

·临床研究·

尿道板宽度对尿道下裂行尿道板纵切卷管成形术疗效的影响

许英蕊, 杜国强, 王晓庆, 吴荣德, 刘伟*

(山东大学, 山东省立医院 小儿外科, 山东 济南 250021)

摘要: **目的** 探讨尿道板宽度对尿道下裂行尿道板纵切卷管成形术(tubularized incised plate, TIP)术后并发症、外观、排尿功能等的影响。**方法** 回顾性分析2018年4月至2019年6月山东省立医院收治的行TIP尿道成形术的89例尿道下裂患儿的临床资料。根据尿道板宽度分为A组(尿道板平均宽度 ≥ 6 mm)52例和B组(尿道板平均宽度 < 6 mm)37例,通过随访并发症的发生率、阴茎外观及排尿情况,观察对比两组患儿的术后疗效。**结果** A组患儿尿道板平均宽度6.15(6.00~7.45)mm, B组平均宽度5.00(3.50~5.30)mm。两组患儿手术年龄($P=0.28$)、尿道下裂类型($P=0.10$)、阴茎头直径($P=0.11$)、是否行背侧白膜紧缩($P=0.05$)及留置尿管型号($P=0.30$)等差异均无统计学意义。A组术后并发症10例(19.23%),包括尿道瘘7例,阴茎头裂开2例和尿道外口狭窄1例;B组术后并发症7例(18.92%),包括尿道瘘5例,尿道外口狭窄2例;两组术后总并发症发生率($P=0.97$)和尿道瘘的发生率($P=0.99$)均无明显统计学差异。两组无并发症患儿手术1年后进行尿道下裂客观阴茎评分(Hypospadias Objective Penile Evaluation, HOPE)分别为(50.79 \pm 4.96)和(49.67 \pm 4.96)分,平均尿流率分别为(8.54 \pm 3.79)和(7.78 \pm 3.17)ml/s,差异均无统计学意义($P=0.46$; $P=0.49$)。**结论** 尿道板宽度对尿道下裂TIP术后并发症、外观及术后尿流率无明显影响。

关键词: 尿道下裂; 尿道板纵切卷管成形术; 尿道板宽度; 疗效

中图分类号: R699.6

文献标识码: A

文章编号: 1674-7410(2023)01-0043-05

DOI: 10.20020/j.CNKI.1674-7410.2023.01.09

Effect of the urethral plate width on the outcome of tubularized incised plate urethroplasty in hypospadias

Xu Yingrui, Du Guoqiang, Wang Xiaoqing, Wu Rongde, Liu Wei

Department of Pediatric Surgery, Shandong Provincial Hospital, Shandong University, Jinan, Shandong 250021, China

Corresponding author: Liu Wei, E-mail: lemontree1119@126.com

Abstract: Objective To evaluate the effect of the urethral plate width (UPW) on the urethroplasty complications, cosmetic and functional outcomes of tubularized incised plate (TIP) urethroplasty in hypospadias. **Methods** Data were collected retrospectively from 89 hypospadias patients who underwent primary TIP urethroplasty at Shandong Provincial Hospital from April 2018 to June 2019. The patients were categorized into groups A and B according to the pre-incision UPW, and there were 52 patients in group A with UPW ≥ 6 mm and 37 patients in group B with UPW < 6 mm. Urethroplasty complications, cosmetic outcome, and average urine flow rates were recorded during follow up. **Results** The mean UPW in group A was 6.15 (6.00–7.45) mm and the mean UPW in group B was 5.00 (3.50–5.30) mm. There were no statistical differences in patient age ($P=0.28$), hypospadias type ($P=0.10$), glans width ($P=0.11$), the ratio of dorsal plication ($P=0.05$), and the size of urethral catheter ($P=0.30$) between the two groups. Urethroplasty complications occurred in 10 patients (19.23%) in group A including seven fistulas, two glans dehiscence and one meatal stenosis, and 7 patients (18.92%) in group B including five fistulas and two meatal stenosis. In addition, there were no differences in the rate of urethroplasty complications ($P=0.97$) and fistula ($P=0.99$) between the two groups. In the patients

※通信作者: 刘伟, E-mail: lemontree1119@126.com

without complications, the mean Hypospadias Objective Penile Evaluation (HOPE) score was (50.79±4.96) in group A and (49.67±4.96) in group B ($P=0.46$), and the average urine flow rates was (8.54±3.79) ml/s in group A and (7.78±3.17) ml/s in group B ($P=0.49$), and there were no differences between them. **Conclusion** The UPW may not impact urethroplasty complications, cosmetic, and functional outcomes of hypospadias TIP repair.

