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# Laparoscopic Versus Open Orchiopexy for High-inguinal Palpable Undescended Testis in Children

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## Abstract

**Background:** Cryptorchidism, sometimes referred to as undescended testis, is the most common genitourinary disorder found in male children. Orchiopexy, a surgery used to treat undescended testicles, is considered fundamental and might be used utilizing either laparoscopic or open procedures.

**Aim:** To evaluate the efficacy and safety of laparoscopic versus open orchiopexy procedures for the treatment of high inguinal undescended testis in pediatric patients.

**Patients and methods:** In this randomized controlled trial, a total of 41 patients (46 Testes) admitted to the pediatric surgery department at Al-Hussein Hospital and Sayed Galal Hospital, Al-Azhar University, Egypt, presented with palpable undescended testis during the period from May 2022 to November 2022; divided into two groups; first group consisted of 21 (23 testes) patients who had laparoscopic orchiopexy, while second group consisted of 20 patients (23 testes) who underwent open inguinal orchiopexy.

**Results:** Laparoscopic surgery group had a success rate of 100%, while the open surgery group had a success rate of 97.8%. No statistically significant difference in success rates between the two groups, as shown by a *P* value of 0.5. Regarding the final position of the testis, lower position is the standard position, laparoscopic surgery was associated with 86.9% final lower positioning of the cases, while open surgery was associated with 69.5% final lower positioning of the cases, thus showing that there was statistically significant difference toward laparoscopic surgery regarding the final testicular position 'lower position', *P* value = 0.001.

**Conclusion:** Laparoscopic orchiopexy exhibits superior efficacy and a reduced incidence of complications when compared with open orchiopexy.

**Keywords:** Laparoscopic, Orchiopexy, Undescended testis

## 1. Introduction

Cryptorchidism, or undescended testis, is male children's most common genitourinary illness. The prevalence of undescended testicles in male neonates is 1%.<sup>1</sup>

Normal testicular descent to the scrotum occurs between the 25th and 35th weeks of gestation. At delivery, undescended testicles are seen in 1–4% of term infants and up to 45% of preterm children. By 90 days old enough, numerous undescended testicles spontaneously descend to the scrotum.

Testicular descent is possible following three months, particularly in premature babies. Around 1–2% of male children more than 6 months have an undescended testis after early post-natal descend. Undescended testicles are associated with infertility and increased cancer risk. Undescended testicles need laparoscopic or open orchiopexy (OO).<sup>2</sup>

Throughout the past 10 years, many articles have revealed that laparoscopic orchiopexy (LO) results in children with palpable undescended testicles. Recent studies revealed that LO is better than OO and might be suggested for the management of such

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cases. LO's main benefits are high retroperitoneal dissection and the modified Prentiss maneuver, which improves scrotal positioning by passing the testis medially to the inferior epigastric arteries.<sup>3</sup>

Perserving the inguinal canal anatomy and avoiding the inferior epigastric vessels division during dissection are among LO benefits. By dissecting the peritoneum over the testicular vessels up to the kidney's lower pole and the vas deferens to the urinary bladder, the spermatic cord length may be increased to drag the testis down to the scrotal bottom without strain. Magnification power permits cautious dissection to avoid injuring the vas deferens or testicular vessels during LO.<sup>4</sup>

Therefore; this study aims to evaluate the efficacy and safety of laparoscopic versus OO procedures for the treatment of high inguinal undescended testis in paediatric patients.

## 2. Patients and methods

In this randomized controlled trial, a total of 41 patients (46 testes) admitted to the pediatric surgery department at Al-Hussein Hospital and Sayed Galal Hospital, Al-Azhar University, Egypt, presented with high inguinal undescended testis during the period from May 2022 to May 2023; divided into two groups; first group consisted of 21 (23 testes) patients who had laparoscopic orchiopexy, while second group consisted of 20 patients (23 testes) who underwent open inguinal orchiopexy.

