Original Paper

Urologia Internationalis

Urol Int 2012;89:355–357
DOI: 10.1159/000342665

Received: April 30, 2012
Accepted: August 2, 2012
Published online: September 28, 2012

Complete Testis-Epididymis Nonfusion Anomaly: A Typical Association with Cryptorchid Testis

E. Rachmani[a] Z. Zachariou[b] H. Snyder[c] F. Hadziselimovic[b]

[a]Department of Pediatric Surgery, University Children's Hospital, Bern, and [b]Kindertagesklinik, Liestal, Switzerland; [c]Division of Urology, The Children's Hospital of Philadelphia, Philadelphia, Pa., USA

Key Words
Cryptorchidism · Epididymis · Undescended testis · Contralateral descended testis · Epididymal fusion anomalies

Abstract
Introduction: Fusion anomalies of the testis and epididymis are associated with cryptorchidism. We present an analysis of the fusion anomalies of the epididymis in cryptorchid boys. ***Patients and Methods:*** We performed a retrospective review of patients presenting with undescended testes between 1986 and 1993. Patients were stratified among four groups based on the degree of testis-epididymis nonfusion. ***Results:*** A total of 880 testes were eligible for review, of which 93% (815/880) had normal fusion, 3.6% (32/880) had epididymal head nonfusion, 2% (19/880) had epididymal tail nonfusion, and 1.6% (14/880) had complete nonfusion. Increasing degree of nonfusion was associated with higher perioperative testes position. Head and tail nonfusion were observed together with a contralateral descended testis, but less frequently than in bilateral undescended testes ($p = 3.89 \times E{-}10$). Complete nonfusion was not observed in the contralateral descended testes in unilateral cryptorchid boys. ***Conclusions:*** Different degrees of fusion anomalies of the epididymis are associated with unilateral and bilateral undescended testis, indicating that nonfusion anomalies interact with epididymal-testicular descent because of impaired epididymal function.

Introduction

Fusion anomalies of the epididymis and testis, ascertained during orchidopexy, are associated with cryptorchidism [1–9]. The role of these anomalies in the process of epididymotesticular descent is controversial [1–10]. Furthermore, an intimate association was described between epididymal changes, especially epididymotesticular nonunion, and retarded testicular development, indicated by severe histological changes in the testis [4]. We hypothesize that complete testis-epididymis nonfusion interrupts the pull-function of the epididymis in the process of epididymotesticular descent, while isolated partial nonfusion may not in every case hinder epididymal-testis union and descent.

This study received institutional review board approval.

KARGER

Fax +41 61 306 12 34
E-Mail karger@karger.ch
www.karger.com

0042–1138/12/0893–0355$38.00/0

Accessible online at:
www.karger.com/uin

Prof. Dr. Faruk Hadziselimovic
Kindertagesklinik
Oristalstrasse 87a
CH–4410 Liestal (Switzerland)
E-Mail faruk@magnet.ch

Table 1. Incidence of epididymal nonfusion (NF) in unilateral, bilateral and contralateral descended testes

	Normal	Head NF	Tail NF	Complete NF
UUDT	331 (87%)	25 (6.5%)	17 (4.5%)	7 (1.8%)
BUDT	141 (92.2%)	4 (2.6%)	1 (0.6%)	7 (4.6%)
CDT	343 (98.9%)	3 (0.9%)	1 (0.2%)	0 (0%)

CDT has the lowest incidence of epididymal fusion abnormalities. p = 3.89×E–10.

Patients and Methods

A retrospective database review identified 486 patients who underwent bilateral testicular biopsies during orchidopexy between 1986 and 1993 at the Division of Urology Children's Hospital of Philadelphia. The study population consisted of males younger than 18 years with a primary diagnosis of undescended testis. The database contains information recorded at surgery, including patient age, preoperative testis position, and level of testis-epididymis fusion. Exclusion criteria were incomplete data regarding age, epididymis morphology, or preoperative testicular position. The testes included in the study were categorized into four groups based on the degree of testis-epididymis fusion as follows: complete fusion, epididymal head nonfusion, epididymal tail nonfusion, and complete nonfusion.

