

Pediatrics | Research article

Association between Testicular Appendix and Undescended Testicle in children: A comparative study

Kevin Emeka Chukwubuike

Pediatric surgery unit, Department of Surgery, Enugu State University Teaching Hospital, Enugu, Nigeria.

Submitted: 03 April 2021

Approved: 13 April 2021

Published: 14 April 2021



Address for correspondence: Kevin Emeka Chukwubuike, Department of Surgery, Enugu State University Teaching Hospital, Enugu, Nigeria.
E-mail: chukwubuikeonline@yahoo.com.
ORCID ID: 0000-0003-4973-6935

How to cite this article: Chukwubuike KE. Association between Testicular Appendix and Undescended Testicle in children: A comparative study. *G Med Sci.* 2021; 2(2): 010-014.
<https://www.doi.org/10.46766/thegms.pedia.21040301>

Copyright: © 2021 Kevin Emeka Chukwubuike. This is an Open Access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Abstract

Background: The appendix testis may be involved in the normal testicular descent and there are reports of decreased incidence of appendix testis in children with undescended testis. The aim of this study was to evaluate the incidence of appendix testis in children with undescended testis in comparison to the incidence in children with normally descended testis.

Materials and Methods: This was a comparative study of 2 cohorts studied over a period of 5 years. One cohort had orchidopexy for undescended testis (group A) and the second cohort had herniotomy for inguinal hernia/hydrocele (group B) and this second group served as control. The incidences of appendix testis in both groups of patients were assessed during the surgical procedures (orchidopexy and herniotomy).

Results: A total of 100 children with undescended testis and 103 children with hernia/hydrocele were seen during the study period. The incidence of appendix testis in group A and group B respectively was 63% and 69% respectively. However, statistical analysis gave a p value of 0.123 which is not statistically significant. There was no significant difference in the patients' demographics, side of the lesion and post-operative complications. However, patients with undescended testis have more associated epididymal abnormalities.

Conclusion: There is no statistically significant decrease in the incidence of appendix testis in children with undescended testis when compared with children with inguinal hernia/hydrocele (control).

Keywords: Appendix, pediatric, correlation, hydrocele, incidence, testis.

1. Introduction

Pediatric surgeons have shown reasonable interest in the appendix testes in children due to its involvement in torsion (acute scrotum). However, little attention is paid to the relationship between appendix testis and undescended testis. The appendix testis is considered to be the remnant of the paramesonephric duct [1]. Histologically, the normal appendix testis is made of loose gelatinous vascular connective tissue stroma covered by müllerian-type cuboidal to columnar epithelium [2]. The descent of the testis is a complex multistage process that involves synchronized activities of various genetic, anatomical structures, hormones and environmental factors [3]. The phases of testicular descent have been categorized into transabdominal and transinguinal phases. The transabdominal and transinguinal phases of testicular descent are regulated by human testicular insulin-like factor 3 and by androgen respectively. These hormones also ensure development of the gubernaculum testis [4, 5]. However, there are still ambiguities surrounding the physiology of testicular descent. Several human and experimental studies have postulated about the possible role of the appendix testis in testicular descent, noticing a decreased occurrence of appendix testis in children with undescended testis: This is in comparison to children with normally descended testis [6, 7]. The appendix testis may also be involved in controlling the amount of serous fluid in the space of the tunica vaginalis [8]. Surgery for undescended testis (orchidopexy) is necessary before the age of 12 months because of the deleterious effect of body heat on the testis and the risk of malignancy. The aim of this study was to compare the incidence of appendix testis in children with undescended testis in comparison to the incidence in children with normally descended testis.

2. Materials and Methods

This was a comparative study of 2 cohorts studied over a period of 5 years. In one cohort, the ipsilateral testis was examined for the presence of appendix testis during orchidopexy (group A). In the other cohort, the testes of children with normal descended testis (who underwent herniotomy) were assessed for the presence of appendix testis (group B). The study groups were children aged 15 years and younger managed at the pediatric surgery unit of Enugu State University Teaching Hospital (ESUTH) Enugu, Nigeria. The study period was between January 2015 and December 2019. ESUTH serves the whole of Enugu State, which according to the 2016 estimates of the National Population Commission and Nigerian National Bureau of Statistics, has a population of about 4 million people and a population density of 616.0/km². The hospital also receives referrals from its neighboring states. Ethical approval was obtained from the Research Ethics committee of ESUTH and patients' caregivers gave consent before commencement of the study. This study followed the principle of Declaration of Helsinki.