### 2.1. Patients criteria

Patients with high inguinal undescended testes were included, whereas those with impalpable undescended testis, older than 14 years, congenital abnormalities, and previous inguinal surgery were excluded.

### 2.2. Sample size

Epi-info 7.2 (CDC, 2018; Atlanta, GA, USA) to determine our sample size. With a  $P$  value of 0.05 and 90% power, an estimated 41 patients (46 testes) were needed to detect an effect size of 0.3 between the two groups (23 open and 23 laparoscopic). Patients eligible for laparoscopic or OO were randomized.

Method of Randomization was computerized based on randomization.

### 2.3. Surgical procedure

All supine individuals were sterilized and draped under endotracheal general anesthesia.

### 2.4. Laparoscopic orchiopexy

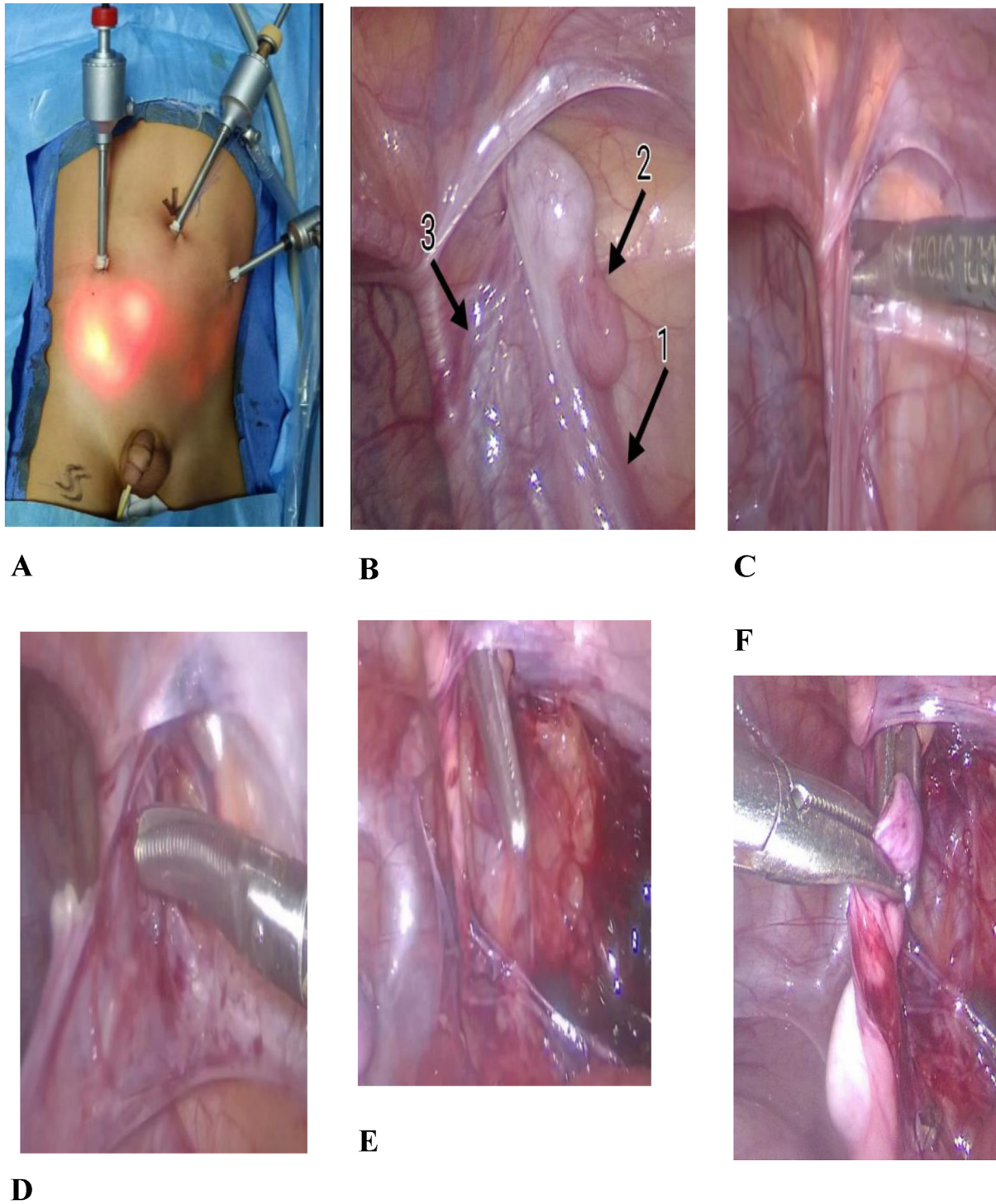
After emptying the bladder, the umbilicus was the laparoscope's initial port. Two umbilicus-side 5 mm or 3 mm instruments were inserted at the mid-clavicular line. After bringing the testis into the abdominal cavity, the peritoneum sidelong to the testicular vessels was dissected. A great care ought to be taken to avoid the injury of looped vas deferens during the gubernaculum dissection. The gubernaculum was dissected after incising the peritoneum lateral to the testicular vessels at the internal inguinal ring. Dissection of the peritoneum reached up to the kidney's lower pole. Peritoneum was dissected medially across the vas deferens to the urinary bladder. The spermatic cord lengthened, making the testis easy to be mobilized to the opposite internal ring. Forceps through a scrotal incision brought the testis medial to the inferior epigastric vessels (modified Prentiss maneuver). In the event that there was any tension on the spermatic cord, further dissection of the peritoneum anterior to the spermatic vessel would relief this tension. The skin was stitched utilizing absorbable thread (Fig. 1).

