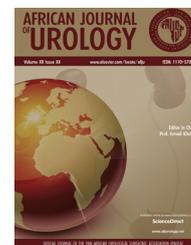




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Original article

High (trans) scrotal orchidopexy for palpable undescended testes in children: Influence of age and testicular position

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KEYWORDS

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Abstract

Objectives: To assess the influence of increasing age of subjects and testicular position on the outcome of single incision orchidopexy.

Subjects and methods: A prospective randomized study of children aged ≤ 15 years with palpable undescended testes. The study was conducted between July 2015 and December 2016 in a Nigerian tertiary hospital. Patients were randomized into two groups: single incision orchidopexy and conventional orchidopexy group by simple balloting. The parameters studied were the patients' bio-data, most caudal position of the testes, duration of surgery, wound complications such as wound infection, scrotal edema and haematoma. Others included testicular position at 6 months post-operatively, testicular hypotrophy and cosmetic appearance of scar. A p-value <0.05 was deemed significant.

Results: There were 52 patients with 59 testes. Their ages ranged from 1 year to 13 years with a mean of 6.5 ± 3.5 years. The age groups and testicular positions were well matched, $p > 0.05$. There was no conversion from high scrotal to conventional orchidopexy irrespective of the age and testicular position during surgery. The operative time was shorter in the high scrotal group compared to conventional group, $p < 0.05$. The rate of testicular reascent between both groups did not attain statistical significance, $p > 0.05$. Within the high scrotal group, increasing age and testicular location had no influence on the operative time, $p > 0.05$. There was no statistical significant difference in the rate of testicular retraction between the young and relatively older children among the high scrotal group, $p > 0.05$. All wounds healed without wound infection, scrotal edema and haematoma.

Conclusion: Increasing age of patients and location of testes had no effect on the outcome of high scrotal orchidopexy in terms of successful placement of testes in the scrotum and rate of testicular retraction

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when compared to the conventional orchidopexy. However, the operative time was shorter and the cosmetic appearance of scar was better in the high scrotal group compared to the conventional orchidopexy.

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Introduction

High scrotal single incision orchidopexy was pioneered by Bianchi and Squire [1] in 1989 as an alternative technique to the conventional groin and scrotal-incision orchidopexy. This approach was based on two observations: firstly, majority of undescended testes are palpable and distal to inguinal canal. Secondly, the vas deferens and vascular pedicle of most undescended testes are often long enough after dissection and division of associated processus vaginalis to allow adequate placement of the testis in a satisfactory position in the scrotum.

The advantages of this technique include short operative time, excellent cosmetic appearance of scar, less disruption and dissection of the inguinal canal and or retroperitoneum, and less post-operative pain which makes it suitable for day case procedure [2–4].

As the technique gains widespread popularity, there arose a controversy about its suitability in older children as adequate length of the vas deferens and spermatic vessels may be difficult to achieve through the scrotum. Some series believe that single incision orchidopexy becomes less feasible with increasing age of patients and as such, is fraught with more complications, and also consumes more time [4–6].

We hypothesized that for palpable undescended testes; single incision orchidopexy may not be achievable during surgical operation as the age of patients' increases, and in highly located testes in the groin compared to conventional orchidopexy. The primary outcome measure of this prospective study was to compare the rate of successful placement of palpable undescended testes into a satisfactory position in the scrotum between both approaches irrespective of the age and most caudal position of the testes along the path of descent. The secondary objectives were to compare the duration of operation, rate of testicular retraction and wound complications between single incision and conventional orchidopexy

Subjects and methods

This was a prospective study of children ≤ 15 years with palpable undescended testes conducted between July 2015 and December 2016. The study was approved by the ethics and research committee of the hospital. The details of the operation and the sort of incision to be used in each instance were discussed with the parents and an informed consent was obtained. The inclusion criteria consisted of children with palpable undescended testes between ages 1 year to 15 years, and children whose parents gave consent to participate in the study. All cases with previous groin surgeries, retractile testes, ectopic testes and those receiving surgeries for other pathologies were excluded. The age, side(s) involved, duration of operation,

