CHAPTER 24

TESTICULAR ATROPHY IN CHILDREN ETIOLOGY

Ender Cem BULUT[1]

GENETIC FACTORS

One of the most important genetic causes of atrophic testicles is Kleinfelter syndrome. While 80-90 percent of Klinefelter patients have a 47, XXY karyotype without mosaicism, mosaicism appears in 5-10 percent. The most common is the 47, XXY/46, XY mosaicism. Patients with Klinefelter syndrome usually do not become noticeable until adolescence. Men with Klinefelter syndrome tend to be tall and have relatively long legs compared to their overall height. It is characterized by atrophic testicles that remain hard in size in the 1-4 ml range after puberty (1). Most patients are infertile due to azoospermia. Regarding the treatment of infertility, in rare cases, sperm may be found in the ejaculate, and exceptionally spontaneous paternity can also be achieved. Almost two decades of experience with TESE/ICSI in patients with Klinefelter syndrome shows that testicular sperm can be obtained in approximately 50% of patients (2). XX-male syndrome, also known as de la Chapelle syndrome, is characterized by the combination of male external genitalia, differentiation of gonads into testicles, and a 46, XX karyotype obtained by conventional cytogenetic analysis. The incidence of undescended testicles is significantly higher. The testicles are atrophic (1-4 ml) and hard, and endocrine changes of primary testicular failure are observed, with a decrease in serum testosterone and an increase in estrogen and gonadotropin levels (3). Although serum testosterone and gonadotropin levels are high

[1] Gazi University Medical Faculty, Department of Urology, endercemotmail.com, ORCID iD: 0000-0002-5002-5471

resulting in testicular ischemia. It usually occurs during adolescence but can occur at any age. Left untreated, it may result in testicular atrophy and orchiectomy. Therefore, torsion must be treated within the first 24 hours (31,32).

Cryptorchidism is a common condition in children. Undescended testicles generally have a lower volume than normal testicles, associated with decreased reproductive function. Therefore, appropriate surgery should be planned in these patients to prevent possible testicular atrophy and to evaluate reproductive and hormonal function (33,34).

REFERENCES

1. Westlander G, Ekerhovd E, Bergh C. Low levels of serum inhibin B do not exclude successful sperm recovery in men with nonmosaic Klinefelter syndrome. Fertil Steril. 2003;79:1680-2.
2. Schiff JD, Palermo GD, Veeck LL, Goldstein M, Rosenwaks Z, Schlegel PN. Success of testicular sperm injection and intracytoplasmic sperm injection in men with Klinefelter syndrome. J Clin Endocrinol Metab. 2005;90(11):6263-7.
3. Vorona E, Zitzmann M, Gromoll Jr, Schüring AN, Nieschlag E. Clinical, endocrinological, and epigenetic features of the 46, XX male syndrome, compared with 47, XXY Klinefelter patients. J Clin Endocrinol Metab. 2007;92(9):3458-65.
4. Götz MJ, Johnstone E, Ratcliffe S. Criminality and antisocial behaviour in unselected men with sex chromosome abnormalities. Psychol Med.1999;29(4):953-62.
5. Simoni M, Tüttelmann F, Gromoll J, Nieschlag E. Clinical consequences of microdeletions of the Y chromosome: the extended Münster experience. Reprod Biomed Online. 2008;16(2):289-303.
6. Krausz C, Forti G, McElreavey K. The Y chromosome and male fertility and infertility Int J Androl. 2003;26(2):70-5.
7. Foresta C, Ferlin A, Garolla A, Moro E, Pistorello M, Barbaux S, et al. High frequency of well-defined Y-chromosome deletions in idiopathic Sertoli cell-only syndrome. Hum Reprod. 1998;13(2):302-7.
8. Brambilla DJ, O'Donnell AB, Matsumoto AM, McKinlay JB. Intraindividual variation in levels of serum testosterone and other reproductive and adrenal hormones in men. Clin Endocrinol (Oxf).2007;67(6):853-62.
9. Hardelin J-P, Levilliers J, Blanchard S, Carel J-C, Leutenegger M, Pinard-Bertelletto J-P, et al. Heterogeneity in the mutations responsible for X chromosome-linked Kallmann syndrome. Hum Mol Genet. 1993;2(4):373-7.
10. Duskin-Bitan H, Shimon I. Prolactinomas in males: any differences? Pituitary. 2020;23:52-7.
11. Steinbrecher H. The undescended testis: working towards a unified care pathway for 2014. Arch Dis Child. 2014;99(5):397-8.
12. Hutson JM, Li R, Southwell BR, Petersen BL, Thorup J, Cortes D. Germ cell development in the postnatal testis: the key to prevent malignancy in cryptorchidism? Front Endocrinol (Lausanne). 2013;3:176.
13. Merry C, Sweeney B, Puri P. The vanishing testis: anatomical and histological findings. Eur Urol. 1997;31(1):65-7.
14. Madgar I, Weissenberg R, Lunenfeld B, Karasik A, Goldwasser B. Controlled trial of high spermatic vein ligation for varicocele in infertile men. Fertil Steril. 1995;63(1):120-4.

