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Original Article

# Single-Center Experience with a Bridging Antibiotic Strategy Following Pediatric Distal Hypospadias Repair

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ABSTRACT

**Background:** The optimal duration of antibiotic prophylaxis following pediatric urethroplasty remains controversial. While recent evidence suggests limited benefit from prolonged postoperative antibiotics, many surgeons continue their routine use because of concerns regarding urinary tract infections (UTIs) and surgical complications. This study evaluated the outcomes of a bridging antibiotic strategy consisting of a single perioperative antibiotic dose followed by a short postoperative oral course in children undergoing primary distal hypospadias repair.

**Methodology:** This retrospective single-center observational cohort study was conducted at a tertiary pediatric urology center in Dubai, United Arab Emirates. Medical records of 239 consecutive children who underwent primary distal hypospadias repair between July 2021 and July 2025 were reviewed. All patients received a single perioperative intravenous dose of a second-generation cephalosporin followed by a short postoperative oral antibiotic course until urethral stent removal. Postoperative infectious and structural complications were assessed during routine follow-up.

**Results:** A total of 239 children underwent primary distal hypospadias repair, with a mean age of 22.5 ± 5.1 months. Postoperative infectious morbidity was low, with only three cases of culture-confirmed urinary tract infection (1.3%), all successfully managed with oral antibiotics. No wound infections, soft tissue infections, stent-related infectious complications, or febrile episodes were observed. Structural complications were uncommon, with urethrocutaneous fistula occurring in five patients (2.0%). No cases of meatal stenosis, wound dehiscence, or diverticulum were identified during follow-up.

**Conclusion:** A bridging antibiotic regimen consisting of a single perioperative antibiotic dose followed by brief postoperative chemoprophylaxis was associated with low rates of infectious and structural complications after primary distal hypospadias repair. This approach may represent a practical strategy for reducing antibiotic exposure while maintaining favorable surgical outcomes and supporting antimicrobial stewardship principles.

## INTRODUCTION

Hypospadias is one of the most common congenital anomalies of the male genitalia, affecting approximately 1 in every 200–300 live male births worldwide. It is characterized by an ectopic urethral meatus, ventral penile curvature, and varying degrees of incomplete foreskin development. Surgical correction is the standard treatment and aims to restore normal urinary function, achieve satisfactory cosmetic outcomes, and minimize long-term psychological and functional complications. Distal hypospadias represents the most common subtype and is frequently managed through urethroplasty during early childhood [1,2].Despite significant advances in surgical techniques and perioperative care, postoperative complications remain a concern following hypospadias repair. Common complications include urinary tract infection (UTI), urethrocutaneous fistula, meatal stenosis, wound infection, wound dehiscence, and urethral diverticulum. Because urethral stents are often left in place for several days after surgery, many pediatric urologists routinely prescribe postoperative antibiotics in an attempt to reduce infectious complications and improve surgical outcomes [3,4].The role of antibiotic prophylaxis after hypospadias repair, however, remains controversial. While perioperative antimicrobial prophylaxis is widely accepted, the benefit of continuing antibiotics postoperatively has been increasingly questioned. Several recent studies and systematic reviews have reported low rates of postoperative urinary tract infections regardless of antibiotic duration and have suggested that prolonged antibiotic exposure may not significantly reduce complication rates. Furthermore, unnecessary antibiotic use contributes to antimicrobial resistance, increased healthcare costs, and potential adverse drug reactions, highlighting the importance of antimicrobial stewardship in pediatric surgical practice [5–8].Recent evidence has focused on balancing effective infection prevention with minimizing unnecessary antibiotic exposure. Although some institutions have adopted single-dose perioperative prophylaxis protocols, others continue to prescribe antibiotics until urethral stent removal because of concerns regarding infection and urethroplasty-related complications. Consequently, considerable variation exists in clinical practice, and the optimal antibiotic strategy following distal hypospadias repair remains uncertain [9–11].At our institution, a bridging antibiotic protocol consisting of a single perioperative intravenous antibiotic dose followed by a short postoperative oral antibiotic course until stent removal has been routinely employed. This approach aims to provide adequate protection during the immediate postoperative period while limiting prolonged antibiotic exposure.The present study was conducted to evaluate postoperative infectious and structural outcomes associated with this antibiotic regimen in children undergoing primary distal hypospadias repair. Specifically, we sought to determine the incidence of urinary tract infection, wound infection, urethrocutaneous fistula, meatal stenosis, and other postoperative complications following implementation of this standardized prophylactic strategy.

