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ORIGINAL ARTICLE

Comparison of Laproscopic Burnia Technique Versus Laparoscopic-Assisted Needle Herniotomy for Inguinal Hernia Repair in Female Pediatric Patients

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ABSTRACT

Objectives: To compare operative outcomes of the Burnia technique versus laparoscopic-assisted needle herniotomy in female pediatric patients with inguinal hernias.

Study Settings: Department of Paediatric Surgery, Sahiwal Teaching Hospital, Sahiwal.

Duration of Study: From May 2023 to November 2023.

Data Collection: This randomized controlled trial(RCT) was conducted on 80 female children aged 1–12 years with unilateral or bilateral inguinal hernias. Participants were randomized equally into two groups: Group A underwent laparoscopic-assisted needle herniotomy, while Group B received the Burnia technique. Operative time, recurrence, and scar visibility were recorded. Follow-up was conducted at 1 week, 1 month, and 3 months postoperatively to note the outcome of both techniques.

Results: The mean operative time was significantly shorter in the Burnia group (25.43 ± 7.74 minutes) compared to the needle herniotomy group (30.99 ± 9.04 minutes; p = 0.004). Recurrence occurred in 10.0% of Group A and 2.5% of Group B patients (p = 0.166). Visible scarring was significantly lower in the Burnia group (17.5%) than in the needle herniotomy group (42.5%; p = 0.015).

Conclusion: The Burnia technique is a safe and effective sutureless alternative with reduced operative time and improved cosmetic outcomes.

Keywords: Burnia technique, pediatric hernia, laparoscopy, sutureless repair, needle herniotomy

INTRODUCTION

With a cumulative incidence of 6.62% in males and 0.74% in females by age 15,[1] inguinal hernia represents a common condition addressed in pediatric surgical care.[2] These hernias predominantly affect male children, with studies noting a male-to-female ratio of approximately 19:1. The condition is even more common in premature infants, with incidence rates ranging from 10–30%, underscoring the clinical importance of early diagnosis and surgical management. Timely intervention is critical to avoid complications such as incarceration or strangulation.

Laparoscopic hernia repair has become a routine procedure for children, showcasing a variety of techniques.[3] Inguinal hernia repair involves the high ligation of the patent processus vaginalis at the level of the internal inguinal ring, which can be performed either through traditional open hernia repair or laparoscopically.[3] The laparoscopic approach is superior to open repair in terms of operative and recovery time, as well as offering advantages such as improved cosmesis, decreased postoperative pain, and enhanced visualization of the contralateral processus vaginalis and intestines for ischemia in incarcerated hernias.[4]

Several laparoscopic techniques include the ligation of the hernial sac at the internal inguinal ring, either with extracorporeal or intracorporeal sutures.[5-9] The repair methods vary by intra- or extracorporeal suturing technique and by the number of trocars placed. One method involves high ligation of the hernial sac through a percutaneously passed loop of prolene 2.0 using single-trocar laparoscopy.

A more recent advancement is the Burnia technique, a sutureless laparoscopic method specifically applied in female children. It involves a “spaghetti maneuver” in which the hernial sac is grasped, inverted, and cauterized eliminating the need for sutures.[10] This technique is performed through a single-site laparoscopic approach using a 30° camera and Maryland grasper, resulting in minimal scarring and favorable cosmetic outcomes. Studies have demonstrated the safety and feasibility of the Burnia technique, with no reported complications or recurrences, and significantly reduced operative times in bilateral cases compared to conventional open repair.

The rationale of the study is based on the proposition that the Burnia technique will be more advantageous in terms of reduced operative time, lower recurrence rates, better cosmesis, a simplified learning curve, and less economic burden due to the absence of sutures, while maintaining comparable cosmesis, postoperative pain, and recovery time when contrasted with laparoscopic needle herniotomy in female children. Despite the widespread application of these techniques, no randomized control trial studies comparing laparoscopic needle herniotomy and Burnia are available globally. Only retrospective studies have been conducted, with no direct comparisons between laparoscopic-assisted needle herniotomy and Burnia, apart from retrospective comparisons between open herniotomy and Burnia. This study aims to compare laparoscopic needle herniotomy and Burnia in terms of operative time, recurrence rate, and abdominal scar formation.

METHODOLOGY

This randomized controlled trial was conducted at the Department of Paediatric Surgery, Sahiwal Teaching Hospital, Sahiwal, over a 6 month period following the approval of the synopsis by the Institutional Ethical Review Board. A total of 80 female patients between 1 and 12 years of age, diagnosed with unilateral or bilateral inguinal hernias, were enrolled through simple random sampling and allocated equally into two groups using the lottery method. Group A underwent laparoscopic-assisted needle herniotomy, while Group B received the Burnia technique. The sample size was calculated based on a two-sided significance level of 5% and a power of 87%, referencing a previous study by Duh et al. (2021), which reported an operative time of 31.6 ± 9.5 minutes for needle herniotomy and 24.2 ± 7.6 minutes for Burnia.

