UDK 616.681-089.168.1:572.7

Atiqur Rahman, Rizwan Ahmad Khan, Syed Amjad Ali Rizvi, Shagufta Wahab

A comparative study to evaluate the morphological features in undescended testes and changes following orchiopexy

JNMCH, AMU, Aligarh, India

Paediatric surgery.Ukraine.2020.4(69):63-66; DOI 10.15574/PS.2020.69.63

For citation: Atiqur Rahman, Rizwan Ahmad Khan, Syed Amjad Ali Rizvi, Shagufta Wahab. (2020). A comparative study to evaluate the morphological features in undescended testes and changes following orchiopexy. Paediatric Surgery.Ukraine. 4(69):63-66; doi 10.15574/PS.2020.69.63

A successful operative treatment of undescended testis has always been defined as a comparable scrotal position of the testis with no evidence of atrophic changes. The most important determinants for this are the type of undescended testis i.e. palpable and non-palpable and the timing of surgery. The ultimate goal of orchiopexy is to preserve its spermatogenic potential. However, that can only be ascertained at a later age. Therefore, early assessment of the procedure has been suggested by some radiological features. We undertook this study to evaluate these blood flow parameters.

The authors declare they have no conflict of interest.

Key words: Undescended testis, testicular volume, peak systolic velocity, end diastolic velocity, perioperative.

Оцінка морфологічних особливостей неопущених яєчок і змін після орхіопексії: порівняльне дослідження

Atiqur Rahman, Rizwan Ahmad Khan, Syed Amjad Ali Rizvi, Shagufta Wahab

Госпіталь Джавахарлала Неру при Мусульманському університеті Алігарха, Алігарх, Індія

Успішне оперативне лікування неопущеного яєчка визначається його положенням у калитці без ознак атрофічних змін. Найважливішими факторами, що визначають успішність оперативного лікування, є тип неопущеного яєчка, тобто пальпується / не пальпується, а також час операції. Кінцева мета орхіопексії - зберегти сперматогенний потенціал. Однак, у цьому можна впевнитися тільки у більш пізньому віці пацієнта. Тому на ранньому етапі для оцінки були використані радіологічні дані. Ми провели це дослідження для оцінки параметрів кровотоку.

Автори заявляють про відсутність конфлікт інтересів.

Ключевые слова: неопущене яєчко, об'єм яєчка, пікова систолічна швидкість, кінцева діастолічна швидкість, періопераційний період.

Оценка морфологических особенностей неопущенных яичек и изменений после орхиопексии: сравнительное исследование

Atiqur Rahman, Rizwan Ahmad Khan, Syed Amjad Ali Rizvi, Shagufta Wahab

Госпиталь Джавахарлала Неру при мусульманском университете Алигарха, Мусульманский университет Алигарха, Алигарх, Индия

Успешное оперативное лечение неопущенного яичка определяется положением яичка в мошонке без признаков атрофических изменений. Наиболее важными факторами, определяющими успешность оперативного лечения, являются тип неопущенного яичка, т.е. пальпируется / не пальпируется, а также время операции. Конечная цель орхиопексии – сохранить ее сперматогенный потенциал. Однако, в этом можно убедиться только в более позднем возрасте пациента. Поэтому на раннем этапе для оценки были использованы радиологические данные. Мы провели это исследование для оценки параметров кровотока.

Авторы заявляют об отсутствии конфликта интересов.

Ключевые слова: неопущенное яичко, объем яичка, пиковая систолическая скорость, конечная диастолическая скорость, периоперационный период.

Background and Introduction

The incidence of undescended testis (UDT) at birth arrays from 1% to 9% and out of which mostly descend during the first half year of life. The prevalence is reported to be around 1% among boys at one year of age. The size and volume of the testis shows great relation with future testicular function and semen profile, since 80–90% of the testis is formed from seminiferous tubules. Thus, precise assessment of the volume of the testis and its blood flow parameters is fundamental for estimating the growth of testis and projecting future fertility [4]. In this study we assessed the relationship between testicular volume and

Table 1
Mean preoperative and postoperative testicular volume

Groups (years)	Preop testicular volume on USG(Mean ± SD, ml)	Postop testicular volume on USG (Mean ± SD, ml)	P-value
<4	0.55±0.13	0.60±0.18	>0.05
4.1–8	0.69±0.19	0.85±0.28	<0.01
8.1–12	1.27±0.74	1.34±0.82	>0.05
>12	2.22±0.64	2.20±0.47	>0.05

its relation with different blood flow parameters in the preoperative and early postoperative period [3].

Objective: to do prospective case control study in children who underwent or orchiopexy for undescended testes.

