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Original Article

Short Term Outcome of Staged Laparoscopic Traction Technique in Management of Abdominal Undescended Testis in Zagazig University Hospitals

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ABSTRACT

Background: The majority of cases with abdominal undescended testis could be safely and effectively managed with the laparoscopic assisted staged traction-orchiopexy approach. This study aimed to identify the short-term outcome of the new procedure (laparoscopic traction technique in management of abdominal undescended testis and to identify the possible complications of the technique.

Methods: This prospective interventional clinical study included 56 cases with intra- abdominal testis, who were operated with staged laparoscopic traction orchiopexy, most of the cases had postoperative good position of the testis mid or low scrotal position keeping the testicular vessels intact not divided or clipped. Patients then followed up at 1 week,1 month, 3 months, 6 months postoperatively.

Results: the duration of first stage was 34.7± 7.3 min, the duration of second stage was 66.3± 11.9 min and the time interval between 2 stages was 115.8± 15.8 days, only 2 cases (3.6 %)of the operated 1st stage cases had slipped ligature, needed redo 1st stage, the majority of cases had mid scrotal position of the testis after 1, 3 and 6 months, one case became in low scrotal position after being in mid scrotal position, after resolution of post operative edema in the 3 months follow up. Success rate after 6 months was 91% ,51 cases the testis position was mid and low scrotal position. The failure rate after 6 months was 8.9 %, 5 cases the testis found to be in high position (not in the scrotum).

Conclusions: The technique of staged laparoscopic traction is successful and safe for management of abdominal undescended testis. It can be used in cases of abdominal undescended testis which cannot undergo one stage laparoscopic assisted orchidopexy.

Keywords: Outcome; Staged Laparoscopic Traction; Abdominal Undescended Testis

INTRODUCTION

The undescended testis (UDT), also known as cryptorchidism, is a very common genital abnormality in males. The incidence of presence of cryptorchidism in in full term newborns is 2-3% , and 1% in 1-year-olds; in up to 33–45% of premature males, 80% of the testes are clinically palpable and 20% of them are nonpalpable [1].

The main indications for performing orchidopexy are 1) prevention of abnormal morphological changes in germ cells 2) repair a concomitant hernia 3) reduction of the risk of torsion 4) prevention of trauma or pain 5) psychological and cosmetic benefit 6) help early detection of testicular tumors [2].

Ultrasound (US) and magnetic resonance imaging (MRI) are currently the imaging techniques of choice for diagnosis of abdominal testis, but diagnostic laparoscopy has been established as the most reliable diagnostic technique for the diagnosis

and management also of the abdominal testes with nearly 100% sensitivity and specificity [3].

Three arterial vessels supply the testis with oxygenated blood, the main testicular, the vasal, and the cremasteric arteries. A key step of the Fowler-Stephens procedure is the ligation of the main testicular artery to allow compensatory development of the arteries of the vas and the collateral vessels. This by design should facilitate the surgeon's achievement of adequate spermatic cord length to reach the dartos pouch in the second stage orchidopexy that can be done 6 months after. With performing significant retroperitoneal dissection laparoscopically, this technique is being used more and more infrequently [4].

The aim of the new technique in management of abdominal undescended testis is to perform a laparoscopically assisted progressive elongation of the testicular vasculature by means of bowel movement-induced traction following intra-abdominal testis fixation to the anterior abdominal wall. The procedure requires testicular fixation for a duration of 12 weeks to a location 2-3 cm superior and medial to the opposing anterior superior iliac spine. In the second stage, Subdartos orchiopexy is performed. Both procedures are carried out with the help of laparoscopy [5].

When it comes to treating intra-abdominal testis, the approach of laparoscopic assisted staged traction-orchiopexy is both safe and effective. When a one-stage laparoscopically aided orchiopexy isn't an option for treating abdominal testis, this procedure is used. On top of that, this method can be applied to both sides of a patient's body at the same time [6].

So, this study aimed to identify the short-term outcome of the new procedure (laparoscopic traction technique in management of abdominal undescended testis and to identify the possible complications of the technique.

METHODS

This prospective interventional clinical study was conducted on 56 children Patients with intraabdominal UDT and peeping testes age between 9 months to 12 years at the pediatric surgery department, Zagazig university.