Pre-operative protocol

Children, who presented during the study period, with a history of absent testis/empty scrotum (undescended testis) and had orchidopexy, were recruited into the study. This group of patients was categorized as group A. Children who had herniotomy for inguinal hernias/hydroceles were also recruited into the study. This second group of patients was categorized as group B and served as control. Children who have had orchidopexy or herniotomy before referral to ESUTH were excluded from this study.

All the patients were clinically evaluated and baseline investigations such as hemoglobin estimation, genotype and urinalysis were done. The procedure was explained to the parents and informed consent obtained. All the cases were treated as day cases.

Intra-operative protocol

Access was through a groin crease incision which was deepened to the Scarpa's fascia. For orchidopexy, mobilization of the spermatic cord was done and the testes fixed in the subdartos pouch. For herniotomy, high ligation of the patent processus was performed. In both procedures, the testes were examined for the presence of appendix testis. The incisions were closed subcuticularly using vicryl (polydactin) sutures and dressing applied.

Post-operative protocol

The children were discharged home same day on oral analgesics and antibiotics. They were seen on an outpatient basis on the sixth post-operative day and the wound examined. The wound was subsequently left exposed.

Follow up and outcome measures

The primary outcome measure was the presence (positive) or absence (negative) of appendix testis at surgery whereas the secondary outcome measure was post-operative complications. The follow up period was for 6 months. The patients were seen 2 weekly until adequate healing is achieved.

Data were collected in a proforma which included the age of the patient as at the time of orchidopexy/herniotomy, side of the orchidopexy/herniotomy, presence/absence of appendix testis, any associated anomalies of the epididymis, post-operative complication and outcome of treatment.

Statistical Package for Social Science (SPSS) version 23, manufactured by IBM Cooperation Chicago Illinois, was used for data entry and analysis. Data were expressed as percentages, means, ranges and medians. Student's T test was used to test for significance. P value < 0.05 was considered statistically significant.

3. Results

3.1. Patients' demographics

A total of 100 children with undescended testis and 103 children with hernia/hydrocele were seen during the study period. Children with undescended testis had orchidopexy while children with hernia/hydrocele had herniotomy. All the patients were males. Details of the patients' demographics are shown in Table 1.

Parameters	Group A	Group B
Number of patients	100	103
Mean age	12.7 months (9-18)	8.8 months (3-15)
Gender	Male	Male
Median duration of hospital stay	1.3 days (1-3)	1.1 days (1-3)

Table 1: Demographic features of the patients

3.2. Side of the orchidopexy/herniotomy

For group A patients, 61 (61%) patients had their undescended testis on the right side while 39 (39%) patients had the undescended testis on the left side. For group B patients, 61 (59.2%) patients had right hernia/hydrocele whereas 42 (40.8%) children had left hernia/hydrocele.

3.3. Presence/absence of the appendix testis

The presence of appendix testis in the 2 groups of patients is shown in Table 2.

Findings at surgery	Group A	Group B	p value
Present	63(63%)	69(67%)	
Absent	37(37%)	34(33%)	0.123*
Total	100(100%)	103(100%)	

Table 2: Occurrence of appendix testis in the 2 groups of patients

*Not statistically significant

The entire appendix testis was single. None was multiple.

3.4. Associated anomalies of the epididymis

Fifty-two (52%) patients in group A had an associated epididymal anomaly whereas only 8 (7.8%) patients had an epididymal anomaly in group B.

3.5. Post-operative complications

Seven (7%) patients in group A had surgical site infection while 8 (7.8%) patients in group B had surgical site infection. Other complications included stitch sinus in 6 (6%) patients in group A and 7 (6.8%) patients in group B. There was recurrent undescended testis in 3 (3%) patients in group A and 4 (3.9%) recurrent hernias in group B.

3.6. Outcome of treatment

All the patients achieved full recovery and were discharged home. There was no mortality.