### 2.5. Open orchiopexy

Subcutaneous tissues and the inguinal canal were opened using a transverse inguinal incision. The testis was delivered, the gubernaculum was dissected. Release of any abnormal adhesions was done. The inguinal ring opened. Herniotomy was performed and the dissection continued proximally into the retroperitoneum to lengthen the testicular cord. The testis was fixed at a dartos pouch in the lower part of the ipsi-lateral hemiscrotum. The incisions were sutured anatomically.

### 2.6. Postoperative evaluation

Baseline data on age, palpable undescended testis side (unilateral or bilateral), testis volume, and vascularity before surgery. Both methods were evaluated for testis vascularity, volume, and location after surgery and follow-up. After surgery, we compared both operations' length, intraoperative events (bleeding, vascular damage, etc.), wound-related outcomes (edoema, hematoma, and discomfort), discharge, eating, and activity. Edoema, hematoma, infection, scar, and discomfort are wound-related outcomes throughout follow-up, as well comorbidities such testicular atrophy, reascent, and torsion. Testis site, volume, and vascularity before and after surgery using ultrasonography and doppler ultrasound.



*Fig. 1. (A) Port site; (B) Patent internal ring (1. Testicular vessels, 2. Epididymis and 3. Vas deferens); (C) Incision of the peritoneum near the testicular vessels at the internal ring; (D) Dissection of the gubernaculum. (E) Introduction of a forceps medial to the inferior epigastric vessels via a scrotal incision and (F) Passing the testis medial to the spermatic vessels (modified Prentiss maneuver).*

### 2.7. Follow-up

Patients were followed up for somewhere around a half year after medical procedure. Every patient have been seen on the fourth and seventh post-operative days, the 4, 8, and 12 weeks, and a half year after the activity.

### 2.8. Ethical consideration

The research protocol was approved by the ethical committee, Faculty of Medicine, Al-Azhar University, and the enrolled patients signed a written consent form.

### 2.9. Data management and analysis

STATA, version 9.2, was used for statistical analysis (Inter-cooled STATA, Texas, USA). The Mann–Whitney *U* test was used to analyze non-categorical data (values represented as median, inter-quartile range, or mean and standard deviation). Significant differences was *P* value less than 0.05; nonsignificant differences was *P* value greater than 0.05 and highly significant differences was *P* value less than 0.001.