## MATERIALS AND METHODS

### Study Design and Setting

This retrospective single-center observational cohort study was conducted at the Department of Pediatric Surgery and Pediatric Urology, Al Jalila Children's Specialty Hospital, Dubai, United Arab Emirates. Medical records of consecutive pediatric patients who underwent primary distal hypospadias repair between July 2021 and July 2025 were reviewed. The study aimed to evaluate postoperative infectious and structural outcomes following a bridging antibiotic prophylaxis protocol consisting of a single perioperative intravenous antibiotic dose followed by a short postoperative oral antibiotic course until urethral stent removal.

### Study Population

The study included pediatric patients who underwent primary distal hypospadias repair during the study period. Demographic characteristics, operative details, antibiotic regimens, postoperative complications, and follow-up data were retrieved from electronic medical records.

### Inclusion Criteria

- Children undergoing primary distal hypospadias repair.
- Patients managed using the institutional bridging antibiotic prophylaxis protocol.
- Availability of complete perioperative and follow-up records.

### Exclusion Criteria

- Proximal hypospadias requiring complex reconstruction.
- Redo hypospadias repair.
- Patients with known immunodeficiency disorders.
- Patients with incomplete medical records or inadequate follow-up.
- Associated major urogenital anomalies requiring additional reconstructive procedures.

### Perioperative Antibiotic Protocol

All patients received a single perioperative intravenous dose of a second-generation cephalosporin administered at induction of anesthesia. Following surgery, oral antibiotic prophylaxis was continued until urethral stent removal according to institutional protocol. The objective of this regimen was to provide antimicrobial coverage during the immediate postoperative period while minimizing prolonged antibiotic exposure.

### Surgical Technique and Postoperative Care

All procedures were performed by experienced pediatric urologists using standardized surgical techniques appropriate for distal hypospadias repair. Urethral stenting was routinely employed and maintained according to surgeon preference and clinical indication. Standard postoperative wound care instructions were provided to caregivers. Patients were followed regularly in the outpatient clinic for assessment of wound healing, urinary function, and postoperative complications.

### Outcome Measures

The primary outcome measures included postoperative infectious complications, specifically:

- Urinary tract infection (UTI)
- Wound infection
- Stent-related infectious complications
- Febrile episodes requiring antibiotic treatment

Secondary outcome measures included structural complications:

Urethrocutaneous fistula

- Meatal stenosis
- Wound dehiscence
- Urethral diverticulum

### Data Collection

Data were collected retrospectively from electronic health records using a standardized data extraction form. Variables recorded included patient age at surgery, hypospadias subtype, operative details, antibiotic administration, duration of urethral stenting, postoperative complications, microbiological findings, and follow-up outcomes.

### Statistical Analysis

Data were analyzed using descriptive statistical methods. Continuous variables are presented as mean ± standard deviation (SD), while categorical variables are expressed as frequencies and percentages. Postoperative infectious and structural complications were summarized descriptively. Statistical analyses were performed using Statistical Package for the Social Sciences (SPSS) version 26.0 (IBM Corp., Armonk, NY, USA).

### Ethical Considerations

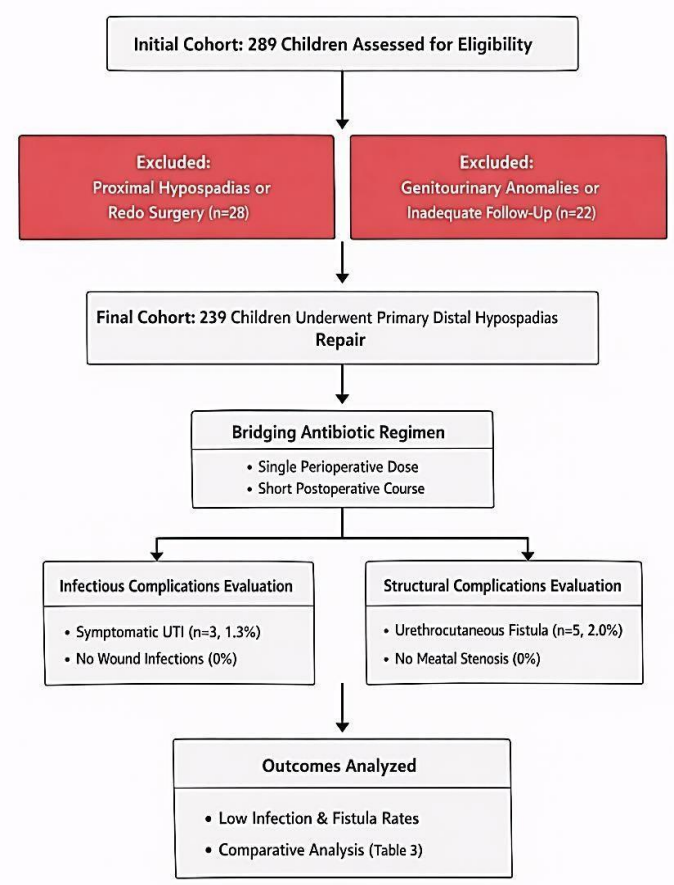
The study was conducted in accordance with the principles of the Declaration of Helsinki. Ethical approval was obtained from the Institutional Review Board of Al Jalila Children's Specialty Hospital, Dubai, United Arab Emirates (Approval No. REF/16533/ERB/04/2023). Patient confidentiality was maintained throughout the study, and all data were anonymized prior to analysis.