Statistical Analysis

The associations between degree of fusion, age, and testis position among patients with bilateral undescended testis (BUDT), unilateral undescended testis (UUDT), and contralateral descended testis (CDT) were assessed. Fischer's exact test was performed for different comparisons while categorical variables were compared using the Fischer-Freeman-Halton test. Logical regression analysis for age, position, and incidence of the degree of epididymis-testis anomaly determined by different surgeons was performed.

Ethical Considerations

In accordance with the Helsinki declaration, the Institutional Review Board of the Kindertagesklinik Liestal approved all aspects of this study. In particular, approval was given for research involving the use of material (data, documents, records, or specimens) initially collected for non-research purposes.

Results

On review of our database, 486 of 504 patients (96%) and 880 testes (380 UDTs, 347 CDTs, and 153 bilateral UDTs) met the criteria for study inclusion. 93% had normal epididymal attachment, 2.1% had epididymal tail nonfusion, 3.6% had head nonfusion, and 1.6% showed complete epididymal-testis nonfusion. Epididymal-testis nonfusion occurred in 12.9% of UUDTs and 7.8% of BUDTs. Among CDTs, 1.15% had head or tail types of epididymal nonfusion. The incidence of complete nonfusion among cryptorchid testes was 2.6% (14/533). Age did not differ significantly among cohorts with complete epididymis-testis nonfusion (unilateral: mean 28 ± 25.8, 95% CI 14–51.7 months; bilateral: mean 57.4 ± 47.6, 95% CI 13.4–101.4 months; p = 0.65). Complete nonfusion was twice as frequent in BUDTs compared to UUDTs (p = 0.0033, Fischer's exact test) whereas complete nonfusion was never found in the contralateral descended testes of boys with unilateral cryptorchidism (table 1). One bilateral cryptorchid boy (0.6% (1/153)) had complete nonfusion of the epididymis in both testes. Noticeably, undescended testes showed more varying degrees of nonfusion compared to the contralateral descended testis in unilateral cryptorchid boys (p = 3.89×E–10; table 1). Increasing degrees of nonfusion were associated with higher testis position at surgery. Nine of 14 cases (64%) in the group with complete nonfusion had testes localized intra-abdominally and/or sliding into the canal, while 35% of cases in the head and tail nonfusion groups were found intra-abdominally (p = 0.06). Logistic regression analysis revealed no differences in surgical judgment of the type and incidence of nonfusion anomalies among eight involved surgeons.

Discussion

Anomalies caused by disturbances of fusion between the testis and epididymis range from mild to severe [1–9]. In our cohort, 11% of UDTs displayed some degree of epididymis-testis nonfusion. The percentage of undescended testes with epididymis fusion anomalies in this study is similar to figures reported from another Philadelphia study, but much lower than the 32–79% cited in the literature [2–8]. The lower incidence of fusion anomalies with cryptorchid testis in our study is due to the fact that we considered only major fusion abnormalities to represent pathologic epididymal development.

Noticeably, it was reported that as much as one-half of intra-abdominally located testes exhibited testis-epididymis fusion anomalies (60/108) [3]. Our findings confirm this, suggesting that fusion anomalies are more commonly associated with a more proximal testicular location [5]. The most severe form of epididymal nonfusion, complete nonfusion, was found in 2.6% of UDTs. This is identical to the incidence of 2.2, 2.3, 4 and 5% reported in the literature [2, 3, 6, 9]. Furthermore, we for the first time analyzed the incidence of complete nonfusion as a sepa-

rate entity in the group of patients with CDT. This is the primary difference from the study by Kraft et al. [9], who analyzed the incidence of nonfusion in CDT as a whole, including head and tail abnormalities. Noticeably, we did not find a single contralateral descended testis with complete epididymis nonfusion, although we analyzed, in part, the same data. Therefore, only complete nonfusion of the epididymis seems to reliably interfere with epididymal-testicular descent.

The highest incidence of severe epididymal anomalies was observed in bilateral high positioned testes; this data, along with increased incidence of nonfusion anomalies in UDTs and lack of complete nonfusion of epididymis in CDTs, are in our opinion indirect evidences for involvement of the epididymis in the testicular descent process. However, it is difficult to draw conclusions concerning the function of the epididymis based solely on morphological descriptive data.