4. Discussion

Appendix testis was first described in 1761 by Morgagni [9]. The pair of appendix testis and appendix epididymis was subsequently described as "hydatid of Morgagni". Apart from the appendix testis, other appendages of the testis include the appendix epididymis (a remnant of the mesonephric duct), the paradidymis (organ of Giralde) and the vas aberrans (organ of Haller) [9]. The interest on the index study is on the appendix testis.

In the present study, the mean age of the studied patients was below one year of age. This finding is comparable to the report of Zvizdic et al. but at variance to the findings of Rakha et al. [2, 10]. The mean age at which the appendix testis is discovered may be dependent on the age at which the patients presented, age at surgery and the meticulous search by the operating surgeon. The surgeries (orchidopexy and herniotomy) were performed as day case surgeries. However, when there are challenges such as delayed recovery from anesthesia or co-morbidities, the patients were admitted in the hospital for close observation.

In both groups of patients, there is predominance of the pathologies (undescended testes/hernias/hydroceles) on the right side. This is consistent with the report of other authors [11, 12]. Howbeit, Rakha et al. reported more appendices on the left side [2]. The physiologic delayed descent of the right testis (when compared to the left testis) may be responsible.

In the current study, less appendix testis was found in patients with undescended testis than in children with hernias/hydroceles. However, statistical analysis of the incidence of appendix testis of the 2 group of patients was found not to be statistically significant. Zvizdic et al. reported decreased incidence of appendix testis in undescended testis located close to the internal inguinal ring [10]. Leslie et al. reported that the absence of the appendix testis is linked to undescended testis [13]. He also documented that the exact role of appendix testis in testicular descent is unclear [13]. Tostes et al. reported that there is no difference in the incidence of appendix testis in relation to the testicular position in patients with undescended testis [12]. Moreover, cases of torsion of the appendix testis in undescended testis have been reported [14]. This may suggest that there is no paucity of appendix testis in undescended testis. The entire appendix testes seen in the present study were single. Although uncommon, multiple appendix testes in a single testis can occur; this could be bilateral or unilateral. About half of the patients with undescended testis had an epididymal anomaly. This is in contrast to the findings in the control group (group B) where only about one-tenth of the patients had an epididymal anomaly. Kim et al. reported that the incidence of epididymal anomalies was significantly higher in boys with undescended testis [15]. They reported that epididymal anomalies were found more frequently in boys with higher testicular location [15]. Examples of such epididymal anomalies associated with undescended testis include epididymal/testicular fusion anomalies, agenesis of the epididymis, atresia of the epididymis and loop or elongated epididymis [16, 17].

Surgical site infection is one of the most common surgical complications. Surgical site infection was the most common post-operative complication, in both groups

of patients, in the current series. Other studies also found surgical site infection as a common complication of inguinal and scrotal surgeries in children [18, 19]. Stitch complications and abnormal scar can also occur following inguinal and scrotal operations in children [20]. Recurrent/iatrogenic undescended testis and recurrent inguinal hernia can occur due to failure to properly bring down the testis or ligate the patent processus during surgery.

No mortality was recorded in the current series. Other studies also did not record any mortality [18, 21].

5. Limitations of the study

The limitations of the study include the small number of patients. A larger number would have availed better analysis. This was a retrospective study. A prospective analysis would have provided more data for detailed analysis. We suggest a larger prospective multicenter study in future for determination of the actual role/function of the appendix testis.

6. Conclusion

There is no statistically significant decrease in the incidence of appendix testis in children with undescended testis when compared with children with inguinal hernia/hydrocele. Further studies are required to determine the actual function of the appendix testis.

