ORIGINAL ARTICLE

# Single Stage Laparoscopic Orchiopexy for Impalpable Low Abdominal Undescended Testis in Children- Analysis of Outcome

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**ABSTRACT**

**Objective**: To evaluate clinical efficacy of single stage laparoscopic orchiopexy by modified Prentiss procedure for the treatment of impalpable undescended testis within 2.5 cm from deep ring in children.

**Study Design**: This was a retrospective case series study design.

**Place and Duration of Study**: Department of surgery, section of pediatric surgery. Northern Area Armed Forces Hospital Hafer Al Batin, Saudi Arabia, from June 15, 2011, to Sep 15, 2021.

**Materials and Methods**: All the children admitted with diagnosis of impalpable undescended testis were treated by single stage laparoscopic orchiopexy by modified Prentiss technique during the study period from June 15, 2011, till Sep 15, 2021. The total number of patients was 22. The age of the patients ranged from 1 year to 7 years. Seventeen (77.26 %) children had unilateral (10 with left sided and 7 with right sided) impalpable undescended testis. Five (22.72%) children had bilateral impalpable undescended testis. All the patients were evaluated by ultrasound and MRI abdomen to confirm the abdominal location. The patients were operated by single stage laparoscopic orchiopexy using modified Prentiss technique by single senior pediatric surgeon after confirming the location of testis within 2.5 cm from deep inguinal ring. All the patients were followed up in out-patient clinic after 1 week, after 6 months and after 1 year.

The operative time, degree of post- operative pain, per operative and post- operative complications and follow up results were analyzed to evaluate the clinical outcome in terms of testicular location in the scrotum and size.

**Results**: A total of 22 children were treated successfully by single stage laparoscopic orchiopexy by modified Prentiss technique. The age ranged from one year to 7 years at the time of surgery. Ten (45.45%) patients had left sided non-palpable testis, 7 (31.81%) had right sided and 5 (22.72%) children were having bilateral non palpable testis. There was no per-operative complication. One patient (4.54%) had scrotal hematoma which resolved spontaneously. All the children had successful outcome in terms of testicular size and location within scrotum after surgery on follow up of more than one year. There was no case (0%) of testicular atrophy in this series. Thirteen (59%) patients had testis in lowest position of scrotum, eight (36.36%) patients had testis in the middle scrotum and one (4.54%) patient had testis in the neck of the scrotum.

**Conclusion**: Single stage Laparoscopic orchiopexy by modified Prentiss procedure is feasible, safe and effective technique to treat children with impalpable low abdominal undescended testis in children.

**Key Words:** *Abdominal Testis, Complications, Impalpable Undescended Testis, Laparoscopic Orchiopexy, Single Stage, Testicular Atrophy*.

## Introduction

Undescended testis (UT) is an important condition that needs surgical treatment in children. The incidence of UT is about 1-4.6% in full term neonates and it is 20-30 % in premature neonates weighing less than 2.5 kilogram. [1]The problems with UT are reduction of potential of fertility, testicular malignancy and torsion in addition to psychological effects.[2] To avoid these complications, orchiopexy is recommended to treat UT not later than one year of age.[3]

Impalpable undescended testis (IUT) is classified as vanished testis, intra-canalicular testis or intraabdominal testis.[4] After exclusion of vanished testis various strategies are used to manage IUT.[5]

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Traditional inguinal exploration for IUT is limited and usually unsatisfactory.

Intra-abdominal high UT may be treated by single or two stage Fowler Stephen laparoscopic orchiopexy (LO) using Shehata technique.[6] Staged laparoscopic traction orchiopexy is another option to treat high intraabdominal testis.[7] Low intra-abdominal and intra-canalicular testis are treated by single stage LO either by laparoscopic trans-inguinal orchiopexy (LTIO) or by laparoscopic orchiopexy by modified Prentiss maneuver (LOMP).[8]

Prentiss et al in 1955 described the technique of retro-peritoneal dissection to mobilize testicular vessels and by dividing inferior epigastric vessels, fascia transversalis and lateral spermatic ligament to gain extra length to bring the testis within scrotum without any tension on testicular vessels.[9]

