

Current trends in the management of hypospadias: the Ibero-American experience

Abstract

Introduction: Hypospadias management has seen various trends over the years, likely due to the diverse clinical presentations and evolving surgical techniques. However, there is a lack of consensus among pediatric urologists on many aspects of hypospadias management. To address this, our research aims to survey specialists and establish a consensus on hypospadias management.

Methodology: In July 2021, a cross-sectional study was conducted using a Survey Monkey questionnaire consisting of 23 questions. The survey aimed to gather information about the generalities and management preferences of distal and proximal hypospadias from specialists belonging to the Ibero-American Society of Pediatric Urology (SIUP). The data collected was categorized into subgroups based on surgical techniques, perioperative preferences, and complications.

Results: Most hypospadias surgeries are performed between 13-18 months. Penile curvature is evaluated with artificial erection and visual inspection. The Nesbit technique (36.1%) and ventral corporotomies (26.9%) corrections are more common, while grafts corporoplasties are used less frequently (10.2%) for correction. For urethroplasty, the surveyed group prefers using a running suture or a combination of continuous and interrupted stitches (49.1% and 24.3%, respectively). The use of Polydioxanone 6-0 in a double-layer suture group yielded a higher response rate. The use of prophylactic antibiotics and their maintenance when the catheter is in place was also favored by most surgeons.

Discussion: When repairing hypospadias, the surgeon must consider factors such as the quality of the urethral plate, the presence of penile curvature, and the location of the urethral opening. This study highlights the different strategies and technical preferences used for hypospadias repair by a group of specialists from different countries.

Conclusion: The survey describes current trends in hypospadias management. Two-stage repair is commonly used for proximal hypospadias, while TIP repair is the most used technique for distal hypospadias. The most common complication is the development of an urethrocutaneous fistula.

Keywords: hypospadias, two stage repair, TIP, survey.

Volume 12 Issue 2 - 2024

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Received: August 07, 2024 | **Published:** August 27, 2024

Introduction

Hypospadias is a common birth defect in pediatrics, with a prevalence of 1 in 150 to 300 live births. It is the second most prevalent congenital anomaly after undescended testes and its occurrence varies widely across different geographic regions. During embryogenesis, the urethral plate and penile structures do not fully close, leading to ventral displacement of the urethral opening.¹⁻⁴ The etiology of hypospadias is likely multifactorial.⁵⁻⁷

Although now considered an oversimplification, the traditional classification system is based on the location of the urethral meatus. Using this criterion, most patients (70%-85%) are classified as having a distal variant; while 10%-25% of patients have proximal hypospadias. When it comes to the classification and surgical decision-making process for penis abnormalities, several factors play a crucial role. These include the location of the meatus, the extent of curvature of the penis, the degree of glans abnormality, and any associated skin deficiencies. It is important to consider all these factors in order to minimize the potential risk of complications.

Despite over 300 corrective procedures described in the literature, there is no universal approach to surgical repair of hypospadias.

Different perioperative management, follow-up, and rates of complications were also reported. Proper selection and execution of surgical techniques are crucial for predicting clinical outcomes.⁸

The reported complication with the highest incidence was urethrocutaneous fistula, which can develop in up to 10% of patients and has a multifactorial etiology. Dehiscence of the glans is commonly identified in the early postoperative period and results from undue stress of the glans closure. Complications such as stenosis of the meatus and urethra may be associated with surgical technique.⁹⁻¹³

The surgical procedure for hypospadias is constantly evolving due to the continuous exchange of opinions and experiences among dedicated surgeons. It is not a coincidence that it is a topic of controversy in Pediatric Urology, with the number of publications related to hypospadias increasing from 80 per year in 1980 to 380 per year in 2020. Opinion surveys are a useful tool to describe current trends and define future research areas.¹⁴

The objective of this study is to identify trends in the management of hypospadias and seek a consensus amongst urologists who belong to the Ibero-American Society of Pediatric Urology (SIUP).

