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Review Article

Morphology of the Gubernaculum Testis-A Factor to Explain the Cryptorchidism in Prune Belly Syndrome

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Abstract

Background: To review current literature regarding the role of gubernaculum testis in cryptorchidism associated to Prune Belly Syndrome (PBS).

Material and Methods: We conducted a comprehensive literature review about the gubernaculum testis in PBS. A PubMed database search was performed in December 2020, focusing on gubernaculum testis and cryptorchidism in PBS.

Results: Collagen matrix of the prune belly gubernaculum is disrupted or degraded. In PBS gubernaculum we observed less amount of nerves and fewer quantity of collagen and elastic system fibers.

Conclusion: These important modifications in gubernaculum testis structure could be a factor involved in undescended testis in PBS.

Keywords: Gubernaculum Testis; Prune Belly Syndrome; Testicular migration; Cryptorchidism

1. Introduction

Prune belly syndrome (PBS) is a rare disorder with an incidence of 1:40,000 live births (affects men in >95% of cases) [1]. Prune Belly Syndrome (PBS) is a disorder with important alterations in kidney, bladder and urethra such as large and hypotonic bladders, dilated and tortuous ureters and bilateral cryptorchidism and is characterized by hypoplasia of the abdominal muscles [2, 3]. Testicular descent is a complex and multifactor event. Several theories explain the testicular migration

[4-7] but the gubernaculums development is one of the most important [8, 9]. In this mini review, we show some aspects of the gubernaculum structure in patients with PBS.

2. Material and Methods

A PubMed database search was fulfilled in December 2020 using the following MeSH terms: 'Prune Belly Syndrome' and either 'gubernaculum testis' or 'Undescended testis' or 'Cryptorchidism. Multiple free text searches were performed using the following terms: 'Prune Belly Syndrome', 'Undescended Testis', and 'gubernaculum testis'. The research was done only in English.

3. Results

The undescended testis and the morphological alterations of the abdominal wall are pathognomonic in PBS, but the reasons that might lead to the testicular non-displacement in this condition in unknown. One important theory is that the enlarged bladder in PBS patients alters the position of the internal inguinal ring and cause that extra-peritoneal position of the processus vaginalis can't reach and develop normally inside the inguinal canal [2, 10] (Figure 1). There are some theories to explain the undescended testis in PBS, but some are more interesting: a) absence or decrease of muscle contraction in abdominal wall; b) bladder distension leading to compression of the internal ring and inguinal canal which would make it impossible the testicular dislocation to the abdominal wall; c) Mechanical modifications of the internal inguinal ring and inguinal canal; and d) Morphological alterations of the extra-cellular matrix of the gubernaculum testis in PBS [3]. Recently, in an important paper about PBS, the morphology of the gubernaculum testis was analyzed in human fetuses and some important modifications in extra-cellular matrix were observed. In this paper the authors observed a minimum amount of nerves in gubernaculum testis [11]. Another theory put forward to justify the undescended testis in PBS is the morphological alterations in internal ring and inguinal canal place where the testis pass during the human fetal period. Some studies show that the processus vaginalis presents morphological alterations inside the gubernaculum in fetus with PBS [1, 11].