## 3. Results

A total number of 41 patients were divided into two groups; 21 patients (23 testes) underwent LO and 20 patients (23 testes) underwent open orchiopepy. The mean age of them was 5.39 years ( $\pm 3.3$ ), ranged from 1 to 13 years. Regarding the age in both groups, we found that there was no statistically significant difference *P* value 0.9. The Side of undescended testis were represents 22 (48%) of left testes and 24 (52%) of right testes. Preoperative position were represents 36 (88%) patients were unilateral high inguinal testis and five (12%) patients were bilateral high inguinal testes (in total 10 testes) (Table 1). Regarding the operative time in both

Table 1. Demographic data and side of undescended testis.

Number of patients (Testes)	Group		<i>P</i> value
	Laparoscopic	Open	
	21 (23 testes)	20 (23 testes)	
Age			
Mean $\pm$ SD	5.39 $\pm$ 3.3		0.09
Min–max	1–13		
Side of undescended testis			
Left (Testes %)	22 (48%)		0.5
Right (Testes %)	24 (52%)		
Unilateral			
Patients (%)	36 (88%)		0.3
Bilateral			
Patients (%)	5 (12%)		

groups, we found that there was no statistically significant difference *P* value 0.9. While regarding the final position of testis, lower position is the standard position, we found that laparoscopic surgery was associated with 86.9% final lower positioning of the cases, while open surgery was associated with 69.5% final lower positioning of the cases, thus showed that there was statistically significant difference toward laparoscopic surgery regarding the final testicular position 'lower position', *P* value = 0.001. No statistically significant difference regarding success rates among both groups, since laparoscopic surgery was associated with 100% success rates, while open group was associated with 97.8% success rates, *P* value 0.5 (Table 2).

Regarding postoperative complications, no statistically significant difference in both groups (Table 3).

Regarding the relation between preoperative testicular volume and post operative testicular volume, between both arms (Table 4), no statistically significant difference regarding the testicular volume between both arms.

Table 2. Using Chi-square test, comparison between both groups regarding final testicular position and success rates.

	Group		Total	<i>P</i> value
	Laparoscopic ( <i>N</i> = 21) [n (%)]	Open ( <i>N</i> = 20) [n (%)]		
Final Testicular position (Lower position)				
No	3 (13.1)	7 (30.5)	10	0.001
Yes	20 (86.9)	16 (69.5)	36	
Success Rate				
No	0	1 (2.2)	1	0.5
Yes	23 (100)	22 (97.8)	45	
Total	23	23	46	

Table 3. Postoperative complications among both groups.

Complications	Laparoscopic	Open	<i>P</i> value
Edema			
No	22	19	0.1
Yes	1	4	
Testicular ascent			
No	23	20	0.07
Yes	0	3	
Recurrence			
No	23	22	0.3
Yes	0	1	
Inguinoscrotal Hematoma			
No hematoma	23	20	0.2
Grade One hematoma	0	1	
Grade two hematoma	0	2	
Testicular atrophy			
No	23	23	NAD
Infection			
No complications	22	21	0.6
Grade one infection	1	1	
Grade two infection	0	1	

Table 4. Preoperative and postoperative testicular volume among both groups.

	Laparoscopic	Open	P value
Preoperative testicular volume in ml	0.24 ± 0.016 ml	0.25 ± 0.17	0.278
Post operative testicular volume in ml	0.25 ± 0.016 ml	0.24 ± 0.15	0.062

Volume was measured by using duplex ultrasound; length X width X height X 0.052.

#### 4. Discussion

Laparoscopy was substantially more successful than OO since it had fewer instances that required reoperation as mentioned by Elderwy *et al.*<sup>5</sup>

It was reported that the results of primary laparoscopic orchiopexy for the treatment of high inguinal testicles were successful, with a success-rate of 100%.<sup>6</sup>

According to the findings of our research, laparoscopic surgery was related with a success rate of 100%, while the open group was associated with a success rate of 97.8%; nevertheless, there was no statistically significant difference between the two groups in terms of success rates value of  $P = 0.5$ .

