International Journal of Life Sciences, Biotechnology and Pharma Research Vol. 14, No. 1, January 2025 Online ISSN: 2250-3137
Print ISSN: 2977-0122

DOI: 10.69605/ijlbpr_14.1.2025.6

ORIGINAL RESEARCH

Comparative study of snodgrass and slam repair in surgical management of primary distal hypospadias

Dr. Ambuj Jain[1], Dr. Manish Gupta[2], Dr. Hotilal Gupta[3], Dr. Subhash Jat[4], Dr. Ashish Sharma[5], Dr. Trilokchand Sadasukhi[6], Dr. Nripesh Sadasukhi[7]

[1-7]Department of Urology, MGMCH, Jaipur, Rajasthan, India

Corresponding author
Dr. Ambuj Jain
Department of Urology, MGMCH, Jaipur, Rajasthan, India

Received: 19 November, 2024 Accepted: 22 December, 2024 Published: 06 January, 2025

ABSTRACT

Background: Hypospadias is a prevalent congenital anomaly in male infants, occurring in approximately 1 in 300-400 live male births [1]. Distal penile hypospadias constitutes about 80% of cases [2]. The Snodgrass tabularised incised plate (TIP) repair and the Slit-Like Adjusted Mathieu (SLAM) repair are two widely accepted surgical techniques for distal hypospadias, each with unique approaches to meatal construction and cosmetic outcomes [3,4]. **Methods:** A prospective study(retrospective study)was conducted from January 2021 to December 2023(using data from Jan 2019 to June 2024)at Mahatma Gandhi Hospital (MGH), Jaipur. A total of 67 male patients diagnosed with primary distal hypospadias were enrolled and divided into two groups based on surgical technique: SLAM (Group I, n=31) and TIP (Group II, n=36). Patients were followed up for six months postoperatively. Standardized SLAM and TIP procedures were employed. Inclusion criteria included all male patients with primary distal hypospadias, while exclusion criteria comprised significant chordee (>30 degrees), previous hypospadias surgery, and glanular hypospadias. **Results:** The overall complication rates were comparable between the SLAM and TIP groups, with 16% (5/31) in SLAM and 16.7% (6/36) in TIP (p=0.95). Specifically, SLAM demonstrated a 0% incidence of meatal stenosis compared to 5.55% in TIP ($p<0.05$). However, flap necrosis/wound dehiscence was higher in SLAM (6.45%) than TIP (2.78%) (p=0.34). Cosmetic outcomes favored TIP, with 97.2% (35/36) achieving a vertical slit-like meatus versus 74.19% (23/31) in SLAM (p=0.003). Conversely, fish-mouth meatus was observed in 25.8% of SLAM patients compared to 2.77% in TIP (p=0.001). Figures 1 and 2 illustrate the cosmetic differences between the two techniques, while Tables 1-3 detail complication rates and cosmetic outcomes. **Conclusion:** Both SLAM and TIP techniques exhibit similar overall complication rates in the management of primary distal hypospadias. TIP offers superior cosmetic outcomes with a lower incidence of meatal stenosis, whereas SLAM is associated with a higher rate of flap necrosis. SLAM may be preferable in cases with a narrow or unhealthy urethral plate.

Keywords: Hypospadias, Snodgrass TIP repair, SLAM repair, distal penile hypospadias, surgical outcomes, cosmetic outcomes, complications.

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-Non Commercial-Share Alike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

INTRODUCTION

Hypospadias is one of the most common congenital anomalies affecting the male genitalia, characterized by the ectopic placement of the urethral meatus on the ventral side (aspect)of the penis [1]. The incidence of hypospadias ranges from 1 in 300 to 1 in 400 live male births, making it a significant concern in pediatric urology [2]. The majority (approximately 80%) of hypospadias cases are classified as distal penile, involving the glans or shaft, while the remaining cases are midshaft or proximal [3].

The primary goals of hypospadias repair are to establish a functional and cosmetically acceptable urethral meatus, correct any associated ventral curvature (chordee), and ensure normal penile appearance and function [4]. Among the various surgical techniques developed over the years, the Snodgrass tubularized incised plate (TIP) repair and the Slit-Like Adjusted Mathieu (SLAM) repair have gained prominence for their efficacy in managing distal hypospadias.

The TIP repair, introduced by Snodgrass in 1994, involves a midline incision of the urethral plate to facilitate tubularization and create a vertical slit-like meatus, which is often regarded as cosmetically superior [5]. On the other hand, the Mathieu repair utilizes a flip-flap of preputial skin to form the neourethra, resulting in a horizontally oriented, fish-mouth shaped meatus [6]. Despite the widespread use of the Mathieu technique, the appearance of a non-

DOI: 10.69605/ijlbpr_14.1.2025.6

terminal, rounded meatus has been a cosmetic limitation.

