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Letter to the Editor

Further misconceptions in glans penis anatomy and hypospadias surgery

I read with great interest the article (in press) in the Journal of Pediatric Urology titled:

"Post-pubertal functional outcomes of one-stage anatomical reconstruction of the corpus spongiosum, bulbo-spongiosus muscle and dartos in 46 children with proximal hypospadias" [1]. I fully agree with the authors' conclusion on the need for a zipping up reconstruction of the corpus spongiosum for normal anatomical reconstruction that also relieves the glans tilt. However, a "limited" approach (up to the sub-glanular level) should be considered and a "septum glandis" should be added, as in normal anatomy. In 2017, we documented anatomical findings of the normal penis with magnetic resonance imaging (MRI) that contradicted almost everything done in hypospadias surgeries [2,3]. We have shown that the corpus spongiosum gradually terminates in the middle of the glans penis and the glans wings are separated ventrally by the "septum glandis" and frenulum, which also form the ventral wall of the glanular urethra (Fig. 1). In my experience, as the midline structures are zipped up, the approximation of not only the diverted corpus spongiosum but also its tunica albuginea contribute to glans tilt correction. Tunica albuginea is the most important fibrous-ligamentous tissue of the ventral midline, as it also forms the fixed boundary sheath for the proximo-distal morphogenesis of the corpus spongiosum, whose bilateral diversion should be responsible for the bending (to be published). Although the technical details of opening the "seam" lines between the penile shaft skin and the outer- and inner-face prepuce are unclear in the authors' article, I think that this is an important step of anatomically degloving the fibrous layers of the penis (dartos, Bucks's fascia and the tunica albuginea) [4].

However, I don't agree with the authors that most surgeons sacrifice the urethral plate and reconstruct a neourethra from an epithelial tube only, ignoring the importance of corpus spongiosum and bulbo-spongiosus muscle. If true, there are more misconceptions than we have outlined before [5,6]. We have also shown that the extensions of the diverted/bifurcated/splayed corpus spongiosum terminate at the sub-glanular/sub-coronal level in distal hypospadias or dissolve more proximal in proximal hypospadias [7]. Although observed by almost all surgeons, this finding has not led to the discontinuation of considering the glans penis as an anterior extension of the corpus spongiosum. In addition to our MRI results, perhaps simple questions can help cast more doubt on this age-old belief. How can we observe the glans penis in patients with severe hypospadias without midshaft corpus spongiosum development? How can the glans (clitoris) develop without any spongiosal connection in patients with 46, XX congenital adrenal hyperplasia? How can the glans together with the dorsal neurovascular bundle be completely and easily isolated in clitoroplasty? Accordingly, the authors' presentation, which shows glans and corpus spongiosum as a single entity in Fig. 2, is a misleading drawing. Considering the glans as an anterior expansion of the corpus spongiosum and the ventral surface of the glans as a "urethral plate" surrounded by corpus spongiosum as in the penile shaft are further misconceptions in hypospadias surgery and in the anatomy of the glans penis. Since

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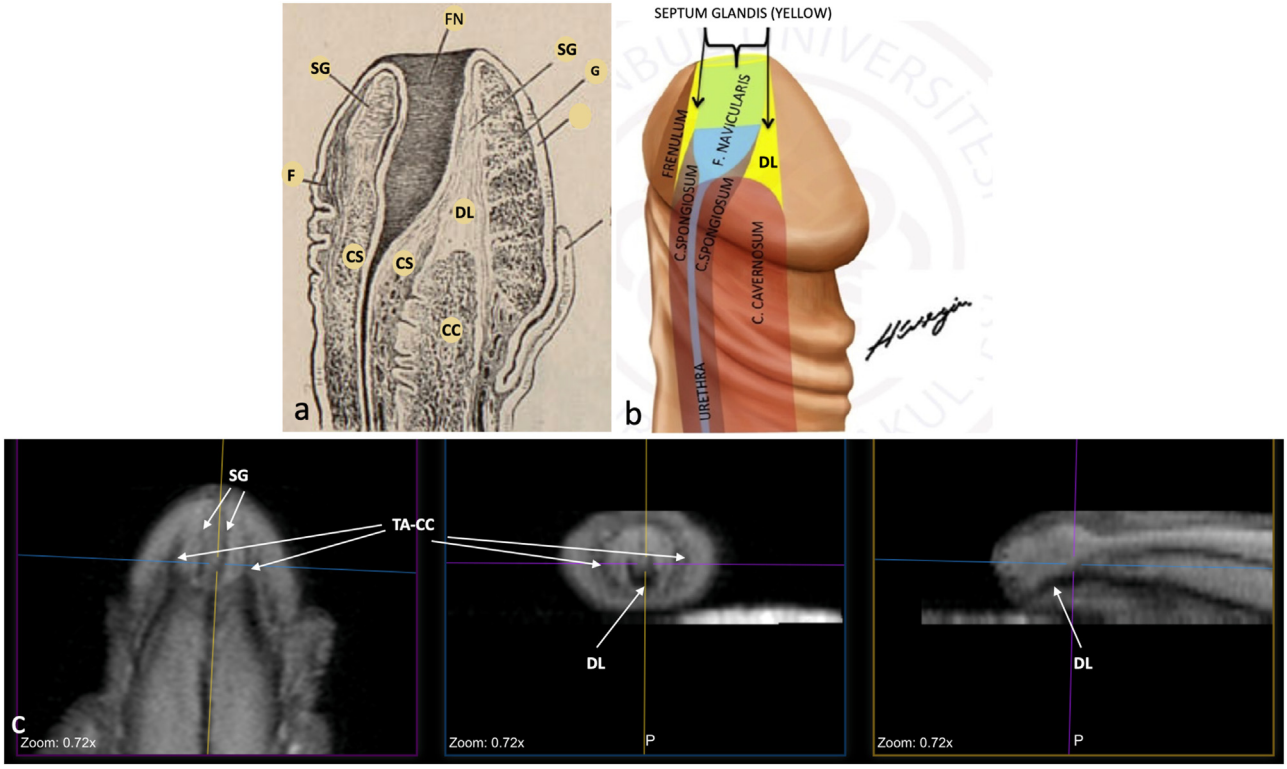

