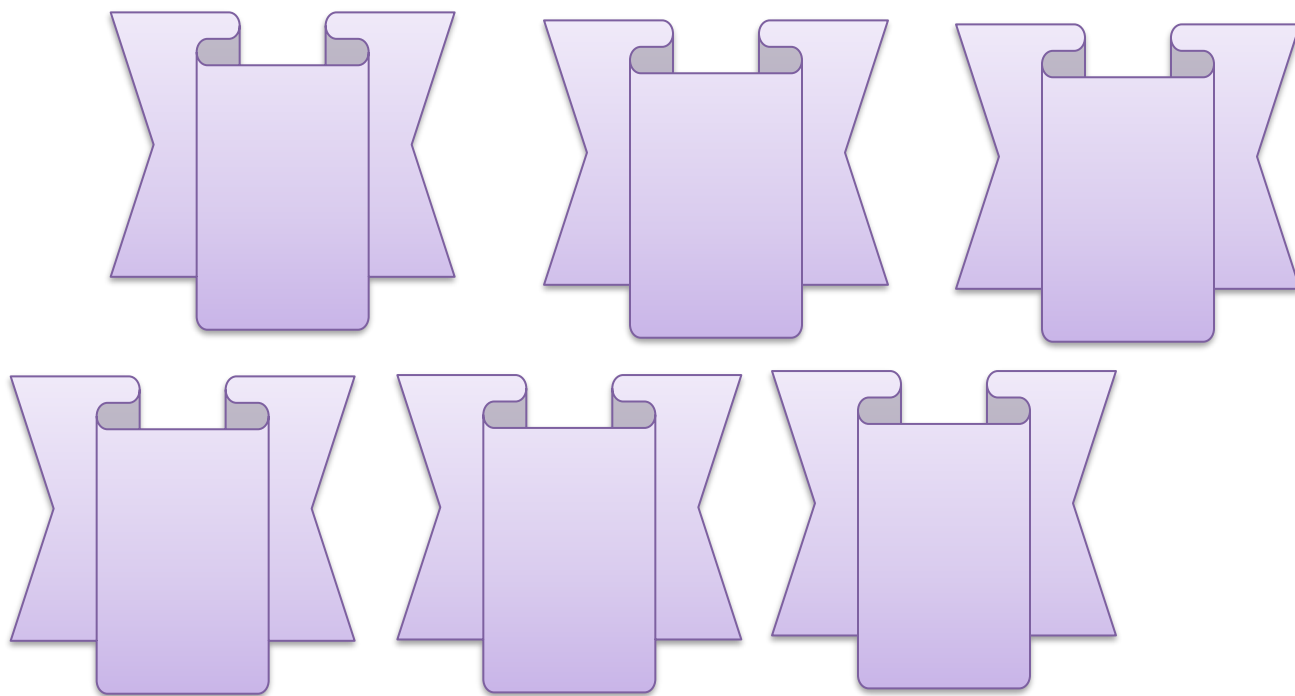


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Original Article

A Comparative Study between Single Scrotal Incision Orchiopexy and Traditional Inguinal Approach in Treatment of Children with Palpable Low-Lying Undescended Testis

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ABSTRACT

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Background: The management of undescended testis encompasses both endocrine therapy and surgical intervention. Nevertheless, the efficacy of endocrine therapy is imprecise and linked with unfavorable outcomes. Consequently, surgical intervention remains the favored approach for addressing cases of undescended testis.

Aim of the work: We aimed to compare the outcomes of single scrotal incision orchiopexy versus the traditional inguinal approach in the treatment of children suffering from the palpable low-lying undescended testis [PUDT].

Patients and Methods: This is a prospective randomized controlled comparative study that included 40 patients presented with palpable low-lying undescended testis to the pediatric surgery outpatient clinic and admitted to the pediatric surgery unit at the general surgery department of Al-Azhar University Hospitals, Assiut. Patients were randomly divided into 2 equal groups 20 patients each: Group 1: underwent the traditional inguinal approach for orchiopexy. Group 2: underwent single scrotal incision orchiopexy.

Results: As regards the operative time, we found that the mean operative time was higher in group 1 than in group 2 [30.5, and 22 minutes respectively], with a statistically significant difference between the two groups [P value = 0.001]. As regards the postoperative complications, we found that five patients [25%] in group 1 developed complications which is higher than that of group 2 in which the total reported complications were in 3 [15%] patients. In terms of Wound infections and dehiscence, they were the most common postoperative complication in our study which represent 45% of the total reported complications. We reported four cases in the traditional inguinal approach orchiopexy group and 2 cases in the single scrotal incision orchiopexy group.

