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CASE REPORT

A Case Report of Surgical Correction of Scrotal Hypospadias in a Pediatric Patient via a Staged Byar's Reconstruction

Purna Rajeena Matta*, Saikumar Naik Ramavath, Girija Bhavani Maddu, Mahitha Kanumuri, Eswara Satya Sai Alla

PharmD Intern, Department of Pharmacy Practice, Aditya College of Pharmacy, Surampalem, Andhra Pradesh, India

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Abstract: Scrotal hypospadias is a severe phenotypic expression of male genitourinary malformation, characterized by a proximal urethral meatus, significant ventral chordee, and often a bifid scrotum. Successful management remains a surgical challenge, necessitating a balance between functional patency and aesthetic restoration. A four-year-old male born with a penoscrotal urethral opening and marked penile curvature underwent a staged surgical strategy utilizing the Byar's technique to address the complex anatomy systematically. The first stage focused on chordee correction, urethral plate mobilization, and initial neourethral construction using local tissue flaps, including a tunica albuginea flap for reinforcement. The second stage involved the completion of the neourethra and glanuloplasty to achieve a terminal meatus. Post-operative outcomes demonstrated successful wound healing and the restoration of a normal urinary stream without fistula formation or stricture. Staged repair continues to be a reliable approach for proximal hypospadias, providing the necessary tissue handling and recovery time required to minimize long-term complications. This case shows the utility of the Byar's procedure in achieving favorable outcomes in complex pediatric urological anomalies through individualized surgical planning.

Keywords: Scrotal hypospadias; Byar's procedure; Urethroplasty; Chordee correction; Pediatric urology

1. Introduction

Hypospadias is a common congenital anomaly of the male external genitalia, occurring in approximately 1 in 200 to 300 live births [1]. It is characterized by the failure of the urethral folds to fuse completely, resulting in a urethral meatus located on the ventral aspect of the penis anywhere from the glans to the perineum. While distal forms are more frequent and often easier to correct, proximal variants specifically scrotal and perineal hypospadias is the most severe end of the spectrum [2]. These cases are frequently associated with a triad of anatomical challenges: a proximal meatus, significant ventral penile curvature known as chordee, and a hooded prepuce due to deficient ventral skin [1, 2]. The implications of severe hypospadias extend beyond immediate urinary dysfunction. If left untreated, the condition can lead to significant distress as the child matures, alongside difficulties with standing micturition and future sexual function [2, 3]. The primary goals of surgical intervention are therefore to straighten the penis by releasing the chordee, construct a functional neourethra that reaches the tip of the glans, and achieve an aesthetically natural appearance of the genitalia [4, 5].

Figure 1. Different types of hypospadias
(Image Source: Wikipedia, Available online at https://en.wikipedia.org/wiki/Hypospadias)

* Corresponding author: Purna Rajeena Matta

Table 1. Classification of Hypospadias by Anatomical Location

Meatal Position	Classification	Anatomical Description
Anterior (Distal)	Glandular / Coronal	Meatus located on the glans or at the coronal sulcus.
Middle	Distal Penile / Mid-shaft	Meatus located along the ventral shaft of the penis.
Posterior (Proximal)	Penoscrotal / Scrotal / Perineal	Meatus at the junction of the penis and scrotum, within the scrotum, or in the perineum.

A variety of surgical techniques have been described to address proximal hypospadias; however, the complexity of scrotal cases often precludes a single-stage repair due to the high risk of complications such as urethrocutaneous fistulas, meatal stenosis, and recurrent chordee [3, 4]. Staged approaches, most notably the Byar's procedure, have regained prominence for their versatility [3]. Surgeons can ensure adequate skin coverage and allow for the stabilization of the neourethra before final closure by dividing the reconstruction into two distinct operations [5-7]. This case shows the utility of the Byar's procedure in achieving favorable outcomes in complex pediatric urological anomalies through individualized surgical planning

2. Case Presentation

2.1. Patient History and Clinical Presentation

A four-year-old male child presented to the department of general surgery for a planned second-stage surgical correction of known scrotal hypospadias. The patient had previously undergone the first stage of a Byar's reconstruction at an earlier age. According to the birth history, the abnormal position of the urethral opening had been present since delivery. Despite the severity of the malformation, the child did not experience associated symptoms such as urinary tract infections or significant difficulty passing urine [6].

2.2. Physical Examination

Clinical evaluation revealed a midline penis with residual ventral chordee. The urethral meatus was situated at the scrotal junction [6]. The scrotum was moderately bifid, a common finding in proximal hypospadias where the scrotal halves fail to fuse completely in the midline. Both testes were palpable within the scrotal sacs, ruling out associated cryptorchidism. The glans was well-formed with an adequate groove, providing a favorable foundation for the final stage of urethroplasty [6, 7].

Table 2. Pre-operative Clinical Evaluation Checklist

Assessment	Observation in Current Case	Clinical Significance
Meatal Location	Scrotal junction	Defines the severity and surgical complexity.
Chordee Severity	Marked ventral curvature	Influences the extent of degloving and plate mobilization.
Glans Configuration	Well-formed with deep groove	Favorable for terminal meatal construction.
Scrotal Morphology	Moderately bifid	Common in proximal variants; requires aesthetic realignment.
Testicular Descent	Bilaterally palpable	Rules out associated cryptorchidism or DSD (Disorders of Sex Development).

