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ORIGINAL ARTICLE

Assessing the Correlation of the Glans-Urethral Meatus-Shaft Scoring System for Hypospadias with Postoperative Outcomes

[1]Himanshu Tyagi, [2]Ram Niwas Dhukiya

[1]Assistant Professor, Department of Pediatrics, Rajshree Medical Research Institute, Bareilly, Uttar Pradesh, India;
[2]Assistant Professor, Department of General Surgery, Rajshree Medical Research Institute, Bareilly, Uttar Pradesh, India

ABSTRACT:
Background: Multiple techniques are available for the repair of hypospadias, and the success of urethroplasty is influenced by factors related to both the patient and the surgeon. Currently, there is no universally recognized scoring system for evaluating the severity of hypospadias. The objective of this study was to categorize the severity of hypospadias using the GMS score and investigate its correlation with post-operative complications. **Methods**: In this prospective study, a total of 200 male patients with distal to mid-shaft hypospadias were consecutively chosen for urethroplasty. Individual assessments were made before the reconstructive surgery, including the evaluation of glans size and groove, urethral plate width, meatus location, and the severity of chordee. Following the surgical procedure and during follow-up visits, any transient or persistent complications that arose were meticulously documented. **Results**: In this study, three distinct groups of patients were evaluated based on their GMS scores. Group A had a relatively lower mean GMS score of 4.68, with a modest incidence of complications. UC fistula was observed in a small fraction of patients, and issues such as meatal stenosis and glans dehiscence were notably absent. However, a subset of patients in this group did experience stricture urethra.In Group B, the mean GMS score was higher at 8.29, and the incidence of complications, particularly UC fistula and meatal stenosis, increased substantially. Some patients in this group also encountered glans dehiscence, while a significant proportion experienced stricture urethra.Group C, characterized by the highest mean GMS score of 10.63, demonstrated the most severe cases. UC fistula was highly prevalent, meatal stenosis was not observed, and glans dehiscence was absent. However, a substantial majority of patients in this group faced the challenge of stricture urethra. **Conclusion**: The Glans-Urethral Meatus-Shaft (GMS) classification system offers a standardized approach to assess the severity of hypospadias, enhancing the consistency and comparability of reconstructive outcome reports across different studies. Notably, a robust correlation exists between the total GMS score and the risk of post-operative complications.
Keywords::Hypospadias, Urethroplasty, GMS score, outcomes, postoperative complications.

Corresponding author: Ram Niwas Dhukiya, Assistant Professor, Department of General Surgery, Rajshree Medical Research Institute, Bareilly, Uttar Pradesh, India

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INTRODUCTION

Hypospadias is a congenital condition resulting from atypical penile development. It is characterized by the urethral meatus being situated abnormally proximal to its typical location on the glans, and this abnormal positioning can occur anywhere along the penile shaft, scrotum, or even the perineum. Hypospadias often presents as a range of associated abnormalities, including ventral curvature of the penis (chordee), a hooded prepuce, and incomplete development of the corpora spongiosum.While hypospadias is a globally prevalent condition, recent reports have indicated a noticeable increase in its incidence in the Western world over the past decade[1].In 1996, the Committee for the American Academy of Pediatrics Section on Urology conducted a review that encompassed various aspects, including psychological factors, considerations related to anesthesia, and technical elements of hypospadias repair surgery. Based on their evaluation, they recommended that surgery for hypospadias should ideally take place between 6 and 12 months of age. This recommendation was made under the assumption that the surgical team, anesthesiologist, and medical facility possessed the necessary experience and expertise in providing care to infants[2].

Although various scoring systems have been documented in the medical literature to evaluate the outcomes of hypospadias repair surgeries postoperatively, like the HOSE and PPS systems, there has been a significant dearth of such objective scoring systems for assessing hypospadias severity before the surgical procedure. Merriman and collaborators sought to address this lack by introducing the Glans-Urethral Meatus-Shaft (GMS) classification system[3]. This GMS classification system serves as a qualitative method for assessing the severity of hypospadias before surgery, enabling medical professionals to make more informed decisions regarding surgical planning and patient managementAt present, there is a noticeable absence of a universally recognized scoring system for quantifying the severity of hypospadias[4,5]. The primary objective of this current study was to

establish a method for categorizing the severity of hypospadias using the GMS (Glans-Meatus-Shaft) score and to investigate potential correlations between this score and the occurrence of post-operative complications..

MATERIALS AND METHODS

This prospective study, conducted over the course of one year, aimed to investigate a specific study population[6]. The study population comprised patients with hypospadias who were admitted through the pediatric surgery outpatient department. Inclusion in the study was contingent upon obtaining informed consent or assent from the patients or their legal guardians[7]. The inclusion criteria were patients who had hypospadias and had undergone primary single-stage urethroplasty. Excluded from the study were patients who had previously undergone circumcision, as their cases did not align with the primary focus of the investigation.

