A Comparative Study on the Outcomes of Mid-shaft to Distal Hypospadias Repair with Stented and Unstented Urethra

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Abstract

Background: The role of catheter or stent placement for urinary diversion in mid-shaft to distal hypospadias repair remains controversial. Thus, the decision depends on the individual surgeon's preference and there has been little scientific evidence behind the choice.

Objective: To determine whether the presence or absence of a catheter affects postoperative complications and evaluation of the efficacy and safety of a non-catheter repair.

Methods: This quasi experimental study was carried out from December 2018 to November 2023 at Department of Urology of National Institute of Kidney Diseases & Urology, Dhaka. A total of 140 patients were purposively assigned with mid-shaft to coronal hypospadias. They were grouped into 2 groups, 70 patients in each group. Patients in group A underwent stented hypospadias repair, group B underwent unstented repair. Variables were type of hypospadias, age at repair, stent usage, and complications of hypospadias repair. Relative risk was determined, and a P-value less than 0.05 was regarded as statistically significant.

Results: No significant statistical differences were found in the parameters measured in either group. Some early complications included urinary retention requiring urethral catheter insertion occurred in 2 patients, bleeding in 2 unstented repair patients, and swelling of the penis, dysuria in 7 unstented repair patients, all of which were managed conservatively. In terms of late complications, out of the 115 patients assessed (56 in the stented repair group and 59 in the unstented repair group), 21 patients (18.26%) developed urethro-cutaneous fistula, with 11 (19.64%) in the stented repair group and 10 (16.95%) in the unstented repair group which showed no significant difference (P = 0.81, RR = 0.86). Meatal stenosis occurred in 5 patients (1 stented repair, 4 unstented repair), with statistically non-significant difference between the groups (P = 0.36, RR = 3.8), and glans dehiscence occurred in 8 patients (3 stented repair, 5 unstented repair) with no significant difference observed (P = 0.71, RR = 1.58).

Conclusion: No significant differences were detected in short-term complications observed between hypospadias repairs with and without stenting. However, in long-term outcomes, higher relative risk for the occurrence of meatal stenosis in unstented hypospadias repair procedures.

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Introduction

Hypospadias is the most prevalent birth defect affecting the penile shaft, occurring in approximately 1 out of every 300 male births.[1] In the traditional approach to repairing hypospadias located from the middle to the tip of the penis, known as tubularized incised plate (TIP) procedure, a stent was utilized to minimize complications such as urethral narrowing and the formation of fistulas. In a recent account of the TIP technique by Snodgrass himself, he advised placing a stent for approximately one week to facilitate drainage from the urinary bladder and serve as a framework for the healing of the urothelium.[2] Nevertheless, the necessity of catheter or stent insertion for urinary diversion during TIP repair remains a subject of debate. Several studies have demonstrated favorable outcomes with non-catheter hypospadias repair, including minimal complications, low infection risk, reduced bladder spasms, and shorter hospital stays.[3,4,5] However, proponents of using a urethral catheter or stent argue that it can prevent issues like urinary retention, bleeding, meatal stenosis, and early urethra-cutaneous fistula formation, as non-catheter repair may be associated with higher complication rates.[6,7,8] Consequently, the choice between the two approaches often hinges on the surgeon's preference, with limited scientific evidence guiding the decision. Therefore, this study aims to assess whether the presence or absence of a catheter impacts postoperative complications and to evaluate the effectiveness and safety of non-catheter repair.

Objective

To evaluate the role of catheterization in postoperative complications and to assess the efficacy and safety of non-catheter repair.

Methods

Conducted as a quasi-experimental study, the research was carried out in the urology department of the National Institute of Kidney Diseases & Urology (NIKDU) from December 2018 through November 2023.

Inclusion criteria: Boys between 6 months to 18 years of age, coronal to mid-shaft hypospadias.