Conclusion: As a less invasive surgical option for PUDT, single scrotal incision orchiopexy is safe, effective, promising, and potentially successful.

Keywords: Testis; Orchiopexy; Single scrotal incision; Undescended testis



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INTRODUCTION

Cryptorchidism, also known as undescended testis, is a prevalent congenital anomaly of the genitourinary system in young males. It affects approximately 1-2% of boys at the age of 1 year, with unilateral presentation observed in about 90% of cases and bilateral presentation in about 10% [1, 2].

While the exact etiology of undescended testicle remains uncertain, certain risk factors have been identified, including the conditions under consideration include gonadotropin stimulation failure, administration of estrogen during pregnancy, gubernaculum disorder, insufficient stimulation of testicular descent by the genitofemoral nerve, epididymal anomalies, and abnormalities of the abdominal wall [3].

The management of undescended testis encompasses both endocrine therapy and surgical intervention. Nevertheless, the efficacy of endocrine therapy is imprecise and linked with unfavorable outcomes. Consequently, surgical intervention remains the favored approach for addressing cases of undescended testis [4].

The first recorded successful orchiopexy was performed in 1877 by Thomas Annandale and published in 1879 [5]. The basic principles of conventional surgical treatment for undescended testes were established during the 19th century by Schuller [6] and Bevan [7].

The trans-scrotal approach has demonstrated efficacy in the treatment of primary and secondary cases of undescended testis and communicating hydroceles. Surgeons generally agree that, in carefully chosen circumstances, it is possible and safe to perform testicular descent and fixation via a scrotal stria incision to treat children with visible undescended testis [8].

Surgical site infection, swelling of the scrotum, hematoma formation, and suture dehiscence are all early consequences of surgical treatment for undescended testes. Testicular reascent and atrophy are the most common long-term problems among undescended testes [9]. Therefore, long-term follow-up, even up to puberty is recommended [10].

In the present study, we compared the effectiveness of a single scrotal incision versus a standard inguinal approach for orchiopexy in patients with low palpable undescended testis.

PATIENTS AND METHODS

Study population

This is a prospective randomized controlled comparative study that included 40 patients presented with palpable low-lying undescended testis to the pediatric surgery outpatient clinic and admitted to the pediatric surgery unit at the general surgery department of Al-Azhar University Hospitals – Assiut. Patients were randomly divided into 2 equal groups 20 patients each: GROUP 1: underwent the traditional inguinal approach for orchiopexy. GROUP 2: underwent single scrotal incision orchiopexy. Patients were operated upon from April 2022 to December 2022. Written informed consent was obtained from the father or the mother of the patients. Our study followed Helsinki's declaration principles. We recruited the patients according to the following criteria.

The Inclusion criteria: 1] Children aged from 6 months to 4 years. 2] Children with unilateral palpable low-lying testis [low inguinal testis and testis distal to the external inguinal ring].

The Exclusion criteria: 1] Children younger than 6 months and older than 4 years old. 2] Children with intra-abdominal and impalpable undescended testis. 3] Children with high inguinal and peeping testis. 4] Children with small-sized testis compared with age. 5] Children with ipsilateral clinically significant inguinal hernia. 6] Children with bilateral undescended testis. 7] Children with previous groin operations. 8] Children with recurrent undescended testis. 9] Children with undescended testis related to disorders of sex development or ambiguous genitalia, primary or secondary hypogonadism, and known hormonal disorders. 10] Children with retractile testis. 11] Children who are not fit for surgery.

Data collection

Complete medical history, physical examinations, and routine laboratory investigations were done for each patient during the enrollment. Inguinoscrotal U.S. and Duplex were ordered for all patients to assess the exact site, size, and vascularity of the testis. The two groups are compared for operative time, early and late postoperative complications, and recurrence rate.

Surgical procedure

Traditional inguinal orchiopexy

Twenty patients were operated on with the same surgical technique of orchiopexy through the traditional inguinal incision. Under general anesthesia, a 1.5-2 cm skin incision was made along the lower abdominal skin crease. The medial end of the incision is level with the pubic tubercle, while the lateral end is at the mid-inguinal point.

