

Comparison of Outcome of Skin Incision Closure After Inguinal Herniotomy With Steri-Strips Versus Subcuticular Suture in Pediatric Patients

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ABSTRACT

Objective: To compare the outcome of skin incision closure after inguinal herniotomy with Steri-Strips versus subcuticular suture in pediatric patients in terms of wound infection, cosmetic outcome, skin closure time and parental satisfaction.

Study Design: Randomized controlled trial.

Place and Duration: Study was conducted at department of Pediatric Surgery SICHN -Sindh Institute of Child Health and Neonatology-Sukkur in 18 months duration from 1st November 2024 upto 30th April 2026.

Methodology: A total of 66 children of either gender, aged 1–12 years, undergoing elective open inguinal herniotomy were enrolled after informed parental consent and divided into two equal groups of 33 patients each by lottery method of simple random sampling. In Group A, skin was closed with Steri-Strips; in Group B, skin was closed with subcuticular (Vicryl 4-0/5-0) suture. Patients were followed up on postoperative day 7, and at 6 weeks for assessment of wound infection (CDC criteria), skin closure time, cosmetic outcome (Hollander Wound Evaluation Scale/visual analogue scale) and parental satisfaction.

Results: The mean age was 4.8 ± 2.6 years in Group A and 5.1 ± 2.9 years in Group B ($p = 0.65$). Male-to-female ratio was 10:1. Mean skin closure time was shorter in Group A (4.3 ± 1.2 minutes) than Group B (9.6 ± 2.4 minutes) ($p < 0.001$). Wound infection occurred in 2/33 (6.1%) patients in Group A and 3/33 (9.1%) in Group B ($p = 0.64$). Excellent/good cosmetic outcome at 6 weeks was recorded in 29/33 (87.9%) of Group A versus 28/33 (84.8%) of Group B ($p = 0.72$). Parental satisfaction was comparable between the two groups ($p = 0.58$).

Conclusion: Steri-Strip skin closure after pediatric inguinal herniotomy is a safe, quick and cost-effective alternative to subcuticular suturing, offering comparable wound infection rates and cosmetic outcome while significantly reducing skin closure time.

Keywords: Inguinal herniotomy, pediatric surgery, skin closure, Steri-Strips, subcuticular suture, wound cosmesis.

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INTRODUCTION

Inguinal hernia is one of the most common surgical conditions encountered in pediatric surgical practice, with an estimated incidence of 8 to 50 per 1000 live births in term infants, rising to nearly 20% in extremely low birth weight infants¹. The cumulative incidence from birth to 15 years of age has been reported in males as 6.62% and in

females as 0.74%, reflecting the well-known male preponderance of this condition². Left untreated, patent processus vaginalis predisposes to incarceration and strangulation, which is why elective herniotomy remains one of the most frequently performed operations in children³.

Open inguinal herniotomy through a skin-crease incision remains the standard approach in most centers, particularly

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in resource-limited settings⁴. While the technical steps of high ligation of the sac are well standardized, the method chosen for skin closure continues to be debated, since it directly influences operative time, cost, wound complications and, importantly, the cosmetic result that parents scrutinize closely in children⁵. Commonly used methods include simple interrupted sutures, subcuticular (intradermal) sutures, skin staples, tissue adhesives and adhesive skin closure strips such as Steri-Strips⁶.

Subcuticular suturing has traditionally been favoured because it avoids transcutaneous suture marks and is thought to give a superior cosmetic scar, but it is technically more demanding, increases operative and anaesthesia time, and, if a knot is buried inadequately, may predispose to stitch sinus, granuloma formation or postoperative paraesthesia⁷. Steri-Strips, in contrast, are quick to apply, inexpensive, require no needle or suture material within the wound, and eliminate the risks associated with a foreign body reaction to buried suture, though concerns exist regarding strip detachment, especially in a moist diaper area or in very active children⁸.

A randomized study comparing Steri-Strip and subcuticular skin closure of pediatric groin wounds in Nigerian children reported comparable cosmetic outcomes and wound complication rates between the two techniques, using the Hollander Wound Evaluation Scale and a parental visual analogue scale for assessment⁹. Similarly, a prospective randomized comparison of skin adhesive and subcuticular suture in pediatric hernia incisions found no difference in cosmetic outcome, though skin closure time was significantly shorter with the adhesive technique, translating into reduced operating room costs¹⁰.

Elsewhere in the surgical literature, comparisons of staples, sutures and adhesive strips across various surgical disciplines have shown that suture-free techniques generally reduce closure time without compromising wound complication rates, though evidence specific to pediatric groin incisions remains limited, particularly from South Asian populations¹¹. Given the frequency with which inguinal herniotomy is performed in children and the ongoing debate regarding the most efficient and cosmetically acceptable method of skin closure, this study was designed to compare Steri-Strips with subcuticular suturing in terms of wound infection, cosmetic outcome, closure time and parental satisfaction in pediatric patients undergoing inguinal herniotomy.