Exclusion criteria: Patients with megameatus with intact prepuce (MIP), glanular and proximal variety of hypospadias, patients presenting with severe chordee requiring Nesbit procedure, patients who required staged procedure; fistula repair & redo repair.

A total of 140 patients were enrolled after informed written consent of the treatment options and explanation of all risks & benefits of each treatment modality. Purposive sampling was done and selected patients were grouped into Group A (stented repair) and Group B (unstented repair) (Figure 1).

All patients underwent caudal block and received antibiotics upon induction of anesthesia. They all underwent either Snodgrass/TIP or Thiersch–Duplay procedures. Urethroplasty was performed with a continuous technique and the glans was reconstructed using 6/0 Polyglactin suture. Spongioplasty and a waterproofing layer were also applied. In the stented repair group, an 8F NG tube was used as a stent. All procedures concluded with the application of a Tegaderm dressing. Anticholinergic medication was not routinely administered. Children in the stented repair group returned for stent removal one-week post-surgery, while those in the unstented repair group had their dressings removed after 48 hours. Follow-up appointments were scheduled at 6 months. Complications were categorized into two groups: early complications, which occurred before discharge or necessitated a revisit to the emergency department within 28 days post-surgery, and late complications, were recorded during scheduled outpatient visits. Early complications encompassed

difficulty in urination, substantial pain requiring additional analgesia, bleeding, bladder spasms, and issues related to the catheter, leading to unscheduled hospital visits. Late complications comprised fistula formation, stricture development, meatal stenosis, or glans dehiscence.[9]

Results were analyzed using Statistical Package for the Social Sciences (SPSS 26, IBM Corp., Armonk, NY, USA) and Microsoft Excel 2019 (Microsoft Corporation, Redmond, WA, USA). Continuous data were presented as mean ± standard deviation (SD) and categorical data as frequency, percentage. Relative risk (RR) for major complications was computed, and Fisher's Exact test assessed intergroup differences; P-values less than 0.05 were considered significant. Prior clearance from institutional review board of NIKDU was taken before commencement of the study.

