Original Research Article

Sonological follow up of children with undescended testis post orchidopexy with comparison to age match controls

Kumar Ashish [1*], Alok Kumar [2], Rahul Singh [3], Anand Prakash[1], Dipu Singh[4], Prashant Kumar[4]

[1]Assistant Professor, Department of General Surgery, Narayan Medical College & Hospital, Sasaram, Bihar, India

[2]Professor, Department of General Surgery, Narayan Medical College & Hospital, Sasaram, Bihar, India

[3]Senior Resident, Department of General Surgery, Narayan Medical College & Hospital, Sasaram, Bihar, India

[4]Assistant Professor, Department of Radiodiagnosis, Narayan Medical College & hospital, Sasaram, Bihar, India

Received: 22-05-2021 / Revised: 01-07-2021 / Accepted: 03-08-2021

Abstract

Aims and objectives: Aim of our study was to study the pattern of change in testicular volume and echogenicity of testis post orchidopexy for unilateral Undescended testis (UDT). **Material and method:** A prospective study was done on twenty children excluding neonates with primary unilateral UDT. It was a prospective study over a duration of 18 months in which a total of twenty patients upto 12 years of age awaiting orchidopexy for unilateral UDT were included. Also 60 children upto 12 years of age with non urogenital conditions and with no history of condition/treatment likely to affect testicular volume (TV) were taken as controls. All subjects and controls underwent sonographic assessment of the TV of both their testes and average testicular volume (ATV), where ATV is equal to right TV plus left TV divided by 2. The study subjects undergoing elective orchidopexy were followed up sonologically for TV, echogenicity and Testicular microlithiasis (TM) at 3 months and 1 year of follow up. **Result and conclusion:** Preoperatively TV was generally found to be significantly lower than controls while compensatory hypertrophy of contralateral normal descended testis (cNDT) was noted in 25 percent of the study subjects. The echogenicity and TM showed improvement over follow up period in most patients and there was significant improvement in echogenicity in palpable group. Also it was surprising to find that Mean of average testicular volume (MATV) in older children at 1 year follow up exceeded MATV of controls. Also TV of cNDT are generally known to be higher but are known to gradually come down with orchidopexy of the affected side. Since our results are not fully in agreement with the conventionally upheld view on the findings in the existing literature, we deduce that testicular volume in isolation may not be considered as an index for future fertility.

Key words- Children, Orchidopexy, Undescended testis

Introduction

Undescended testes (UDT) is the strongest risk factor for infertility and timely orchidopexy can help preserve germ cell functions to the maximum [1]. The beneficial effects of surgical correction of cryptorchidism on infertility, testicular atrophy and cancer risk are known. The relation of testicular volume (TV) to testicular function is also gaining ground and monitoring of TV and echogenicity using sonography forms important follow up tool of surgically pexed testes in children. It is said that TV of the pexed UDT improves greatly only when surgery is done before 2 years of age [1-3]. TV in follow up may differ with different orchidopexy procedures (inclusive of staging or open/laparoscopic approach) and different locations of UDT and maximum chances of testicular atrophy have generally been reported with Fowler Stephen's procedure [4-6]. In an interesting study by Chin-shin Tseng, [7] it was found that catch up of volume of pexed UDT in pediatric patients to normative values was seen only after follow up period of 2.5 years and in the initial post-operative period, TV of the pexed testis decreased in comparison to pre-operative value. Our study basically focused to see changes in TV and echogenicity of the UDT and also the opposite testes in children over early follow up period.

**Correspondence*

Dr. Kumar Ashish

Assistant Professor,Department of General Surgery, Narayan Medical College & Hospital, Sasaram, Bihar India.

E-mail: dmcashish@gmail.com

Few workers believe that children with unilateral UDT have compensated hypertrophy of the other testis and therefore have better testicular function.[8] On the other hand other workers feel that defective germplasm along with many other factors like INSL3/LGR8 abnormality is a cause of testicular maldescent, and leads to poor overall testicular functions and higher incidence of carcinoma (even in contralateral descended testis).[9] Majority of data indicates the beneficial effects of surgical correction of cryptorchidism on infertility and cancer risk.[10] ultrasound is the best tool to measure volume echogenicity micro calcification and resistive index of testis. [11,12]

Aims and objectives

To study the pattern of change in testicular volume and echogenecity following orchidopexy for UDT in short follow up period following orchidopexy and to compare the pattern of change in these two parameters based on laterality and palpability of testes.