Keywords: Hypospadias; Tubularized incised plate; Urethral plate width; Outcome

尿道下裂是小儿泌尿系统常见畸形,手术方法多种多样。尿道下裂手术中,对于无需横断尿道板即可完全矫正阴茎下弯的患儿,通常采用保留尿道板的手术方式,其解剖学基础在于尿道板是本来应发育成尿道的组织,具有丰富的血运和延展性,其位置也是尿道的原位^[1-3]。尿道板纵切卷管成形术(tubularized incised plate, TIP)是目前应用较广的保留尿道板的尿道下裂手术。有研究认为此术式对尿道板的宽度、尿道板沟槽深浅有一定要求,尿道板发育不良者术后发生并发症的可能性较大^[4,5]。本研究通过分析尿道板宽度对尿道下裂TIP术后尿道并发症的发生、排尿及外观的影响,探讨尿道板宽度在TIP手术选择中的参考价值。

1 资料与方法

1.1 研究对象及分组 本研究已通过山东第一医科大学附属省立医院医学伦理委员会审核(省医伦批第SWYX: NO.2021-191)。回顾性分析本院2018年4月至2019年6月由同一术者所治疗尿道下裂患儿的临床资料。纳入标准:首次行TIP尿道成形术,术前未接受激素治疗,患儿年龄小于12岁,随访时间均大于12个月。排除标准:随访资料不全、包皮环切手术史、合并性别发育异常,阴茎脱套后行人工勃起试验阴茎下弯仍 $>30^\circ$ 。每例患儿测量阴茎头、冠状沟及阴茎体部尿道板宽度2~3处取平均值。根据尿道板平均宽度分为两组:A组(尿道板平均宽度 ≥ 6 mm)52例和B组(尿道板平均宽度 < 6 mm)37例。

1.2 TIP尿道成形术 沿着尿道口至舟状窝做尿道板平行切口,对阴茎脱套和人工勃起后仍有小于 30° 阴茎下弯者行阴茎背侧白膜紧缩术。于尿道板正中做纵形切口至阴茎海绵体白膜扩展尿道板宽度(图1),然后行尿道板卷管成形尿道,采用7-0可吸收线两层皮下缝合(第一层间断缝合、第二层连续缝合),保证无张力成形尿道。取背侧包皮皮下带蒂筋膜覆盖成形尿道外。广泛游离阴茎头翼瓣,将阴茎头翼无张力缝合成形阴茎头。根据尿道情况留置6号或

8号Foley尿管,术后3周拔除。

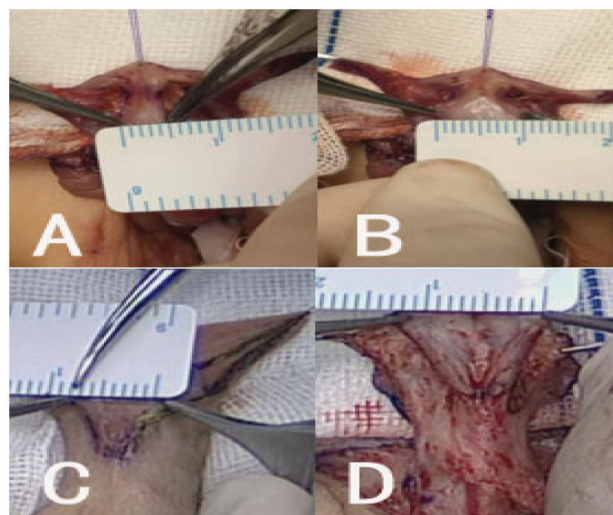


图1 尿道板切开前后宽度测量

注:图A和B:尿道板宽度 < 6 mm组切开前后尿道板宽度的测量;图C和D:尿道板宽度 ≥ 6 mm组切开前后尿道板宽度的测量。

1.3 随访 术后6个月随访患儿并发症的发生情况,并发症包括:尿道瘘、尿道/尿道外口狭窄、阴茎头裂开、阴茎下弯复发等。术后12~18个月随访无并发症患儿阴茎外观及排尿情况。阴茎外观采用尿道下裂客观阴茎评分(Hypospadias Objective Penile Evaluation, HOPE)系统进行评估,包括:尿道外口位置、尿道外口形状、阴茎头形状、包皮形态、阴茎有无下弯和扭转。排尿情况通过尿流率测定进行评估,记录平均尿流率。