The incision was deepened by opening the subcutaneous tissue, Camper's and Scarpa's fascia with diathermy. Coagulation and division of the superficial epigastric vein were done if it was seen running in the subcutaneous tissue. After opening the Scarpa's fascia, the fibers of external oblique aponeurosis were identified and cleared. The external inguinal ring was identified. The incision was made in the external oblique aponeurosis and extended to the external ring using scissors or diathermy. The testis and spermatic cord were freed from their attachments with the external oblique aponeurosis and delivered out through the wound. The abnormal gubernacular attachments were identified and divided using diathermy with special care not to injure any cord structures, especially the vas deferens which may be looping below the lower pole of the testis. The testis and the cord were grasped and released from their posterior and lateral attachments.

Dissection and separation of the patent processus vaginalis or the from the vas deferens and the vessels was done carefully followed by ligation and cutting of the sac. A finger was

introduced through the incision down to the scrotum. A transverse incision was made in the scrotal skin and a subdartos pouch was created using scissors or fine artery forceps. Artery forceps were introduced through the scrotal incision towards the inguinal incision guided by the finger. The gubernaculum was grasped by the artery and pulled down with the testis through the scrotal incision with special care not to twist the cord structures. The testis was placed into the previously made subdartos pouch. The external oblique aponeurosis was closed anterior to the cord structures using Vicryl 4/0. The subcutaneous tissue was closed by interrupted sutures using vicryl 4/0. The skin of the inguinal incision was closed by subcuticular sutures using vicryl 4/0. The skin of the scrotal incision was closed using vicryl 4/0.

Single scrotal incision orchiopexy

Twenty patients were operated on with the same surgical technique of orchiopexy through the single scrotal incision. Under general anesthesia, a 1-1.5 cm transverse incision was made in the upper scrotum. Creation of the dartos pouch was done. The testis was brought down to the scrotum by the assistant and the incision was deepened through the layers of the scrotum till the testis was reached. Release of the gubernacular attachments was done. Dissection and separation of the cremasteric fibers from the cord were done. Dissection and separation of the PPV from cord structures were done [figure 1]. Traction on the sac till reaching its origin was done. Placement of the testis in the previously made subdartos pouch was done. Closure of the skin was done using 4/0 vicryl sutures [figure 2].



Figure [1]: Ligation of PPV in single scrotal incision technique



Figure [2]: Closure of the wound in single scrotal incision technique

Follow up

Patients were monitored in a recovery room for about 2 hours. Systematic analgesia as non-steroidal anti-inflammatory drugs was described. Intake of fluids was resumed 2 hours after the operation and a normal diet was allowed in the evening. Patient discharge to home was allowed 2 hours after surgery.

All patients were evaluated at one week, one month, and 3 months at an outpatient clinic. Inguinoscrotal US was done 3 months after the operation.

Statistical analysis

Data were analyzed using IBM SPSS software package version 26.0. [Armonk, NY: IBM Corp]. Qualitative data were described using numbers and percent and were compared using the Chi-square or Fisher Exact test. The Shapiro-Wilk test was used to verify the normality of the distribution of Quantitative data that were described using mean \pm standard deviation, median and interquartile range [IQR], and was compared using the independent t-test. The significance of the obtained results was considered at a P value < 0.05 .

RESULTS

Our study included 40 patients with undescended testis divided into two groups [20 patients in each group]. Table [1] shows the demographic characteristics of the studied patients. The mean age of the patients was 1.7 years in group 1 and 1.9 years in group 2 with no statistically significant difference between the two groups [P value = 0.4]. As regards the site of undescended testis, 60% of the patients in group 1, and 55% of the patients in group 2 had undescended testis on the right side, with no significant difference between the 2 groups.

As regards the operative time, we found that the mean operative time was higher in group 1 than in group 2 [30.5, and 22 minutes respectively], with a statistically significant difference between the two groups [P value = 0.001].

As regards the postoperative complications, we found that Five patients [25%] in group 1 developed complications which is higher than that of group 2 in which the total reported complications were in 3 [15%] patients.

In terms of Wound infections and dehiscence, they were the most common postoperative complication in our study which represent 45% of the total reported complications. We reported four cases in the traditional inguinal approach orchiopexy group and 2 cases in the single scrotal incision orchiopexy group.