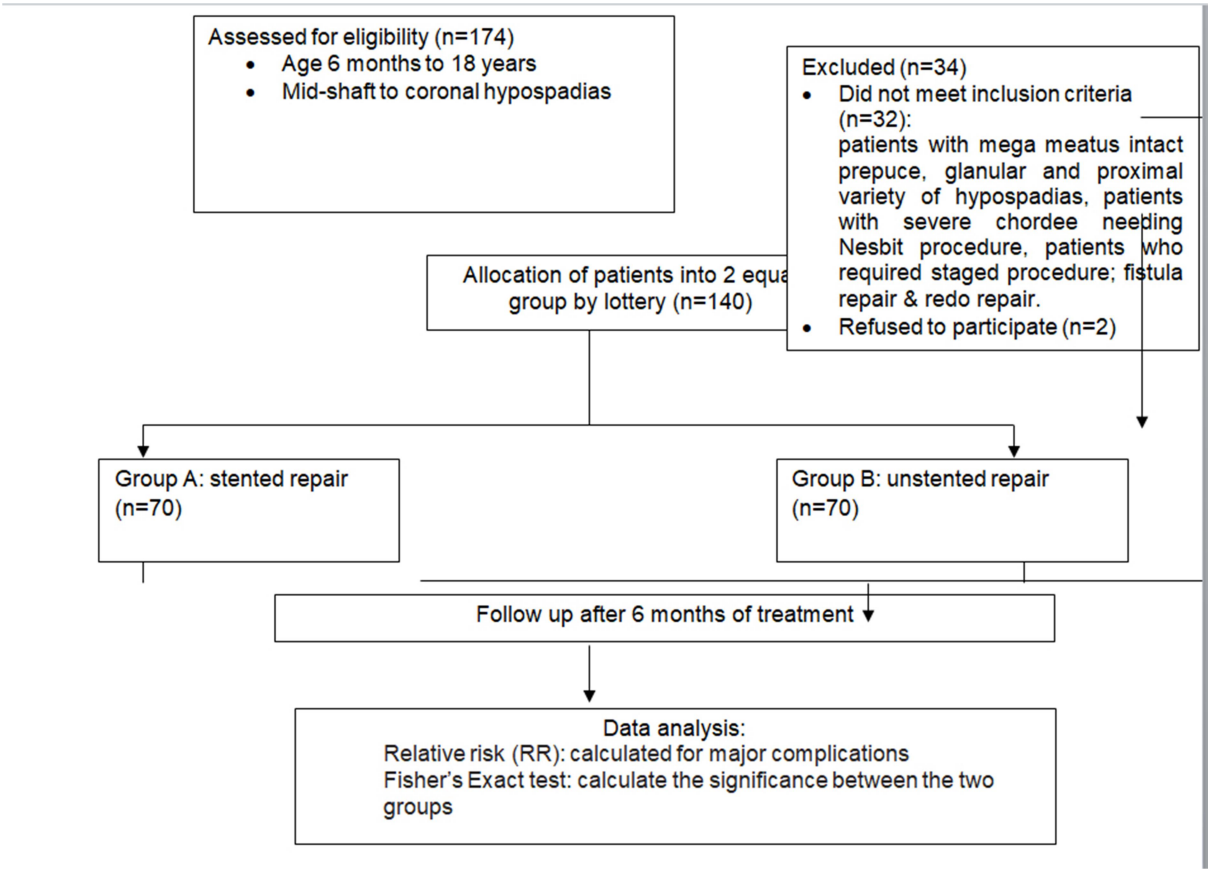

Figure 1. Flowchart for patient assignment throughout the study

Results

In this study, no significant differences were observed among the groups regarding the type of hypospadias, median age of repair, method of repair, or duration of follow-up (Table I).

Table I: Demographics of patients

	Total n=140	Group-A n=70	Group-B n=70
Median age of repair (months)		26	29
Median follow-up duration (months)		16	15
Age at last follow-up, median (months)		42	43
Type of hypospadias			
Coronal	69	34	35
Subcoronal	41	22	19
Mid-shaft	30	14	16

Group-A: stented repair, Group-B: unstented repair. Results were expressed as Mean

After surgery, five patients in the unstented repair group experienced postoperative issues. Among them, two encountered bleeding that were stopped with compression dressing. Additionally, two boys in this group faced difficulty in urination, suprapubic pain and palpable urinary bladder unresponsive to conservative measures. They required per-urethral catheterization under general anesthesia. Following hospital discharge, 11 patients revisited the emergency department, with four from the stented repair group and seven from the unstented repair group. Those in the stented repair group presented with stent-related symptoms attributed to bladder spasms, necessitating tolterodine administration. Patients from the unstented repair group sought emergency care for penile swelling and dysuria, all of which were managed conservatively.

During long-term follow-up, data from 115 patients were available, while the remaining patients either had a short follow-up duration or were lost to follow-up. No statistically significant differences were found between the two groups regarding late complications (all $p>0.05$). Meatal stenosis occurred in 1.79% of patients in the stented repair group compared to 6.78% in the unstented repair group. Urethro-cutaneous fistula was observed in 19.64% of patients in the stented repair group and 16.95% in the unstented repair group. Glans dehiscence occurred in 5.36% of patients in the stented repair group and 8.47% in the unstented repair group. Not a single patient in either group developed stricture urethra (Table II, Figure 2). Among the 34 patients who experienced late complications, 32 underwent corrective surgery for the complications.

