

ENHANCED POSTOPERATIVE RECOVERY AND RISK FACTORS FOR CHRONIC INGUINAL PAIN FOLLOWING MODIFIED TAPP HERNIOPLASTY

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ABSTRACT

Postoperative pain, delayed functional recovery, and chronic inguinal pain remain clinically important after inguinal hernia repair. Objective: To compare recovery outcomes following modified transabdominal preperitoneal (TAPP) hernioplasty, conventional TAPP, and open Lichtenstein repair and identify factors associated with prolonged hospitalization and chronic pain. A comparative observational analysis included 252 patients undergoing inguinal hernia repair: conventional TAPP (n=72), modified TAPP (n=70), and Lichtenstein repair (n=110). The modified approach incorporated reduced penetrating mesh fixation, preferential atraumatic adhesive fixation, and optimized peritoneal closure. Pain scores, analgesic consumption, mobilization, hospitalization, functional recovery, and longer-term outcomes were evaluated. Multivariable logistic regression assessed selected risk factors. Pain at 6 hours was 4.6 ± 1.1 , 4.0 ± 1.1 , and 5.8 ± 1.2 points, respectively ($p < 0.001$). Median morphine-equivalent analgesic consumption was 20.9, 16.6, and 30.7 mg ($p < 0.001$). Mobilization occurred after 9.1 ± 2.6 , 7.8 ± 1.9 , and 14.2 ± 3.6 hours ($p < 0.001$); median hospitalization was 2.5, 2.4, and 3.5 days ($p < 0.001$). Return to work occurred after a median of 13.2, 10.6, and 21.6 days ($p < 0.001$). Chronic pain at 6 months (VAS ≥ 3) occurred in 6.9%, 4.3%, and 16.4% ($p = 0.018$). Tack fixation was associated with higher adjusted odds of chronic pain (aOR 2.52; 95% CI 1.06–6.02), whereas modified TAPP was associated with lower odds versus Lichtenstein repair (aOR 0.24; 95% CI 0.07–0.82). Modified TAPP was associated with favorable recovery measures and reduced chronic pain; nonrandomized comparisons warrant cautious causal interpretation.

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Introduction

Inguinal hernia is a common indication for abdominal wall surgery. Although tension-free mesh repair has improved anatomical durability, the quality of recovery is determined by more than recurrence prevention. Early postoperative pain, need for analgesia, delayed mobilization, and persistent groin discomfort may affect patient function and health-care resource use [1–3]. Laparoscopic transabdominal preperitoneal (TAPP) repair provides access to the preperitoneal space and avoids some of the anterior inguinal dissection associated with open Lichtenstein repair [1,2].

The manner of mesh fixation is a potentially modifiable component of TAPP. Penetrating tack fixation may contribute to local tissue or nerve irritation, while atraumatic adhesive fixation may reduce this exposure in selected cases. In addition, standardized peritoneal closure and an enhanced recovery pathway may facilitate early mobilization and discharge [3,4,5]. However, comparisons of surgical techniques are subject to patient-selection and perioperative-care differences. The present study examines postoperative recovery and longer-term pain outcomes in the dissertation cohort, complementing a separate report focused on intraoperative performance [6–9].

We aimed to compare early and functional recovery after modified TAPP, conventional TAPP, and open Lichtenstein hernioplasty, and to assess factors associated with prolonged hospitalization and chronic inguinal pain.

Materials and methods

The source dissertation describes a comparative observational cohort of 252 adults with inguinal hernia treated at the multidisciplinary clinic of Samarkand State Medical University. Patients were grouped according to the procedure performed: conventional TAPP (Group I, n=72), modified TAPP (Group II, n=70), or open Lichtenstein repair (Group III, n=110). The modified TAPP strategy emphasized limiting penetrating tack fixation, greater use of adhesive fixation, and optimized peritoneal closure. The underlying thesis and example manuscript report differing study date ranges; therefore, the exact recruitment dates should be verified against the primary clinical records before submission.

Patients underwent clinical evaluation and hernia characterization using the European Hernia Society (EHS) framework. Pain intensity was assessed using a visual analogue scale (VAS) at 6, 24, and 72 hours. Additional outcomes were morphine-equivalent analgesic consumption,

time to first mobilization, postoperative length of stay, return to daily activity and employment, postoperative discomfort, and chronic pain at 3 and 6 months. The dissertation also reported chronic inguinal pain syndrome as a separate longer-term outcome; these definitions should not be treated as interchangeable.

Quantitative results are presented as mean $\pm$ standard deviation or median [reported interval], as reproduced from the thesis. Categorical outcomes are reported as n (%). The source used parametric or nonparametric comparisons as appropriate and multivariable logistic regression to report adjusted odds ratios (aOR) with 95% confidence intervals (CI). Statistical significance was defined as $p < 0.05$. As this

is a secondary manuscript based on the dissertation, no additional statistical tests were performed.

Results

Early postoperative pain and rehabilitation. Modified TAPP showed the lowest early pain scores and analgesic use. At 6 hours, VAS scores were 4.0 ± 1.1 after modified TAPP, 4.6 ± 1.1 after conventional TAPP, and 5.8 ± 1.2 after open repair. The same general pattern persisted at 24 and 72 hours. The modified group mobilized earlier and had a shorter median stay than the open repair group (Table 1).