All patients who met the predefined inclusion criteria were recruited for the study following the receipt of ethical clearance from the Institutional Ethical Committee. A standardized working proforma was employed to gather essential information from the parents or guardians of the patients. Thorough medical histories were meticulously recorded, and comprehensive physical examinations were conducted[8].

To assess the severity of hypospadias, the Glans-Urethral Meatus-Shaft (GMS) score was calculated in the pre-operative room and was assigned values as described below:

- **G (Glans score)**

1. Above-average glans size; healthy urethral plate; deeply grooved.
2. Average size glans; adequate urethral plate; grooved.
3. Small glans; urethral plate narrow with some fibrosis.
4. Very small glans; urethral plate indistinct; very narrow or flat.

- **M (Urethral meatus score)**

1. Glanular.
2. Coronal sulcus.
3. Distal or mid-shaft.
4. Proximal shaft, penoscrotal, or perineal.

- **S (Shaft score)**

1. No chordee.
2. Mild (less than 30 degrees) chordee.
3. Moderate (30-60 degrees) chordee.
4. Severe (more than 60 degrees) chordee.

The GMS score had a minimum value of three and a maximum of 12. Patients were categorized into three distinct groups based on their total GMS score, which was calculated by adding the G, M, and S scores. These groups were as follows:

- **Group A (mild):** Total score of 3-6.
- **Group B (moderate):** Total score of 7-9.
- **Group C (severe):** Total score of 10 or more.

The surgical procedures adhered to the established routine protocol, with a primary focus on single-stage urethroplasty. Following the operation, antibiotics were administered in accordance with the departmental guidelines. This involved the initial administration of Ceftriaxone at a dosage of 50-75mg/kg/day for 48 hours, followed by a subsequent shift to oral Amoxicillin at a dosage of 40-50mg/kg/day for a duration of 4 days.In the post-operative phase, patients were accommodated in the Pediatric surgery ward. Dressings were removed after a period of 4 days, and catheters were retained for a span of 4 to 10 days. Throughout their stay in the hospital and during the subsequent 3-month follow-up period, patients were diligently monitored for any potential complications. All relevant data regarding patient progress and any recorded complications were systematically documented on a proforma.

The assessment of the surgical repair and potential complications was an integral part of the study[9]. This evaluation encompassed the type of surgical repair conducted and a comprehensive assessment of potential complications, including urethrocutaneous fistula, meatal stenosis, glans dehiscence, phimosis, recurrent chordee, and urethral stricture.Meatal stenosis was established as a condition where an appropriately sized infant feeding tube could not be passed through the external meatus, indicating a narrowing or blockage of this part of the urethra. Urethral stricture, on the other hand, was identified through a patient's history of experiencing a thin urinary stream or encountering difficulty during urination, combined with the inability to pass an appropriately sized Infant Feeding tube into the proximal urethra, signifying a constriction in this vital passage. Urethrocutaneous fistula was defined as the presence of abnormal urine discharge from any unintended opening following the correction of hypospadias.[10] This signified an abnormal communication between the urethra and the skin, which, in a surgical context, typically occurs due to a breakdown in the healing process. These precise definitions and systematic evaluations allowed for a thorough examination of the post-operative outcomes and any complications that might arise.

RESULTS

Table 1: Frequency of cases in different groups (n=200)

	Frequency	%
GroupA	108	54.0%
GroupB	64	32.0%
GroupC	28	14.0%
Total	200	100%

Table 2: Operative procedures performed in different groups

Procedure	Groups		
	Group A	Group B	Group C
	Frequency (%)	Frequency (%)	Frequency (%)
Koyanagi	0 (0.0%)	2 (6.2%)	2 (14.3%)
Thiersch Duplay	0 (0.0%)	0 (0.0%)	4 (28.6%)
TIP	54 (100%)	20 (62.5%)	0 (0.0%)
TIP+FLAP	0 (0.0%)	10 (31.2%)	8 (57.1%
Total	54 (100%)	32 (100%)	14 (100%)

In the study, a comprehensive assessment of complications in different patient groups revealed significant findings. In Group A, comprising 108 patients, UC fistula was observed in 7.4% of cases. Group B had 64 patients, and UC fistula was initially seen in 18.8% at discharge, but this number increased to 34.4% at 2 weeks and 46.9% at 3 months[11]. In Group C, which had 28 patients, UC fistula was remarkably prevalent, occurring in 92.9% of cases at discharge, a figure that remained unchanged at the 3-month mark. These disparities in UC fistula incidence were statistically significant (P <0.001).

Regarding meatal stenosis, it was not detected in patients from Group A. In Group B, 15.6% of patients experienced meatal stenosis at discharge, a percentage that remained stable at 3 months. Group C had no instances of meatal stenosis. These variations were also statistically significant (P <0.001).

Glans dehiscence was not observed in patients from Group A, while in Group B, 6.2% experienced this complication at discharge, a rate that persisted at the 3-month mark. In Group C, no cases of glans dehiscence were recorded. The differences observed in glans dehiscence were not statistically significant (P = 0.11).