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To strengthen the statistical power and reliability, the sample size was increased from 60 to 80 patients, with 40 in each group.

Patients were included if they were female, aged 1 to 12 years, and presented with reducible inguinal hernias. Exclusion criteria comprised recurrent, irreducible, or obstructed hernias, history of prior abdominal, pelvic, or laparoscopic surgery, presence of any syndromic or comorbid conditions, or a hernial sac containing visceral organs such as the fallopian tube. After obtaining informed consent from guardians, all patients were assessed for anesthesia fitness and administered preoperative broad-spectrum antibiotics. Group A underwent laparoscopic-assisted needle herniotomy, where a prolene 2.0 loop was passed percutaneously and ligation was performed at the internal ring under laparoscopic guidance. Group B received the Burnia technique, involving inversion, twisting, and cauterization of the hernia sac without sutures. Both procedures were conducted using a single-trocar laparoscopic setup with a 5 mm umbilical port for the camera and a 3 mm stab incision for the Maryland grasper.

Operative time was defined as the duration from the initial skin incision to final wound closure and was recorded in minutes for each procedure. Postoperatively, all patients received analgesia and were encouraged to ambulate early. Discharge was planned for the first postoperative day, provided no complications occurred. Patients were followed up at 1 week, 1 month, and 3 months post-surgery to monitor for recurrence, which was defined as the reappearance of swelling in the inguinal region. All data, including demographic information, operative time, and recurrence, were documented on a structured questionnaire. Data were analyzed; quantitative variables such as operative time were reported as mean ± standard deviation, while categorical variables including recurrence were expressed as frequencies and percentages. The independent Student's t-test was applied to compare mean operative times between groups, and the chi-square test was used to evaluate recurrence rates.

RESULTS

Table 1 presents the demographic and clinical characteristics of the study population comprising 80 female paediatric patients with inguinal hernias. The majority of patients (80%) were between 1 and 10 years of age, while the remaining 20% were aged 11 to 12 years. Regarding the type of hernia, unilateral hernias were more commonly observed, accounting for 75% of cases, whereas bilateral hernias were noted in 25% of the patients.

Table 2 compares the outcomes of the Burnia technique and laparoscopic-assisted needle herniotomy in terms of operative time, recurrence, scar visibility, and follow-up completion. The mean operative time was significantly shorter in the Burnia group (25.43 ± 7.74 minutes) compared to the needle herniotomy group (30.99 ± 9.04 minutes), with a statistically significant p-value of 0.004. In terms of recurrence, 10.0% (n=4) of patients in Group A experienced recurrence versus only 2.5% (n=1) in Group B,(p = 0.166). Scar visibility was more frequent in the needle herniotomy group, observed in 42.5% of patients, compared to 17.5% in the Burnia group—a difference that reached statistical significance (p = 0.015). Follow-up completion was high in both groups, with 95.0% of patients in Group A and 92.5% in Group B completing the scheduled follow-ups; (p = 0.644).

Table 1: Demographics and clinical findings of the patients (n=80)

Variables		Count	%
Age(years)	1-10	64	80
	11-12	16	20
Type of hernia	Unilateral	60	75
	Bilateral	20	25

Table 2: Comparison Of Laproscopic Burnia Technique Versus Laparoscopic-Assisted Needle Herniotomy For Inguinal Hernia Repair In Female Pediatric Patients

Variable		Group A (Needle Herniotomy)	Group B (Burnia Technique)	Total	p-value
Operative Time(mean+sd)		30.99 ± 9.04	25.43 ± 7.74	-	0.004
Recurrence	Yes	4 (10.0%)	1 (2.5%)	5 (6.3%)	0.166
	No	36 (90.0%)	39 (97.5%)	75 (93.8%)	
Scar Visibility	Yes	17 (42.5%)	7 (17.5%)	24 (30.0%)	0.015
	No	23 (57.5%)	33 (82.5%)	56 (70.0%)	
Follow-up Completed	Yes	38 (95.0%)	37 (92.5%)	75 (93.8%)	0.644
	No	2 (5.0%)	3 (7.5%)	5 (6.3%)	