Table 1. Early postoperative pain and recovery outcomes

Outcome	Conventional TAPP (n=72)	Modified TAPP (n=70)	Lichtenstein (n=110)	p
VAS at 6 h	4.6 ± 1.1	4.0 ± 1.1	5.8 ± 1.2	<0.001
VAS at 24 h	3.4 ± 1.0	3.2 ± 0.8	4.5 ± 1.1	<0.001
VAS at 72 h	2.4 ± 0.7	2.0 ± 0.7	3.2 ± 0.9	<0.001
Analgesics, morphine-equivalent mg	20.9 [17.2–26.0]	16.6 [13.8–19.1]	30.7 [24.2–38.0]	<0.001
Time to mobilization, h	9.1 ± 2.6	7.8 ± 1.9	14.2 ± 3.6	<0.001
Hospitalization, days	2.5 [2.0–3.2]	2.4 [2.1–2.9]	3.5 [2.6–4.3]	<0.001

Functional recovery and chronic pain. Median return to usual activity was 5.5 days after modified TAPP versus 6.5 and 10.8 days in the conventional TAPP and Lichtenstein groups, respectively. Return to work was also earliest in the modified group. At 3 months, the between-group difference

in VAS-defined chronic pain was not statistically significant ($p=0.085$); at 6 months, it was significant ($p=0.018$). The separately reported chronic inguinal pain syndrome outcome showed a similar pattern (Table 2).

Table 2. Functional and longer-term outcomes

Outcome	Conventional TAPP	Modified TAPP	Lichtenstein	p
Return to daily activity, days	6.5 [5.7–7.5]	5.5 [4.7–6.1]	10.8 [9.4–13.1]	<0.001
Return to work, days	13.2 [11.0–15.4]	10.6 [9.1–13.4]	21.6 [17.4–25.7]	<0.001
Exercise tolerance, points	7.2 ± 1.2	8.2 ± 1.0	6.2 ± 1.5	<0.001
Groin discomfort at 1 month	12 (16.7%)	8 (11.4%)	29 (26.4%)	0.037
Pain at 3 months (VAS ≥ 3)	8 (11.1%)	5 (7.1%)	20 (18.2%)	0.085
Pain at 6 months (VAS ≥ 3)	5 (6.9%)	3 (4.3%)	18 (16.4%)	0.018
Chronic inguinal pain syndrome	4 (5.6%)	2 (2.9%)	17 (15.5%)	0.008
Patient satisfaction (1–5)	4.2 ± 0.6	4.5 ± 0.4	3.8 ± 0.7	<0.001

Independent predictors. In the adjusted model, ASA III status and EHS III defect size (>3 cm) were associated with prolonged hospitalization (>3 days). Both laparoscopic procedures were associated with lower adjusted odds of prolonged stay relative to the open reference category. For chronic inguinal pain (VAS ≥ 3 at 6 months), higher preoperative pain, bilateral hernia, and tack fixation were associated with higher odds, while modified TAPP was associated with lower odds relative to Lichtenstein repair (Table 3).

Discussion

The findings suggest that optimizing laparoscopic repair may be associated with clinically meaningful recovery advantages. The lower early VAS scores and analgesic requirements in the modified TAPP group were accompanied by earlier mobilization, shorter hospital stay,

and quicker return to daily activity and employment. These outcomes are relevant to enhanced recovery because they address patient-centered functioning rather than operative metrics alone. However, the available comparison evaluates a combined surgical and perioperative strategy; it does not isolate the independent contribution of each recovery component.

The association between penetrating tack fixation and chronic pain is consistent with the clinical rationale for limiting potentially traumatic fixation in appropriately selected repairs [2,3]. Nevertheless, fixation method may be related to hernia anatomy, surgeon preference, or procedural complexity. The adjusted association for tack use (aOR 2.52) should therefore not be interpreted as proof that tacks cause chronic pain. Likewise, the reduced odds associated with modified TAPP (aOR 0.24) represent an observational

finding rather than a randomized estimate of treatment efficacy.

Table 3. Selected multivariable associations reported in the dissertation

Outcome / factor	Adjusted OR	95% CI	p
Prolonged stay: ASA III	2.18	1.06–4.47	0.034
Prolonged stay: EHS III defect	1.96	1.03–3.75	0.041
Prolonged stay: conventional TAPP	0.29	0.15–0.56	<0.001
Prolonged stay: modified TAPP	0.14	0.07–0.29	<0.001
Chronic pain: preoperative VAS (+1 point)	1.48	1.07–2.06	0.019
Chronic pain: bilateral hernia	3.46	1.02–11.78	0.047
Chronic pain: tack fixation	2.52	1.06–6.02	0.037
Chronic pain: modified TAPP	0.24	0.07–0.82	0.023

Differences between pain definitions deserve particular attention. The dissertation reports VAS-defined pain at 6 months (4.3% in modified TAPP) and a separate chronic inguinal pain syndrome outcome (2.9% in modified TAPP). These measures may differ in clinical thresholds or ascertainment, and both are retained rather than combined. The 3-month pain comparison did not reach statistical significance, whereas the 6-month comparison did. Recurrence outcomes were not statistically different among groups in the dissertation, but the available sample and follow-up do not establish equivalence of long-term durability.

Several limitations should be acknowledged: observational treatment allocation, possible residual confounding, uncertain precision of some reported summary intervals, and incomplete detail in the source manuscript concerning follow-up completeness and the operational definition of the enhanced recovery protocol. The dissertation and the example article also contain inconsistent descriptions of the recruitment period. Prospective registration, standardized pain instruments, complete follow-up accounting, and external validation would strengthen future research.

Conclusions

In this 252-patient observational cohort, modified TAPP hernioplasty was associated with lower early postoperative pain scores, reduced analgesic consumption, earlier mobilization, shorter hospitalization, and faster functional recovery than the comparison procedures. Chronic pain at six months was less frequent in the modified group, and adjusted analyses identified preoperative pain, bilateral hernia, and tack fixation as factors associated with higher odds of persistent pain. These results support further prospective evaluation of less traumatic fixation and structured enhanced recovery pathways, without establishing causal superiority.

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