Later, Ayub et al described small incision in fascia transversalis above pubic tubercle avoiding division of inferior epigastric vessels.[10] Recently, laparoscopy and LO using LOMP procedure has become gold standard treatment of IUT.[11] Laparoscopy has made mobilization of testicular vessels and vas deference in abdominal cavity possible under direct vision.[12] Laparoscopy makes precise path of descent possible for testis medial to inferior epigastric vessels. Single stage LOMP is effective and safe method of treatment of abdominal testis within 2.5 cm of distance from deep ring. Retraction of testis or testicular atrophy are complications found on follow up of LOMP.

Our study was a retrospective analysis of 22 children with impalpable low abdominal undescended testis treated by single stage LOMP during the period from June 15, 2011, till Sept 15, 2021, to evaluate the clinical outcome in terms of testicular size and location within the scrotum.

## Materials and Methods

This was a retrospective study of 22 children diagnosed as impalpable testis located in abdomen within 2.5 cm from deep ring and treated successfully by single stage LOMP at Northern area Armed Forces Hospital, Saudi Arabia, during the period from June 15, 2011, till Sep 15, 2021. The electronic data was collected by the operating pediatric surgeon after getting permission from the hospital ethical committee.

All the patients were referred from primary health care center to pediatric surgery out- patient clinic with diagnosis of UT. The age ranged from 1 year to 7 years. Clinical examination was done to confirm the diagnosis of IUT and to exclude any associated congenital anomaly. Seventeen (77.27%) children (10 on left side and 7 on right side) had unilateral IUT and five (22.72%) children had bilateral IUT.

All the patients were evaluated by ultrasound abdomen and MRI abdomen to confirm the presence and abdominal location of testis. All the children were admitted one day prior to surgery through out-patient clinic for elective surgery. The surgery was performed under general anesthesia by single senior pediatric surgeon at Northern Area Armed Forces Hospital Hafer Al Batin, Saudi Arabia.

Laparoscopic evaluation was done to confirm the location of testis or exit of testicular vessels and vas through deep ring. Blind ending vas and vessels were found in cases of vanished testis within abdomen or on groin exploration.

The cases of the peeping testis, cryptorchidism associated with syndromes, patients with history of hormonal therapy and vanished testis were excluded from the study. All the patients were treated by single stage LOMP technique by descending the adequately mobilized testis through a path medial to inferior epigastric vessels to reach within scrotum. We have used a 2-point fixation with tunica albuginea of testis. We didn't close the deep ring in our patients.

All the patients were given prophylactic intravenous cefuroxime and were discharged home after 72 hours of surgery in good health. All children were followed up in out- patient clinic after 1 week, after 6 months and after 1 year. We used color Doppler evaluation on follow up after 6 months and after 1 year in all our patients to evaluate the blood flow and volume of the testis and found good blood flow and increase in volume of testis.

The hospital electronic data including operative time, per-operative and post- operative complications, post- operative pain and outcome of surgery with evaluation of scrotal location, testicular blood flow and volume of testis on follow up was analyzed by the operating pediatric surgeon to evaluate the efficacy and safety of LO.

The statistical analysis was done via SPSS version 21. Chi square test was applied to categorical variable


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(testis location in lowest art of scrotum vs testis location in middle/ neck of scrotum} with p-value 0.083.

Based upon our experience with limited number of patients, it is found that single stage LOMP has a better position of testis within scrotum. However more studies with a bigger number of patients are needed to analyze the clinical outcome.

## Results

A total of 22 children with IUT in abdomen within 2.5 cm from deep ring were treated successfully by single stage LOMP procedure. The age of the patients ranged from one year to 7 years at the time of surgery.

Ten (45.45%) patients had left sided IUT, 7 (31.81%) had right sided IUT and 5 (22.72%) children were having bilateral IUT. The abdominal presence and location of testis was confirmed at diagnostic laparoscopy. All the patients with vanished testis were excluded from the study. All the patients had abdominal testis within 2.5 cm from the deep ring and were treated by single stage LOMP by descending the adequately mobilized testis medial to inferior epigastric vessels (Figure 1, 2, 3 and 4).