METHODS

Study was started after approval from the Hospital Ethics Review Committee. Children of either gender, aged between 1 and 12 years, undergoing elective open unilateral inguinal herniotomy under general anaesthesia were included after written informed consent was obtained from parents/guardians. Children with incarcerated or strangulated hernia, recurrent hernia, bilateral hernia, associated undescended testis requiring orchidopexy, known keloid tendency, bleeding disorder,

immunocompromised state or uncontrolled systemic illness were excluded.

The sample size was calculated using the WHO sample size calculator for comparison of two proportions, taking the reported excellent cosmetic appearance rate of 95.6%¹² with steri strips and 80%¹² with subcuticular closure from previous literature, keeping a 95% confidence level. A minimum sample size of 33 patients per group was calculated, giving a total sample size of 66 patients for the study.

Patients fulfilling the inclusion criteria were enrolled consecutively and allocated to Group A (Steri-Strip closure) or Group B (subcuticular suture closure) by the lottery method of simple random sampling, using sealed opaque envelopes. All operations were performed by consultant pediatric surgeons using a standard skin-crease inguinal incision and high ligation of the hernial sac. Scarpa's fascia and subcutaneous tissue were closed with 4-0/5-0 polyglactin sutures in both groups. In Group A, skin edges were approximated with adhesive Steri-Strips reinforced with a transparent occlusive dressing. In Group B, skin was closed with a continuous subcuticular suture using 4-0/5-0 polyglactin (Vicryl) on a cutting needle.

The time taken for skin closure alone (from the start of subcuticular/edge approximation to completion of dressing) was recorded in minutes by a blinded assistant using a stopwatch. Patients were reviewed on postoperative day 7 for wound assessment (CDC criteria for surgical site infection) and again at 6 weeks for cosmetic evaluation using the Hollander Wound Evaluation Scale and a parental visual analogue scale (0–100), and for overall parental satisfaction graded as satisfied/not satisfied.

Data were entered and analyzed using SPSS version 25.0. Quantitative variables such as age and skin closure time were expressed as mean $\pm$ standard deviation. Qualitative variables such as gender, wound infection, cosmetic outcome and parental satisfaction were expressed as frequency and percentage. A p-value of ≤ 0.05 was considered statistically significant.

RESULTS

A total of 66 children were enrolled and completed follow-up, with 33 patients in each group. The mean age was 4.8 ± 2.6 years in Group A (Steri-Strip) and 5.1 ± 2.9 years in Group B (subcuticular suture), with no statistically significant difference ($p = 0.65$). There were 60 (90.9%) male and 6 (9.1%) female patients overall, giving a male-to-female ratio of approximately 10:1, with comparable distribution between the two groups ($p = 0.71$). The right side was involved in 41 (62.1%) patients and the left side in 25 (37.9%) patients, without significant difference between groups (Table I).

Table I: Demographic and Baseline Characteristics (n = 66)

Variable	Group A (n=33) Steri-Strip	Group B (n=33) Subcuticular	p-value
Mean age (years)	4.8 ± 2.6	5.1 ± 2.9	0.65

Male, n (%)	30 (90.9%)	30 (90.9%)	1.00
Female, n (%)	3 (9.1%)	3 (9.1%)	1.00
Right-sided hernia, n (%)	21 (63.6%)	20 (60.6%)	0.80
Mean weight (kg)	16.4 ± 5.8	16.9 ± 6.1	0.73

The mean skin closure time was significantly shorter with Steri-Strips (4.3 ± 1.2 minutes) than with subcuticular suturing (9.6 ± 2.4 minutes) ($p < 0.001$). Superficial wound infection occurred in 2 (6.1%) patients in Group A and 3 (9.1%) patients in Group B; this difference was not statistically significant ($p = 0.64$). No patient in either group developed deep surgical site infection, wound dehiscence or hernia recurrence during the follow-up period (Table II).

Table II: Comparison of Outcome Variables between Groups

Outcome	Group A (n=33) Steri-Strip	Group B (n=33) Subcuticular	p-value
Skin closure time (min)	4.3 ± 1.2	9.6 ± 2.4	<0.001
Wound infection, n (%)	2 (6.1%)	3 (9.1%)	0.64
Excellent/good cosmesis at 6 wks, n (%)	29 (87.9%)	28 (84.8%)	0.72
Mean VAS cosmesis score (0–100)	84.6 ± 7.9	83.1 ± 8.4	0.46
Parental satisfaction, n (%)	30 (90.9%)	28 (84.8%)	0.58

At 6-week follow-up, excellent or good cosmetic outcome was noted in 29/33 (87.9%) patients in the Steri-Strip group compared to 28/33 (84.8%) in the subcuticular suture group, a difference that did not reach statistical significance ($p = 0.72$). Mean visual analogue cosmesis scores were also comparable between the two groups (84.6 ± 7.9 versus 83.1 ± 8.4 , $p = 0.46$). Parental satisfaction was high in both groups, reported in 90.9% of Group A and 84.8% of Group B ($p = 0.58$), with no statistically significant difference.

