Evaluation of Testicular Volume Before and After Unilateral Childhood Inguinal Herniotomy at Aminu Kano Teaching Hospital, Kano, Nigeria

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DOI: https://doi.org/10.51244/IJRSI.2026.1311000110

Received: 08 November 2026; Accepted: 13 November 2026; Published: 25 November 2026

ABSTRACT

Background: Paediatric inguinal herniotomy involves dissection adjacent to the spermatic cord, creating concern about early postoperative testicular changes. Prospective Nigerian data on ultrasonographic testicular volume are limited.

Objective: To evaluate ipsilateral testicular volume before and after unilateral childhood inguinal herniotomy at Aminu Kano Teaching Hospital, Kano, Nigeria.

Methods: In this prospective, single-centre study, 125 boys with unilateral inguinal hernia were recruited between October 2022 and October 2023. Testicular volume was assessed by ultrasonography before surgery and on postoperative days 7 and 30. Seven children were lost to follow-up, leaving 118 for analysis. Baseline-to-postoperative comparisons were reported using paired t-tests.

Results: Mean age was 3.78 ± 3.12 years; 90 children (76.3%) had right-sided hernias. Mean ipsilateral testicular volume was 0.65 ± 0.45 mL preoperatively, 0.63 ± 0.48 mL on day 7 and 0.66 ± 0.49 mL on day 30. Reported paired comparisons were not statistically significant ($p = 0.655$ and $p = 0.912$, respectively). Superficial surgical-site infection occurred in 3/118 (2.5%) and scrotal haematoma in 8/118 (6.8%); no testicular atrophy was reported within 30 days.

Conclusion: No statistically significant change in mean ipsilateral testicular volume was detected within 30 days of unilateral inguinal herniotomy. These short-term volume findings cannot establish long-term testicular growth or reproductive function.

Keywords: inguinal hernia, herniotomy, testicular volume, ultrasonography.

INTRODUCTION

Inguinal herniotomy is a common paediatric operation. Although major testicular complications are uncommon, surgical manipulation near the spermatic cord may affect testicular perfusion. Ultrasonography provides a non-invasive measure of testicular size that can be repeated over time; however, volume does not directly measure endocrine function or future fertility (Erdogan et al., 2013; Tuncer et al., 2017).

Prospective investigations of testicular volume and blood flow after paediatric inguinal operations have produced context-dependent results, reflecting variation in surgical procedures, patient characteristics, measurement methods and observation periods (Basha et al., 2020; Tuncer et al., 2017; Virdi et al., 2022). Evidence from Nigerian centres is valuable for characterising early outcomes in local practice. We therefore assessed ipsilateral testicular volume before surgery and on postoperative days 7 and 30 among boys undergoing unilateral herniotomy at Aminu Kano Teaching Hospital.

METHODS

Study design, setting and participants

This prospective hospital-based study was conducted at Aminu Kano Teaching Hospital, Kano, Nigeria, between October 2022 and October 2023. Consecutively presenting boys approximately one month to 12 years of age with unilateral inguinal hernia were enrolled. All 118 analysed children presented with reducible groin or scrotal swelling. Of 125 enrolled children, seven did not complete follow-up, resulting in a complete-case analysis of 118 (94.4%).

Surgical procedure and ultrasonography

Open inguinal herniotomy was performed. The Mitchell Banks technique was used for most children, whereas the Gross and Ferguson technique was used for some older participants. Ipsilateral testicular ultrasonography was undertaken before surgery and on postoperative days 7 and 30, using a Nortek CS-50 scanner with a 9 – 16 MHz linear-array transducer. Two radiologists performed examinations using the same equipment, and the study record describes duplicate measurements being averaged. Length, width and height were measured along three orthogonal axes.

The documented volume equation was length × width × height × 0.52, corresponding to the ellipsoid approximation.

Outcomes and statistical analysis

The primary outcome was ipsilateral testicular volume (mL) at baseline, day 7 and day 30. Secondary descriptive outcomes were patient characteristics, hernia laterality, loss to follow-up and short-term complications. Continuous variables are reported as mean ± standard deviation (SD) and categorical variables as number (percentage). The original analysis, undertaken using SPSS version 29, reported paired t-tests comparing each postoperative measurement with baseline and used a two-sided significance level of 0.05.

Ethical considerations

The Aminu Kano Teaching Hospital Health Research Ethics Committee approved the study (NHREC/28/01/2020/AKTH/EC/3388). Parents or guardians provided consent and assent from children.

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue XI November 2026

Results

Participants and baseline characteristics

Of 125 recruited boys, 118 completed follow-up (94.4%) and seven were lost to follow-up (5.6%). Mean age was 3.78 ± 3.12 years (range 0.2–12.0 years), with 54 (45.8%) younger than three years. Right-sided inguinal hernias were present in 90 children (76.3%) and left-sided hernias in 28 (23.7%). Symptom duration ranged from one to seven months (mean 4.0 ± 2.7 months; Table 1).

