

# CYSTOSTOMY DIVERSION REDUCED COMPLICATIONS FOLLOWING HYPOSPADIAS REPAIR: A SYSTEMATIC REVIEW AND META-ANALYSIS

<sup>1</sup>Irfan Wahyudi, <sup>1</sup>Putu Angga Risky Raharja, <sup>1</sup>Gerhard Reinaldi Situmorang, <sup>1</sup>Arry Rodjani.

<sup>1</sup> Department of Urology, Faculty of Medicine/Universitas Indonesia, CiptoMangunkusumo General Hospital Jakarta.

## ABSTRACT

**Objective:** This study aims to investigate the associations between the use of cystostomy diversion and the incidence of complications following hypospadias repair. **Material & Methods:** An extensive search of PubMed, ScienceDirect, Embase, and the Cochrane Library, was performed to identify studies that assessed the impact of cystostomy diversion on complication rates after hypospadias repair. To evaluate potential biases, the RoB 2 tool was applied for randomized controlled trials (RCTs), while the ROBINS-I tool was used for observational studies. Data analysis was conducted using Review Manager 5.4. **Results:** This review included ten studies involving 1.120 patients who underwent hypospadias repair. The overall complication was 16.9%. The meta-analysis revealed that opting against cystostomy diversion after hypospadias repair led to a notably increased risk of complications, as evidenced by a pooled odds ratio (OR) of 1.48 (95% confidence interval (CI) 1.07–2.03). The significant negative effect of not performing cystostomy on the risk of complications was consistent in sub-analysis of distal hypospadias (OR 1.97; 95% CI 1.11–3.51) and primary hypospadias repair (OR 1.80; 95% CI 1.19–2.73). In the funnel plot, there was no significant publication bias identified. **Conclusion:** Our meta-analysis demonstrated that cystostomy diversion reduces the incidence of complications following hypospadias repair. The positive effects were consistent in both distal hypospadias and primary hypospadias repair.

**Keywords:** Complications, cystostomy, hypospadias.

## ABSTRAK

**Tujuan:** Penelitian ini bertujuan untuk mengetahui hubungan antara penggunaan pengalihan sistostomi dan kejadian komplikasi setelah perbaikan hipospadia. **Bahan & Cara:** Pencarian ekstensif di PubMed, ScienceDirect, Embase, dan Cochrane Library, dilakukan untuk mengidentifikasi penelitian yang menilai dampak pengalihan sistostomi terhadap tingkat komplikasi setelah perbaikan hipospadia. Untuk mengevaluasi potensi bias, alat RoB 2 diterapkan untuk uji cobater kontrol secara acak (RCT), sedangkan alat ROBINS-I digunakan untuk studi observasional. Analisis data dilakukan dengan menggunakan Review Manager 5.4. **Hasil:** Ulasan ini mencakup sepuluh penelitian yang melibatkan 1.120 pasien yang menjalani perbaikan hipospadia. Komplikasi keseluruhan adalah 16.9%. Meta-analisis mengungkapkan bahwa memilih untuk tidak melakukan pengalihan sistostomi setelah perbaikan hipospadia menyebabkan peningkatan risiko komplikasi, sebagaimana dibuktikan oleh rasio odds (OR) yang dikumpulkan sebesar 1.48 (interval kepercayaan (CI) 95% 1.07–2.03). Efek negatif yang signifikan dengan tidak melakukan sistostomi terhadap risiko komplikasi konsisten pada sub-analisis hipospadia distal (OR 1.97; 95% CI 1.11–3.51) dan perbaikan hipospadia primer (OR 1.80; 95% CI 1.19–2.73). Pada plot funnel, tidak ada bias publikasi signifikan yang teridentifikasi. **Simpulan:** Meta-analisis kami menunjukkan bahwa pengalihan sistostomi mengurangi kejadian komplikasi setelah perbaikan hipospadia. Efek positifnya konsisten pada hipospadia distal dan perbaikan hipospadia primer.