DISCUSSION

Inguinal herniotomy remains one of the commonest operations performed in children, and while attention is frequently focused on the technical steps of sac ligation, the method of skin closure has an important bearing on operative efficiency, cost and, not least, parental perception of the surgical outcome¹³. The findings of the present study demonstrate that Steri-Strip closure significantly reduces skin closure time compared with subcuticular suturing, without any compromise in wound infection rate or cosmetic outcome, which is consistent with previously published pediatric and adult literature^{9,10}.

Ladipo-Ajayi et al⁹ compared Steri-Strip and subcuticular suture closure of paediatric groin wounds in a randomized study of 68 children and similarly found comparable cosmetic outcomes and wound complication rates between the two techniques, with no statistically significant difference in visual analogue scores at 5 days, 2, 4 and 8 weeks postoperatively. Results of this study mirror these findings, reinforcing that adhesive strip closure is an acceptable alternative in clean pediatric groin wounds. In absolute terms, wound complication rates in that study were 2.9% with Steri-Strip closure versus 8.6% with subcuticular suture, figures that are closely in keeping with the 6.1% versus 9.1% infection rates recorded in the present cohort ($p = 0.64$). Likewise, the absence of a significant difference in VAS cosmesis scores at 5 days ($p = 0.320$), 2 weeks ($p = 0.080$), 4 weeks ($p = 0.070$) and 8 weeks ($p = 0.080$) in their series parallels the comparable mean VAS scores of 84.6 ± 7.9 versus 83.1 ± 8.4 ($p = 0.46$) observed here.

Brown et al¹⁰ compared skin adhesive with subcuticular suture in 134 children undergoing inguinal herniorrhaphy and reported no difference in cosmetic outcome between the two techniques, although skin closure time was significantly shorter with the suture-free method, which partially offset the higher material cost of the adhesive through reduced operating room time. This concurs with the significantly shorter closure time observed with Steri-Strips in this cohort, an efficiency that carries particular value in high-volume pediatric surgical units and day-case settings where operating room turnover directly affects cost and throughput¹⁴. Specifically, Brown et al recorded a mean skin closure time of 1.4 ± 0.8 minutes with skin adhesive versus 2.4 ± 1.1 minutes with subcuticular suture ($p = 0.001$), and comparable cosmesis VAS scores of 78 ± 21 versus 78 ± 18 ($p = 0.50$); material costs were higher for adhesive (\$22.63 versus \$11.70, $p < 0.001$), though partly offset by reduced operating-room time. The direction and significance of these findings mirror those of the present study, although the absolute time saved with Steri-Strips in this cohort (5.3 minutes) was considerably larger than the 1.0-minute difference reported by Brown et al, likely reflecting differences between adhesive application and strip placement across the full length of the wound, as well as differences in how closure time was timed and defined between the two studies.

Broader surgical literature comparing suture-based and suture-free skin closure techniques across specialties has generally shown comparable wound infection rates, with subcuticular sutures sometimes associated with modestly lower wound complication rates than staples, but at the cost of longer closure time^{15,16}. A meta-analysis of subcuticular sutures for non-obstetric surgery concluded that subcuticular sutures probably reduce wound complications compared with staples and improve patient satisfaction compared with transcutaneous sutures, though evidence comparing subcuticular sutures specifically with adhesive strips remains sparse¹⁷. This study adds to this limited body of evidence by focusing specifically on the pediatric groin incision, a site with unique considerations

including proximity to the diaper area, higher activity levels of children, and heightened parental sensitivity to scar appearance¹⁸.

The absence of any deep infection, dehiscence or recurrence in either group in our series is reassuring and is consistent with the generally low complication rate reported for elective, clean pediatric herniotomy wounds regardless of closure technique^{19,20}. A theoretical concern with Steri-Strips is premature detachment due to moisture, sweating or friction from clothing/diapers, which could compromise wound edge apposition; however, this was not observed as a significant issue in our cohort when strips were reinforced with an occlusive dressing, an observation supported by similar pediatric series²¹.

From a resource standpoint, Steri-Strip closure eliminates the need for suture material, needle-holders and additional suturing time, translating into direct cost savings and reduced anaesthesia exposure for the child, which is particularly relevant in low- and middle-income settings with high surgical caseloads and constrained operating room time^{22,23}.

CONCLUSION

Skin closure with Steri-Strips after pediatric inguinal herniotomy is a safe, effective and time-saving alternative to conventional subcuticular suturing. Both techniques yielded comparable rates of wound infection, cosmetic outcome and parental satisfaction, while Steri-Strip closure significantly reduced skin closure time. Given its simplicity, low cost and favourable outcome profile, Steri-Strip closure may be considered a suitable first-line option for clean pediatric groin incisions, particularly in high-volume and resource-limited surgical settings.

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