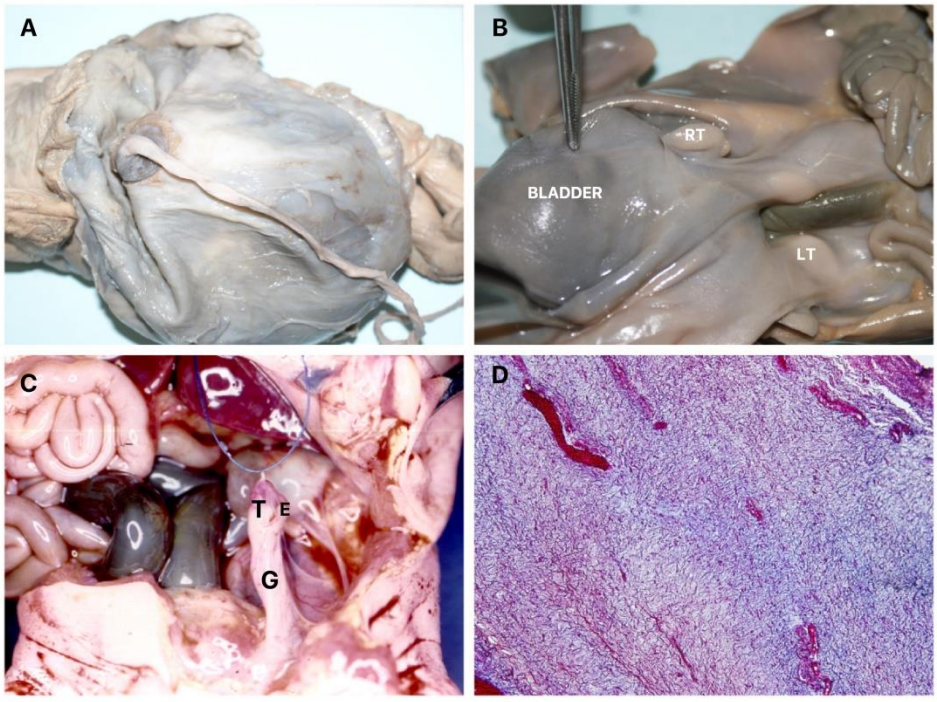

Figure 1: (A) Fetus with Prune Belly Syndrome with 32 weeks post conception. The abdominal wall was dissected and we can observe the characteristic aspect of the musculature in this syndrome; (B) In the same fetus with PBS aged 32 weeks post conception the abdominal cavity was dissected and we can observe the enlarged bladder and the testes situated in abdominal position, RT=right testis, LT=left testis; (C) In this figure we can observe the abdominal cavity of a fetuses aged 20 weeks post conception without apparent anomalies. The testis is in abdominal position and the gubernaculum testis is attached at the inguinal canal distally, T=Testis, E=Epididymis, G=gubernaculum; and (D) Photomicrography of a fetus aged 24 weeks post conception showing the histology of the gubernaculum testis. Masson's trichrome × 200.

These morphological modification in gubernaculum could be one of the factors involved in undescended testis in PBS [11]. This paper speculates that obstructions in inguinal canal and the abdominal wall hypoplasia in PBS hinders the remodeling of the gubernaculum [11]. Gubernaculum testis is one of the most important anatomical structures involved in testicular descent. The gubernaculum presents important modifications during the human fetal period with morphological modifications that leaves to shortening and contraction which is very important to testicular dislocation through the abdominal wall and inguinal canal [7, 9]. To confirm this hypothesis an important paper of Costa [11] studied 3 human fetuses with PBS and 7 human fetuses without apparent congenital anomalies and observed that the collagen matrix of the Prune Belly gubernaculum is disrupted or degraded which leads a speculation that the abdominal wall alterations or an obstruction in inguinal canal in PBS could be associated with modifications within the remodeling of the gubernaculum.

In this study, the authors show a less amount of nerves in gubernaculum also in PBS and in fetuses without apparent anomalies without statistical differences. The analyzed gubernaculums from the PBS group show

important alterations in extra-cellular matrix (collagen and elastic fibers). This morphological modification in gubernaculum could be one of the factors associated to undescended testis in this syndrome (Figure 1).

4. Conclusion

We can conclude that the alterations in abdominal wall in Prune Bely Syndrome alter the rise in intra-abdominal pressure and this factor associated with morphological alterations in extra-cellular matrix of gubernaculum testis could be involved in undescended testis in PBS.

References

1. Routh JC, Huang L, Retik AB, et al. Contemporary epidemiology and characterization of newborn males with prune belly syndrome. Urology 76 (2010): 44-48.
2. Hasset S, Smith GH, Holland AJ. Prune Belly Syndrome. Pediatr Surg Int 28 (2012): 219-228.
3. Zugor V, Schott GE, Labanaris AP. The Prune Belly syndrome: Urological aspects and long-term outcomes of a rare disease. Pediatr Rep 4 (2012): 20.
4. Clarnette TD, Hutson JM. The genitofemoral nerve may link testicular inguinal-scrotum descent with congenital inguinal hernia. Aust N Z J Surg 66 (1996): 612-617.
5. Nation TR, Balic A, Southweel BR, et al. The hormonal control of testicular descent. Pediatr Endocrinol Rev 7 (2009): 22-31.
6. Logsdon NT, Sampaio FJB, Favorito LA. The role of intra-abdominal pressure in human testicular migration. Int. Brazilian J. Urol 47 (2021): 36-44.
7. Favorito LA, Costa SF, Julio JR HR, et al. The importance of the gubernaculum in testicular migration during the human fetal period. Int Braz J Urol 40 (2014):722-729.
8. Heyns CF. The gubernaculum during testicular descent in the human fetus. J Anat 153 (1987): 93-112.
9. Heyns CF, Hutson JM. Historical review of theories on testicular descent. J Urol 153 (1995): 754-767.
10. Stephens FD, Smith ED, Hutson JM. Morphology and embryogenesis of the triad (prune belly) syndrome. In Congenital anomalies of the kidney, urinary and genital tracts. London: Martin Dunitz 37 (2002): 391-409.
11. Costa SF, Costa WS, Sampaio FJ, et al. Structural study of gubernaculum testis in fetuses with prune belly syndrome. J Urol 193 (2015): 1830-1836.