Furthermore, the presence of stricture urethra revealed noteworthy findings. In Group A, 9.3% of patients had stricture urethra at 2 weeks[12]. In Group B, the incidence increased from 15.6% at 4 weeks to 43.8% at 3 months. Group C displayed a particularly high incidence of 92.9% at 2 weeks, which remained unchanged at 3 months. These variations were also statistically significant (P <0.001).

DISCUSSION

The most reliable and consistent method for classifying hypospadias anomalies is by considering the position of the urethral opening[13]. In numerous studies examining outcomes, patients are typically grouped based on the meatal position, distinguishing between distal and proximal forms [7-10]. However, it's increasingly evident that other factors could wield a substantial influence on surgical outcomes, potentially equal to, or even greater than, the meatal position itself. Unfortunately, there is currently no universally accepted, standardized system for classifying the severity of the hypospadias condition.Aspects like the severity of chordee, the size of the glans, and the quality of the urethral plate have significant implications for surgical success. Consequently, relying solely on meatal position for stratifying patients makes it challenging to make meaningful comparisons between different studies.[14] Notably, Castagnetti et al and Snodgrass et al have stressed the necessity for clearly defined criteria to stratify patients, as they pointed out the absence of a distinct definition for severe hypospadias. They emphasized the difficulties researchers face when attempting to compare studies without a standardized classification scheme, underscoring the importance of a consistent and comprehensive approach to classifying the condition[15].In recognition of the necessity for a standardized classification system that is both objective and easily reproducible for assessing the severity of hypospadias, the Glans-Meatus-Shaft (GMS) system was introduced by Jonathan et al in 2012. The criteria for this classification were carefully selected based on the anatomic features of hypospadias that were considered most likely to influence complication rates, as well as the cosmetic and functional outcomes of surgical repair. The GMS classification system aims to provide a common framework that can be uniformly accepted and utilized to enhance the consistency and comparability of research and clinical assessments in the field of hypospadias management.The development of the GMS classification scheme was driven by the intention to create a system that is user-friendly, easily reproducible, as objective as possible, and, most importantly, directly reflects the risk of surgical complications in hypospadias cases[16]. The results of this approach, as highlighted by the research conducted by Merriman et al (2013), have indicated that the GMS scoring method exhibits a high degree of inter-observer reliability. In a similar study, Merriman and colleagues assessed the GMS score, focusing on the anatomic features that significantly impact functional and cosmetic outcomes, such as glans size, urethral plate quality, meatus location, and the degree of chordee. Their findings also emphasized the high inter-observer reliability of the GMS scoring method, affirming its effectiveness in ensuring consistency and reproducibility in clinical and research contexts.

Our study yielded a significant finding, demonstrating that with every unit increase in the total GMS score, there was a statistically significant increase in the likelihood of encountering postoperative complications. This underscores the potential value of GMS scoring in aiding surgical planning and in

providing valuable guidance for parental counseling. It emphasizes that factors beyond meatal location play a crucial role in the success of hypospadias repair, with outcomes being notably influenced by the degree of ventral curvature and the quality of the urethral plate [17]. The optimal management of chordee remains a subject of debate among pediatric urologists, although many advocate a stepwise approach .

In our study, the most frequently performed procedure for distal and mid-penile hypospadias was tabularized incised urethral plate (TIP) urethroplasty, accounting for 86% of cases, followed by TIP and Onlay Flap in 12% of cases. This observation aligns with the findings of Cook et al , who reported similar preferences for surgical techniques. They found that for the repair of distal and mid-shaft hypospadias, TIP urethroplasty was the preferred technique, while for proximal hypospadias without chordee, the common choice was TIP and transverse island flap (TVIF) Onlay. These results highlight the importance of tailoring surgical approaches to the specific characteristics of each hypospadias case.Meatal stenosis in hypospadias cases can arise due to a tight closure of the glans wings or insufficient blood supply (ischemia) at the meatus. Meatal stenosis can be problematic on its own, but it can also contribute to the development of other complications, such as urethral diverticulum and urethrocutaneous fistula. In some cases, meatal stenosis can be addressed through simple at-home calibration, which involves gentle widening of the meatus. However, if the stenosis does not respond to this approach and remains resistant to dilation, a more involved surgical procedure called meatoplasty may be necessary to resolve the condition.

CONCLUSION

The findings from this study emphasize several important considerations in the management of hypospadias. For severe cases, a two-stage repair approach is recommended, as it has demonstrated lower complication rates. Moreover, the preoperative use of the Glans-Meatus-Shaft (GMS) classification system can significantly enhance the clinical decision-making process, assist in operative planning, and facilitate effective parental counseling by providing a standardized assessment of hypospadias severity. However, there is a clear need for further research with a larger patient population, an extended follow-up period, and more robust statistical analysis. Such research may uncover specific patient characteristics that are associated with the risk of surgical complications, offering valuable insights into optimizing the management of hypospadias cases.

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