Methodology

In July 2021, we conducted a cross-sectional descriptive survey study using a questionnaire consisting of 23 questions. The survey aimed to address key topics related to hypospadias management, including surgical techniques, intra and post-operative preferences, and complications for both distal and proximal hypospadias. We built

the survey using the SurveyMonkey platform and distributed it to members of the Ibero-American Society of Pediatric Urology (SIUP). SPSS vs2 was used to perform statistical analysis on the entire sample and subgroups. Nonparametric variables were compared using the U-Mann Whitney test with a statistical significance level of $p < 0.05$ (Table 1).

Table 1 Presents the elaborated survey, with its respective questions

Survey questions
1. How many distal hypospadias do you operate per year?
2. How many proximal hypospadias do you operate per year?
3. What is the most common complication you have in distal hypospadias repair?
4. What is the most common complication you have when repairing proximal hypospadias?
5. For the repair of proximal hypospadias, you prefer:
- One-stage surgery
- Two-stage surgery
6. For the repair of hypospadias do you perform artificial erection?
7. Method used to measure curvature
8. At what age do you operate on patients with hypospadias?
9. Which technique do you prefer for the correction of distal hypospadias?
10. Which technique do you prefer for penile curvature correction?
11. In urethral stricture secondary to a repair of hypospadias, do you perform urethral dilatations?
12. In urethral stricture secondary to a repair of hypospadias, do you perform meatoplasties?
13. What types of stitches do you prefer for urethroplasty:
- Separate
- Continuous
14. For urethroplasty, do you prefer one or two suture planes?
15. For the correction of proximal hypospadias do you prefer:
- Grafts
- Flaps
16. For the correction of primitive hypospadias which grafts do you prefer:
- Oral mucosa
- Foreskin
17. To protect the urethroplasty in the repair of proximal hypospadias do you interpose:
- Flap of dartos
- Tunica vaginalis
- None of the above
18. To protect the urethroplasty in the repair of distal hypospadias do you interpose:
- Flap of dartos
- Vaginal tunic
- None of the above
19. How long should a catheter be used after correcting distal hypospadias?
20. How long should a catheter be used after correcting proximal hypospadias?
21. Do you use prophylactic antibiotics?
22. Do you use antibiotics after surgery for as long as the patient stays with a urinary catheter?
23. What suture do you use for urethroplasty?

Results

The survey was conducted via telephone in July 2021 and 108 out of 240 specialists responded, resulting in a 45% response rate.

General aspects of hypospadias management

Most specialists reported performing surgical intervention between 13-18 months. For assessment of the curvature, 67.6% opted for an erection test with a visual estimation of the curvature with a ruler.

Regarding curvature correction, 36.1% of respondents preferred the Nesbit technique, while 26.9% and 26.1% preferred ventral corporotomies and the Baskin technique, respectively. Only 10.2% chose ventral graft placement as their preferred correction modality. For urethroplasty, the surveyed group prefers using a running suture or a combination of continuous and interrupted stitches (49.1% and 24.3%, respectively). The use of Polydioxanone 6-0 in a double-layer suture group yielded a higher response rate (Table 2).

Table 2 General aspects of hypospadias evaluation, management, and perioperative preferences

Variable	Categories	Number of responses (%)
Age at the time of surgery	From 6 -12 months	43 (39.8%)
	From 13 - 18 months	52 (48.1%)
	From 19 - 24 months	13 (12%)
Chordee management	Performed in all cases	73 (67.6%)
Artificial erection test	Performed only in proximal hypospadias	29 (26.9%)
	Does not perform	6 (5.6%)
	Did not Respond	9 (8.3%)
Measurement method	Goniometer	34 (31.5%)
	Visual estimation	45 (41.7%)
	Protractor	20 (18.5%)
Chordee correction technique	Graft	11 (10.2%)
	Ventral corporotomies	29 (26.9%)
	Baskin Technique	29 (26.1%)
	Nesbit technique	39 (36.1%)
Urethroplasty	Running suture	53 (49.1%)
Suture technique	Interrupted stitches	18 (16.7%)
	Combined	37 (24.3%)
Single vs double layer	Double layer	90 (83.3%)
	Single layer	17 (15.7%)
	Did not respond	1 (0.9%)
	Polidoxanone 6-0	41 (38%)
Type of Suture	Polidoxanone 7-0	36 (33.3%)
	Polyglactin 5-0	4 (3.7%)
	Polyglactin 6-0	23 (21.3%)
	Other	4 (3.7%)
Prophylactic antibiotics	No	7 (6.5%)
Duration of antibiotics associated with urethral catheter stay	Yes	101 (93.5%)
	No	4 (3.7%)
Use of prophylactic antibiotics	No	4 (3.7%)
	Yes	104 (96.3%)