cosmetic appearance of scar and position of the testes 6 months after surgery were recorded into a proforma. The sample size of 60 patients was estimated based on the incidence of undescended testes in a previous study [7] and considering attrition rate of 25%. Sixty closed envelopes, each containing a small piece of paper which was marked conventional or high scrotal orchidopexy of equal number, were used to divide the patients into 2 study groups by simple balloting (closed envelope technique) at the reception of day case theatre. The technique of the single incision approach was as documented in our previous study [8]. Patients were examined on two occasions, firstly, during preoperative clinic visit, and secondly, during induction of anaesthesia to ensure that they were not retractile testes. No antibiotics were given pre- or post-operative. All procedures were performed by one surgeon and as day case surgery. Oral paracetamol 15 mg/kg was given post-operatively to all patients. Patients were seen at 4 days, 14 days, and 30 days post-operative for wound revision for presence or absence of wound infection, scrotal edema and haematoma, and subsequently 3–6 months after surgery. During each visit, the testicular positions were recorded. Testicular volume (size) was measured at baseline by using ultrasound (Mindray DC 7 ultrasound machine with 7.5 MHz high frequency linear probe) and repeated also at six month to determine those with testicular hypotrophy. We also examined the patients for possible post-operative hernia. For the purpose of this study, we define hypotrophy as decrease in testicular volume 6 months after surgery. We also define children <9 years as young children and those ≥ 9 years as relatively older children. Furthermore we define palpable undescended testes located at the external ring and suprascrotal region as distal inguinal testes. Lastly, success was defined based on successful placement of the testes into the scrotum at operation, no testicular hypotrophy, and no retraction at 6 months of follow up.

Data collected were analyzed using Microsoft excel and Statistical Package for Social Scientists version 17 for windows (SPSS Inc. Illinois, Chicago, USA). The data were summarized using means and standard deviation (SD) for continuous variables and frequencies for categorical variables. Inferential statistics with Chi Square test was used to establish association with p value less than 0.05 considered as statistically significant.

Results

Of the 60 patients with 69 testes that were enrolled, only 52 children with 59 testicular units completed the study. There were 26 children with 28 testes in the conventional group while there were 26 children with 31 testes in the high scrotal group. Their ages ranged from 1 year to 13 years with a mean age of 6.46 ± 3.5 years. The mean age of children in the conventional group was 6.1 ± 3.6 years while the mean age of children in the high scrotal group was 6.8 ± 3.4 years. The difference was not statistically

Table 1 Pre- and post-operative characteristics of patients.

Variables	High scrotal orchidopexy (N = 31)	Conventional orchidopexy (N = 28)	p Value
Mean duration of operation in minutes	34.3 ± 10.8 min	39.9 ± 10.6 min	0.04
Age group in years			0.424
1–8	17 (54.8%)	19 (67.9%)	
9–15	14 (45.2%)	9 (32.1%)	
Most caudal position			1.000
Suprascrotal	8 (25.8%)	7 (25.0%)	
External ring	16 (51.6%)	14 (50.0%)	
Inguinal canal	7 (22.6%)	7 (25.0%)	
Mean length of vas gained	4.29 ± 1.00 cm	4.36 ± 1.2 cm	0.813
Wound infection	–	–	
Scrotal edema	–	–	
Scrotal haematoma	–	–	
Testicular atrophy	1 (3.2%)	1 (3.6%)	1.000

significant, $p > 0.05$. The age groups were well matched between both study groups, $p > 0.05$ as shown in Table 1. The most caudal position of the testes was well matched between both groups, $p > 0.05$ (Table 1). Most (76.3%) of the testes were distal to inguinal canal, (Table 1). Pre-operative clinical examinations revealed associated inguinal hernia in 29% of the undescended testes; however, at surgery all patients in both groups were found to have patent processus vaginalis. The operative time ranged from 19 min to 60 min with a mean of 34.3 ± 10.1 min in the high scrotal group while in the conventional group, the operative time ranged from 21 min to 56 min with a mean of 39.9 ± 10.6 min. The difference was statistically significant, $p < 0.05$ (Table 1). However, when the mean durations of operation between the relatively young, 1 year to 8 years (32.7 ± 7.2 min) and older 9 years to 13 years (36.2 ± 12.8 min) children within the high scrotal group were compared, the difference did not attain statistical significance, $p = 0.34$. Similarly, we observed no statistically significant difference, $p = 0.192$ in the operation time between testes located in proximal position, inguinal and those distal to inguinal canal among patients in the high scrotal group.

All testicles were successfully placed into the sub-dartos pouch in both groups. There was no conversion from the high scrotal to traditional approach among the high scrotal single incision orchidopexy. The age of patients and most caudal position of the testes had no influence on mobilization and fixation of the testes into the sub-dartos pouch during surgery.

The rate of testicular retraction was 9.6% (N = 3) and 7.1% (N = 2) in the single incision and conventional groups respectively. The difference did not attain statistical significant difference, $p > 0.05$ (Table 2). All wounds healed satisfactorily without surgical site infection. Similarly we recorded no cases with scrotal edema and haematoma. Testicular atrophy occurred in 3.6% (N = 1) of the conventional group compared to 3.2% (N = 1) of the high scrotal group, $p = 1.000$. The overall rate of testicular hypotrophy was 3.4%. We had no case of post-operative inguinal hernia in both groups.

The cosmetic appearance of most scars (90.3%, N = 28) was well hidden within the scrotal rugae in the high scrotal incision compared to 14.3% (N = 4) in the conventional groin incision orchidopexy. There was statistically significant difference, $p = 0.001$. The mean follow up period was 8.6 ± 3.3 months with a range of 6 months to 18 months.