Table II: Comparisons between groups in regards of late complications

Complications	Total n=115	Group-A n=56	Group-B n=59	*p*-value (RR)
Meatal stenosis	5 (4.34%)	1 (1.79%)	4 (6.78%)	0.36 (3.8)
Urethro-cutaneous fistula	21 (18.26%)	11 (19.64%)	10 (16.95%)	0.81 (0.86)
Glanular dehiscence	8 (6.96%)	3 (5.36%)	5 (8.47%)	0.71 (1.58)
Stricture urethra	0	0	0	0

Group-A: stented repair, Group-B: unstented repair, RR: Relative risk. Results were expressed as frequency, percentage. To determine significance, Fisher's Exact test was used

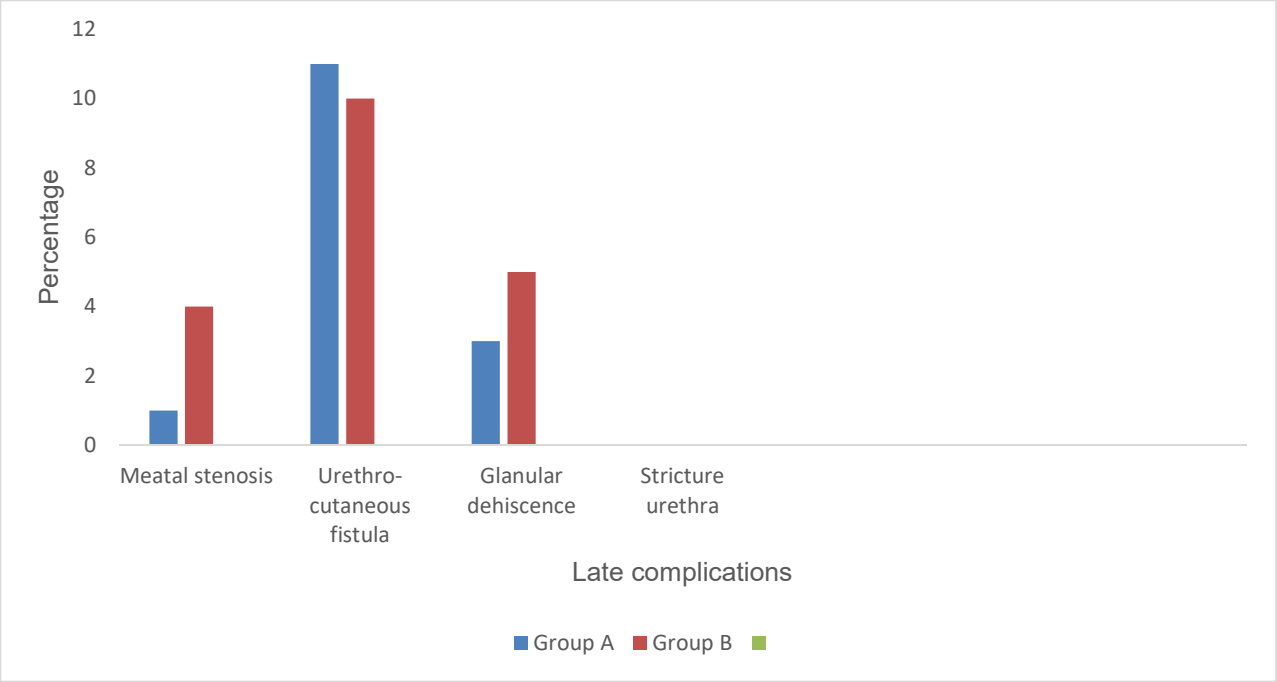

Figure 2. Comparisons between groups regarding late complications

Discussion

Hypospadias repair continues to be most frequently performed procedures by pediatric urologists. Presently, TIP urethroplasty stands as the predominant technique for single-stage hypospadias repair globally.[10] However, numerous unresolved matters surround hypospadias repair, and the utilization of postoperative stents, particularly following distal hypospadias repair, remains a significant topic of discussion.