The operation time was (Min) = 41.32+- 5. There was no per-operative complication. One patient (4.54%) had post-operative scrotal hematoma which resolved spontaneously. All children were followed up in out- patient clinic after 1 week, after 6 months and after 1 year. We used color Doppler evaluation on follow up after 6 months and after 1 year in all our patients to evaluate the blood flow and volume of the testis and found good blood flow and increase in volume of testis.

Based upon our experience, it is suggested that single stage LOMP has a better position of testis within scrotum. After 6 months and one year of follow up, we found that the testis was in lower scrotum in 13 (59%) patients, in the mid scrotum in 8 (36.36%) patients and at the scrotal neck in one (4.54%) patient.

No patient (0%) had testicular atrophy. No retraction (0%) of testis was seen on follow up. We found single stage LOMP as safe and effective method of treatment for IUT within 2.5 cm from deep inguinal ring (Table 1 and 2)

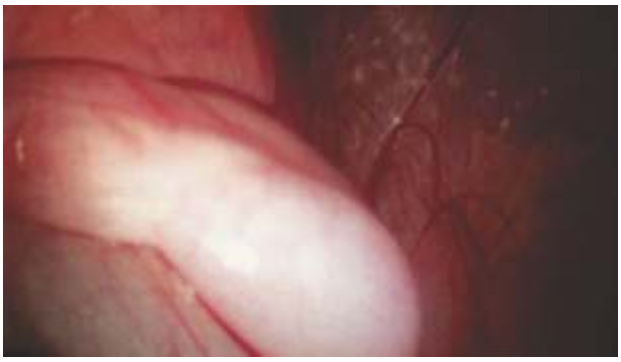

**Figure 1 : Intraabdominal Location of Testis within 2.5 cm from Deep Ring**

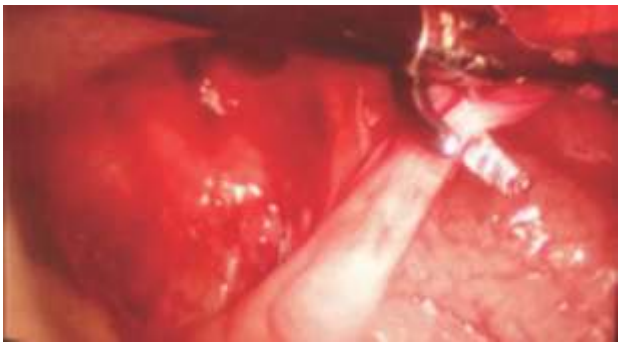

**Figure 2: Establishment of Channel for Descent of Testis Medial to Inferior Epigastric Vessels**

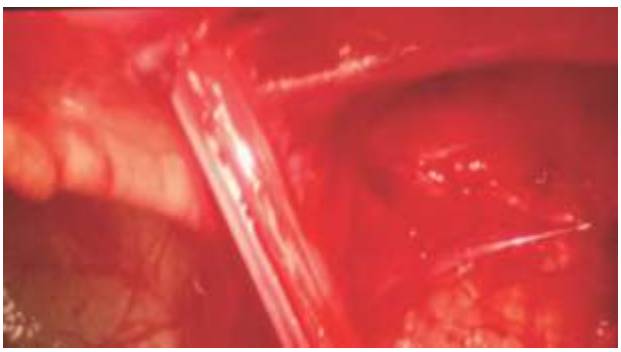

**Figure 3: Testis being Brought Down into the Scrotum Through the Channel Medial to Inferior Epigastric Vessels**

**Figure 4: The Testis Brought Down within the Scrotum**

**Table** I:**Pre-Operative and Intraoperative Data**

| | |
|---|---|
| No of patients | 22 |
| Age (months)= | 12+_ 84 |
| Laterality of IUT | Left sided IUT=10 (45.45%)<br>Right sided IUT=7 (31.81%)<br>Bilateral IUT=5 (22.72%) |
| Location of IUT in the abdomen | In the abdomen Within 2.5 cm from deep ring |

