia belt group versus 3.3% in the control group. Although this translated to a relative risk of 5.19 (95% CI: 0.66-40.98), the association was not statistically significant (P=0.084).

Surgical site infection (SSI): Observed in 4 patients (7.7%) in the hernia belt group and 1 patient (3.3%) in the control group. Again, no significant difference was observed (P=0.648).

Chronic postoperative inguinal pain (CPIP): Developed in 9 patients (17.3%) in the hernia belt group and 6 patients (20.0%) in the control group. The relative risk was 0.87 (95% CI: 0.31-2.43), showing no meaningful difference (P=0.774).

Recurrence: Notably, recurrence was lower in the hernia belt group (7.7%) compared to the control group (20.0%). The relative risk was 0.38 (95% CI: 0.11-1.36), indicating a potential protective effect, though the difference did not reach statistical significance (P=0.159).

Overall, while the intervention group demonstrated numerically higher rates of some complications (acute pain, hematoma), recurrence was lower. However, none of these differences were statistically significant.

Functional outcomes

Postoperative recovery outcomes revealed more pronounced differences between groups (Table 3).

Length of hospital stay

Patients in the hernia belt group had a significantly longer stay compared with controls. The median duration was 2 days (IQR: 2-3) versus 1 day (IQR: 1-2), respectively. This difference was statistically significant (P=0.001).

Time to return to normal activity

Recovery time was slightly longer in the hernia belt group (median 5 days, IQR: 3.5-7.5) compared with the control group (median 4 days, IQR: 3-5). Although this trend suggested slower functional recovery with belt use, the difference did not achieve statistical significance

(*P*=0.062).

Table 2. Comparison of postoperative complications between groups

Outcome	Hernia belt (n=52)	Control (n=30)	Relative Risk (95% CI)	*P* (Fisher)
Seroma, n (%)	12 (23.1)	6 (20.0)	1.15 (0.43–3.07)	0.790
Acute pain, n (%)	12 (23.1)	3 (10.0)	2.31 (0.65–8.18)	0.235
Hematoma, n (%)	9 (17.3)	1 (3.3)	5.19 (0.66–40.98)	0.084
Surgical site infection, n (%)	4 (7.7)	1 (3.3)	2.31 (0.26–20.65)	0.648
Chronic pain, n (%)	9 (17.3)	6 (20.0)	0.87 (0.31–2.43)	0.774
Recurrence, n (%)	4 (7.7)	6 (20.0)	0.38 (0.11–1.36)	0.159

Table 3. Functional recovery outcomes

Outcome	Hernia belt group	Control group	*P*
Length of hospital stay, median (IQR), days	2 (2–3)	1 (1–2)	0.001
Time to return to activity, median (IQR), days	5 (3.5–7.5)	4 (3–5)	0.062

Discussion

In this study of 82 patients undergoing laparoscopic transabdominal preperitoneal (TAPP) inguinal hernia repair, postoperative hernia belt use for six weeks did not result in statistically significant reductions in early or late postoperative complications compared with standard care without a belt. Incidences of seroma (23.1% vs. 20.0%; RR=1.15, 95% CI: 0.43-3.07), acute pain (23.1% vs. 10.0%; RR=2.31, 95% CI: 0.65-8.18), hematoma (17.3% vs. 3.3%; RR=5.19, 95% CI: 0.66-40.98), surgical site infection (7.7% vs. 3.3%; RR=2.31, 95% CI: 0.26-20.65), chronic postoperative inguinal pain (CPIP) (17.3% vs. 20.0%; RR=0.87, 95% CI: 0.31-2.43), and recurrence (7.7% vs. 20.0%; RR=0.38, 95% CI: 0.11-1.36) were similar between groups. Notably, the hernia belt group had a significantly longer median hospital stay (2 days vs. 1 day; *P*=0.001) and a non-significant trend toward slower return to normal activity (5 vs. 4 days; *P*=0.062).

These data strengthen the generalizability of our findings and suggest that routine belt application is unlikely to improve outcomes after laparoscopic hernia repair. Our findings align with prior randomized and quasi-experimental trials that have reported no significant effect of postoperative supportive devices on complication rates after minimally invasive inguinal hernia repair. In a randomized trial by Wang *et al*., (10) assessing truss use for six weeks following totally extraperitoneal (TEP) repair, no significant differences were seen in seroma, neuralgia, or recurrence, though they reported significantly lower early pain scores—a contrast to our observed higher acute pain rate (23.1% vs. 10.0%) in the belt group. Differences in surgical technique (TAPP vs. TEP) and patient selection (our study excluding diabetics and patients with wound healing disorders) may partly explain these contrasting pain outcomes.