Discussion

This study found that all palpable undescended testes were successfully placed in a dependent position within the scrotum in both techniques irrespective of the age and testicular position without the need for conversion of those in the high scrotal group to conventional method and the operative time was shorter in the single incision orchidopexy. The post-operative complications between both techniques were comparable. Most surgeons are accustomed to the conventional transverse groin crease incision technique of managing undescended testes in children and may be hesitant to alter their practice despite the fact that majority of undescended testes are palpable and distal to inguinal canal where they can easily be accessed through high scrotal incision [6]. The conventional technique of managing undescended testes requires making two incisions; a groin incision to identify, dissect and mobilize the testes, and scrotal incision to fix the testes in the sub-dartos pouch. The approach emphasizes the need for retroperitoneal dissection and mobilization of highly placed undescended testes so as to allow tension free placement into the scrotum. Some authors believe that the approach is associated with more tissue disruption leading to more discomfort and more post-operative pain. Single incision orchidopexy is associated with less pain, suitable for day case surgery with excellent cosmetic appearance of scar. This technique has also been used to treat inguinal hernias and hydrocele in children with excellent outcome [1,3,4,8,9].

Previous reports [4,6] have documented that the older the patient, the higher the failure rate of high scrotal orchidopexy in terms of successful placement of the testis in a dependent position in the scrotum. Docimo [5] in a meta-analysis of 64 articles pertaining to 3425 undescended testes documented that in studies in which the average age of patients at surgery was less than 6 years, especially when the testes were distal to inguinal canal, there was a higher success rate in terms of successful placement of the testes in the scrotum compared to older children with proximal testes. It is believed that palpable testes located in high position in the inguinal canal and deep ring may be difficult to place in a dependent position in the scrotum. In the current study, despite the fact that the mean age of patients in both groups were more than 6 years of age and 24% of testes were in proximal position, the testes in both groups were successfully placed in the scrotum during surgery without tension after division and ligation of processus vaginalis. The import from our findings is that age and testicular position does not affect successful placement

Table 2 Comparison of testicular retraction based on age and pre-operative location of testes in both groups.

Testicular retraction	High scrotal orchidopexy (N = 31)	Conventional orchidopexy (N = 28)	p Value
1–8 years			0.472
No	18 (94.1%)	19 (100.0%)	
Yes	1 (5.9%)	0 (0.0%)	
9–15			
No	12 (85.7%)	7 (77.8%)	
Yes	2 (14.3)	2 (22.2%)	
Distal to inguinal			1.000
No	24 (100.0%)	21 (100.0%)	
Yes	0 (0.0%)	0 (0.0%)	
Inguinal canal			
No	4 (57.1%)	5 (71.4%)	
Yes	3 (42.9%)	2 (28.6%)	

of the testes in the scrotum and that single incision orchidopexy can serve as a suitable alternative to conventional approach in palpable undescended.

Gordon et al. [10] in a meta-analysis observed that the rate of conversion from high scrotal single incision orchidopexy to conventional groin incision ranges from 0% to 14% with a mean of 4.4%. In the present series, conversion rate from single incision to conventional approach was 0% which was consistent with some studies [3,9] concluding that the single incision orchidopexy is safe and effective alternative to the standard inguinal approach in cases of palpable undescended testes. However, Na et al. [11], Ramzan et al. [12] and Eltayeb [13] reported conversion rates of 6.2%, 7.4% and 8.65 respectively from single incision to conventional method.

We did not find it difficult to perform high ligation of the processus vaginalis and or hernia sac when operating from below due to the relative mobility of the groin skin in children in contradistinction to the observation of Dayanc et al. [14] in their series. However, Lais and Ferro [15] showed that high ligation of the sac via scrotal incision could lead to more complications. Handa et al. [3] observed that there is no increased risk of inguinal hernia without ligation of the processus vaginalis and it is equally simple, safe and effective

The main advantage of single incision orchidopexy over conventional approach as noted in some studies is avoiding an extra incision and less operative time [11,16,17]. In contrast, Lais and Ferro [15] observed that dissection of the processus vaginalis from the cord below the external ring through scrotal single incision was time consuming, require more skill, and could lead to more complications. The mean duration of surgery in our series was significantly shorter for the single incision approach, 34.3 ± 10.8 min compared with 39.9 ± 10.6 min for conventional approach. A comparable study conducted by Ramzan et al. [12] found a mean operative time of 28.32 ± 10 min for single incision orchidopexy and 47.83 ± 12 min for conventional with a $p < 0.05$. Similarly, Cloutier et al. [18] showed a mean \pm SD for single incision to be 28 ± 10 min and 37 ± 12 min for convention two-incision orchidopexy. A shorter operation time of 18 min for single incision and 25 min for conventional orchidopexy had been described by Eltayeb in Egypt [13]. We believe that the single incision orchidopexy provides direct access to most palpable testes especially those lying distal to inguinal canal. This observation couple with the fact that there is no need for extra incision and retroperitoneal dissection, single scrotal skin incision orchidopexy is a faster approach compared to standard