*IUT: Impalpable Undescended testis

**Table II: Per-Operative and Postoperative Complications**

| Complications | Number of patients (%) |
|---|---|
| Per-operative complications | 0 (0%) |
| Post-operative complications | Scrotal hematoma=1 (4.54%)<br>Hernia or hydrocele =0 (0%)<br>Testicular retraction= 0 (0%)<br>Testicular atrophy= 0 (0%) |
| Testicular position in the scrotum | Low scrotum=13 (59 %)<br>Mid scrotum= 8 (36.36 %)<br>Scrotal neck=1 (4.54 %) |

## Discussion

Twenty to 35 % of children with UT present with IUT.[13] To avoid future complications, orchiopexy is recommended to treat UT not later than one year of age. [14] Traditional inguinal exploration for IUT is limited and unsatisfactory. LO is performed to treat IUT located inside the abdomen.

Yang et al, Elderwy et al and Prentiss et al have reported that LOMP shortens the distance of descent of testis. [15] Agrwal et al believed that primary LO is feasible when the distance from deep ring is less than 2.5 cm .[16] Begga et al suggested that single stage LO is considered when the distance from deep ring is less than 1 cm.[17] We found that singe stage LO is feasible if the distance from deep ring is less than 2.5 cm.

Many authors have noted that when testis can reach the contralateral deep ring after mobilization, it makes single stage LO feasible.[18] This is one of the modes of evaluation but if the testis is more than 3 cm away from the deep inguinal ring, staged orchiopexy should be considered.[19]

In our series, we used LOMP technique to treat all our patients with impalpable abdominal testis located within 2.5 cm from the deep ring.

Closure of peritoneum at deep ring is described in some series.[20] We did not close the peritoneum at the deep ring in any of our patients and found no complication of inguinal hernia or hydrocele on follow up.

There was no per-operative complication in our series. Poor wound healing and scrotal hematoma is reported in literature after LO.[21] There was no complication of poor wound healing in our patients. In this series, 4.54% of patients developed scrotal hematoma which was resolved spontaneously.

Color Doppler ultrasonography is used to evaluate testicular blood flow and volume in follow up evaluation status of testis.[22]

We used Color Doppler evaluation on follow up after 6 months and after one year in all our patients to evaluate the blood flow and volume of the testis and found good blood flow and increase in volume of testis. Testicular atrophy is defined as loss of more than 50% of post-operative testicular volume.[23] In our series none (0%) of the patients developed testicular atrophy.

Testicular retraction is described as a complication of single stage LO.[24] In our series adequate testicular mobilization and a proper dartos pouch was found critical for testicular fixation within scrotum. We have used a 2-point fixation with tunica albuginea of testis. There is no case (0%) of testicular retraction in our series. We found that the testis was in lower scrotum in 59% patients, in the mid scrotum in 36.36% patients and at the scrotal neck in 4.54 % patients.

Older patients tend to face difficulty in obtaining satisfactory testicular position as the distance from testis to scrotum increases with age.[25] The morphology of the spermatic cord may be tense and small in some patients and tortuous and thick in others.[25] All the factors including age, distance from the deep ring and laxity of spermatic cord should be considered for single stage LO.

Our study has limitations of small number of patients. More studies are needed in future to evaluate the clinical outcome of single stage LOMP. Based upon our experience, it is suggested that single stage LOMP has a better position of testis within scrotum.

## Conclusion

Single stage LOMP procedure is feasible, safe, and effective technique to treat children with impalpable low abdominal undescended testis within 2.5 cm from deep inguinal ring.

## Conflict of interest

The authors declare that there are no conflicts of interest with respect to the authorship and publication of this article.


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**CONFLICT OF INTEREST**

Authors declared no conflicts of Interest.

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Authors have declared no specific grant for this research from any funding agency in public, commercial or nonprofit sector.

**DATA SHARING STATMENT**

The data that support the findings of this study are available from the corresponding author upon request.