1.4 统计学处理 采用IBM SPSS 19.0软件进行数据整理和统计分析。符合正态分布的计量资料以 $(\bar{x} \pm s)$ 表示,两组间比较采用 t 检验;对于非正态分布的计量资料用中位数(下、上四分位数)表示,两组间比较采用秩和检验;计数资料以率表示,两组间比较采用 χ^2 检验。 $P < 0.05$ 为差异有统计学意义。

2 结果

2.1 可能影响因素比较 A组患儿52例(58.40%),尿道板宽度6.00~7.45 mm,平均6.15 mm;B组患儿37例(41.60%),尿道板宽度3.50~5.30 mm,平

均5.00 mm。两组手术年龄、尿道下裂类型、阴茎头直径、行背侧白膜紧缩矫正阴茎下弯的例数及留置尿管型号差异均无统计学意义 ($P>0.05$) (见表1)。A组切开后尿道板宽度达10.00~13.00 mm, 较切开前平均增加了63%; B组切开后尿道板宽度达9.00~12.00 mm, 较切开前平均增加了141%。

2.2 随访结果 A组术后并发症10例(19.23%), 包括尿道瘘7例, 阴茎头裂开2例和尿道外口狭窄

1例; B组术后并发症7例(18.92%), 包括尿道瘘5例, 尿道外口狭窄2例; 两组术后总并发症发生率($\chi^2=0.001, P=0.97$)及尿道瘘发生率($\chi^2=0.000, P=0.99$)差异均无统计学意义。术后12~18个月随访阴茎外观及排尿情况, A组共随访到无并发症患儿28例, B组共随访到无并发症患儿18例, 两组术后阴茎外观HOPE评分及平均尿流率比较, 差异均无统计学意义 ($P>0.05$) (见表2)。

表1 不同尿道板宽度组临床参数的比较

组别	例数	手术时年龄 (月)	尿道下裂类型:远端型/ 中间型(例)	阴茎头直径 (mm)	背侧白膜紧缩 (例)	留置尿管型号 (F6/F8, 例)
A组	52	34.50(27.25,54.00)	44/8	15.00(14.00,16.00)	16	34/18
B组	37	34.00(22.00,42.50)	26/11	14.00(13.25,15.00)	19	28/9
Z值/ χ^2 值		-1.08	2.65	-1.61	3.84	1.08
P值		0.28	0.10	0.11	0.05	0.30

表2 组间术后无并发症者随访外观 HOPE 评分和平均尿流率比较 ($\bar{x} \pm s$)

组别	例数	HOPE评分	平均尿流率(ml/s)
A组	28	50.79±4.96	8.54±3.79
B组	18	49.67±4.96	7.78±3.17
t值		0.75	0.70
P值		0.46	0.49

3 讨论

尿道下裂的手术方式众多, 尿道板作为修复尿道的最佳材料有其无可比拟的优势, 有研究证实, 尿道板切开手术后, 上皮缺损区会被完全地再上皮化, 而无过多的胶原沉淀或疤痕形成^[6]。保留尿道板的TIP术式由于其操作相对简单、并发症少、外观好的优势, 在远端型尿道下裂的尿道成形中得到广泛应用, 甚至在近端型尿道下裂及再手术病例中也有应用^[7-10]。尿道板通常被认为是选择TIP手术的参考因素, 但尿道板的形状和宽度是否影响TIP手术的选择和术后疗效仍存在争议。早期研究认为尿道板较窄可能会增加术后并发症, Holland等^[4]报道了48例远端型尿道下裂行TIP术式的病例, 其中11例(23%)尿道板切开前宽度<8 mm, 而所有6例尿道瘘的并发症都发生在这些病例中。Sarhan等^[5]报道了80例TIP手术病例, 发现尿道板宽度<8 mm占49%, 尿道并发症(8例尿瘘、2例阴茎头裂开、3例尿道外口狭窄)在尿道板宽度<8 mm组中明显增高($P=0.048$)。Aboutaleb等^[11]的研究也发现尿道板宽度<8 mm组中TIP术后尿道瘘的发生率明显高