A recent systematic review and meta-analysis published in Medicine (Baltimore) further supports these conclusions, showing that routine use of postoperative abdominal binders was not associated with statistically significant reductions in seroma, hematoma, or recurrence rates, though selective benefits may exist for certain patient subgroups such as obese individuals or those with large hernia defects (11). These subgroup considerations may hold clinical value: obese patients experience increased intra-abdominal pressure, and those with large hernia sacs may benefit from transient mechanical support during tissue remodeling. In the broader abdominal surgery literature, studies on abdominal binders have produced mixed results. A multicenter randomized pilot trial after open incisional hernia repair (12) found no significant effect on pain, seroma, or mobility, but did observe a significant reduction in surgical site infection rates within 14 days. Our data showed a non-significant trend toward higher infection rates in the belt group (7.7% vs. 3.3%). Similarly, a randomized trial on binder use after laparoscopic intraperitoneal onlay mesh (IPOM) incisional hernia repair (9) demonstrated reduced postoperative pain, differing from our results possibly due to procedural differences and binder application methods. Meta-analyses and systematic reviews have echoed these inconsistencies. A recent review of binder uses after ventral hernia repair (13) concluded that benefits are more pronounced in open repairs, with limited advantages in laparoscopic approaches—supporting our null findings in TAPP repairs. Another meta-analysis on abdominal binders after major abdominal surgery (14) found no significant seroma

reduction but noted improvements in physical function and psychological comfort, effects that were not formally assessed in our trial. The lack of statistically significant differences in complications may be due to the inherent mechanical stability provided by the mesh in TAPP repairs, which reduces the need for additional external support. Minimal tissue disruption in laparoscopic repairs may lower baseline complication rates, making further reduction by external compression unlikely. The trends toward higher acute pain, hematoma, and infection in the belt group could reflect adverse effects of sustained external pressure—impairing venous return, increasing local tissue congestion, and creating a warm, moist microenvironment conducive to bacterial growth. Conversely, the lower (though non-significant) recurrence rate in the belt group (7.7% vs. 20.0%) may suggest that belts could provide early postoperative stabilization of the repair site, possibly aiding mesh integration. However, our sample size limits the power to confirm this effect. Given the absence of significant reductions in complications and the potential for increased hospital stay, routine hernia belt use after TAPP inguinal hernia repair cannot be recommended for all patients. Selective use may be considered for high-risk individuals—such as those with large hernia defects, obesity, or occupations requiring heavy lifting—where mechanical support might reduce recurrence risk. Current findings support an individualized approach rather than universal postoperative belt prescription, in line with existing recommendations emphasizing patient-specific care. Strengths of this study include matched allocation on key baseline characteristics (age, sex, hernia type, smoking status), use of a standardized TAPP technique by experienced surgeons, and 12-month follow-up with predefined outcome definitions.

Routine postoperative belt use appears unnecessary for most patients; however, selective application may be considered in specific subgroups (e.g., patient with large hernias or obesity) pending confirmation from multicentric trials may potentially benefit. Future studies focusing on these populations are warranted. Limitations include the non-randomized design and potential selection bias, the modest sample size (n=82) limiting power for rare outcomes, single-center setting limiting generalizability, and lack of blinding, which may have influenced subjective outcomes such as pain. Future multicenter randomized controlled trials with larger sample sizes are needed to validate these findings and explore whether specific patient subgroups derive benefit from belt use. Studies should incorporate patient-reported outcomes (comfort, quality of life), objective measures of physical function, and cost-effectiveness analyses. Investigating the optimal duration, type, and material of postoperative support devices may refine recommendations for postoperative care after hernia repair.

In this study, hernia belt use following TAPP inguinal hernia repair did not significantly alter rates of seroma, acute pain, hematoma, surgical site infection, CPIP, or recurrence, and was associated with a longer hospital stay. Routine belt use is not supported by current evidence. However, selective use in high-risk subgroups—such as obese patients or those with large hernia defects—may be considered pending confirmation from multicentric randomized trials."

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