Materials and methods

The study was conducted in the Department of Surgery along with Department of Radiodiagnosis, at a tertiary care center. It was a prospective study over a duration of 16 months in which a total of twenty patients up to 12 years of age awaiting orchidopexy for unilateral UDT were included. Also 60 children up to 12 years of age with non urogenital conditions and with no history of condition or treatment likely to affect TV were taken as controls. Both study subjects and controls were divided into three age wise groups; namely, Group1: 0-4 years, Group 2: >4-8, Group 3: >8-12 years. All

subjects and controls underwent sonographic assessment of the TV of both their testes and ATV (average testicular volume = right TV+left TV/2) for each subject was computed. TV was measured by the technique described by Sakamoto H [11]. The study subjects undergoing elective orchidopexy were followed up for monitoring TV, echogenicity and TM by scrotal sonography at 3 months and 1 year of follow up. Statistical methods were used to compute significance between subjects and controls and between groups for various parameters.

Observation and results

In our study according to laterality UDT in 11 study subjects were right sided while it was left sided in 9 subjects. Group wise distribution of subjects was as: Group 1: 9, Group 2: 5, Group 3: 6; whereas there were 20 controls in each group. In either laterality group, TV of the operated testis at 3-month postoperative interval was similar to the preoperative values, but TV was significantly higher than pre-operative value at 1-year follow up (**figure-1**).

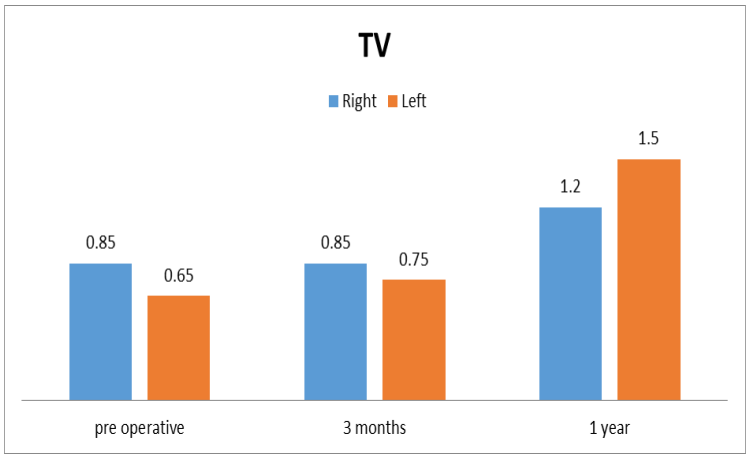

Fig 1: Bar chart showing comparison between mean testicular volume of operated testis

While assessing difference in the TV before orchidopexy and on post-surgery follow up periods at 3 month and 1 year interval there was increase in the TV in all subject but it was not statistically significant (**Table-1**).

Table 1: Comparison between mean testicular volume of right and left UDT

TV	Right UDT (n=11)		Left UDT (n=9)		P value
	Mean	SD	Mean	SD	
Preoperative	0.85	0.81	0.65	0.93	0.61
3 months	0.85	0.88	0.75	1.02	0.81
P value (Pre vs 3 months)	0.99		0.42		
1 year	1.20	1.15	1.50	2.25	0.70
P value (Pre vs 1 year)	0.04		0.02		

In our study 20 subjects of unilateral UDT were studied in which 15 were palpable and 5 were impalpable. Palpable testis had more improvement in MTV at 3-month and 1-year postoperative interval as compared to impalpable testis though the difference was statistically insignificant. (**figure-2**).

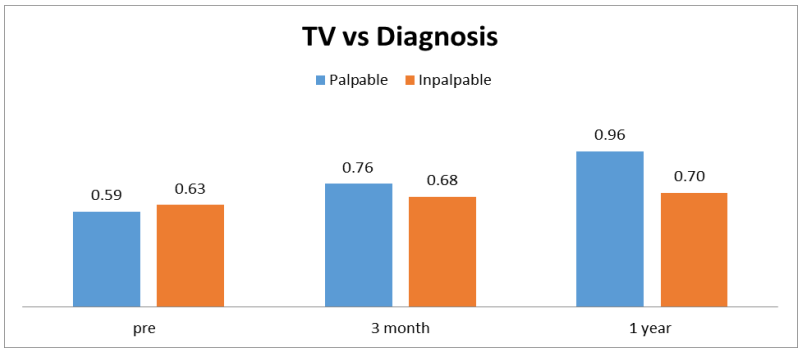

Fig 2: Bar chart showing comparison of mean testicular volume of UDT according to palpability

When MTV of the affected testes (UDT) of study subjects in different age groups were compared with MATV of respective controls it was found that the volumes of the affected testes were lower across all time points under consideration except for the subjects in prepubertal children, where the volume of the affected testes surpassed that of the control group **(table 2).**

Table 2: Table showing the comparison of MTV of UDT (Green) with MATV of controls (blue)