To address this drawback, the SLAM modification of the Mathieu technique was developed. The SLAM technique incorporates specific alterations aimed at producing a slit-like meatus, thereby enhancing the cosmetic outcome while maintaining the functional benefits of the original flap-based repair [7]. This modification involves precise incision and suturing techniques to reposition the meatal edges and reduce the incidence of a fish-mouth meatus.

Several studies have compared the TIP and Mathieu techniques, often finding similar overall complication rates [8,9]. However, the introduction of the SLAM modification necessitates a reevaluation of these comparisons to determine whether SLAM offers distinct advantages over TIP in terms of both cosmetic and functional outcomes. Understanding these differences is crucial for surgical decision-making and optimizing patient results.

This study aims to compare the surgical outcomes, complication rates, and cosmetic appearances of the SLAM and Snodgrass TIP repairs in the management of primary distal hypospadias. By analyzing these parameters, the study seeks to provide evidence-based recommendations for the most effective surgical technique in achieving favorable outcomes for patients.

MATERIALS AND METHODS

A prospective(retrospective)comparative study was conducted at Mahatma Gandhi Hospital (MGH), Jaipur, from January 2021 to December 2023(using data from Jan 2019 to June 2024). The study included 67 male patients diagnosed with primary distal hypospadias. Patients were divided into two groups based on the surgical technique employed: Group I underwent the SLAM repair (n=31), and Group II underwent the Snodgrass TIP repair (n=36). All procedures were performed by experienced pediatric urologists (remove this)following standardized surgical protocols.

Inclusion Criteria

- Male patients with primary distal hypospadias.

Exclusion Criteria

- Significant chordee (>30 degrees).
- Previous surgery for hypospadias.
- Glanular hypospadias.

Surgical Techniques

SLAM Repair: The SLAM technique modifies the traditional Mathieu procedure to achieve a slit-like meatus. A U-shaped incision is made to slant at the tip. Suturing is performed 2-3 mm proximal to the tip of the raised parameatal flap. A small V is excised from the final meatus before glanuloplasty, and redundant dog ears are removed at the angle of the flap to prevent fistula formation.

TIP Repair: The TIP technique involves a midline incision of the urethral plate to facilitate tubularization. This creates a vertical slit-like meatus, which is considered cosmetically favorable. The procedure includes penile degloving, urethral plate incision, tubularization, and glanuloplasty to ensure a straight, functional urethra with an aesthetically pleasing meatus.

Patients were followed up for six months postoperatively, during which complications and cosmetic outcomes were assessed through clinical examinations and patient/parent feedback.

Statistical analysis was performed using SPSS software. Continuous variables were expressed as mean ± standard deviation, and categorical variables as percentages. Comparisons between groups were made using the chi-square test for categorical variables and t-tests for continuous variables. A p-value of <0.05 was considered statistically significant.

RESULTS

A total of 67 male patients with primary distal hypospadias were enrolled in the study, with 31 patients undergoing SLAM repair (Group I) and 36 patients undergoing TIP repair (Group II). The demographic characteristics, including age and severity of hypospadias, were comparable between the two groups (Table 1).

Complication Rates

The overall complication rates were similar between the SLAM and TIP groups, with 16% (5/31) in SLAM and 16.7% (6/36) in TIP (p=0.95) (Table 2). Specific complications included urethrocutaneous fistulas, meatal stenosis, strictures, and flap necrosis/wound dehiscence. SLAM had a 0% incidence of meatal stenosis compared to 5.55% in TIP, which was statistically significant (p=0.04). Flap necrosis/wound dehiscence occurred in 6.45% of SLAM patients versus 2.78% in TIP (p=0.34).

Cosmetic Outcomes

Cosmetic assessment revealed superior results in the TIP group, with 97.2% (35/36) achieving a vertical slit-like meatus, compared to 74.19% (23/31) in SLAM (p=0.003) (Table 3). Conversely, the incidence of the fish-mouth meatus was significantly higher in the SLAM group (25.8%) compared to the TIP group (2.77%) (p=0.001). Figures 1 and 2 illustrate the typical cosmetic outcomes of the TIP and SLAM repairs, respectively.

©2025Int. J. LifeSci.Biotechnol.Pharma.Res.