## RESULTS

A total of 239 children who underwent primary distal hypospadias repair during the study period met the inclusion criteria and were included in the final analysis. The mean age at surgery was 22.5 ± 5.1 months. All patients received the institutional bridging antibiotic prophylaxis protocol consisting of a single perioperative intravenous dose of a second-generation cephalosporin followed by a short postoperative oral antibiotic course until urethral stent removal. The baseline demographic and clinical characteristics of the study population are summarized in **Table 1.** Postoperative infectious morbidity was low. As shown in **Table 2**, only three patients (1.3%) developed symptomatic culture-confirmed urinary tract infections during follow-up. All cases responded successfully to oral antibiotic therapy, and none required hospital admission or additional surgical intervention. No wound infections, soft-tissue infections, stent-related infectious complications, or postoperative febrile episodes were observed.Structural complications were uncommon. As presented in **Table 3**, urethrocutaneous fistula developed in five patients (2.0%). All fistulas were small and managed electively. Importantly, none of these patients had a preceding urinary tract infection or local wound infection. No cases of meatal stenosis, wound dehiscence, or urethral diverticulum were identified during the follow-up period.A comparison of complication rates with previously published studies is presented in **Table 4**. The observed urinary tract infection rate of 1.3% and urethrocutaneous fistula rate of 2.0% were comparable to or lower than those reported in contemporary pediatric urology

literature, supporting the safety of the bridging antibiotic protocol.The overall study flow and postoperative outcomes are illustrated in **Figure 1.** Of the 239 children who underwent primary distal hypospadias repair and received the bridging antibiotic regimen, only three developed urinary tract infections and five developed urethrocutaneous fistulas, while no other major infectious or structural complications were recorded. The low incidence of postoperative morbidity observed in this cohort suggests that the bridging antibiotic strategy provides adequate perioperative protection while limiting unnecessary antibiotic exposure.

**Figure 1:** Flow Diagram of Patient Selection, Antibiotic Protocol, and Postoperative Outcomes.




Flow diagram illustrating patient inclusion, administration of the bridging antibiotic prophylaxis protocol, follow-up, and postoperative outcomes. A total of 239 children underwent primary distal hypospadias repair and received a single perioperative intravenous antibiotic dose followed by a short postoperative oral antibiotic course until urethral stent removal. During follow-up, three patients (1.3%) developed culture-confirmed urinary tract infections and five patients (2.0%) developed urethrocutaneous fistulas, while no cases of wound infection, meatal stenosis, wound dehiscence, or diverticulum were observed.

Flow diagram illustrating patient inclusion, administration of the bridging antibiotic prophylaxis protocol, follow-up, and postoperative outcomes. A total of 239 children underwent primary distal hypospadias repair and received a single perioperative intravenous antibiotic dose followed by a short postoperative oral antibiotic course until urethral stent removal. During follow-up, three patients (1.3%) developed culture-confirmed urinary tract infections and five patients (2.0%) developed urethrocutaneous fistulas, while no cases of wound infection, meatal stenosis, wound dehiscence, or diverticulum were observed.

**Table 1. Baseline Characteristics of the Study Population (N = 239)**

| Variable | Value |
|---|---|
| Total patients | 239 |
| Mean age (months) | 22.5 ± 5.1 |
| Distal hypospadias | 239 (100%) |
| Primary repair | 239 (100%) |
| Urethral stent placement | 239 (100%) |
| Perioperative IV antibiotic | 239 (100%) |
| Postoperative oral antibiotic | 239 (100%) |

Baseline demographic and perioperative characteristics of children undergoing primary distal hypospadias repair.

**Table 2. Postoperative Infectious Complications**

| Complication | Frequency (%) |
|---|---|
| Urinary tract infection | 3 (1.3%) |
| Wound infection | 0 (0%) |
| Soft tissue infection | 0 (0%) |
| Stent-related infection | 0 (0%) |
| Febrile episode | 0 (0%) |

Postoperative infectious outcomes following implementation of the bridging antibiotic prophylaxis protocol.

**Table 3. Structural Postoperative Complications**

| Complication | Frequency (%) |
|---|---|
| Urethrocutaneous fistula | 5 (2.0%) |
| Meatal stenosis | 0 (0%) |
| Wound dehiscence | 0 (0%) |
| Urethral diverticulum | 0 (0%) |

Structural complications observed after primary distal hypospadias repair.