Table 1. Baseline characteristics of children included in the analysis (N = 118)

Characteristic	Result
Age (years), mean ± SD	3.78 ± 3.12
Age (years), range	0.2–12.0
Age <3 years, n (%)	54 (45.8)
Right-sided hernia, n (%)	90 (76.3)
Left-sided hernia, n (%)	28 (23.7)
Reducible groin/scrotal swelling, n (%)	118 (100.0)
Symptom duration (months), mean ± SD	4.0 ± 2.7
Symptom duration (months), range	1–7
Hausa/Fulani ethnicity, n (%)	85 (72.0)

Percentages are based on 118 analysed children.

Preoperative volume by age

Mean preoperative testicular volume varied among age groups. Several strata included fewer than ten participants, so these values should not be interpreted as demonstrating a reliable age-related trend (Table 2).

Table 2. Preoperative ipsilateral testicular volume by age group (N = 118)

Age group (years)	n (%)	Volume (mL), mean ± SD
0–0.99	20 (16.9%)	0.28 ± 0.08
1–1.99	16 (13.6%)	0.60 ± 0.12
2–2.99	18 (15.3%)	0.54 ± 0.10
3–3.99	7 (5.9%)	0.55 ± 0.17
4–4.99	16 (13.6%)	0.89 ± 0.21
5–5.99	3 (2.5%)	0.59 ± 0.16
6–6.99	10 (8.5%)	0.53 ± 0.09
7–7.99	4 (3.4%)	0.67 ± 0.20
8–8.99	2 (1.7%)	0.63 ± 0.17
9–9.99	7 (5.9%)	0.89 ± 0.20
10–10.99	0 (0.0%)	—
11–11.99	7 (5.9%)	0.84 ± 0.24
12–12.99	8 (6.8%)	0.79 ± 0.22

Longitudinal testicular volume

Mean ipsilateral testicular volume was 0.65 ± 0.45 mL before herniotomy, 0.63 ± 0.48 mL on day 7 and 0.66 ± 0.49 mL on day 30. Neither reported paired comparison with baseline was statistically significant (Table 3).

Table 3. Testicular volume before and after herniotomy and reported paired comparisons (N = 118)

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue XI November 2026

Assessment	Volume (mL), mean ± SD	Range (mL)	p-value*
Preoperative	0.65 ± 0.45	0.18–2.30	—
Postoperative day 7	0.63 ± 0.48	0.23–2.52	0.655
Postoperative day 30	0.66 ± 0.49	0.20–2.41	0.912

Early postoperative outcomes

Three children experienced superficial surgical-site infection (2.5%), and eight experienced scrotal haematoma (6.8%). No testicular atrophy was documented during the 30-day observation period (Table 4).

Table 4. Follow-up status and early postoperative outcomes

Outcome	n/N	%
Completed reported follow-up	118/125	94.4
Lost to follow-up	7/125	5.6
Superficial surgical-site infection	3/118	2.5
Scrotal haematoma	8/118	6.8
Testicular atrophy reported by day 30	0/118	0.0

DISCUSSION

The mean ipsilateral testicular volume remained close to the preoperative mean on days 7 and 30 after unilateral childhood inguinal herniotomy, with no statistically significant differences in the originally reported paired comparisons. Prior prospective studies have also evaluated testicular volume and vascularity after surgery for inguinal and related scrotal conditions, although their clinical populations and techniques differ (Basha et al., 2020; Tuncer et al., 2017; Virdi et al., 2022). These similarities do not establish equivalence between operative approaches or rule out individual postoperative changes.

Right-sided hernias accounted for approximately three-quarters of the analysed cases. Preoperative volume varied across age groups, but the sparse distribution in several strata precludes a dependable interpretation of age-related patterns. Although early scrotal haematoma and superficial surgical-site infection were uncommon, postoperative swelling could influence the short-term ultrasound measurement.

No atrophy was reported by day 30. This finding is reassuring for the observed interval but should not be interpreted as evidence that delayed atrophy cannot occur. Likewise, a non-significant paired test does not establish absence of a clinically meaningful change. Testicular volume alone cannot establish hormonal function or future fertility.

The study was limited by its single-centre setting, seven losses to follow-up, short postoperative observation, and lack of a comparison group. The ultrasound calculation terminology was corrected to the ellipsoid approximation, but confirmation against original measurements remains desirable. Findings may not generalise to complicated or emergency presentations.

Future multicentre with standardised sonography and reproducibility assessment; bilateral testicular measurements and Doppler flow where feasible; and extended follow-up, including assessment of age-related growth. Where data permit, investigators should report individual absolute and percentage volume changes, paired effect estimates with 95% confidence intervals, and appropriately adjusted analyses of clinically relevant factors.

CONCLUSION

In 118 boys with follow-up to 30 days, the analyses detected no statistically significant change in mean ipsilateral testicular volume at postoperative days 7 or 30. These findings pertain to short-term structural measurements and do not establish long-term testicular development or fertility outcomes.

Declarations

Ethical approval: Aminu Kano Teaching Hospital Health Research Ethics Committee (NHREC/28/01/2020/AKTH/EC/3388).

Funding: No funding.

Competing interests: The authors reported no conflicts of interest.

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