Age group		Pre		3 month		1 year	
		Mean	SD	Mean	SD	Mean	SD
Cases	0 to 4 year (1)	0.38	0.24	0.38	0.17	0.37	0.13
	>4 to 8 year (2)	0.40	0.08	0.47	0.18	0.64	0.54
	>8 to 12 year (3)	1.25	1.09	1.71	0.95	**2.16**	1.37
Controls	0 to 4 year (1)	0.67	0.21	0.67	0.21	0.67	0.21
	>4 to 8 year (2)	0.83	0.15	0.83	0.15	0.83	0.15
	>8 to 12 year (3)	1.86	1.40	1.86	1.40	1.86	1.40

The data was further analysed to compare MTV of contralateral normally descended testes (cNDT) among study subjects with MATV in their respective age groups. Higher MTV of cNDT was not observed in groups 1 and 3 study subjects. However, a statistically significant higher TV of cNDT was noted in Group 2 (4-8 years) study subjects as compared to controls (**Table 3**).

Table 3: Comparison of MTV (Green) of contralateral NDT (cNDT) with MATV of controls (blue)

Age group		Pre		3 month		1 year	
		Mean	SD	Mean	SD	Mean	SD
cNDT	0 to 4 year (1)	0.57	0.17	0.52	0.18	0.58	0.20
	>4 to 8 year (2)	1.26	0.77	0.91	0.60	1.55	0.80
	>8 to 12 year (3)	1.44	1.27	2.10	1.08	4.35	2.92
Controls	0 to 4 year (1)	0.67	0.21	0.67	0.21	0.67	0.21
	>4 to 8 year (2)	0.83	0.15	0.83	0.15	0.83	0.15
	>8 to 12 year (3)	1.86	1.4	1.86	1.4	1.86	1.4

Four of total study subjects had TV of cNDT exceeding MATV+SD value of their respective age group which could be labeled as compensatory hypertrophy (incidence of 20%).On comparison of results of open and laparoscopic procedures, MTV was higher in subjects undergoing laparoscopic orchidopexy as compared to open surgery, though the difference was statistically insignificant. Within each of these groups, there was increase MTV was observed at 1-year interval as compared to preoperative and 3 month follow up values though the difference was statistically insignificant (**Table 4**).

Table 4: Comparison of MTV of UDT in open and laparoscopic orchidopexy groups

TV	Procedure		P Value
	Open	Lap	
pre (Mean ± SD)	0.57 ± 0.69	0.77 ± 0.30	0.62
3 month (Mean ± SD)	0.70 ± 0.76	0.91 ± 0.61	0.66
P value (Pre vs 3 month)	0.60	0.73	
1 year (Mean ± SD)	0.87± 1.03	1.06 ±1.17	0.77
P value(Pre vs 1 year)	0.32	0.69	

We did not find laterality of UDT, its palpability or type of orchidopexy procedure to cause significant difference in TV over follow up period. The echogenicity and TM showed improvement over follow up period in most patients and there was significant improvement in echogenicity in palpable group (as compared to those in 'impalpable' group) at 3 month and at 1 year interval as compared to preoperative level.

Discussion

The physiologic functions of the testes are the production of spermatozoa and the male sex hormone, testosterone. The seminiferous tubules constitute about 70%–90% of the testicular mass, and as such, spermatogenesis can be assessed by measuring the testicular volume. [6] A number of clinical methods have been used for the measurement of testicular volumes in the scrotum: a centimeter ruler, sliding calipers, and orchidometers. The Prader orchidometer is also widely used in clinical settings.[11] However, scrotal ultrasound offers the potential for greater accuracy in testicular measurement compared to the Prader orchidometer along with ability to measure the echogenicity, resistive index and detection of microcalcification. [10-13]. The optimal time for orchiopexy hasalso been debated. However, a recent randomized controlled study shows that surgery at 9 months of age is followed by a better post-operative growth of the testes than surgery at 3 years, which supportsprevious arguments for early surgery. The unanimous conclusion of the group was that surgery isgenerally the preferred mode of treatment, rather than hCG or GnRH treatments. Orchiopexy shouldbe performed between 6 and 12 months of age, or soon after diagnosis. [14,15]

Most studies in literature have concluded that testicular volume of the pexed testis increases over the time on follow up. In a study by Prabhu et al, [16] which was done on Indian children, 66 patients in the age group of 1 -12 years were included. There was a highly significant increase in the mean testicular volume both at 1 month and at 6 month follow up, similar to our result they had also observed a significant increase in the size of affected testes as compared to the pre-operative value for both sided teste,

Chi-Shin Tseng et al,[7] in there retrospective study had found that boys in the age range of 0 to 18 years who had undergone unilateral or bilateral orchiopexy due to undescended testes, the mean volume of undescended testes was significantly smaller ($p < 0.001$) than the mean normative value of controls. Post orchiopexy UDT actually revealed a growing trend and appeared to be faster growing than the NDT group which was similar to our report.