Fig. 1 Anatomy of the glans penis showing how the corpus spongiosum gradually terminates at its junction with the navicular fossa. The glans is a separate tissue attached to the shaft of the penis by the extensions of the tunica albuginea of the corpora cavernosa and the tunica albuginea of the corpus spongiosum. These fibrous ligamentous tissues form the distal ligament, extend into the glans and divide the glans into outer and inner layers, cover the navicular fossa, and connect to the foreskin with septum glandis and frenulum **(a and b).** MRI views of the fibrous ligamentous tissues of the penis: transvers, coronal and saggital sections at the same level **(c)** [2,3]. SG:septum glandis, TA-CC:tunica albuginea of the corpora cavernosa, DL:distal ligament.

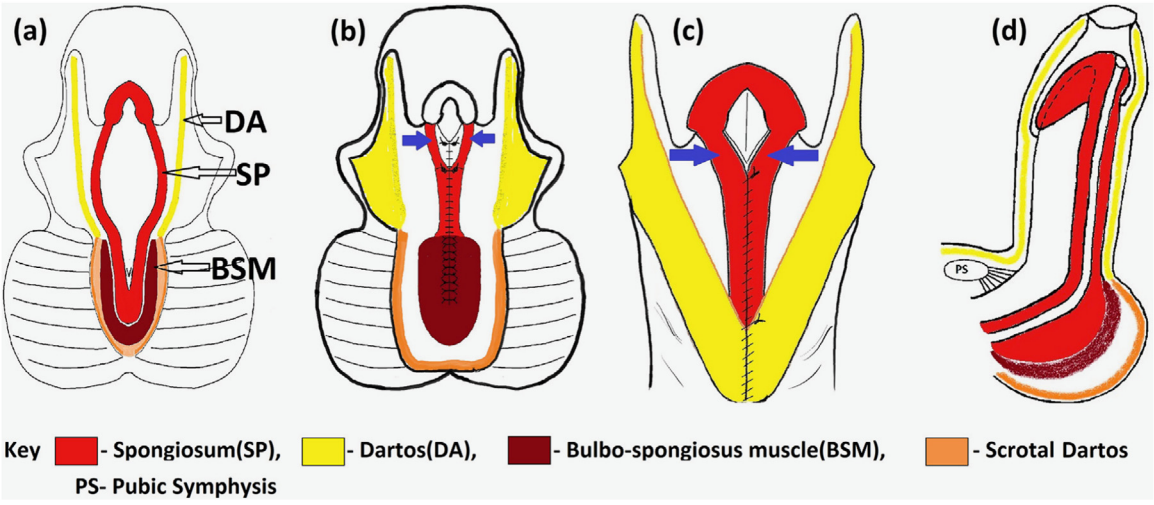

Fig. 2 The corpus spongiosum and the glans are shown as a single entity in red color. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article).

current concepts in hypospadias surgery involve non-anatomical reconstruction of the glanular urethra, these erroneous approaches should be discarded and hypospadias surgery redesigned with a new perspective.

Conflicts of interest

No conflict of interest.

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