

TUBULAR FERTILITY INDEX (TFI) IN UNDESCENDED TESTIS: CORRELATION WITH AGE, LATERALITY AND LOCATION

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ABSTRACT: AIM: To evaluate the Tubular Fertility Index in children with undescended testis and assess its correlation with age, laterality and location of testis. **MATERIALS AND METHODS:** Children with undescended testis located in the inguinal canal and superficial inguinal ring were recruited over a period of 30 months. Single stage standard open orchiopexy was done in all patients during which a testicular biopsy was taken from the affected side. Under light microscopy 100 seminiferous tubules were counted and the number of tubules containing germ cells was expressed as tubular fertility index. In children with bilateral undescended testes, mean of TFI of both sides was calculated. TFI was statistically correlated with patient's age, laterality and location. **RESULTS:** Total of 31 patients (Median age: 5yrs, range 1.3-12) were included. Of them, 27(87%) had unilateral and 4(12.9%) of them had bilateral undescended testes. 21(67.7%) patients had testes located in the inguinal canal while 10(32.2%) had testes located at the superficial inguinal ring. Mean (\pm SD) TFI was 25.37(\pm 9.17). Though there was a trend towards negative correlation between age and TFI ($r=-0.22$), it was not statistically significant ($p=0.2$). There was no statistically significant correlation between TFI and unilaterality or bilaterality of undescended testes ($p=0.2$). There was a highly significant correlation ($r=0.79$, $p<0.001$) between TFI and location of testis. **CONCLUSION:** TFI in children with undescended testis is lower than that in normal children. TFI and hence, the fertility potential appear to be better in children with testis located in the superficial inguinal ring than in the inguinal canal.

KEYWORDS: Tubular Fertility Index, Undescended Testis.

INTRODUCTION: Undescended testis is one of the common conditions that we encounter as pediatric surgeons. The incidence of undescended testis is 3-5% in all male neonates.¹ The histological appearance of the undescended testis show pathological differences from that described for the normal testis and early changes have been identified as early as 6 months of age by electron microscopy.² Tubular Fertility Index is the percentage of seminiferous tubules containing germ cells.³ TFI appears to closely correlate to location of testis.

MATERIALS AND METHODS: 31 boys below the age of 12 years who presented with undescended testis located in the inguinal canal or superficial inguinal canal were recruited over a period of 30 months between Jan 2006 to April 2008. All children underwent standard open orchidopexy along with testicular biopsy from the affected side. Biopsy was sent to the pathology laboratory in Bouin's solution. With the help of the pathologist Tubular Fertility Index was determined using light microscopy with 40x magnification.

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100 seminiferous tubules were counted and the percentage of seminiferous tubules that contained germ cells were noted and recorded as Tubular Fertility Index (Figure 1). In children with bilateral undescended testes, mean of TFI was calculated. TFI was statistically correlated with child's age, laterality and location of the testis.

Figure.1: Histopathological picture showing spermatogonia in seminiferous tubules in a 2 year boy.

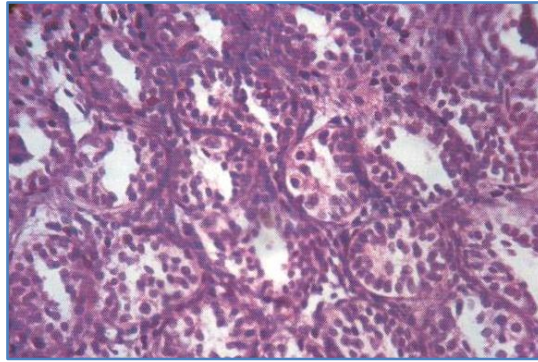


Figure 1

RESULTS: All children below 12 years who presented with undescended testis located in the inguinal canal and superficial inguinal ring were included in this study. Children with undescended testes in any other location other than the mentioned above locations, associated anomalies, ambiguous genitalia were excluded. 31 boys (median age: 5years range 1.3-12) were considered. The youngest was 15months old and the oldest was 12 years old. Of them, 27(87%) had unilateral and 4(12.9%) had bilateral undescended testes. 21 (67.7%) patients had testis located in the inguinal canal while 10(32.2%) had testis located in the superficial inguinal ring. Mean (\pm SD) TFI was 25.37(\pm 9.17).

Children below 2 years had better TFI when compared to older than 2 years. Though there was a trend towards negative correlation between age and TFI ($r=-0.22$), it was not statistically significant ($p=0.2$). Children with bilateral undescended testes had lower TFI when compared to those with unilateral undescended testis. There was no statistically significant correlation between TFI and unilaterality and bilaterality of undescended testis ($p=0.2$). The average TFI in the group who had undescended testes located in the superficial inguinal ring was 35.75 (range 15-45) which was better than the children inguinal undescended testes with 20.4 (range 10-28). There was a highly significant correlation ($r=0.79$, $p<0.001$) between TFI and location of testis.

DISCUSSION: The two negative outcomes associated with cyrptorchism are infertility and malignancy.⁴ in bilateral cyrptorchidism the incidence of infertility is 56% and in unilateral it is 8%.

Nistal et al.⁵ found that TFI in infancy compared with spermatogeneitic development in adulthood, provided the most precise information regarding germ cell evolution after puberty.