Our study found that laparoscopic surgery was associated with 86.9% final lower positioning of the cases, whereas open surgery was associated with 69.5% final lower positioning of the cases. This demonstrated that there was a statistically significant difference in favour of laparoscopic surgery regarding the final testicular position 'lower position,' with a  $P$  value of 0.001 for the comparison. The lower position is the standard position for the UDT.

In a previous study; Mehendale *et al.*,<sup>7</sup> the superiority of testicular position results achieved with laparoscopic surgery may be attributed to a wide variety of factors. First, testicular dissection and full freeing of the arteries may be performed using laparoscopy, which has the advantage of less problems, particularly post-operative hematoma and intraoperative haemorrhage.

As mentioned before; Escarcega-Fujigaki *et al.*,<sup>8</sup> orchiopexy performed laparoscopically may also increase the length of the spermatic cord and put the testis closer to the button of the scrotum without causing any stress. On the other hand, while doing open surgery, it might be challenging to dissect the area of the retroperitoneum that is located near to the kidney's lower pole.

Moreover, Hutcheson *et al.*,<sup>9</sup> The benefit of laparoscopy becomes more apparent when dealing with testes located in higher positions. During laparoscopic surgery, extensive dissection may be

necessary in order to achieve a favourable testicular position.

Riquelme *et al.*,<sup>10</sup> performed laparoscopic surgery on 192 patients with palpable undescended testes (UDT) and found that it resulted in good results. Only two testicles had returned (0.4% of the total).

According to the findings of a research that was conducted by He *et al.*<sup>11</sup> There was just one difficulty that arose, and all of the testicles were properly positioned and of a sufficient size inside the scrotum. An higher likelihood of recurrence and testicular malposition is one of the drawbacks of open surgery. This is particularly true in older adolescents who have a greater distance between the proximal region of the inguinal canal and the scrotum.

Previous study Alam *et al.*,<sup>12</sup> observed that achieving a stable upper scrotal position constitutes a good result we can conclude that both of these groups have a very high rate of accomplishment. If the testis can be felt, any method is suitable for management.

Orchiopexy may be performed either laparoscopically or openly, however the results of the earlier research did not find any significant differences between the two approaches. Escarcega-Fujigaki *et al.*<sup>13</sup> conducted a study in which they compared the results of LO to OO on 75 palpable testicles and found that the outcomes were practically identical for both procedures.

Laparoscopic medical procedure is related with a lower chance of inconveniences contrasted with open a medical procedure. Yang *et al.*,<sup>14</sup> discovered that there were no Clavien–Dindo Grade III problems associated with laparoscopic surgery, but open surgery had two such issues.

As per previous study Ahmed *et al.*,<sup>15</sup> observed that; Both laparoscopic and OO were protected and powerful in fix of peeping and high inguinal undescended testis. In any case, LO was better than OO as it was related with improved results as respects last testicular situation at the lower part of the scrotum or low level beneath the mid-scrotal point and more limited clinic stay. It was additionally connected with non-essentially higher achievement rate.

According to the findings of our research, three patients who received OO acquired a hematoma of grade one or two in the arm, but the arms of patients who did not have OO did not develop hematoma.

In a previous prospective study by Daboos *et al.*,<sup>16</sup>; conducted to evaluate the safety and efficacy of LO for intracanalicular testis, included; 62 male kids with 70 intracanalicular (peeping) testicles, with age range from 8 months to four years (mean age: two years), saw that LO for the treatment of

(intracanalicular) undescended testicles is safe, effective, less invasive, without effect on inguinal canal anatomy, and with better cosmetic outcomes.

#### 4.1. Conclusion

As compared with open orchiopexy, LO achieved better successful rate and fewer incidence of complications. LO exhibits superior efficacy when compared with open orchiopexy.

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#### Conflicts of interest

There are no conflicts of interest.

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