DISCUSSION

Inguinal hernia repair in pediatric populations has traditionally relied on high ligation of the hernial sac using sutures. However, emerging evidence suggests that peritoneal trauma alone may suffice for internal ring closure, leveraging the body's inherent healing mechanisms.[11] This paradigm shift has inspired the development of sutureless techniques such as the Burnia method, which utilizes electrocautery to induce localized peritoneal damage, promoting natural ring obliteration without the need for suturing. The present randomized controlled trial compared the Burnia technique with laparoscopic-assisted needle herniotomy in female pediatric patients. Our findings demonstrated a significantly shorter operative time in the Burnia group, with a mean of 25.43 ± 7.74 minutes compared to 30.99 ± 9.04 minutes in the needle herniotomy group (p = 0.004). These results are consistent with a previous study by Duh et al[10] which reported a similar time-saving advantage with the Burnia technique (24.2 ± 7.6 minutes) over needle herniotomy (31.6 ± 9.5 minutes). The efficiency observed in Burnia is likely attributable to its simplified approach, which circumvents the need for suture placement at the internal ring.

In terms of clinical effectiveness, the recurrence rate in our study was lower in the Burnia group (2.5%) compared to the needle herniotomy group (10.0%), although this difference did not reach statistical significance (p = 0.166). Thiss trend supports prior observations by Riquelme et al[12] and Novotny et al[13] who documented zero recurrence rates in their respective sutureless repair techniques.[13] These findings reinforce the hypothesis that peritoneal cauterization alone, when executed with precision, is sufficient to achieve long-term closure of the hernia defect. Cosmesis is a crucial consideration in pediatric surgery, particularly for female patients. In our study, scar visibility was significantly reduced in the Burnia group (17.5%) compared to the needle herniotomy group (42.5%) (p = 0.015). This aligns with the observations of Novotny et al., who emphasized that single-site laparoscopic techniques, with incisions hidden within the umbilicus, offer near-invisible scars and superior aesthetic outcomes.[13]

Our findings regarding the effectiveness and safety of the Burnia technique are further corroborated by a retrospective study conducted by Sabriye Dayı in Turkey, involving 41 girls who underwent laparoscopic cauterization of the hernia sac without suturing.[14] The study reported zero peroperative and postoperative complications and no recurrences over a follow-up period of up to three years, reinforcing the long-term viability of this technique. These results mirror our own findings, in which the Burnia group showed a low recurrence rate (2.5%) and no intraoperative complications.

Our findings are further strengthened by the long-term follow-up study by Finn D et al[15] which evaluated the outcomes of 69 hernia repairs in 44 pediatric female patients over a 7-year period. The recurrence rate was remarkably low (1.45%), and the average follow-up duration extended to over four years. These results affirm the long-term durability of the Burnia technique across a broad pediatric age range, from neonates to adolescents. Consistent with our study, the Godoy Burnia study also reported a

low complication profile, with only two short-term adverse events among 44 patients. Similarly, Sabriye Dayı's Turkish cohort reported no intraoperative or postoperative complications across 41 cases.[14] These findings collectively support the procedural safety of laparoscopic sutureless repair using electrocautery.

Despite its advantages, the Burnia technique presents unique technical challenges, particularly in newborns with sliding hernias or when internal reproductive organs, such as the ovary, are in close proximity to the hernia sac. Novotny et al. reported a case requiring conversion due to the ovary obstructing safe access to the sac.[13] In such cases, maneuvers like external compression and sequential cauterization of the hernia sac ("spaghetti" technique) are essential to ensure complete and safe repair. The potential for thermal injury to nearby structures, such as the genitofemoral nerve, is a valid concern when using electrocautery. To mitigate this risk, it is crucial to employ low power settings and maintain continuous visual monitoring during coagulation. Although no cases of genital paresthesia were reported in our study or previous literature, cautious application of the Burnia technique remains paramount. Additionally, the round ligament is often damaged during the procedure. While no immediate complications were observed, the long-term impact of ligament disruption—particularly on uterine stability during pregnancy—remains uncertain and warrants future investigation.

This study has several limitations. The sample size, although increased to 80 patients for greater statistical power, may still be insufficient to detect rare complications or long-term outcomes such as delayed recurrence or reproductive implications. Furthermore, the follow-up duration was limited to three months, which, while adequate for early postoperative assessment, may not capture late-onset recurrences or fertility-related concerns. These limitations are consistent with those acknowledged in prior studies assessing early outcomes of sutureless techniques.

CONCLUSION

In conclusion, the Burnia technique offers a safe, effective, and cosmetically favorable alternative to laparoscopic-assisted needle herniotomy for inguinal hernia repair in female pediatric patients. It significantly reduces operative time and improves cosmetic outcomes without increasing recurrence risk. However, long-term surveillance and larger multi-center studies are essential to fully establish its safety profile, especially in terms of reproductive outcomes and nerve preservation.

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