Materials and methods

We did a prospective case control study in children who underwent unilateral or bilateral orchiopexy for undescended testes at Department of Pediatric Surgery, J. N. Medical College, AMU, Aligarh between November 2017 and January 2020. Patients' clinical features, associated diseases, laterality of the disease, age of orchiopexy, pre- and postoperative scrotal echo findings were noted. Comparative studies were done with patients of same age group, who came to our hospital any other complaints unrelated to testes. Approval from Institutional Ethics committee was obtained. Patients who did not undergo orchiopexy as per our protocol were excluded from the study. A total of 25 patients were studied. The preoperative radiologic evaluation was done by one radiologist in all cases. Ultrasonography was done using Toshiba Istyle Aplio XG/Seimens Acuson machine. Both low (3–5 Mega Hz) and high frequency (7–12 Mega Hz) probe was used. Colour Doppler evaluation was done using the same machine. The testis was measured in three dimensions (length, breadth and anteroposterior diameter). The volume hence calculated was multiplied by 0.52 to get the final volume. The colour Doppler of the intratesticular artery was done to evaluate the Peak systolic velocity (PSV), end diastolic velocity (EDV) and resistive index (RI).

The operative procedure was standard open orchiopexy performed by one pediatric surgeon. All the clinical and sonographic data were compiled and were subjected to statistical analysis using SPSS statistical software version 20. Statistical comparison was performed using Paired T-test in preoperative and postoperative findings in cases and unpaired T-test between cases and controls. The results were expressed in p-values. Any value ($p<0.05$) was taken as significant.

Results

The age of the patients in this study ranged from 10 months to 14 years. The maximum numbers (40%) of patients were ≤4 years. In our study there was equal proportion of right and left UDT (44%) and only 12% bilateral UDT. In six cases (24%) the testes was not palpable clinically but it was detectable on ultrasonography. Most of the undescended testis were located in the inguinal canal (44%) and superficial inguinal pouch (36%). However in 4 cases the testis was at deep ring (16%) and in one patient it was intra-abdominal (4%).

The mean preoperative testicular volume on ultrasonography ranged form 0.55±0.13 to 2.22±0.64 ml. While the range of postoperative (6 months) volume was 0.60±0.18 to 2.20±0.47 ml. Table 1 shows the comparison of testicular volume in preoperative and period and6 months postoperatively. From table 1 we can see that there increase in testicular volume in postoperative is significant in children of age group 8 to 12 years. On comparing with age-matched controls, there was no significant difference in the postoperative testicular volume (6 months postoperative) and the volume of age-matched testes in all the age groups (table 2).

After postoperatively 6 months this PSV value decreases showing successful orchiopexy. In all age groups the PSV decreases postoperatively and the difference was not statistically significant (table 3, 4). Postoperatively fall in peak systolic velocity was noted with steeper de-

Table 2
Mean testicular volume in postoperative period with age-matched controls

Groups (years)	Postop Testicular volume on USG (Mean ± SD, ml)	Testicular volume in age-matched controls (Mean ± SD, ml)	P-value
≤4	0.60±0.18	0.61±0.11	> 0.05
4.1–8	0.85±0.28	0.86±0.13	> 0.05
8.1–12	1.34±0.82	1.69±0.24	> 0.05
>12	2.20±0.47	2.34±0.43	> 0.05

Table 3
Blood flow parameters in preoperative and postoperative period

Groups (years)	Peak Systolic Velocity (mean ± SD) (cm/s)			End Diastolic Velocity (mean ± SD) (cm/s)			Resistive Index (mean ± SD)		
	Preop	Postop	p-value	Preop	Postop	p-value	Preop	Postop	p-value
≤4	3.53±0.87	2.67±1.03	<0.05	0.16±0.45	0.00±0.00	NA	0.97±0.08	1.00±0.00	>0.05
4.1–8	5.35±.97	4.60±1.37	>0.05	0.41±1.02	0.68±1.33	>0.05	0.96±0.06	0.85±0.37	>0.05
8.1–12	7.26±1.94	4.20±0.60	<0.01	2.46±1.19	2.40±0.60	>0.05	0.76±0.40	0.78±0.37	>0.05
>12	6.80±1.97	5.30±0.14	>0.05	2.82±0.45	2.62±0.74	>0.05	0.60±0.31	0.30±0.14	>0.05

cline in 4–8 and 8–12 age groups at 3 months. At 6 months postoperatively, further decline in peak systolic velocity below controls was associated with heterogenous irregular appearance of testis on sonography.