two-incision orchidopexy. Another important point that should be considered is the operative time between the young and relatively older children who underwent high scrotal orchidopexy. Rajimwale et al. [4] as well as Gockora et al. [6] postulated that the operative time during high scrotal method increases with increasing age of patients at surgery. In our current series we observed no statistical significant difference in the operative time between young children, < 9 years (32.7 ± 7.2 min), and those relatively older, ≥ 9 years (36.2 ± 12.8 min) among this group of patients, $p > 0.05$.

Dayanc et al. [19] compared the duration of operation among children whose testes were in the inguinal canal with those whose testes were distal to inguinal canal using high scrotal incision and found no difference. We observed similar results among this group of children.

Wound complications following orchidopexy are rare. In our current study, all wounds healed satisfactorily without infection as noted by Bianchi and Squire [1] as well as Na et al. [11]. Ramzan et al. [12] observed wound infection in 1.4% of single incision compared to 4.4% in the conventional group. Gokcora et al. [8] in a comparative study using both approaches for inguinal and scrotal abnormalities in boys recorded wound infection rate of 0.4% in the single incision group and 2.52% in the conventional group. Similarly, we observed no scrotal edema and haematoma in both approaches in our study. Some studies witnessed transient scrotal haematoma which subsided spontaneously after few days in single approach and none following conventional approach [9,18]. Ramzan et al. [12] however, observed a higher rate of scrotal haematoma in conventional method (4.4%) compared to single incision (2.2%), though the difference was not significant. We believe that with meticulous dissection, proper identification of tissue planes and adequate haemostasis, some of these complications can be minimized.

Testicular retraction is a well-recognized complication of orchidopexy. Khirallah et al. [20] noted that the rate of retraction ranged from 1.2 to 8.4%. During our follow up of cases at six to eighteen months, (mean \pm SD, 8.6 ± 3.3 months), 9.7% of the testes had retracted out of the scrotum after single incision compared to 7.1% following conventional method. This finding is higher than a study carried out by Ramzan et al. [12] that reported 2.2% for single incision and 1.4% for conventional method. Another study from Korea Democratic Republic [11] found no testicular retraction in their series. In our present series, we attribute the high retraction rate to technical errors (loose ligature after fixation of the testes).

Testicular hypotrophy or atrophy may accompany orchidopexy. In our series, the rate of testicular hypotrophy was 3.2% and 3.6% for high scrotal and conventional techniques respectively. Eltayeb [13] in his study found testicular hypotrophy rate of 2.4% for single incision and 0% rate for conventional approach. Na et al. [11] also observed no cases of hypotrophy using single incision and conventional orchidopexy. Zouari et al. [21] reported no hypotrophy among patients that underwent single approach in their study. Other studies in the past [22,23] have also shown that atrophic testes can readily be identified via single scrotal incision, thus recommending the scrotal incision as the initial incision, and in these cases obviating the need for the conventional incision

Novaes et al. [24] in a systematic review reported that the incidence of post-operative inguinal hernia following orchidopexy was low. Al-Madil et al. [25] in their series reported recurrent rate of 3% using single incision and 0% with standard orchidopexy. Handa et al. [3] and Dayanc et al. [19] reported I recurrence each using single approach. Gokcora et al. [6] and Eltayeb [13] in a comparative study observed no cases of recurrent inguinal hernia in both approaches. We also noted no incidence of recurrent hernia in both techniques in our series which implies that high ligation of the associated processus vaginalis can be safely achieved through single incision technique.

The overall success rate for high scrotal incision orchidopexy was 87.1% (27/31) and this was almost similar to 89.3% (25/28) for the conventional orchidopexy.

In conclusion, the increasing age of patients and location of palpable undescended testes had no influence on successful placement of the testes into the scrotum es via both techniques. The operative time is however shorter in single incision compared to conventional approach. The post-operative complications are comparable.

Conflict of interest

The authors have no conflict of interest to declare.

Ethical committee approval

The Ethics and Research Committee of our institution gave approval to conduct the study.

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Authors' contribution

AOT: Concept, design, literature search, clinical studies, experimental studies, data acquisition, data analysis, manuscript preparation, manuscript editing, manuscript review.

OAT: Concept, design, clinical studies, experimental studies, data acquisition, data analysis, manuscript preparation, manuscript editing, manuscript review.

OA: Concept, design, clinical studies, experimental studies, manuscript editing, manuscript review.

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