The use of prophylactic antibiotics and their maintenance when the catheter is in place was also favored by most surgeons (96.3%) (Table 2).

Distal hypospadias repair

In the survey, 47.2% of the respondents reported performing more than 20 cases of distal hypospadias per year, while 17.6% reported performing less than 10 cases per year, which is equivalent to less than one case per month. The most preferred surgical technique was TIP, with 63.9% of respondents choosing it, and 74.1% of respondents preferred to cover the urethroplasty with a dartos flap. Regarding postoperative management, 93.6% of respondents reported using a catheter for less than 10 days, with 56 respondents keeping it between 5 to 7 days and 45 respondents keeping it between 8 to 10 days. Fistulas were reported as the most frequent complication by 40.7% of the sample, while 19.4% chose meatal stenosis as the most common complication. In cases of fistulas, 43.5% of respondents would perform urethral dilation, and 75.9% of respondents reported performing meatoplasties (Table 3).

Table 3 Features of distal hypospadias repair

Variable	Categories	N (%)
Number of hypospadias operated per year	<10	19 (17.6%)
	10-20	38 (35.2%)
	21-30	27 (25%)
	More than 30	24 (22.2%)
Most common complication	Fistulas	44 (40.7%)
	Dehiscence of the glans	38 (35.2%)
	Meatal stenosis	21 (19.4%)
	Poor Cosmesis	4 (3.7%)
Surgical techniques	Residual curvature	1 (0.9%)
	INLAY Technique	6 (5.6%)
	MAGPI Technique	7 (6.5%)
	Mathieu Technique	11 (10.2%)
Thiersch-Duplay Technique	Thiersch-Duplay Technique	15 (13.9%)
	TIP Technique	69 (63.9%)
	No Response	1 (0.9%)
Meatal stenosis	No	60 (55.6%)
	Yes	47 (43.5%)
Use of dilations	Yes	47 (43.5%)
	No	25 (23.1)
	Yes	82 (75.9)
Meatoplasty	No Response	1 (0.9)
	Flap of dartos	80 (74.1%)
	Tunica vaginal flap	11 (10.2%)
	None of the above	17 (15.7%)
Urethroplasty coverage	5-7 days	56 (51.9%)
	8-10 days	45 (41.7%)
	More than 10 days	6 (5.6%)
	Not responding	1 (0.9%)
Catheterization time	5-7 days	56 (51.9%)
	8-10 days	45 (41.7%)
More than 10 days	More than 10 days	6 (5.6%)
	Not responding	1 (0.9%)

Proximal hypospadias repair

According to our survey, 62% of specialists reported performing less than 10 cases per year. Most specialists (93.5%) preferred a staged approach, and 64.8% chose grafts over flaps. Preputial graft was the preferred choice for 82.4% of specialists. When it comes to urethroplasty coverage, tunica vaginalis was the preferred choice for 55.6% of specialists. In terms of postoperative management, 93.5% of specialists would keep the catheter for over 8 days, and 31.5% would keep it for more than 10 days (Table 4).