Experimental evidence and observations on cryptorchid animals favor a role of the epididymis as a driving force for testicular descent. Absent or impaired development of the smooth musculature in the epididymis in Insl3 homozygous mutant mice resulted in a high intra-abdominal undescended position [10]. Furthermore, if the Wolffian duct fails to form in the early developmental stage, the testis does not descend [11–14]. In naturally cryptorchid rodents, the epididymis was found to be on average 20% shorter compared to descended epididymis [13, 15]. In particular, the caudal part of the crypto-epididymis was underdeveloped. Testicular testosterone content from cryptorchid testes was 50% lower compared to controls [13, 15]. Treatment with luteinizing hormone-releasing hormone induces epididymotesticular descent in 60% of naturally cryptorchid mice. In successfully treated mice, increased testosterone secretion induced growth of the underdeveloped epididymis and its descent into the scrotum [13, 15].

Boys with successful descent of the epididymis and testis had a normal-sized epididymis, while the majority of nonresponders to hormonal treatment had small, irregular epididymides [16]. Similar to cryptorchid mice, hormone treatment of cryptorchid boys induced increased testosterone secretion and stimulated further development of the epididymis, thus completing testicular descent [16, 17]. Nonfusion anomalies of the epididymis represent forms of developmental delay and should not be considered a congenital dysplastic organ.

This study has limitations inherent to a retrospective database review. Information bias may surround measurements of preoperative position of the testis and degree of nonfusion.

In conclusion, fusion anomalies in our cohort were associated with more proximal testicular location and undescended testes. Only complete nonfusion of the epididymis seems to reliably interfere with epididymal-testicular descent.

Disclosure Statement

The authors have no conflicts of interest to declare.

References

1 Michelson L: Congenital anomalies of the ductus deferens and epididymis. J Urol 1949; 61:384–390.
2 Scorer CG, Farrington GH: Congenital Deformities of the Testis and Epididymis. New York, Appleton-Century-Crofts, 1971, pp 136–146.
3 Marshal FF, Shermeta DW: Epididymal abnormalities associated with undescended testis. J Urol 1979;121:341–343.
4 Gutierrez A, Campos A, Canizares FJ, Crespo PV, Sanchez C: Anatomical and clinical correlation with histological and histometric patterns in cryptorchidism. Br J Urol 1993;72:506–509.
5 Merksz M, Toth J: Testicular-epididymal fusion abnormality in undescended testis. Int Urol Nephrol 1987;19:179–187.
6 Gill B, Kogan S, Starr S, Reda E, Levitt S: Significance of epididymal and ductal anomalies associated with testicular maldescent. J Urol 1989;142:556–558.
7 Koff WJ, Scaletscky R: Malformations of the epididymis in undescended testis. J Urol 1990;143:340–343.
8 Mollaeian M, Mehrabi V, Elahi B: Significance of epididymal and ductal anomalies associated with undescended testis: study in 652 cases. Urology 1994;43:857–860.
9 Kraft K, Mucksavage P, Canning D, Snyder H, Kolon T: Histological findings in patients with cryptorchidism and testis-epididymis nonfusion. J Urol 2011;186:2045–2049.
10 Hadziselimovic F, Adham I: Insulin 3-like hormone and its role in epididymo-testicular descent. Int Braz J Urol 2007;33:407–411.
11 Pearls AH, Scott EA, Cox JE: Monorchidism in the horse. Equine Vet J 1989;21:215–217.
12 Hadziselimovic F: Funktionelle Morphologie und Pathologie der Nebenhoden und ihr Einfluss auf den Descensus Testiculorum. Morphol Med 1981;1:31–42.
13 Hadziselimovic F: Mechanism of testicular descent. Urol Res 1984;12:155–157.
14 Ikadai H, Ajisawa C, Tsujimura S, Watanabe G, Taya K Imamichi T: A new male pseudohermaphrodite rat mutant with androgen deficiency. J Reprod Fertil 1988;84: 303–312.
15 Hadziselimovic F: Pathogenesis of cryptorchidism; in Kogan SJ, Hafez ESE (eds): Pediatric Andrology. The Hague, Martinus Nijhoff, 1981, pp 147–162.
16 Bica DTG, Hadziselimovic F: Buserelin treatment of cryptorchidism: a randomized, double-blind, placebo controlled study. J Urol 1992;148:617–621.
17 Bica DTG, Hadziselimovic F: The behavior of epididymis, processus vaginalis, and testicular descent in cryptorchid boys treated with buserelin. Eur J Pediatr 1993;52(suppl 2):S38–S42.