15. Damsgaard J, Joensen UN, Carlsen E, Erenpreiss J, Jensen MB, Matulevicius V, et al. Varicocele is associated with impaired semen quality and reproductive hormone levels: a study of 7035 healthy young men from six European countries. Eur Urol. 2016;70(6):1019-29.
16. Kumanov P, Robeva RN, Tomova A. Adolescent varicocele: who is at risk? Pediatrics. 2008;121(1):e53-e7.
17. McCormack J, Kretz A, Tocantins R. Traumatic rupture of the testicle. J Urol. 1966;96(1):80-2.
18. Cross J, Berman L, Elliott P, Irving S. Scrotal trauma: a cause of testicular atrophy. Clin Radiol. 1999;54(5):317-20.
19. Lian BS, Ong CC, Chiang LW, Rai R, Nah SA. Factors predicting testicular atrophy after testicular salvage following torsion. Eur J Ped Surg. 2015:017-21.
20. Orth RC, Towbin AJ. Acute testicular ischemia caused by incarcerated inguinal hernia. Pediatr Radiol. 2012;42:196-200.
21. Bukowski TP, Lewis AG, Reeves D, Wacksman J, Sheldon CA. Epididymitis in older boys: dysfunctional voiding as an etiology. J Urol. 1995;154(2):762-5.
22. Cappele O, Liard A, Barret E, Bachy B, Mitrofanoff P. Epididymitis in children: is further investigation necessary after the first episode? Eur Urol. 2000;38(5):627-30.
23. Alharbi B, Rajih E, Adeoye A, Allatiefe BA, Abdullah MH. Testicular ischemia secondary to epididymo-orchitis: a case report. Urol Case Rep. 2019;27:100893.
24. Steinbrecher HA, Malone PS. Testicular problems in children. Paediatr Child Health. 2008;18(6):264-7.
25. Hayes F, Dwyer A, Pitteloud N. Hypogonadotropic hypogonadism (HH) and gonadotropin therapy. 2 Hayes F, Dwyer A, Pitteloud N. Hypogonadotropic Hypogonadism (HH) and Gonadotropin Therapy. 2013 Nov 25. In: Feingold KR, Anawalt B, Blackman MR, Boyce A, Chrousos G, Corpas E, de Herder WW, Dhatariya K, Dungan K, Hofland J, Kalra S, Kaltsas G, Kapoor N, Koch C, Kopp P, Korbonits M, Kovacs CS, Kuohung W, Laferrère B, Levy M, McGee EA, McLachlan R, New M, Purnell J, Sahay R, Shah AS, Singer F, Sperling MA, Stratakis CA, Trence DL, Wilson DP, editors. Endotext [Internet]. South Dartmouth (MA): MDText.com, Inc.; 2000–. 015.
26. Winters SJ. Laboratory assessment of testicular function. Endotext [Internet]. 2020.
27. Kavoussi PK, Abdullah N, Gilkey MS, Hunn C, Machen GL, Chen S-H, et al. The impact of ipsilateral testicular atrophy on semen quality and sperm DNA fragmentation response to varicocele repair. Asian J Androl. 2021;23(2):146.
28. Raivio T, Falardeau J, Dwyer A, Quinton R, Hayes FJ, Hughes VA, et al. Reversal of idiopathic hypogonadotropic hypogonadism. N England J Med. 2007;357(9):863-73.
29. Lund L, Tang Y, Roebuck D, Lee K, Liu K, Yeung C. Testicular catch-up growth after varicocele correction in adolescents. Pediatr Surg Int. 1999;15:234-7.
30. Akbay E, Cayan S, Doruk E, Duce M, Bozlu M. The prevalence of varicocele and varicocele-related testicular atrophy in Turkish children and adolescents. BJU Int. 2000;86(4):490-3.
31. Aggarwal D, Parmar K, Sharma AP, Tyagi S, Kumar S, Singh SK, Gupta S. Long-term impact of testicular torsion and its salvage on semen parameters and gonadal function. Indian J Urol. 2022;38(2):135-139.
32. Sharp VJ, Kieran K, Arlen AM. Testicular torsion: diagnosis, evaluation, and management. Am Fam Physician. 2013;88(12):835-40.
33. Tseng C-S, Huang K-H, Pu Y-S, Chiang I-N. Volume alteration of undescended testes: Before and after orchiopexy. Urol Sci. 2016;27(3):161-5.
34. Kraft KH, Mucksavage P, Canning DA, Snyder III HM, Kolon TF. Histological findings in patients with cryptorchidism and testis-epididymis nonfusion. J Urol. 2011;186(5):2045-9.