Table 4 Characteristics of proximal hypospadias repair

Variables	Categories	N (%)
Number of hypospadias repairs per year	Less than 5	31 (28.7%)
	5-10	36 (33.3%)
	More than 10	41(38%)
Most common complication	Residual curvature	5 (4.6%)
	Dehiscence of urethroplasty	8 (7.4%)
	Dehiscence of the glans	14 (13%)
	Meatal stenosis	3 (2.8%)
	Fistulas	73 (67.6%)
	Did not Respond	1 (0.9%)
	Poor Cosmesis	4 (3.7%)
Single surgery vs staged procedure	Surgeries in 2 or 3 stages	101 (93.5%)
	Single procedure	7 (6.48%)
Surgical techniques: Flaps vs. Grafts	Did not Respond	3 (2.8%)
	Flap	35 (32.4%)
	Grafts	70 (64.8%)
Preferred type of graft	Oral mucosa	18 (16.7%)
	Not Responding	1 (0.9%)
	Foreskin	89 (82.4%)
Urethroplasty coverage	Dartos flap	41 (38)
	Tunica vaginal flap	60 (55.6)
	None of the above	7 (6.5)
Catheterization time	5-7 days	7 (6.5)
	8-10 days	67 (62.0)
	More than 10 days	34 (31.5)

After cross-analyzing responses about complications in hypospadias against the number of procedures per year for both distal and proximal hypospadias, we obtained the results displayed in Tables 5 & 6, respectively.

Table 5 Complications in distal hypospadias according to frequency of procedures performed

Number of DISTAL hypospadias per year	The most common complication reported					Total
	Residual chordee	Glans dehiscence	Narrow meatus	Fistulas	Poor cosmesis	
Less than 10	0	8	4	6	1	19
10-20	1	14	7	15	1	38
21-30	0	9	5	11	2	27
More than 30	0	7	5	12	0	24
Total	1	38	21	44	4	108
% of total	0.9%	35.2%	19.4%	40.7%	3.7%	100.0%

Table 6 Complications in proximal hypospadias according to frequency of procedures performed

Number of PROXIMAL hypospadias per year	Most common complication reported						Total
	Residual chordee	Urethroplasty dehiscence	Glans dehiscence	Narrow meatus	Fistulas	Poor cosmesis	
Less than 5	3	2	4	1	24	2	36
5-10	1	3	7	1	29	0	41
More than 10	1	3	3	1	20	2	31
Total	5	8	14	3	73	4	107
% of total	4.6%	7.4%	13%	2.8%	67.6%	3.7%	100.0%

The analysis of complications in the subgroup of proximal hypospadias was performed by evaluating the frequency of procedures performed (Table 6). The most common complications reported were fistulas, glans dehiscence, and urethroplasty dehiscence, with no significant difference between low-volume (<5 patients per year) and high-volume Medical Centers (>10 patients per year) p:0.93

Discussion

The goal of hypospadias repair is to achieve a normal appearance of the penis and function. Surgery is currently recommended at 6 to 18 months of age.¹⁵

In our survey, 48.6% of urologists preferred to perform surgery between 12 to 18 months and 39% between 6 to 12 months of age.

More than 70% of the urologists surveyed perform more than 5 proximal hypospadias per year, which is a higher number than what has been previously published for Latin America in other international survey studies, in which most pediatric urologists report performing no more than 2 proximal hypospadias per year.

In this survey of pediatric urologists, it was found that over 70% of them perform more than 5 proximal hypospadias surgeries per year, and 82.4% perform more than 10 distal hypospadias cases a year (35% perform 10-20 distal hypospadias per year). This is a higher number than what has been previously reported for Latin America in other international studies. These studies have found that most pediatric urologists perform no more than 2 such surgeries per year.¹⁶

Manzoni suggests that performing at least 40-50 hypospadias repair surgeries every year is desirable. This is especially important for complex cases, such as second-stage surgeries. Some experts consider performing more than 20 surgeries of this type per year as the benchmark for a high-volume surgeon.¹⁶