**Kata kunci:** Komplikasi, sistostomi, hipospadia.

Correspondence: IrfanWahyudi; c/o: Department of Urology, Faculty of Medicine/Universitas Indonesia, CiptoMangunkusumo Hospital, JalanDiponegoro No. 71, Jakarta 10320, Indonesia. Email:irf.wahyudi2011@gmail.com.

## INTRODUCTION

Hypospadias is a congenital anomaly that impacts the external male genitalia.<sup>1</sup> This condition is marked by a ventral shift of the urethral opening, an insufficient ventral foreskin, and penile

curvature.<sup>1-2</sup> Hypospadias affects one in every 150 to 300 live births.<sup>3-4</sup> In around 70% of instances, the urethral opening is located near the distal part of the penile shaft, indicating a less severe form of the anomaly.<sup>5</sup> The main objective of hypospadias repair is to re-establish both cosmetic and functional

normalcy.<sup>2</sup> To achieve these goals, over 300 surgical techniques for hypospadias correction have been documented in literatures.<sup>6</sup>

Temporary urinary diversions following hypospadias repair is still a debatable issue.<sup>7</sup> Most paediatric urologists have utilized either suprapubic or urethral diversion to guarantee a watertight repair, secure the suture line, and assure patient comfort.<sup>8</sup> Theoretically, cystostomy diversion might lower the probability of urine draining into the neourethra and minimize the risks associated with infection, suture movement, and tissue reactions. Various studies comparing urinary diversion techniques after hypospadias repair have produced inconsistent findings. Consequently, this review was carried out to assess the role of cystostomy diversion after hypospadias repair.

## OBJECTIVE

This study aims to investigate the associations between the use of cystostomy diversion and the incidence of complications following hypospadias repair.

## MATERIAL & METHODS

The study adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) statement. In November 2022, we executed an exhaustive search of PubMed, ScienceDirect, Embase, and Cochrane Library data bases for English-language articles. The search targeted titles, abstracts, or keywords using the following terms: ("hypospadias" or "urethroplasty" or "urethroplasties") and ("diversion" or "cystostomy" or "suprapubic catheter" or "transurethral") and ("outcome" or "complication" or "dehiscence" or "fistula" or "infection" or "stricture" or "stenosis"). There were no restrictions on the publication year. More over, we manually examined the references of the selected articles for potential eligibility. Two authors independently assessed the pertinent literature for inclusion in the quantitative synthesis. The protocol was registered (PROSPERO: CRD42022377624).

The population included patients with distal and proximal hypospadias who underwent repair using any urethroplasty techniques. The intervention of interest was the implementation of cystostomy diversion after hypospadias repair. Comparators involved the use of transurethral urinary diversions or no urinary diversions. Studies lacking a comparator or the specified intervention were excluded from the analysis. The outcomes for this

study were complication rates following hypospadias repair, encompassing dehiscence, fistula, infection, stricture, urethral diverticulum, meatal stenosis, and repair disruption. As for the study design, only observational researches or randomized clinical trials (RCTs) published in peer-reviewed journals were considered. Case series, case reports, animal studies, conference abstracts, and review articles were omitted. When several studies on the identical population were identified, the study with the most comprehensive data was chosen.

Data extraction and quality assessment were carried out independently by two authors. Differences of opinion, if any, were resolved through discussions with the help of a third author when required. The collected data included: (1) basic information such as authors, year, country, designs, patient age, hypospadias type (location of the urethral opening), history of previous urethroplasty (primary or secondary repair), and urethroplasty technique; (2) relevant outcomes available for further analysis; and (3) the number of patients experiencing the outcomes of interest. Quality assessment was performed utilising the ROBINS-I tool for observational researches and version 2 of the Cochrane risk of bias tool (RoB 2) for RCTs.<sup>9-10</sup>

Data analysis was conducted using Review Manager version 5.4. The associations between cystostomy diversion and complication rates after hypospadias repairs were assessed by calculating the odds ratio (OR) and the 95% confidence interval (CI). Heterogeneity assessment was carried out using the  $\chi^2$ -Q statistic, where a p-value of 0.10 signifies considerable heterogeneity. For homogeneous studies, the fixed-effects model was applied to calculate the OR, while the random-effects model was used for heterogeneous studies. When a minimum of two studies were accessible, subgroup analysis were performed, taking into account the type of hypospadias and the history of previous urethroplasty. Publication bias was detected by evaluating the Begg's funnel plot.

