



Distal urethral plate adhesions: New anatomical perspective in hypospadias

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Summary

Introduction

We found midline epithelial adhesions in the glandular urethral plate in patients with hypospadias. After dissolution, a blind epithelized channel becomes visualized inside of the plate pointing to immature embryonic luminization. In addition it reveals that the epithelized surface of the distal urethral plate is larger than previously considered.

Objective

To determine the incidence and extent of these new anatomical details of urethral plate in hypospadias patients.

Methods

We prospectively assessed the detailed anatomy of the urethral plate in 72 consecutive patients with hypospadias. We recorded the presence of adhesions in the middle of the glandular urethral groove that can be easily dissolved (dissolution line – D-line). We recorded the plate width before and after D-line dissolution, the presence of the hidden blind channel at continuation of D-line (channel type-A) and of the visible blind channel between D-line and urethral hypospadiac meatus (type-B) (Figure). In 62 patients, where the urethral plate tubularization was considered (Duplay, TIP), septa between channels were opened in the midline and a final width of the plate was measured by rolling the plate around a tube.

Results

Midline adhesions (D-line) were found in all 72 patients. Mean length of D-line was 5.13 ± 0.17 mm. Mean plate width before dissolution was 5.9 ± 0.15 mm, and after dissolution 7.8 ± 0.16 mm. A blind channel of type A was detected in 22 patients (31%), type B in 24 (33%), type A and B in 16 (22%), and none in 10 patients (14%). Mean final plate width after D-line dissolution and opening of septa between channels in 62 patients with urethral plate tubularization was 8.7 ± 0.15 mm.

Discussion

The main contribution of our study is a new perspective of distal urethral plate anatomy that enables enlargement of the epithelized surface of the distal urethral plate by dissolution of the pre-existing epithelized groove and opening of epithelized channels within the plate. To the best of our knowledge, this anatomical anomaly has not been described previously.

Conclusions

The distal urethral plate of all hypospadias patients is partially “folded” in the midline by epithelial adhesions of different depth and extent that may be easily dissolved. In half of the patients (53%) the “folded” part of the plate continues proximally as a blind channel inside the urethral plate (type A channel). Opening of these structures together with the well-known urethral plate pits (type B channel) helps augment the width and the overall epithelized surface of the distal urethral plate.

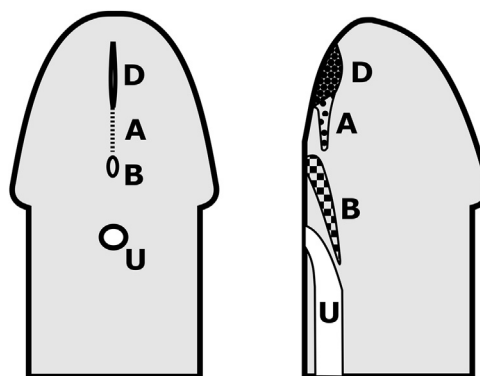


Figure Position of epithelized groove and channels in distal urethral plate: (U) urethra; (B) channel type-B; (A) hidden channel type-A; (D) groove under D-line.

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Introduction

We found that the distal urethral plate is not a flat epithelial strip of tissue, as historically reported in studies [1], but rather an epithelial groove hidden by synechia (cellular adhesions) in the middle of glandar plate, that may be dissolved. This line of dissolution (D-line) depicted in Fig. 1, may continue proximally and more deeply as a blind luminized channel inside the plate. We found these hidden, not open parts of the plate to be completely epithelized (Fig. 2). Adhesion dissolution in combination with opening of blind channels augment the width of the epithelized urethral plate. This technical modification opens up a new perspective of urethral plate anatomy. To the best of our knowledge, this has not been described previously. We carried out a prospective pilot study to determine the incidence and extent of these anatomical details in hypospadias patients.