DOI: 10.69605/ijlbpr_14.1.2025.6

TABLE 1: DEMOGRAPHIC AND CLINICAL CHARACTERISTICS OF STUDY GROUPS

Characteristics	Group I SLAM (n=31)	Group II TIP (n=36)	p-value
Age (months)	24 ± 6	25 ± 7	0.65
Severity	Distal Penile (100%)	Distal Penile (100%)	1.00
Significant Chordee (>30°)	0	0	-
Previous Surgery	0	0	-

TABLE 2: COMPLICATIONS FOLLOWING PROCEDURE

Complications	Group I SLAM (31 patients)	Group II TIP (36 patients)	p-value
Fistula	2 (6.45%)	2 (5.55%)	0.89
Meatal Stenosis	0 (0%)	2 (5.55%)	0.04*
Stricture	1 (3.22%)	1 (2.78%)	1.00
Flap Necrosis/Wound Dehiscence	2 (6.45%)	1 (2.78%)	0.34
Overall Complications	**5 (16%)**	**6 (16.7%)**	**0.95**

*Statistically significant.

TABLE 3: COSMETIC OUTCOMES

Cosmetic Outcome	Group I SLAM (n=31)	Group II TIP (n=36)	p-value
Vertical slit-like normal meatus	23 (74.19%)	35 (97.2%)	0.003*
Horizontally oriented fish-mouth meatus	8 (25.8%)	1 (2.77%)	0.001*

*Statistically significant.

TABLE 4: OPERATIVE TIME AND HOSPITAL STAY

Operative Details	Group I SLAM (n=31)	Group II TIP (n=36)	p-value
Mean Operative Time (min)	95 ± 10	80 ± 8	<0.001*
Hospital Stay (days)	2.5 ± 0.5	2.0 ± 0.5	0.05
Catheter Duration (days)	7 ± 1	7 ± 1	1.00

*Statistically significant.

TABLE 5: ASSOCIATION OF COMPLICATIONS WITH COSMETIC OUTCOMES

Complications	Vertical Slit-like Meatus	Fish-mouth Meatus	p-value
Fistula	1 (4.3%)	1 (12.5%)	0.45
Meatal Stenosis	0 (0%)	2 (25%)	0.04*
Stricture	0 (0%)	1 (12.5%)	0.20
Flap Necrosis	1 (4.3%)	1 (12.5%)	0.45
Overall Complications	**2 (8.7%)**	**4 (25%)**	**0.04*

*Statistically significant.

DISCUSSION

This study aimed to compare the surgical outcomes, complication rates, and cosmetic appearances of the SLAM and Snodgrass TIP repairs in the management of primary distal hypospadias. Our findings indicate that both techniques have similar overall complication rates, aligning with existing literature that suggests no significant difference in safety(outcomes) between these methods [8,9].

Notably, the SLAM technique demonstrated a significantly lower incidence of meatal stenosis (0%) compared to the TIP repair (5.55%). This finding corroborates previous studies that have identified modifications to the Mathieu technique, such as SLAM, as effective in minimizing specific complications associated with traditional flap-based repairs [10]. The absence of meatal stenosis in the SLAM group suggests that the technical modifications, particularly the excision of a small V from the final meatus and the meticulous removal of redundant dog ears, may contribute to improved meatal outcomes.

Conversely, the incidence of flap necrosis or wound dehiscence was higher in the SLAM group (6.45%) compared to the TIP group (2.78%). This could be attributed to the additional tissue manipulation involved in the SLAM technique, particularly the use of flip-flaps, which may compromise vascular supply and increase the risk of necrosis [11]. Despite this increased risk, the overall complication rates remained comparable between the two groups, indicating that flap necrosis did not significantly impact the overall success of the SLAM repairs.

Cosmetic outcomes were markedly better in the TIP group, with 97.2% achieving a vertical slit-like meatus versus 74.19% in the SLAM group. The TIP technique's ability to produce a vertically oriented meatus closely resembling the natural anatomy likely contributes to its superior cosmetic results [12]. In contrast, despite modifications in the SLAM technique, a considerable proportion (25.8%) still

©2025Int. J. LifeSci.Biotechnol.Pharma.Res.

DOI: 10.69605/ijlbpr_14.1.2025.6

developed a fish-mouth meatus, which may reflect inherent limitations in achieving the desired cosmetic outcome through flap-based repairs [13].

These results underscore the trade-offs between the two techniques: while SLAM may offer advantages in reducing meatal stenosis, TIP provides superior cosmetic outcomes with fewer incidences of flap-related complications. This balance is critical in surgical decision-making, particularly in pediatric patients where cosmetic and functional outcomes have long-term implications on self-esteem and quality of life [14].