## RESULTS

The flowchart outlining the study selection process is depicted in Figure 1. The database search yielded 850 studies, and an additional three studies were recognized from the reference of the eligible studies. After removing duplicates, 555 studies remained. Screening of titles and abstracts narrowed the list down to 64 studies for full-text evaluation. Following the full-text review, 54 studies were excluded, leaving ten studies that fulfilled the inclusion criteria for the review. The characteristics

of the included articles are depicted in Table 1, while Table 2 provides the quality assessment of the eligible studies. The ROBINS-I tool assessment

indicated moderate to high risk of bias, while the RoB 2 tool evaluation demonstrated overall low risk of bias among the eligible studies.

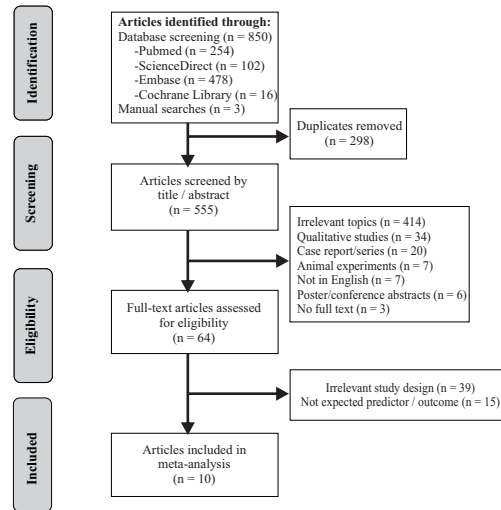


Figure 1. Study selection process flowchart.

Table 1. Characteristics of eligible studies for quantitative synthesis.

No	Study	Country	Designs	Age	Hypospadias Type	Urethroplasty Technique	Complications	Number of Complications	
								No Cystostomy	Cystostomy Diversion
1	Mitchell et al., 1986 <sup>11</sup>	United States	Retrospective	1-16 years	Distal and proximal hypospadias	Primary repair ~ Duckett tube, Devine flip-flap, MAGPI, and others	Urethrocutaneous fistula	1/29	1/15
2	Chuang et al., 1995 <sup>12</sup>	Taiwan	Retrospective (1986-1993)	5 months-14 years	Proximal hypospadias	Primary repair ~ Duckett tube	Urethrocutaneous fistula, stricture, meatal stenosis, or urethral diverticulum	16/45	16/58
3	Demirbilek et al., 1997 <sup>13</sup>	Turkey	Retrospective (1993-1996)	20 months-14 years	Distal and proximal hypospadias	Primary repair ~ Mathieu, Duckett tube, Devine flip-flap, MAGPI, and others	Meatal stenosis or urethrocutaneous fistula	13/49	6/56
4	Ozturk et al., 2005 <sup>14</sup>	Turkey	Retrospective (1986-2003)	<15 years	Distal and proximal hypospadias	Primary repair ~ TIP, MAGPI, Mathieu, GAP, onlay island flap, Asopa / Duckett tube	Meatal stenosis or urethrocutaneous fistula	11/45	16/62
5	Germiyanoğlu et al., 2006 <sup>15</sup>	Turkey	Retrospective (2001-2005)	1-23 years	Distal hypospadias	Primary and secondary repair ~ TIP, Mathieu	Failure	10/41	6/35
6	Karabulut et al., 2008 <sup>16</sup>	Turkey	Retrospective (1993-2006)	2-30 years	Distal hypospadias	Secondary repair ~ TIP, Mathieu	Meatal stenosis, dehiscence, or urethrocutaneous fistula	0/9	12/67
7	Radwan et al., 2012 <sup>17</sup>	Egypt	RCTs	1-12 years	Distal hypospadias	Primary repair ~ TIP	Failure, urethrocutaneous fistula, or meatal stenosis	14/63	13/129
8	Qamar et al., 2013 <sup>18</sup>	Pakistan	RCTs (2010-2011)	1-10 years	Distal hypospadias	Primary repair ~ TIP, Mathieu	Urethrocutaneous fistula, stricture, meatal stenosis, or repair disruption	7/30	2/30
9	Laura et al., 2014 <sup>19</sup>	Indonesia	Retrospective (2013-2014)	1-6 years	Not Mentioned	Not mentioned	Urethrocutaneous fistula	6/34	1/34
10	Duarsa et al., 2020 <sup>20</sup>	Indonesia	Retrospective (2018)	Not mentioned	Distal and proximal hypospadias	Primary and secondary repair ~ TIP, MAGPI, Mathieu, onlay island flap, dorsal inlay graft, Duckett tube, Koyanagi, staged repair	Urethrocutaneous fistula	29/213	20/136