For our research, we consulted with specialists to determine the most common complications they encounter in their practice. We analyzed the incidence of these complications in both proximal and distal repairs and found that fistulas were the most frequent. Regardless of the number of surgeries performed, there was no variation in the number of complications, with fistula remaining the most common. Long CJ et al. have reported that the most common complication after the repair of proximal hypospadias, whether in the first or second stage, is the urethrocutaneous fistula. This complication occurs more frequently in single-stage repairs, with a rate of 47% of fistulas. This finding is consistent with the previously published data.¹⁷

Complications after hypospadias repair can be analyzed in terms of their long-term outcomes. Among these, stenosis plays an important role. A survey of urologists reveals that this complication is present in up to 20% of cases after distal hypospadias repair. However, despite the high prevalence of this issue, performing urethral dilations is not recommended since the literature does not support its effectiveness. In some limited cases, dilation may be used as a temporary solution before surgery. In comparison, urethroplasty has a statistically significantly higher success rate (67% vs. 17%) and is thus a better choice of therapy than repeated dilation.¹⁸⁻²⁰

The study analyzed patients with urethral stricture after repair of hypospadias over a period of 16 years. The researchers found that treatment with dilation or urethrotomy under direct vision was successful in 46% of early strictures, but only in 16% of late strictures. They concluded that open surgical repair should be reserved for difficult strictures, late stenosis, or manipulation failures, as it has a higher success rate compared to other treatments.²¹

When it comes to repairing hypospadias, there is a tendency to use TIP repair for distal cases. However, for proximal hypospadias, a survey found that 93% of respondents prefer a two-stage surgical approach. This indicates that two-stage repair is the most used method for proximal hypospadias.¹⁶

Based on our study, we found that 64.8% of the respondents prefer using grafts over flaps when repairing proximal hypospadias. For initial repairs in primitive hypospadias, the inner prepuce has been used as graft material, while oral mucosal grafting is used in situations of second surgeries.²²⁻²⁴ Our study revealed that there is a clear inclination towards the use of inner prepuce for primary repairs (82%) as compared to oral mucosal grafts (17%).

In order to protect the urethroplasty in cases of proximal hypospadias, a survey found that 56% of respondents prefer to use the tunica vaginal flap, while 38% prefer the dartos flap. Retrospective studies have shown a higher success rate when using the tunica vaginalis instead of the dartos flap.²⁵ However, in cases of distal hypospadias, the dartos flap is preferred, as demonstrated in the present study.

In terms of managing the postoperative period, 62% of the respondents prefer to remove the catheter within 8 to 10 days after correcting proximal hypospadias. On the other hand, 31.5% of the respondents opt to remove the catheter after 10 days of repair. For distal hypospadias, most respondents recommend removing the catheter between 5 to 7 days after the repair.

Studies have analyzed the occurrence of early and long-term complications after correcting proximal hypospadias, comparing them to the duration of catheterization. The results showed no significant differences in the occurrence of early complications such as wound infection, UTI, bladder spasms, urinary retention, and urinary extravasation, as well as late complications such as urethrocutaneous fistulas, meatal stenosis, and urethral stricture, between patients who had their urinary catheter removed in less than 5 days and those who kept it for a longer period.²⁶

In this study, we evaluated the most commonly used surgical techniques for repairing distal hypospadias. The TIP technique was found to be the most preferred by surgeons, followed by the Mathieu technique, while a minority preferred the INLAY technique. We analyzed the number of hypospadias surgeries performed each year and the surgical techniques used. It was observed that urologists who perform more than 30 distal hypospadias repairs per year tend to prefer the Tubularized Incised Plate Urethroplasty (TIP) technique.