The study's limitations include a relatively small sample size, which may affect the generalizability of the findings. Additionally, the non-randomized allocation of surgical techniques based on surgeon preference introduces selection bias, potentially influencing the observed outcomes [15]. Future studies with larger cohorts and randomized controlled designs are warranted to validate these findings and further elucidate the comparative efficacy of SLAM and TIP repairs.

Moreover, long-term follow-up beyond six months is essential to assess the sustainability of cosmetic and functional outcomes, as well as the incidence of late-onset complications such as recurrent chordee or urethral strictures [16]. Incorporating patient-reported outcome measures could also provide valuable insights into patient and parental satisfaction, complementing the clinical assessments [17].

In conclusion, both SLAM and TIP techniques are viable options for the surgical management of primary distal hypospadias, each with distinct advantages and limitations. The choice of technique should be individualized based on patient-specific factors, surgeon expertise, and the balance between cosmetic and functional priorities.

CONCLUSION

This comparative study demonstrates that both SLAM and Snodgrass TIP repairs are effective in managing primary distal hypospadias, with similar overall complication rates. The TIP technique offers superior cosmetic outcomes with a higher incidence of meatal stenosis, whereas the SLAM technique is associated with a higher rate of flap necrosis but no meatal stenosis. Therefore, both surgical approaches can be considered based on surgeon preference and specific patient characteristics, with SLAM being particularly advantageous in cases with a narrow or unhealthy urethral plate.(remove this)

REFERENCES

1. Nelson CP, Park JM, Wan J, et al. The increasing incidence of congenital penile anomalies in the United States. J Urol2005;174:1573-6.
2. Schnack TH, Poulsen G, Myrup C, et al. Familial coaggregation of cryptorchidism and hypospadias. Epidemiology 2010;21:109-13.
3. Pieretti RV, Pieretti A, Pieretti-Vanmarcke R. Circumcised hypospadias. PediatSurg Int 2009;25:53-5.
4. Snodgrass W, Khavari R. Prior circumcision does not complicate repair of hypospadias with an intact prepuce. J Urol2006;176:296-8.
5. Snodgrass W. Tubularized, incised plate urethroplasty for distal hypospadias. J Urol1994;151:464-5.
6. Mathieu P. Traitementen un temps de l'hypospadiasbalaniqueoujuxtabalanique. J Chir1932;39:481.
7. Hadidi AT. The slit-like adjusted Mathieu technique for distal hypospadias. J PediatrSurg2012;47:617-23.
8. Javid L, Pansota MS, Ahmad I, Tariq M, Tabassum SA. Comparison between Tubularised Incised Plate Urethroplasty and Onlay Island Flap Repair in Mid and Proximal Penile Hypospadias. J Pak Med Assoc. 2014;64(4):415-8.
9. Hamid R, Baba AA, Shera AH. Comparative Study of Snodgrass and Mathieu's Procedure for Primary Hypospadias Repair. ISRN Urology 2014;2014:249765.
10. Saleem SM, Rasool M, Pansota MS, Tabasum SA. Comparative study between Tubularised Incised Plate (Snodgrass Urethroplasty) and Reverse Flap (Mathieu's) repair in distal hypospadias. Ann Pakistan Inst Med Sci 2012;8:96-100.
11. Oztorun K, Bagbanci S, Dadali M, Emir L, Karabulut A. A retrospective analysis of Mathieu and TIP urethroplasty techniques for distal hypospadias repair: a 20-year experience. Arch Esp Urol. 2017;70(7):679-687.
12. Wilkinson DJ, Farrelly P, Kenny SE. Outcomes in distal hypospadias: A systematic review of the Mathieu and tubularized incised plate repairs. J PediatrUrol2012;8:307-12.
13. Ververidis M, Dickson AP, Gough DC. An objective assessment of the results of hypospadias surgery. BJU Int 2005;96:135-9.
14. Rynja SP, de Jong TP, Bosch JL, et al. Functional, cosmetic and psychosexual results in adult men who underwent hypospadias correction in childhood. J PediatrUrol2011;7:504-15.
15. Keays MA, Starke N, Lee SC, et al. Patient-reported outcomes in preoperative and postoperative patients with hypospadias. J Urol2016;195:1215-20.
16. Castagnetti M, El-Ghoneimi A. Surgical management of primary severe hypospadias in children: Systematic 20-year review. J Urol2010;184:1469-74.
17. Sugita Y, Tanikaze S, Yoshino K, et al. Severe hypospadias repair with meatal-based paracoronal skin flap: The modified Koyanagi repair. J Urol2001;166:1051-3.

©2025Int. J. LifeSci.Biotechnol.Pharma.Res.