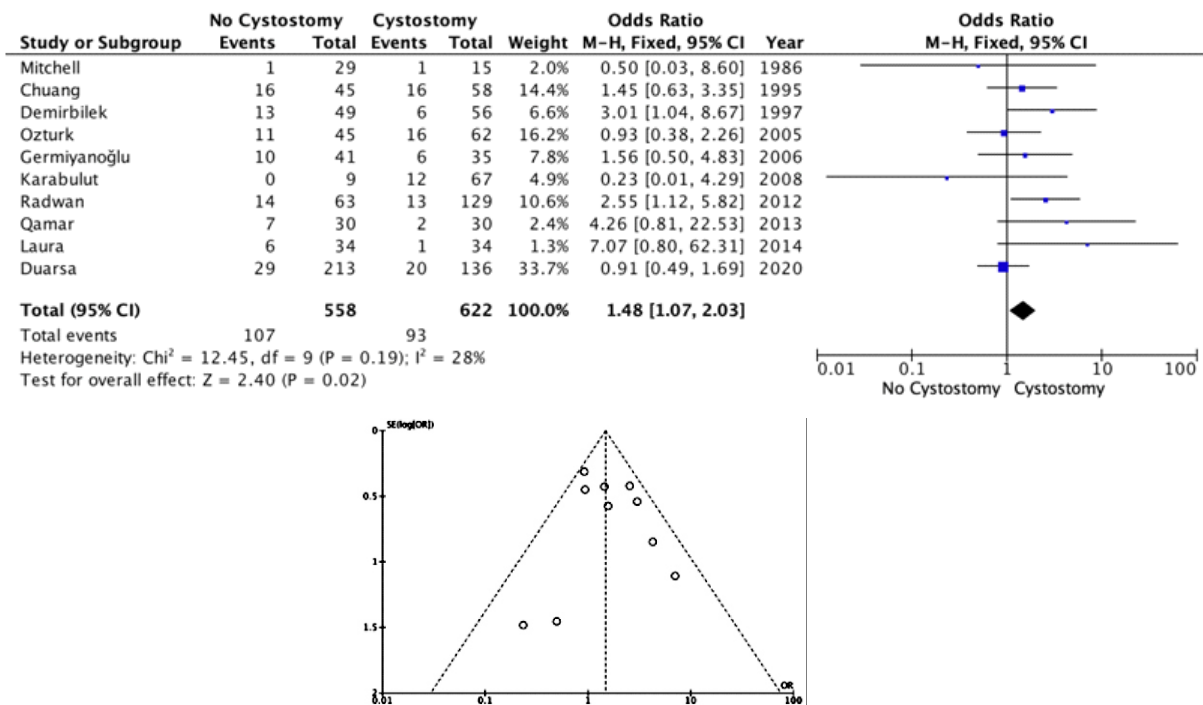
GAP: glans approximation procedure; MAGPI: meatal advancement and glanuloplasty incorporated; RCTs: randomised controlled trials; TIP: tubularised incised plate.