Our study revealed an average TFI of 25.37 (10-28). Normal testes have a TFI of 100% at the age of 15.³ Studies have shown children with cyrptorchidism show a decrease in the spermatic index.⁶ by 15 months -18 months of age with a markedly critical low value of spermatic index by 8-9 m of age.

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However in our study we found that there was a decrease in TFI (21.58) in children older than 2 yrs. although not significant, which correlates with Wilkerson's study.⁶

Our study comparing the location of the testis to TFI shows that the testis located near the superficial inguinal ring (35.75) had a better TFI compared to those located near to the deep ring (20.4). Farrington.⁵ et al showed the TFI in testis at superficial inguinal ring was 42.4%. Wilkerson et al⁶ showed there was no difference in the fertility potential in intra-abdominal testis compared to intracanalicular testis up to age of 5 years but they showed a marked decrease in spermatic index 8-9m.

The TFI in those children with bilateral disease (18.4) was lower than those with unilateral cryptorchidism (26.4). This compares to studies by showing decreased fertility in bilaterally cryptorchid males.⁴ they have shown that the paternity rate for bilateral cryptorchid patients was 65.3% compared to unilateral 89.7%.

They also found that all patients with history of bilateral cryptorchism had sperm counts well below normal with a mean of 5.20 million sperm/ml compared to unilateral 42.5 million/ml.

There are five milestones of germ cell maturation¹. 1. Gonocytes appear at 8 weeks of gestation, 2. Spermatogonia represent at 15 weeks of gestation, 3. Adult's dark spermatogonia appear at 3 months of age and remain for the rest of their life, 4. Primary spermatocytes (first meiotic form) appear at 4 years of age and 5. Spermatogenesis begins at puberty.²

Normal total germ cell counts are dependent upon the two steps in maturation of germ cells that normally occur in prepubertal testis. First at 2-3 months there is a surge in gonadotrophin and testosterone (Mini puberty) that triggers the transformation of the fetal stem cell pool (Gonocytes) into the adult sperm cell pool (Adult dark spermatogonia). At 4-5 years there is a rise in urinary LH which is associated with Adult dark sperm cell in primary spermatocytes (Onset of meiosis). These steps are deficient in cryptorchid patients bringing down their fertility in spite of a successful orchidopexy.¹ There are studies which recommend the use of gonadotrophin releasing hormone therapy in adjuvant to orchidopexy to increase fertility potential.

CONCLUSION: Tubular Fertility Index (TFI) in children with undescended testes is lower than that in normal children. Despite noticeable trends, we could not statistically demonstrate that TFI decreases with increasing age, probably because most of our patients were older than 2 years. Our study does not show any significant difference in TFI of children with unilateral or bilateral undescended testes.

The fertility potential appears to be better in children with testis located in the superficial inguinal ring than in the inguinal canal. The stages of spermatogenesis are impaired in cryptorchidism. Surgery alone will not suffice to improve fertility. There are current studies.^{1,4,7,8,9} showing the addition of gonadotrophin releasing hormone therapy to improve fertility potential. We recommend there be a further study of the long term outcome of adjuvant therapy in cryptorchid patients.

REFERENCES:

1. Jallouli M, Rebai T, Abid N, Bendhaou M, Kassis M and Mhiri R. Neoadjuvant Gonadotrophin releasing hormone therapy before surgery and effect of fertility index in unilateral undescended testis: A prospective randomized Trial. *Urology* 73(6); 1251-1254.
2. Hadziselimovic F, Herzog B. Importance of early postnatal germ cell maturation for the fertility of cryptorchid males. *Horm Res* 2001; 55: 6-10.

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3. Farrington GH. Histologic observations in cryptorchidism: the congenital germinal-cell deficiency of the undescended testis. *J Pediatr Surg.* 1969 Dec; 4(6):606-13.
4. Lee PA, Coughlin MT. Fertility after Bilateral Cryptorchidism. *Horm Res* 2001; 55: 28-32.
5. Nistal M, Riestra ML, Paniagua R. Correlation between testicular biopsies (Prepubertal and Postpubertal) and Spermogram in cyrptorchid men. *Hum Pathol* 31: 1022-1030.
6. Wilkerson ML, Bartone FF, Fox L, Hadziselimovic F. Fertility Potentail: A comparision of Intraabdominal and Intracanalicular Testes by age groupsd in children. *Horm Res* 2001; 55: 18-20.
7. Schwentner C, Oswald J, Kreczy A, Lunacek A, Bartsch G, Deibl M and Radmayr C. Neoadjuvant gonadotrophin-releasing hormone therapy before surgery may improve the fertility index in undescended testes: A prospective randomized trial. *The Journal of Urology* 2005; 173:974-977.
8. Huff DH, Snyder III HM, Rusnack SL, Zderic SA, Carr MC, Canning DA. Hormonal therapy for the subfertility of cryptorchidism. *Horm Res* 2001; 55:38-40.
9. Demirbilek S, Atayurt HF, Celik N, Aydin G. Does treatment with human chorionic gonadotrophin induce reversible changes in undescended testes in boys? *Pesiatr Surg Int* (1997) 12: 591-594.

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