The preoperative EDV of UDT becomes undetectable in postoperative period. Also controls the End-diastolic velocity was not detected. In the preoperative period, the UDT group demonstrated slightly detectable velocity which may be due to hyperaemia and increased vascularity (table 3, 4). No End diastolic flow was noted in either cases or controls till 8 years of age. Hence the resultant Resistive index remained 1 pre- and postoperatively (diastolic flow only detectable with our scanners once testicular volume reaches about 4 ml). In preoperative period RI of UDT <1 but after orchiopexy it becomes 1 because EDV was not detected.

Discussion

The testis receives is supplied by Internal spermatic arteries through the spermatic cord. The testis requires a constant blood supply for its proper function and spermatogenesis. A decrease in the blood supply leads to small testis due to ischaemia and damage and inadequate spermatogenesis [1,13]. The problem of undescended testis and its management is of considerable surgical importance, from the point of view of the psychological wellbeing to protection and preservation of spermatogenic potential and hence fertility and prevention and treatment of its complications [5,12,14]. The details regarding the relationship of blood flow to testis and its effect on spermatogenesis has still not been completely explained [15]. Some authors have shown that tissue in arteries supplying the testis have receptors for the androgens and that the endothelial layer of these arteries are of increased size [7,10]. Therefore, there is always a need to evaluate the consequences of orchiopexy performed for undescended testes in children. Accurate measurement of testicular volume and blood flow parameters can be one such assessment tools.

In our study, there was no significant volume difference between the UDT and the age matched testis in all age groups. A study by Gill et al suggested that it is only after two years of a age, the difference in the volume of an undescended and descended testes becomes apparent [8]. However in our study we found that the volume of undescended testis did not change with age from birth till 5 years of age. The volume increases after 6 months as the collaterals develop and as a result testicular and paratesticular tissue develops. After surgery the volume increases but is not as par with control testis. This is may be due to vascularity compromise, excessive tissue handling. In all the groups there is increment in the testicular volume after orchiopexy except in >12 years age group where there is decrease in the volume even after orchiopexy. In a study by S.O. Kim et al, it was suggested that results of orchipexy in the form of increase in testicular volume is noted only after two years of surgery and that if the surgery is performed within 2 years of birth [11]. The peak systolic velocity (PSV) in UDT group is increased before orchiopexy in all age group as compared with the contralateral and age matched group. At 3 months of orchiopexy the vascularity still remains increased and gradually decreases towards normalcy at 6 months of surgery. The End Diastolic velocity was not detected in <4 and 4.1–8 years age groups with means testicular volume of about 0.55±0.13 cc and

Table 4
Blood flow parameters in postoperative period and age-matched controls

Groups (years)	Peak Systolic Velocity (mean ± SD) (cm/s)			End Diastolic Velocity (mean ± SD) (cm/s)			Resistive Index (mean ± SD)		
	Postop	Controls	p-value	Postop	Controls	p-value	Postop	Controls	p-value
≤4	2.67±1.03	3.08±0.56	<0.05	0.00±0.00	0.00±0.00	NA	1.00±0.00	1.00±0.00	>0.05
4.1–8	4.60±1.37	4.22±1.20	>0.05	0.68±1.33	0.47±0.94	>0.05	0.85±0.37	0.87±0.33	>0.05
8.1–12	4.20±0.60	7.01±0.95	<0.01	2.40±0.60	2.57±0.72	>0.05	0.78±0.37	0.24±0.06	<0.001
>12	5.30±0.14	7.17±1.53	>0.05	2.62±0.74	2.75±0.92	>0.05	0.30±0.14	0.25±0.06	>0.05

0.69±0.19 cc after that it become detectable but slight vascularity was detected in UDT group preoperatively because of hyperemia.

The resistive index remains 1 as long as the EDV was not detected. In successful orchiopexy its value is around 1 till 8 years of age. As the age increases its value decreases. The role of resistive index values in predicting other testicular inflammatory diseases has also been suggested by some authors [9]. A higher resistive index and a higher value of peak systolic velocity (PSV) have been found to be correlated with poor sperm count and inversely associated with the spermatogenesis [5,2,17]. Pinggera et al reported that an RI value of more than 0.6 is correlated with pathological sperm count [16]. Besides blood flow parameters being noninvasive method to assess testicular blood vessels, they are reliable method of gauging the blood flow to testes and, as suggested by our study and other studies, provides conformable results.

Conclusions

To conclude, the morphological changes such as size and volume can be measured easily and the volume of UDT is significantly lesser than that of normally located testis in all age subgroups and that the growth pattern is slow up to 8 years. After the follow up for 6 months after orchiopexy, the UDT group shows a rapid catch up growth in up to 8 years group but this trend is not seen in more than 12 years group. On Color Doppler evaluation PSV shows an increasing trend in all the age group with increasing age.