**Table 2.** Quality assessment of eligible studies for quantitative synthesis.

Observational Studies: ROBINS-I tool									
No	Study	Bias due to confounding	Bias in selection of participants into the study	Bias in measurement of interventions	Bias due to departures from intended interventions	Bias due to missing data	Bias in measurement of outcomes	Bias in selection of the reported result	Overall judgement of risk of bias
1	Mitchell et al., 1986 <sup>11</sup>	High	High	Low	Moderate	Moderate	High	Moderate	High
2	Chuang et al., 1995 <sup>12</sup>	High	Moderate	Low	Moderate	Moderate	Low	Moderate	Moderate
3	Demirbilek et al., 1997 <sup>13</sup>	High	Moderate	Low	Moderate	Moderate	Moderate	Moderate	Moderate
4	Ozturk et al., 2005 <sup>14</sup>	Moderate	Moderate	Low	Low	Moderate	Low	Moderate	Moderate
5	Germiyanoğlu et al., 2006 <sup>15</sup>	High	High	Low	Moderate	Moderate	High	Moderate	High
6	Karabulut et al., 2008 <sup>16</sup>	High	Moderate	Low	Low	Moderate	Low	Moderate	Moderate
7	Laura et al., 2014 <sup>19</sup>	High	High	Moderate	Moderate	Moderate	High	Moderate	High
8	Duarsa et al., 2020 <sup>20</sup>	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate

RCTs: RoB 2 tool							
No	Study	Bias arising from the randomization process	Bias due to deviations from the intended interventions	Missing outcome data	Bias in measurement of the outcome	Bias in selection of the reported result	Overall risk of bias
1	Radwan et al., 2012 <sup>17</sup>	Low	Low	Low	Some concerns	Low	Low
2	Qamar et al., 2013 <sup>18</sup>	Low	Low	Low	Some concerns	Low	Low



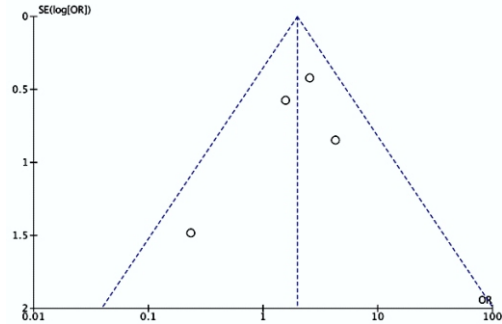
**Figure 2.** Analysis of overall complications according to cystostomy diversion.

A total of ten studies were identified that evaluated the differences in complication rates related to cystostomy diversion following hypospadias repair. The overall complications in this population were 16.9% (200/1,120) and 14.9% (93/622) of patients with cystostomy diversion developed complications compared to 19.1%

(107/558) of patients without cystostomy diversion. Not performing cystostomy diversion following hypospadias repair had a significant higher risks of developing complications with a pooled OR of 1.48 (95% CI 1.07–2.03) as shown in Figure 2. The dataset was homogeneous (I<sup>2</sup> = 28%; Q test p-value = 0.19). Based on the funnel plot analysis, no