## Discussion

The use of postoperative antibiotics following hypospadias repair has been a topic of considerable debate for many years, with significant variation in clinical practice. Traditionally, surgeons have prescribed extended postoperative antibiotic prophylaxis to prevent postoperative urinary tract infections (UTIs), wound infections, and potential downstream complications, such as urethrocutaneous fistula formation. [11]. This concept has been evaluated in high-quality studies, including the PROPHY trial which is a randomized, placebo-controlled, and double-blind Study that showed no observance of decreased symptomatic UTIs, surgical site-infections, and complication of urethroplasty, when extended postoperative antibiotics were used upon the completion of stented mid-to-distal hypospadias repair [12].We used a more simplified antibiotic program in our study, whereby a single perioperative dose of intravenous antibiotic was used and subsequently a short postoperative course was introduced. We found that infectious morbidity was very low, and only 1.3% of the patients had culture-confirmed UTI that developed and was treated with oral antibiotics and did not need any hospitalization or intravenous therapy [13]. This low infection rate is in line with the findings of prior studies indicating that a single dose of perioperative agents is adequate in the clean urologic surgeries [14-16]. Interestingly, none of the wound infections, soft-tissue infections, stent-related infectious issues, and postoperative fevers were observed in our group, which further indicates that routine cases may not need lengthy antibiotic treatment. On structural complications, our Study revealed that 2.0% of patients had urethrocutaneous fistulas. Notably, none of those fistulas was coupled with a previous UTI or local infection, which once again implies that the emergence of said complication has no direct association with infectious morbidity. The results are in line with other studies that have emphasized a role of surgical technique, manipulation of tissues, and vascularity on the development of fistulas and not the use of antibiotic prophylaxis [17].The findings of the present study are also consistent with the results of other randomized controlled trials and comparative studies that have never shown any significant difference in infection or fistula rates between the patients who took only perioperative prophylaxis and those who took long-term postoperative antibiotics [18].A study reported the same incidence of urinary tract infections and wound complications as long as the prophylaxis remains, which supports the conclusion of the study that long-term antibiotic use is of little value in otherwise healthy patients undergoing stented distal hypospadias repairs [19].Considering the accumulating evidence, contemporary medical practice, including the position taken by the American Urological Association and institutional antimicrobial stewardship programs, suggests a single dose of antibiotic perioperative, scheduled to give optimal serum and tissue concentrations at the incision point. Prolonged postoperative courses are not recommended in most instances, with an exception of few cases of active infection, complex reconstruction, or patient-specific risk factors [20-22]. This strategy is justified in our study, since the short course of antibiotics in bridging mode is effective as a middle ground between avoiding the infections and limiting the unnecessary exposure to antibiotics. Finding of our Study is an addition to the existing evidence to the safe decrease in antibiotic exposure after distal hypospadias repair [23]. One dose of pharmacological prevention of postoperative complications is adequate in the routine cases with a brief postoperative chemoprophylaxis. This measure is in line with the principles of antimicrobial stewardship, the reduction of the unnecessary use of antibiotics, and the limitation of the risk of antimicrobial resistance. The increased use of evidence based and standardized antibiotic guidelines, along with the use of outcome monitoring and multi-center groups will persistently develop clinical practice and promote safe and prudent use of antibiotics in pediatric urethral surgery [24].

## Limitations

This study is a retrospective observational analysis conducted at a single center, limiting its generalizability. The absence of randomized controlled trials and the variation in surgical techniques may also introduce bias. Additionally, the relatively short follow-up period may not capture long-term complications or late-onset infections.

## Conclusion

Our study demonstrates that a single perioperative antibiotic dose, followed by brief postoperative chemoprophylaxis, effectively minimizes infectious complications without increasing structural morbidity. This approach aligns with antimicrobial stewardship principles, supports evidence-based guidelines, and offers a practical solution for reducing unnecessary antibiotic use in pediatric hypospadias repair.

## Conflict of Interest

The authors declare no conflict of interest.

## Funding Statement

No external funding was received for this study.

## Data Availability Statement

The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

**AI Disclosure Statement**

Artificial intelligence tools were used solely for language editing and manuscript formatting. All scientific content, interpretation, and final approval were undertaken by the authors.

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**Authors Contribution**

**Vipul Gupta:** Conceptualization, methodology, supervision, and manuscript review.

**Wisam Salih Saad:** Data collection, data curation, and original draft preparation.

**Ghadir Jaber:** Investigation, visualization, and data interpretation.

**Diary A Mohammad:** Writing, review, and editing.

**Mamoun Marzouqi:** Supervision, validation, critical revision of the manuscript, and final approval of the version to be published.

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