Grzegorz Jedrzejewski et al [17] studied 128 patients between the ages of 2 and 10 years who underwent orchidopexy for undescended testes. Similar to our study design he also divide the children in three group and formed a control to compare. Ultrasound was used for the determination of testicular structure and volume. This study proved that significant growth was evident after three years of follow up after surgery in group which confirms the need for long term follow up after orchidopexy, a limitation in our study.

Conclusion

In our study, preoperatively TV was generally found to be significantly lower than controls while compensatory hypertrophy of cNDT was noted in only 1/5th of the study subjects. Also it was surprising to find that MATV in older children at 1 year follow up exceeded MATV of controls. Few of these observations do match

with the general assumption and earlier observations in available literature that TV of UDT gets lower with increasing age. Also TV of cNDT are generally known to be higher but are known to gradually come down with orchidopexy of the affected side. Fortunately, echogenicity and TM showed improvement after orchidopexy in the affected testes. Since our results are not fully in agreement with the conventionally upheld view on the findings in the existing literature, we deduce that testicular volume in isolation may not be considered as an index for future fertility. A longer follow up in adulthood for paternity pattern may help in assessing relevance of our observation.

References

1. Cortes D, Thorup JM, Visfeldt J. Cryptorchidism: aspects of fertility and neoplasms. A study including data of 1,335 consecutive boys who underwent testicular biopsy simultaneously with surgery for cryptorchidism. Horm Res.2001;55:21-7.
2. Kolon TF, Herndon CD, Baker LA, Baskin LS, Baxter CG, Cheng EY,et al. American Urological Assocation.Evaluation and treatment of cryptorchidism: AUA guideline. J Urol.2014 ;192:337-45.
3. Docimo SG. The results of surgical therapy for cryptorchidism: a literature review and analysis. J Urol. 1995 ;154:1148-52.
4. Pettersson A, Richiardi L, Nordenskjold A, Kaijser M, Akre O. Age at surgery for undescended testis and risk of testicular cancer. N Engl J Med. 2007 ;356:1835-41.
5. Ein SH, Nasr A, Wales PW, Ein A. Testicular atrophy after attempted pediatric orchidopexy for true undescended testis. J Pediatr Surg. 2014 ;49:317-22.
6. Kirsch AJ, Escala J, Duckett JW, Smith GH, Zderic SA, Canning DA, Snyder HM 3rd. Surgical management of the nonpalpable testis: the Children's Hospital of Philadelphia experience. J Urol. 1998 ;159:1340-3.
7. Tseng CS. Volume alteration of UDT before and after orchidopexy. Urol Scien. 2016 ;27:S24-S35.
8. Koff SA. Does compensatory testicular enlargement predict monorchism? J Urol.1991 ;146:632-3.
9. Bogatcheva NV, Agoulnik AI. INSL3/LGR8 role in testicular descent and cryptorchidism. Reprod Biomed Online. 2005 ;10:49-54.
10. Akre O, Pettersson A, Richiardi L. Risk of contralateral testicular cancer among men with unilaterally undescended testis: a meta analysis. Int J Cancer 2009 ;124:687-9.
11. Sakamoto H, Ogawa Y, Yoshida H. Relationship between testicular volume and testicular function: comparison of the Prader orchidometric and ultrasonographic measurements in patients with infertility. Asian J Androl. 2008 ;10:319-24.
12. Dergisi C. Testicular volume and resistive index of boys with undescended testis by colour Doppler ultrasonography. J Urol. 2008 ;22:88-90.
13. Miller FN,Sriprasad S, Muir GH, Sidhu PS. Testicular calcification and microlithiasis: association with primary intra-testicular malignancy in 3,477 patients. Eur Radiol. 2007 ;1:363-9.
14. Ritzén EM. Undescended testes: a consensus on management. Eur J Endocrinol.2008 ;159:S87-90.
15. Barthold JS, González R. The epidemiology of congenital cryptorchidism,testicular ascent and orchiopexy. J Urol. 2003 ;170:2396-401.
16. Prabhu ABMK, Mahajan J K, Chowdhary S K, Menon P, Rao KLN. Results of orchidopexy. J indian assoc pediatr surg 2003 ;8:96-9.
17. Jedrzejewski G, Wieczorek AP, Osemlak P, Nachulewicz P. The role of ultrasound in the management of undescended testes before and after orchidopexy - an update. Medicine (Baltimore). 2016 ; 95:5731.

Conflict of Interest: Nil
Source of support: Nil