References

1. Jacob M, Barteczko K. Contribution to the origin and development of the appendices of the testis and epididymis in humans. *Anat Embryo (Berl)*. 2005; 209(4): 287-302. doi: 10.1007/s00429-004-0445-7
2. Rakha E, Puls F, Saidul I, Furness P. Torsion of the testicular appendix. Importance of associated acute inflammation. *J Clin Pathol*. 2006; 59(8): 831-834
3. Hutson JM, Balic A, Nation T, Southwell B. Cryptorchidism. *Semin in Pediatr Surg*. 2010; 19(3): 215-224. doi: 10.1053/j.sempedsurg.2010.04.001
4. Zimmerman S, Steding G, Emmen JM, Brinkmann AO, Nayemia AF, Holstein AF et al. Targeted disruption of the *Insl3* gene causes bilateral cryptorchidism. *Mol Endocrinol*. 1999; 13(5): 681-691. doi: 10.1210/mend.13.5.0272

5. Overbeek PA, Gorlov IP, Sutherland RW, Houston JB, Harrison WR, Boettger-Tong HL et al. A transgenic insertion causing cryptorchidism in mice. *Genesis*. 2001; 30(1): 26-35. doi: 10.1002/gene.1029
6. Favorito LA, Cavalcante GL, Babinski MA. Study on the incidence of testicular and epididymal appendages in patients with cryptorchidism. *Int braz j urol*. 2004; 30(1): 49-52.
7. Jozsa T, Csizy I, Kutasy B, Cserni T, Flasko T. Decreased incidence of appendix testis in cryptorchidism with intraoperative survey. *Urol Int*. 2008; 80(3): 317-320. doi: 10.1159/000127349
8. Ivens U. Morphology and function of the appendix testis. *Andrologie*. 1972; 42: 245-258
9. Sahni D, Jit I, Joshi K, Sanjeev. Incidence and structure of the appendices of the testis and epididymis. *J Anat*. 1996; 189 (Pt 2); 341-348
10. Zvizdic Z, Zivkovic D, Sabanovic J, Milisic E. The Role of the Appendix Testis in Normal Testicular Descent: Is There a Connection? *Biomed Research International*. Volume 2018, Article ID 3078031. doi: 10.1155/2018/3078031
11. Marino MJ, Kimble RM. Paediatric torsion of the paradidymis. *J Paediatr Surg Case Rep*. 2018; 32: 82-84
12. Tostes GD, Costa SF, Carvalho JP, Costa WS, Sampaio FJ, Favorito LA. Structural analysis of testicular appendices in patients with cryptorchidism. *Int Braz J Urol*. 2013; 39(2): 240-247
13. Leslie SW, Sajjad H, Villanueva CA. Cryptorchidism. [Updated 2021 March 6] In: *StatPearls* [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 January. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK470270/>
14. Nicolay L, Gitlin J, Palmer LS. Torsion of the appendix testis in an undescended undescended testis. A case report. *Can J Urol*. 2013; 20(3): 6805-6807
15. Kim SO, Na SW, Yu HS, Kwon D. Epididymal anomalies in boys with undescended testis or hydrocele. Significance of testicular location. *BMC Urol*. 2015; 15: 108. doi: 10.1186/s12894-015-0099-1
16. Caterino S, Lorenzon L, Cavallini M, Cavaniglia D, Ferro F. Epididymal-testicular fusion anomalies in cryptorchidism are associated with proximal location of the undescended testis and a widely patent processus vaginalis. *J Anat*. 2014; 225(4): 473-478. doi: 10.1111/iaoa.12222
17. Marshall FF, Shermeta DW. Epididymal abnormalities associated with undescended testis. *J Urol*. 1979; 121(3): 341-343. doi: 10.1016/s0022-5347(17)56780-4
18. Ibrahim M, Ladan MA, Abdussalam US, Getso KI, Mohammad MA, Chukwuemeka AL et al. Open inguinal herniotomy: Analysis of variations. *Afr J Paediatr Surg*. 2016; 12(2): 131-136
19. Vaze D, Samujh R, Narasimha Rao KL. Risk of surgical site infection in paediatric herniotomies without any prophylactic antibiotics: A preliminary experience. *Afr J Paediatr Surg*. 2014; 11(2): 158-161.
20. Dreuning K, Matt S, Twisk J, van Heum E, Derikx J. Laparoscopic versus open pediatric inguinal hernia repair: state-of-the-art comparison and future perspectives from a meta-analysis. *Surg Endosc*. 2019; 33(10): 3177-3191
21. Aihole JS. The demographic profile and management of infantile inguinal hernia: a 3-year's review. *Afr J Urol*. 2020; 26, 28.