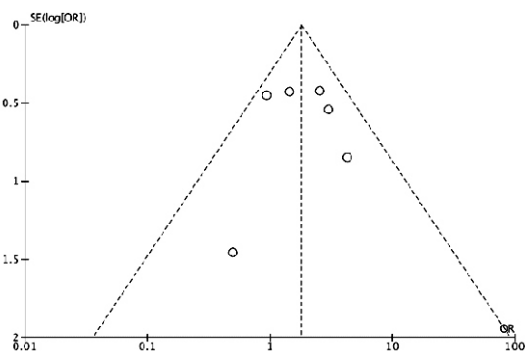
### A. Distal Hypospadias

Study or Subgroup	No Cystostomy		Cystostomy		Weight	Odds Ratio		Year
	Events	Total	Events	Total		M-H, Fixed, 95% CI	M-H, Fixed, 95% CI	
Germiyanoğlu	10	41	6	35	30.4%	1.56 [0.50, 4.83]	2006	
Karabulut	0	9	12	67	18.9%	0.23 [0.01, 4.29]	2008	
Radwan	14	63	13	129	41.2%	2.55 [1.12, 5.82]	2012	
Qamar	7	30	2	30	9.5%	4.26 [0.81, 22.53]	2013	
<b>Total (95% CI)</b>		<b>143</b>		<b>261</b>	<b>100.0%</b>	<b>1.97 [1.11, 3.51]</b>		
Total events	31		33					
Heterogeneity: Chi <sup>2</sup> = 3.42, df = 3 (P = 0.33); I <sup>2</sup> = 12%								
Test for overall effect: Z = 2.32 (P = 0.02)								



### B. Primary Repair

Study or Subgroup	No Cystostomy		Cystostomy		Weight	Odds Ratio		Year
	Events	Total	Events	Total		M-H, Fixed, 95% CI	M-H, Fixed, 95% CI	
Mitchell	1	29	1	15	3.9%	0.50 [0.03, 8.60]	1986	
Chuang	16	45	16	58	27.5%	1.45 [0.63, 3.35]	1995	
Demirbilek	13	49	6	56	12.6%	3.01 [1.04, 8.67]	1997	
Ozturk	11	45	16	62	31.1%	0.93 [0.38, 2.26]	2005	
Radwan	14	63	13	129	20.3%	2.55 [1.12, 5.82]	2012	
Qamar	7	30	2	30	4.7%	4.26 [0.81, 22.53]	2013	
<b>Total (95% CI)</b>		<b>261</b>		<b>350</b>	<b>100.0%</b>	<b>1.80 [1.19, 2.73]</b>		
Total events	62		54					
Heterogeneity: Chi <sup>2</sup> = 5.79, df = 5 (P = 0.33); I <sup>2</sup> = 14%								
Test for overall effect: Z = 2.77 (P = 0.006)								



**Figure 3.** Analysis of overall complications according to cystostomy diversion in distal hypospadias (A) and primary repair (B).

publication bias was observed among the studies that met the eligibility criteria.

Four studies were identified for meta-analysis, comparing complication rates in relation to cystostomy diversion among patients with distal

hypospadias. Subgroup analysis in proximal hypospadias was not possible since there was only one eligible study. In the four studies focusing on distal hypospadias, a total of 404 patients were included, with 64 (15.8%) experiencing

complications. The overall complication rates were 12.6% (33 out of 261) in the cystostomy diversion group and 21.6% (31 out of 143) in the group without cystostomy diversion. Figure 3A demonstrates that the absence of cystostomy diversion significantly increased complication rates in patients with distal hypospadias, with a pooled OR of 1.97 (95% CI 1.11–3.51). No heterogeneity was detected among the eligible studies ( $I^2 = 12\%$ ; Q test  $p$ -value = 0.33). The funnel plot analysis did not reveal any statistically significant publication bias.

In the six studies that assessed complication rates in patients without a history of prior urethroplasty (primary repair), 611 patients were included, and 116 (18.9%) experienced complications. The complication rate was higher in the group without cystostomy (23.7%; 62 out of 261) compared to the cystostomy group (15.4%; 54 out of 350). The meta-analysis revealed that not performing cystostomy had a significant association on the development of complications in patients undergoing primary hypospadias repair, with a pooled OR of 1.80 (95% CI 1.19–2.73), as depicted in Figure 3B. This dataset displayed no considerable heterogeneity ( $I^2 = 14\%$ ; Q test  $p$  value = 0.33). The symmetrical funnel plot in Figure 3B indicates that there was no publication bias. Subgroup analysis among patients with a history of previous hypospadias repair (secondary repair) was not feasible due to the availability of only one eligible study.