The second most complication in our study was a scrotal hematoma, which represents 27.2% of the total reported complications. Scrotal hematoma was higher in the traditional incision group [2 cases] than in the scrotal incision group [one case], however, this difference is not significant statistically [P value = 1].

In terms of testicular atrophy, we reported only one case in the traditional incision group without any cases in the scrotal group. As regards the testicular reascent, we reported only one case in the scrotal incision group without any cases in the traditional groups, however, this difference between the 2 groups was not significant statistically [Table 2].

Spearman's correlation analysis showed no statistically significant negative correlation between the operative time of the studied patients and the occurrence of complications [P value > 0.05] [table 3].

Table [1]: Baseline characteristics of the studied patients.

Variables	Group 1 [n = 20]	Group 2 [n = 20]	P value
Age [years]			
Mean \pm SD	1.7 \pm 1.1	1.9 \pm 0.9	0.4^a
Median and IQR	1.3 [0.7 – 2.5]	2 [1.1 – 2.4]	
Age [Months]			
Mean \pm SD	20.8 \pm 13.7	23.7 \pm 11.8	1^b
Median and range	16 [9 – 31]	24 [13.7 – 29.5]	
Site. N [%]			
Right	12 [60%]	11 [55%]	1^b
Left	8 [40%]	9 [45%]	

a: Independent t-test. **b:** Chi square test. **IQR:** Inter Quartile Range

Table [2]: Operative and postoperative complications of the studied groups.

Variables	Group 1 [n = 20]	Group 2 [n = 20]	P value
Operative time [minutes]			
Mean \pm SD	30.5 \pm 3.4	22 \pm 2.5	0.001^a*
Median and IQR	29.4 [27.8 – 33.8]	21.7 [19.9 – 24]	
Complications, n [%]			
Scrotal hematoma	2 [10%]	1 [5%]	1^b
Wound infection	3 [15%]	2 [10%]	1^b
Wound dehiscence	1 [5%]	0 [0%]	1^b
Testicular hypotrophy	1 [5%]	0 [0%]	1^b
Testicular re-ascent	0 [0%]	1 [5%]	1^b

a: Independent t test. *: Significant P value. b: Fisher exact test. IQR: Inter Quartile Range

Table [3]: Spearman's correlation analysis between the operative time of the studied patients and the occurrence of the complications.

Complications	Group 1		Group 2	
	Correlation Coefficient	P value	Correlation Coefficient	P value
Scrotal hematoma	0.3	0.1	0.2	0.2
Wound infection	0.1	0.5	0.1	0.5
Wound dehiscence	0.04	0.8	-	-
Testicular hypotrophy	-0.3	0.1	-	-
Testicular re-ascent	-	-	0.2	0.2

DISCUSSION

In our study, the mean age of the included patients was 1.7 years in group 1 and 1.9 in group 2, which agree with the results of previous studies [11-13]. However, disagree with **Al-Mandil et al.** [14], who found that the mean age of patients was older than 4 years. The high incidence of reparative procedures in older patients can be attributed to various factors such as the failure of early detection of undescended testis, delayed referral from the primary care provider to a surgeon, or the inclusion of patients with ascending testes.

As regards the operative time, we found that the duration of surgery is shorter in group 2 [single scrotal incision] than in group 1 [Classic method] [22, and 30.5 minutes respectively], which agrees with **Al-Mandil et al.** [14], and disagree with **Badbarin et al.** [15], who found that the classic method had a lower surgical duration.

Ben Dhaou et al. [16] has reported a mean \pm SD operative time of 21.7 \pm 10.2 minutes for the Scrotal incision group and 32 \pm 9 for the traditional incision group. **Takahashi et al.** [17], reported a mean operative time for the scrotal incision group of 45.2 minutes and the traditional group of 66.6 minutes. **McGrath et al.** [18] found that the mean operative time in the scrotal incision group was 30.6 minutes which was shorter than that of the traditional incision group, which was 34.5 minutes. Also, **Chen et al.** [19],

reported a mean operative time of 32 minutes for the scrotal incision group and 46 minutes for the traditional incision group. All the above studies are in line with our findings regarding the operative time of both groups.

As regards the postoperative complications, we found that five patients [25%] in group 1 developed complications which is higher than that of group 2 in which the total reported complications were in three patients [20%]. In terms of wound infections and dehiscence, it was the most common postoperative complication in our study which represent 45% of the total reported complications. We reported four cases in the traditional inguinal approach orchiopepy group and 2 cases in the single scrotal incision orchiopepy group, which were the same results that were reported by **Lee et al.** [20].