2.3. Diagnostic Assessment

The diagnosis of scrotal hypospadias was primarily clinical, based on the anatomical location of the meatus and the associated genital features. Pre-operative laboratory investigations, including a complete blood count, revealed a hemoglobin level of 13.4 g/dL. Routine screenings were conducted to ensure the absence of other systemic congenital anomalies that can sometimes accompany severe hypospadias [2, 5, 8].

3. Surgical Intervention

3.1. Pre-operative Preparation

To minimize the risk of surgical site infection, the patient underwent a standardized protocol including a betadine scrub bath and oral lactulose the evening prior to surgery. Prophylactic antibiotic therapy was initiated with intravenous ceftriaxone (75 mg/kg/day) [6, 9].

3.2. Stage 1: Chordee Correction and Initial Reconstruction

The initial surgical phase focused on the correction of the ventral curvature and the preparation of the urethral bed.

3.2.1. Chordee Release

The penis was degloved, and all fibrous bands causing the chordee were excised to straighten the corpora cavernosa [3, 6].

3.2.2. Neourethral Formation

The neourethra was initiated by mobilizing local tissue and suturing the corpora spongiosum using 6-0 PDS sutures [6, 7].

3.2.3. Tissue Flap Reinforcement

To provide a waterproof layer and reduce fistula risk, a tunica albuginea flap was harvested from the left testis and transposed over the neourethral suture line, secured with 5-0 Vicryl [6, 10].

Table 3. Step-by-Step Surgical Technique for Staged Byar's Procedure

Phase	Surgical Objective	Maneuvers
Stage 1A	Degloving & Chordee Release	Incision of fibrous bands; Artificial erection test to confirm straightness.
Stage 1B	Plate Mobilization	Urethral plate transection or mobilization; Preparation of the bed.
Stage 1C	Skin Grafting / Flaps	Placement of preputial skin flaps (Byar's flaps) to the ventral surface.
Interval	Healing (6–12 months)	Allows for graft take and resolution of inflammatory edema.
Stage 2	Urethroplasty	Tubularization of the matured skin graft into a neourethra; Glanuloplasty.

3.3. Stage 2: Completion of Urethroplasty

The patient was readmitted for the final stage, which involved the completion of the neourethra and the definitive glanuloplasty. This stage ensured that the urinary stream was directed to the tip of the glans [4, 7].

Table 4. Post-operative Monitoring

Potential Complication	Monitoring Strategy	Clinical Presentation to Watch For
Urethrocutaneous Fistula	Observation of urinary stream	"Spraying" or leakage from a secondary ventral opening.
Meatal Stenosis	Calibration / Stream assessment	Narrow, high-pressure stream; straining during voiding.
Urethral Diverticulum	Physical exam	Post-void dribbling; ventral bulging during micturition.
Recurrent Chordee	Follow-up physical exam	Persistent or new ventral curvature during erection.
Wound Dehiscence	Daily dressing inspection	Separation of skin edges or exposed neourethra.

4. Discussion

Scrotal hypospadias is a complex variant where the urethral meatus is located at the junction of the penis and the scrotum. The management represents a significant challenge due to the frequent association with severe ventral chordee and a shortage of available local skin [2, 3, 11]. Current clinical consensus increasingly favors a staged surgical approach for these proximal cases to optimize both functional and aesthetic outcomes [4, 5, 12].

The primary anatomical hurdle in scrotal hypospadias is the marked ventral curvature, which necessitates extensive degloving and mobilization of the urethral plate [2]. The Byar's procedure allows the surgeon to address the chordee and the urethral reconstruction in two distinct phases, reducing tension on the newly formed tissues [3, 7, 13].

The staged strategy allows for the initial correction of the penile curvature and the creation of a neourethral bed using local skin flaps. A recovery period between stages ensures that the transferred tissues are well-vascularized [5, 14]. In this patient, the use of a tunica albuginea flap served as a protective layer, which is a critical step in preventing the formation of urethrocutaneous fistulas [6, 7, 15]. The outcome observed in this case aligns with established literature regarding the efficacy of the staged Byar's technique [3, 7]. While single-stage repairs are often preferred for distal hypospadias, the high incidence of complications in proximal repairs makes the staged alternative a safer choice for achieving a terminal meatus and a straightened penis [4, 6].

5. Conclusion

Scrotal hypospadias remains a severe congenital anomaly that necessitates a meticulous surgical strategy. This case shows that a staged operative approach using the Byar's procedure can effectively address severe chordee and complex urethral defects. The usage of detailed anatomical evaluation and tissue handling is essential for achieving functional success. Documenting such presentations is vital for expanding the clinical knowledge of proximal hypospadias and refining management protocols in pediatric urology.

Compliance with ethical standards

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Conflict of interest statement

The authors declare that they have no competing interests or conflicts of interest that could inappropriately influence the representation or interpretation of the reported findings.

Statement of ethical approval

The present research work involves a clinical case study performed at GSL Medical College. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Statement of informed consent

Informed consent was obtained from the parent of the individual participant included in the study for the publication of this case report and any accompanying clinical information or images.

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