于尿道板宽度 ≥ 8 mm组 ($P=0.004$)。而Bush和Snodgrass^[12]通过对224例尿道下裂TIP手术的随访发现, 切开前尿道板宽度并不是影响术后尿道并发症的独立危险因素; Chukwubuike等^[13]的研究也认为尿道板宽度<8 mm组和 ≥ 8 mm组尿道并发症发生率并无统计学差异(14.3% vs. 16.7%, $P=0.263$)。相比较国外文献中尿道板宽度以8 mm为宽窄标准, 国内学者Zhang等^[14]用尿道板宽度6 mm作为分组标准, 其研究发现尿道板的宽度与TIP手术尿道并发症明显相关($P=0.014$), 并认为 ≥ 6 mm的尿道板可以取得较好的疗效。本组病例中尿道板宽度在8 mm以上者仅12例(13.5%), 因此也选择了尿道板宽度为6 mm作为分组标准, 但结果显示尿道板宽度 ≥ 6 mm组和<6 mm组在术后尿道并发症发生率上并无统计学差异。还有学者根据尿道板沟槽深浅, 将其分为“deep”和“flat”组, 但其与TIP术后尿道并发症也无明显相关性^[4-5,15]。

Bush等^[12]认为标准的TIP手术尿道板需切开足够深至海绵体表面, 使切开后尿道板宽度达到10~12 mm即可成形尿道。Aboutaleb等^[11]也在其文章中指出尿道板切开的深度不够, 导致围绕8 Fr尿管成形尿道时缝合张力过高, 从而导致了尿道板较窄组尿瘘的发生率明显增高。Sarhan等^[5]的研究中尿道板切开后平均增加57%, 而本文病例中尿道板宽度<6 mm组切开后尿道板宽度增加了近1.5倍。由此可见, 尿道板宽度并不是行TIP手术的决定因素, 而切开后尿道板宽度更为重要。目前本文病例中选择TIP手术尿道板宽度均在3 mm以上, Bush等^[12]

的研究中指出尿道板宽度为3 mm时尿道并发症有明显增加,也有研究认为尿道宽度小于4 mm预示着尿道板发育不良,因此提出行TIP加游离包皮内板镶嵌式移植术式,但这种Inlay手术并没有降低手术并发症^[16]。因此对于尿道板较窄的病例,可根据尿道口位置、阴茎头发育情况、手术医生的技术和偏好选择行Inlay或Onlay手术。

TIP术后最常见的并发症是尿瘘,其次为阴茎头裂开及尿道外口狭窄,有研究认为阴茎头宽度是影响尿道下裂并发症的独立危险因素,当阴茎头直径<14 mm会增加并发症^[17]。在本研究中不同尿道板宽度的两组阴茎头直径并无统计学差异,两组术后并发症亦无统计学差异,而且尿道板宽度 ≥ 6 mm组反而尿道并发症发生率略高,表明切开前的尿道板宽度并未影响术后并发症的发生。Snodgrass等^[15]报道的远端型尿道下裂行TIP术后尿瘘的并发症为4%,系统性文献回顾分析远端型和近端型尿道下裂TIP术后尿道瘘平均发生率分别为5.7%和10.3%^[18]。但本组研究中总的尿道瘘发生率为13.5%,高于上述研究,可能与患儿手术年龄、尿道缝合细节、成形尿道外覆盖材料的选择、术后管理等因素有关。

在排尿及外观评价中,两组病例术后HOPE外观评分和平均尿流率均无统计学差异,表明尿道板宽度对尿道下裂术后外观和排尿无明显影响。但有研究均认为尿道板宽度大于8mm会取得较好的术后外观^[11,19],Chukwubuike等^[13]的研究表明尿道板宽度不会影响术后外观,但与尿线粗细具有相关性。而Nguyen等^[20]的研究中发现尿道下裂术后排尿情况取决于手术方法,而非尿道板宽度。Da Silva等^[21]的研究也认为尿道板宽度不会影响术后排尿功能。因此尿道板宽度对于TIP术后外观及排尿的影响观点不一,还需要长期随访研究证实。

综上所述,本组病例的研究结果显示尿道下裂TIP手术尿道板切开前宽度并不影响术后尿道并发症的发生、外观及排尿。表明尿道板宽度并不是影响TIP手术疗效的决定因素,但是在尿道板切开时需要将尿道板切开至海绵体表面以获得足够宽度成形尿道,而且对于尿道板宽度低于3 mm的病例建议选择Inlay或Onlay术式。本研究存在以下局限性:为单一手术者回顾性资料,病例数相对较少,后期可进一步行多中心研究扩大样本量,并完善长期随访的数据,从而更加客观评价尿道板对TIP手术疗效的影响。

参考文献:

- [1] BASKIN LS, EROL A, LI YW, et al. Anatomical studies of hypospadias [J]. *J Urol*, 1998, 160(3 Pt 2): 1108–1137.
- [2] SNODGRASS WARREN T. Utilization of urethral plate in hypospadias surgery [J]. *Indian J Urol*, 2008, 24(2): 195–199.
- [3] EROL A, BASKIN LS, LI YW, et al. Anatomical studies of the urethral plate: Why preservation of the urethral plate is important in hypospadias repair [J]. *BJU Int*, 2000, 85(6): 728–734.
- [4] HOLLAND AJA, SMITH GHH. Effect of the depth and width of the urethral plate on tubularized incised plate urethroplasty [J]. *J Urol*, 2000, 164(2): 489–491.
- [5] SARHAN O, SAAD M, HELMY T, et al. Effect of suturing technique and urethral plate characteristics on complication rate following hypospadias repair: a prospective randomized study [J]. *J Urol*, 2009, 182: 682–685.
- [6] SNODGRASS. Tubularized incised plate urethroplasty for distal hypospadias [J]. *Urology*, 1994, 151(2): 464–465.
- [7] SAEEDI SHARIFABAD P, POUDINEH V, HIRADFAR M, et al. Current Trends in Hypospadias Repair. Where are we Standing [J]. *Urol J*, 2020.
- [8] SNODGRASS W, BUSH N. Primary hypospadias repair techniques: A review of the evidence [J]. *Urol Ann*, 2016, 8(4): 403–408.
- [9] TAM YH, PANG KK, WONG YS, et al. Improved outcomes after technical modifications in tubularized incised plate urethroplasty for mid-shaft and proximal hypospadias [J]. *Pediatr Surg Int*, 2016, 32(11): 1087–1092.
- [10] TURKYILMAZ Z, KARABULUT R, ATAN A, et al. Redo hypospadias repair: comparison of three different methods [J]. *Urol Int*, 2020, 104(5–6): 391–395.
- [11] ABOUTALEB H. Role of the urethral plate characters in the success of tubularized incised plate urethroplasty [J]. *Indian J Plast Surg*, 2014, 47(2): 227–231.
- [12] BUSH NC, SNODGRASS W. Pre-incision urethral plate width does not impact short-term tubularized incised plate urethroplasty outcomes [J]. *J Pediatr Urol*, 2017, 13(6): 625.e1–625.e6.
- [13] CHUKWUBUIKE KE, OBIANYO NEN, EKENZE SO, et al. Assessment of the effect of urethral plate width on outcome of hypospadias repair [J]. *J Pediatr Urol*, 2019, 15(6): 627.e1–627.e6.
- [14] ZHANG B, RUAN S, BI Y. Urethral plate in tubularized incised plate urethroplasty: how wide is enough [J]. *Transl Androl Urol*, 2021, 10(2): 703–709.
- [15] SNODGRASS WT, BUSH N, COST N. Tubularized incised plate hypospadias repair for distal hypospadias [J]. *J Pediatr Urol*, 2010, 6(4): 408–413.
- [16] SELEIM HM, ELSHEEMY MS, ABDALAZEEM Y, et al.

- Comprehensive evaluation of grafting the preservable narrow plates with consideration of native plate width at primary hypospadias surgery [J]. *J Pediatr Urol*, 2019, 15(4): 345.e1-345.e7.
- [17] BUSH NC, VILLANUEVA C, SNODGRASS W. Glans size is an independent risk factor for urethroplasty complications after hypospadias repair [J]. *J Pediatr Urol*, 2015, 11(6): 355.e1-355.03555.
- [18] PFISTERMULLER KL, MCARDLE AJ, Cuckow PM. Meta-analysis of complication rates of the tubularized incised plate (TIP) repair [J]. *J Pediatr Urol*, 2015, 11(2): 54-59.
- [19] SHIVAJI M, JAMIR A, NITIN D. Modified tubularized incised plate urethroplasty [J]. *J Indian Assoc Pediatr Surg*, 2013, 18(2): 62-65.
- [20] NGUYEN MT, SNODGRASS WT, ZAONTZ MR. Effect of urethral plate characteristics on tubularised incised plate urethroplasty [J]. *J Urol*, 2004, 171(3): 1260-1262.
- [21] DA SILVA EA, LOBOUNTCHENKO T, MARUN MN, et al. Role of penile biometric characteristics on surgical outcome of hypospadias repair [J]. *Pediatr Surg Int*, 2014, 30(3): 339-344.