## DISCUSSION

Our analysis indicates that complications rate after hypospadias repair were higher among patients without cystostomy diversion (19.1% vs 14.9%). Not performing cystostomy diversion was discovered to be a significant predictor of complications following hypospadias repair. Further sub analysis revealed that the effects of not performing cystostomy with complication rates were consistent in distal hypospadias and primary hypospadias repair.

Regardless of the outcome of the hypospadias repair, each type of urinary diversion has distinct advantages and disadvantages. Transurethral diversion provides various advantages, including the prevention of urine retention, which can serve as a tampon and stent at the same time. However, Qamar et al reported that transurethral diversion had higher complication of bladder irritability and voiding problems compared

to suprapubic cystostomy.<sup>18</sup> Bladder irritability was associated with detrusor muscle irritation by the tip of the catheter.<sup>21</sup> Cystostomy rarely cause bladder spasm and can be used for a longer period of time. Despite its simplicity, the insertion of a cystostomy also posed the possibility of serious morbidities and mortalities, including bowel injury.<sup>22</sup>

Our findings demonstrated that patients with cystostomy diversion had less complications. These findings were consistent with those of several studies.<sup>17-20</sup> Theoretically, since cystostomy has no contact with surgical wounds, it could reduce the likelihood of urine drainage to the neourethra, infection risk, suture mobility, and tissue reaction.<sup>20</sup> Transurethral urinary diversion has been associated with an increased risk of infection because of the possibility of urine extravasation from the catheter sides.<sup>23</sup> Transurethral diversion also poses a risk of neourethral damage at the time of catheter withdrawal. Qamar et al also demonstrated that post-operative care was more difficult for patients with transurethral diversion.<sup>18</sup> These may have caused more complications in the transurethral diversion group following hypospadias repair.

In sub-analysis of distal hypospadias and primary hypospadias repair, the beneficial effects of conducting cystostomy to minimize the rate of complications were also observed. The results of this study may convince paediatric urologists to perform cystostomy after every hypospadias repair. Due to the insufficient number of studies, our investigation was unable to assess the efficacy of cystostomy in proximal hypospadias and secondary hypospadias repair. Theoretically, the positive effect of cystostomy should be greater in proximal and secondary hypospadias repairs due to the complexity of these conditions. Further studies are required to evaluate the role of cystostomy diversion in such patients.

It is important to consider a number of limitations when interpreting the findings of this meta-analysis. The number of eligible studies was limited, and there was significant heterogeneity. Most studies were retrospective and of low quality. For future meta-analysis, it is essential to have high-quality RCTs. Furthermore, the available studies for subgroup analysis of proximal and secondary hypospadias repair were limited. Other factors that could influence the complication rate, including patient age, glans features, urethral plate characteristics, degree of curvature, urethroplasty techniques, neourethral coverage, and stenting, were

not controlled. Additionally, the inclusion of solely English-language publications may have resulted in the omission of pertinent research conducted in other languages.

## CONCLUSION

In conclusion, cystostomy diversion decreased complication rates following hypospadias repair. The beneficial effects were consistent in distal hypospadias and primary hypospadias repair. More high quality RCTs should be conducted to evaluate the associations between cystostomy diversion with complication rates following hypospadias repair.