In a study in 1992 Duckett proposed that postoperative stenting following hypospadias repair aids in maintaining a watertight anastomosis during the healing process and reduces patient discomfort.[11] Research has indicated that stent placement aids in the healing process, particularly after tubularized incised plate repair, and mitigates the risk of stricture formation by facilitating epithelialization proceeds from the margins of the incised plate rather than as concentric rings.[12,13,14] Hafeez et al. (2003) have demonstrated that the application of urethral stent may not be essential to maintain tissue separation until re-epithelialization occurs, as regular voiding achieves a similar effect, allowing for normal epithelialization.[15] Unstented TIP repair exhibits similarly favorable healing outcomes, suggesting that indwelling catheters postoperatively are unnecessary for normal epithelialization. Moreover, it has been argued that apart from stent-induced inflammation, stent might induce bladder spasms, and urine can leak around the catheter under high pressure via the neourethra, potentially promoting fistula formation.[16]

Our study found that unstented repair cases had a high relative risk of meatal stenosis (RR = 3.8), although this failed to reach statistical significance. Similarly, Chalmers et al. reported a comparable 4.7% rate of meatal stenosis.[17] In the systematic review by Wilkinson et al., the incidence of meatal stenosis following unstented TIP repair ranged from 0.5% to 17%.[18]

Fistula rates for hypospadias repairs are typically reported between 6% and 40%, depending on the type of repair and the extent of the anomaly. Large-center studies have reported that the average acceptable fistula rate for distal TIP repair is under 8%. In our study, the incidence of fistula was minimal in both groups, and no significant difference was observed between stented and unstented repairs. Studies evaluating unstented repair consistently report fistula rates below the acceptable 8% limit.[1,3] In unstented Mathieu repair, with the exception of Buson et al. (1994), who reported a 14% fistula rate, other studies shows no notable increase in either fistula or meatal stenosis rates.[6] Wilkinson et al., in a systematic review, reported that the use of a urethral stent in Mathieu repair significantly raised the risk of fistula (RR 7.45, $P < 0.001$) while showing a non-significant increase in meatal stenosis (RR 1.8, $P = 0.31$) when compared with unstented repair.[18]

Our study found a relative risk of 1.58 for glans dehiscence in unstented repairs; however, the result was not statistically significant. The glans dehiscence rate in the unstented group was 8.47%. Similarly, a study by Burki et al. reported a comparable 7.8% glans dehiscence rate.[9]

Urinary retention remains a significant concern in unstented hypospadias repair. Chalmers et al. (2015) conducted an uncontrolled study of 89 infants undergoing distal hypospadias repair without a stent using different methods, and only one patient developed urinary retention that required catheterization immediately after surgery.[17] Leclair et al. (2004) conducted a noncomparative study involving 161 children undergoing TIP repair for mid-shaft to distal hypospadias; urinary retention developed in four cases necessitating a suprapubic catheter.[3] Among these, two children required SPC during the early postoperative period, while the remaining two developed chronic retention and needed SPC on postoperative day 6. Notably, urinary retention was not associated with an increased incidence of later complications such as fistula formation or stenosis.[3] In El Sherbiny's study, unstented repair cases experienced urinary retention in 34% and urinary extravasation in 17%, while neither complication occurred in the stented repair group. A penile block alone was used in their study to prevent postoperative urinary retention.[7] Buson et al. found that 19% of unstented hypospadias repair cases developed urinary retention.[6] The use of a caudal or penile block has been shown to have no significant effect on urinary retention. Our observations matches the conclusions of previous authors, showing that urinary retention does not pose a significant problem, regardless of age or type of anesthesia block. Urinary retention requiring intervention has been reported in 2.5–4% of cases in other studies, slightly higher than our rate of 2.8%.

This study has several limitations, including a small sample size, a short follow-up period, and fewer patients with mid-shaft hypospadias, which resulted in a non-homogeneous study group.

Conclusion

Based on our results, unstented mid-shaft to coronal hypospadias repair does not differ significantly from stented repair in terms of short- or long-term complications, aside from an increased relative risk of meatal stenosis. Thus, urethral stenting does not seem to provide any significant benefit.

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