In **Al-Mandil et al.** [14], and **McGrath et al.** [18], reported one case of Wound infections and dehiscence in each study group. **Ben Dhaou et al.** [16], and **Cloutier et al.** [21], didn't report any case of wound infection or dehiscence in the scrotal incision group, however in the traditional incision group, **Ben Dhaou et al.** [16] reported one case, and **Cloutier et al.** [21] reported 2 cases. Other studies [17, 19, 22] didn't report any case of wound infection or dehiscence in both groups.

The second most complication in our study was a scrotal hematoma, which represents 27.2% of the total reported complications. Unlike the previous literature, scrotal hematoma in our

study was higher in the traditional incision group [2 cases] than in the scrotal incision group [one case], however, this difference is not significant statistically [P value = 1]. Most of the previous studies that compared the traditional inguinal approach orchiopexy and the single scrotal incision orchiopexy reported higher rates of scrotal hematoma in the scrotal incision group than in the traditional incision groups [23, 24].

Single scrotal incision orchiopexy is associated with a higher risk of scrotal bleeding than alternative surgical approaches because the incision made to access the scrotum is larger, try. The surgery lasts longer, and the traction applied to the scrotum is more intense. A significant contributor to postoperative scrotal hematomas is incomplete hemostasis of the scrotal wound after surgery. Therefore, scrotal hematomas can be effectively prevented with the use of a moderate method during the procedure, meticulous hemostasis, and mild pressure bandaging following the operation [24].

Even though hematomas in the scrotum are widespread, they are usually not serious and don't need special treatment. The scrotal hematomas of the 38 cases in the present study disappeared by 1–2 weeks after the operation without treatment. We found one study done by **Ben Dhaou et al.** [16], that reported a higher incidence of scrotal hematoma in the traditional incision group [8 cases] than in the scrotal incision group [4 cases], which is in line with our findings. This higher incidence of scrotal hematoma in the traditional incision group in **Ben Dhaou et al.** [16] may be due to the difference in sample size between the 2 groups in their study as they included 80 patients in the traditional group and 89 patients in the scrotal group.

In terms of testicular atrophy, we reported only one case in the traditional incision group without any cases in the scrotal group. This is in line with several studies [14-16, 21]. However, this disagrees with **Nazem et al.** [11], who reported 5 cases of testicular atrophy in the scrotal incision group and 4 cases in the traditional group. This disagreement may be explained by their larger sample size as they included 50 patients in each study group.

Regarding testicular re-ascent, we reported one case in the scrotal incision group without any cases in the traditional groups, however, this difference between the 2 groups was not significant statistically. This is in agreement with

Takahashi et al. [17], who reported one case in the scrotal incision group and no cases in the traditional incision group and agree with **McGrath et al.** [18], who reported three cases in the scrotal group without any cases in the traditional group, and also agree with **Cloutier et al.** [21], who reported 2 cases in the scrotal group and no cases in the traditional group.

Testicular retraction may manifest due to various factors. Initially, in cases where the spermatic cord remains partially connected, there is a significant amount of tension experienced when the testis is immobilized. Additionally, certain older children may exhibit elongated inguinal tubes, abbreviated spermatic cords, and inadequate scrotal development, resulting in incomplete testicular accommodation. Thirdly, postoperative local scar contraction may result in retraction of the testes. In the course of liberating the spermatic cord, there is a possibility that the interval between the dartos fascia of the scrotum and the external fascia of the spermatic cord may be excessively wide [18].

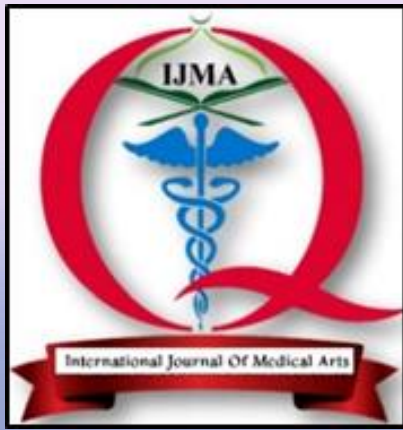
In conclusion, Single scrotal incision orchiopexy is a safe, effective, promising, and potentially minimally invasive surgical approach for PUOT.

Conflict of Interest and Financial Disclosure: None.

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