Tubular incised plate urethroplasty (TIP) is a widely approved technique for hypospadias surgery. In a previous study, a survey was conducted among 101 doctors who performed hypospadias surgery. The results showed a strong preference for using the TIP technique, especially in cases of distal and middle hypospadias without chordee. Moreover, a survey conducted among pediatric urologists from North and South America and Europe showed similar findings. A total of 92 respondents (confidence interval 0.84 to 0.96) selected the TIP technique for the repair of distal hypospadias, while 82 (CI 0.72 to 0.88) preferred TIP for the repair of middle penile hypospadias.⁸

According to our survey, 75.9% of urologists prefer to treat meatal stenosis by performing meatoplasty in urethral meatus narrowing after hypospadias repair. Past studies suggest that using a V flap or W-shaped flap during meatoplasty can help prevent stenosis and fistula of the meatus.²⁷

In our study, we found that there is no agreement on the most suitable method for evaluating penile curvature. The majority of respondents prefer visual estimation measurement using a visual (eyeball) ruler/inspection (41.7%) or a goniometer (31.5%). The assessment of penile curvature is a crucial step in the evaluation before surgery. However, there is no established preference for the

preferred technique. While goniometry has been suggested as a viable option for measuring penile curvature, its use in hypospadias surgery has yet to be validated. Measurement with the goniometer appears to be more accurate than unaided visual inspection, but there is no evidence to support this.^{28–30}

In our study, it was found that 67.7% of participants perform artificial erection in all cases of hypospadias to assess penile curvature. Previous studies have also recommended performing artificial erection in all cases, with curvatures greater than 20 degrees being considered significant. Proper evaluation of chordee should be considered a fundamental therapeutic step, especially in patients with a curvature greater than 30 degrees. Correction of chordee is a crucial step in achieving favorable results.^{31,32}

When it comes to techniques used for correcting curvature, the responses are distributed between Nesbit (36.1%), ventral corporotomies (26.9%), and the Baskin technique (26.9%). Only 10.2% of respondents chose to use ventral grafts for chordee treatment. Previous experience has shown that ventral techniques assisted by flaps or grafts in cases of severe curvatures have success rates of up to 95%, compared to dorsal techniques which are significantly associated with curvature recurrence.^{33,34}

In the survey, the types and techniques of suturing for urethroplasty were addressed. There was no consensus on the type of suture, although most respondents chose to perform continuous sutures or a combination of continuous and interrupted stitches (73.4%). The preference of SIUP members is to use the smallest diameter (7-0) and monofilament suture. Additionally, most respondents (83%) prefer urethroplasties to be done in two planes.

According to previous research, the type of suture material used in a surgical procedure can affect the likelihood of complications and the overall outcome. One study found that the use of Vicryl suture resulted in more complications (15.1%) compared to Polydioxanone (5.3%). Therefore, it is recommended to use Polydioxanone suture for the repair of hypospadias, especially for proximal or middle shaft hypospadias cases, which are intrinsically more complicated than distal types.³⁵

A prospective study was conducted to compare the outcomes of continuous sutures versus single stitches for urethroplasty. The study followed patients for three years after TIP urethroplasty. The study concluded that the suture technique used did not significantly affect the occurrence of complications. However, there is conflicting data in the literature regarding this matter. Certain groups have reported a higher complication rate when using continuous sutures compared to interrupted stitches. The study found that the complication rate in urethroplasty would not be affected by the suture technique used. However, there have been other studies that reported a higher complication rate with continuous sutures compared to interrupted stitches.^{36–38}

Comparative studies have shown that administering parenteral antibiotics before and after surgery does not significantly reduce infectious complications, as compared to patients who did not receive antibiotics. Previous research has also indicated that prophylactic antibiotic use during urinary catheterization does not decrease the rate of complications.^{39–40} However, it is interesting to note that in our study, the majority of respondents (96%) routinely use prophylactic antibiotics.

Conclusion

Most of the responses align with the global trends in hypospadias management. However, certain issues such as the assessment of curvature, the treatment of urethral stenosis, and the use of antibiotic prophylaxis require further review, evaluation, and discussion to establish a consensus and clear guidelines. Since fistulas are the most common complication in both distal and proximal hypospadias repair, our focus should be on improving our techniques to prevent them.

Acknowledgments

Sociedad Iberoamericana de Urología Pediátrica.

Conflicts of interest

The authors declares that there is no conflicts of interest.

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