Material and methods

We prospectively studied detailed urethral plate anatomy in all consecutive patients with primary hypospadias repair operated on between August 2012 and March 2014. We

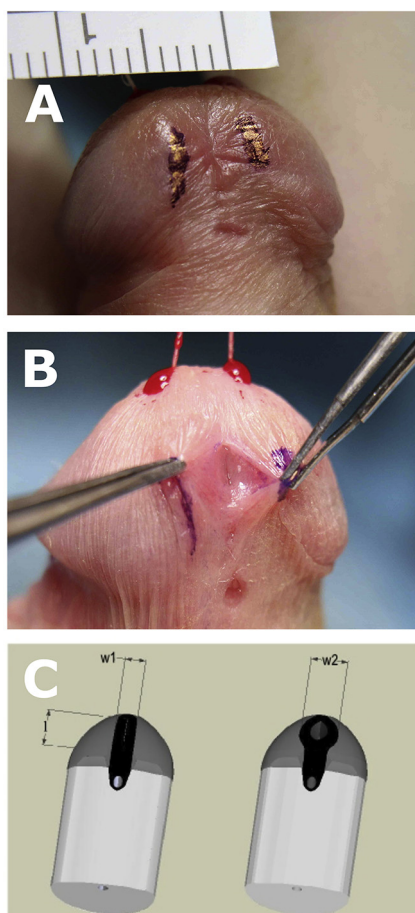


Figure 1 Opening of distal urethral plate adhesions: (A) initial aspect; (B) aspect after dissolution; (C) measured parameters of dissolution line: l – length, w_1 – initial width of the plate, w_2 – width after dissolution.

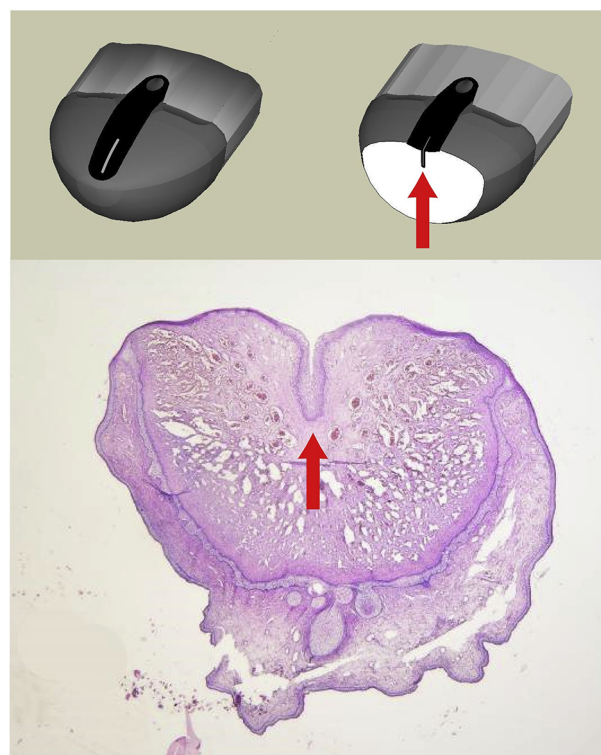


Figure 2 Transverse section of glans of hypospadiac penis at 20 weeks of gestation. Arrow indicates fully epithelized hidden plate groove under the D-line, (magnification $\times 20$). Staining with haematoxylin-eosin.

excluded patients with redo urethroplasty and DSD patients. At the beginning of surgery the patients were assessed for the presence of midline adhesions of the distal urethral plate (D-line), the urethral plate width before and after dissolution of the D-line, length of midline adhesions, and for the presence of dorsal blind channels in the urethral plate. We distinguished two types of channels: Type A – a channel at continuation of D-line that became visible after adhesion dissolution only (Fig. 3); and Type B – a channel opening into the bridge between open D-line and hypospadiac urethral meatus (Fig. 4). In patients with a urethral plate suitable for tubularization and Duplay or TIP repair, we opened all detected channels. All the epithelized walls between D-line, A and (or) B channels and urethral meatus were incised in the midline, creating one large almost completely epithelized urethral plate. Its width was measured by rolling the plate around a catheter. In 10 patients with proximal hypospadias in whom tubularization was not possible because of a narrow and dysplastic plate, we did not open the channels and, instead, directly performed a flap reconstruction (Onlay, Onlay Inlay) or a double stage (Byars) urethroplasty.

To prove epithelization of the hidden groove under the D-line, we carried out histopathological examinations of the distal urethral plate in two boys with severe penoscrotal hypospadias, in whom the short urethral plate was completely excised and a double stage urethroplasty performed. Additionally, we examined the penis of an aborted child of 20 weeks of gestation with hypospadias and Wolf–Hirschhorn syndrome 45XY,del(4)(p13)t(4,21)(p13,q11) (Fig. 2).

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