## REFERENCES

1. Halaseh SA, Halaseh S, Ashour M. Hypospadias: A Comprehensive Review Including Its Embryology, Etiology and Surgical Techniques. *Cureus*. 2022;14(7):e27544.
2. van der Horst HJR, de Wall LL. Hypospadias, all there is to know. *Eur J Pediatr*. 2017;176(4):435-441.
3. Elliott CS, Halpern MS, Paik J, Maldonado Y, Shortliffe LD. Epidemiologic trends in penile anomalies and hypospadias in the state of California, 1985-2006. *J Pediatr Urol*. 2011;7(3):294-298.
4. Springer A, van den Heijkant M, Baumann S. Worldwide prevalence of hypospadias. *J Pediatr Urol*. 2016;12(3):152.e1-7.
5. Duckett JW. Hypospadias. *Pediatr Rev*. 1989;11(2):37-42.
6. Baskin LS, Ebberts MB. Hypospadias: anatomy, etiology, and technique. *J Pediatr Surg*. 2006;41(3):463-472.
7. Bhat A. General considerations in hypospadias surgery. *Indian J Urol*. 2008;24(2):188-194.
8. Oesterling JE, Gearhart JP, Jeffs RD. Urinary diversion in hypospadias surgery. *Urology*. 1987;29(5):513-516.
9. Sterne JA, Hernán MA, Reeves BC, et al. ROBINS-I: a tool for assessing risk of bias in non-randomised studies of interventions. *BMJ*. 2016;355: i4919.
10. Sterne JAC, Savovi? J, Page MJ, et al. RoB 2: a revised tool for assessing risk of bias in randomised trials. *BMJ*. 2019;366:14898.
11. Mitchell ME, Kulb TB. Hypospadias repair without a bladder drainage catheter. *J Urol*. 1986;135(2):321-323.
12. Chuang JH, Shieh CS. Two-layer versus one-layer closure in transverse island flap repair of posterior hypospadias. *J Pediatr Surg*. 1995;30(5):739-742.
13. Demirbilek S, Atayurt HF. Repair With Stent or Suprapubic Diversion: Which is Better? *J Pediatr Surg*. 1997;32(12):1711-1712.
14. Ozturk H, Onen A, Otçu S, Kaya M, Ozturk H. The outcome of one-stage hypospadias repairs. *J Pediatr Urol*. 2005;1(4):261-266.
15. Germiyano?lu C, Nuho?lu B, Ayyildiz A, Akgül KT. Investigation of factors affecting result of distal hypospadias repair: Comparison of two techniques. *Urology*. 2006;68(1):182-185.
16. Karabulut A, Sunay M, Erdem K, Emir L, Erol D. Retrospective analysis of the results obtained by using Mathieu and TIP urethroplasty techniques in recurrent hypospadias repairs. *J Pediatr Urol*. 2008;4(5):359-363.
17. Radwan M, Soliman MG, Tawfik A, Abo-Elenen M, el-Benday M. Does the type of urinary diversion affect the result of distal hypospadias repair? A prospective randomized trial. *Ther Adv Urol*. 2012;4(4):161-165.
18. Qamar SA, Pansota MS, Rasool M, Tabassum SA, Saleem MS. Urinary diversion in hypospadias repair: suprapubic cystostomy versus transurethral catheterization. *Pak Armed Forces Med*. 2013;63(1):75-79.
19. Laura SF, Duarsa GWK, Mahadewa ATG. Correlation of Cystostomy To Low Urethrocutaneous Fistula Incident in Hypospadias Surgery. *Bali Med J*. 2014;3(3):125.
20. Duarsa GWK, Tirtayasa PMW, Daryanto B, et al. Risk factors for urethrocutaneous fistula following hypospadias repair surgery in Indonesia. *J Pediatr Urol*. 2020;16(3):317.e1-317.e6.
21. Nazarko L. Bladder pain from indwelling urinary catheterization: case study. *Br J Nurs*. 2007;16(9):511-512.
22. Ahluwalia RS, Johal N, Kouriefs C, Kooiman G, Montgomery BSI, Plail RO. The surgical risk of suprapubic catheter insertion and long-term sequelae. *Ann R Coll Surg Engl*. 2006;88(2):210-213.
23. Aslan AR, Yüceba? E, Tekin A, Sengör F, Kogan BA. Short-term catheterization after TIP repair in distal hypospadias: who are the best candidates? *Pediatr Surg Int*. 2007;23(3):265-269.