References/Література

1. Ashley RA, Barthold JS, Kolon TF. (2010). Cryptorchidism: pathogenesis, diagnosis, treatment and prognosis. Urologic Clinics. 37(2): 183-93.
2. Atilla MK, Sargin H, Yilmaz Y, Odabas O, Keskin A, Aydin S. (1997). Undescended testes in adults: clinical significance of resistive index values of the testicular artery measured by Doppler ultrasound as a predictor of testicular histology. J Urol. 158: 841-3.
3. Bahk JY, Jung JH, Jin LM, Min SK. (2010). Cut-off value of testes volume in young adults and correlation among testes volume, body mass index, hormonal level, and seminal profiles. Urology. 75: 1318-23.
4. Berkowitz GS, Lapinski RH, Gazella JG, Dolgin SE, Bodian CA, Holzman IR. (1993). Prevalence and natural history of cryptorchidism. Pediatrics. 92(1): 44-9.
5. Biagiotti G, Cavallini G, Modenini F, Vitali G, Gianaroli L. (2002). Spermatogenesis and spectral echo-colour Doppler traces from the main testicular artery. BJU Int. 90:903-8.
6. Chung E, Brock GB. (2011). Cryptorchidism and its impact on male fertility: a state of art review of current literature. Canadian Urological Association Journal. 5(3): 210-4.
7. Hsu TH, Huang JK, Ho DM, Liu RS, Chen MT, Chang LS. (1993). Role of the spermatic artery in spermatogenesis and sex hormone synthesis. ArchAndrol. 31: 191-7.
8. Gill B, Kogan S. (1997). Cryptorchidism: current concepts. Pediatric Clinics of North America. 44(5): 1211-27.
9. Jee WH, Choe BY, Byun JY, Shinn KS, Hwang TK. (1997). Resistive index of the intrascrotal artery in scrotal inflammatory disease. Acta Radiol. 38: 1026-30.
10. Jezek D, Schulze W, Rogatsch H, Hittmair A. (1996). Structure of small blood vessels in the testes of infertile men. Int J Androl. 19: 299-306.
11. Kim SO, Hwang EC, Hwang IS, Oh KJ, Jung SI, Kang TW, Kwon D, Park K, Bang-Ryu S. (2011). Testicular catch up growth: the impact of orchiopexy age. Urology. 78(4): 886-90.
12. Kolon TF, Herndon CD, Baker LA, Baskin LS, Baxter CG, Cheng EY, Diaz M, Lee PA, Seashore CJ, Tasian GE, Barthold JS. (2014). Evaluation and treatment of cryptorchidism: American Urological Association (AUA) Guideline. J Urol. 192(2): 337-45.
13. Kurpisz M, Havryluk A, Nakonechnyj A, Chopyak V, Kamieniczna M. (2010). Cryptorchidism and long-term consequences. Reproductive biology. 10(1): 19-35.
14. Mathers MJ, Sperling H, Rübben H, Roth S. (2009). The undescended testis: diagnosis, treatment and long-term consequences. Deutsches Ärzteblatt International. 106(33): 527.
15. Murphy F, Paran TS, Puri P. (2007). Orchidopexy and its impact on fertility. Pediatric surgery international. 23(7): 625-32.
16. Pinggera GM, Mitterberger M, Bartsch G, Strasser H, Gradl J, Aigner F, Pallwein L, Frauscher F. (2008). Assessment of the intratesticular resistive index by colour Doppler ultrasonography measurements as a predictor of spermatogenesis. BJU Int. 101: 722-6.
17. Zvizdic Z, Milisic E, Halimic A, Zvizdic D, Zubovic SV. (2014). Testicular volume and testicular atrophy index as predictors of functionality of unilaterally cryptorchid testis. Medical Archives. 68(2): 79.

Відомості про авторів:

Atiqur Rahman *– MS, Deptt. Of Surgery, J N Medical College, AMU, Aligarh.*

Rizwan Ahmad Khan *– MS, MCh, PhD, Deptt. Of Pediatric Surgery, J N Medical College, AMU, Aligarh.*

Syed Amjad Ali Rizvi *– MS, FRCS, Deptt. Of Surgery, J N Medical College, AMU, Aligarh.*

Shagufta Wahab *MD, PhD, Deptt. Of Radiodiagnosis, J N Medical College, AMU, Aligarh. Email: drshaguftawahab@rediffmail.com. Ph: +919410210350.*

Стаття надійшла до редакції 26.10.2020 р., прийнята до друку 07.12.2020 р.