After institutional review board approval of IRB (#3245/27-2-2017), written informed consent was obtained from all guardians of the participants. Parents were informed about the pathology of impalpable undescended testis, discussed also with them the procedure of laparoscopic traction technique steps and possible complications. Possibility of subfertility that might happen later on was discussed with parents, the degree of that depends on the condition of the testis, unilateral or bilateral affection, Possibility of presence of atrophic testis, resection of the remnant atrophic tissue. Also, possibility of doing fowler Stephen technique according the intraoperative finding, surgeon`s preference to get the best result. The study was done according to The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

We included patients with minimal age 9 month, maximum age 12 years, with unilateral or bilateral impalpable undescended testis.

Exclusion criteria: all the following conditions were excluded: Age before 9 months or above 12 years, Intraoperative finding of (vanished testis, very short vessels, long vessels, that could do one stage orchidopexy).

According the intraoperative finding of intra - abdominal UDT and peeping testes during laparoscopy it was either:

1: Patients who had single-stage vessel-integrated laparoscopic orchiopexy and whose testicles were able to reach the contralateral internal inguinal ring (IIR) without experiencing any tension were not included in the study.

2: Patients who underwent phased laparoscopic procedures or whose testes failed to reach the contralateral internal jugular vein were not included in the study because traction sutures put too much strain on the blood arteries and veins, increasing the risk of testicular damage and they were undergone Stephen Fowler's technique.

3: Participants in the study were patients whose testes were able to reach the contralateral IIR under mild stress after undergoing laparoscopic traction.

Steps and Techniques used:

Pre-Operative preparation:

After informed consent, routine preoperative preparation, Complete blood count (CBC), Coagulation, anesthesia fitness checkup, (nothing per oral) NPO 6 hours before the procedure.

Surgical technique:

First Stage:

Before surgery under general endotracheal anesthesia, the patient was asked to micturition or apply suprapubic pressure to empty their bladder. They were then placed in the supine position. Laying the patient down on their back with their head lowered and the other side of the table elevated. The testicles were located and identified. After that, when the testis could reach the

contralateral IIR under moderate tension, we moved on to the first stage of the traction procedure.

The size of the testis was measured roughly using laparoscopic instrument in relation to the length, width of the testis intracorporal, then extracorporeal measuring the instrument part by a measure tape. In traction technique the gubernaculum was divided as far as possible from the testis using hook on mono-polar diathermy to avoid injury of looping vas, keeping the testicular vessels intact. Minimal dissection of the pretonium around the testis, once properly mobilized, reach towards the contralateral anterior abdominal wall without exerting excessive force, dissection was stopped.

The next step was to secure the testis to the front of the abdomen, about an inch from the top and to the side of the contralateral anterior superior iliac spine. To do this, use blade 11 to make a small 2 mm incision in the skin. Then, under laparoscopic vision, insert the 5 mm needle holder into the abdominal cavity and thread the needle with a non-absorbable 2/0 braided suture material called ethibond.

Using a retrieval needle suture or a back throw with the needle holder, the suture was introduced through the lower pole of the testis and then returned through the abdominal wall through the same small incision. While tying the knot, the testis was checked for tension at regular intervals until it reached the desired level and position. The pneumoperitoneum was released during tension adjustment to get the optimal result, protecting the testis from intense pressure within the abdominal cavity.

The two ends of the knot which are coming out the anterior abdominal wall through the small snip incision are tied and buried under the skin. A Maryland device was used to feel the pedicle after fastening the knot to confirm that the tension was adequate. Using vicryl 2\0 for the sheath and vicryl rapide for the skin, the umbilical incision was sutured closed in layers after the pneumoperitoneum was released and the instruments and ports were withdrawn. under the skin, and then seal the remaining two 5 mm incisions that were used for operation.

Oral paracetamol was prescribed to patients on the same day for a duration of 5 days, with follow-up appointments scheduled in the outpatient department weekly and monthly.

Second stage:

Checking the abdomen for adhesions, internal hernias, or suture slippage was done after 12 weeks using the same preoperative preparation, incision sites, and procedure described before. In order to subjectively evaluate the new strain, length of the bowel movement, and pressure on the pedicle, the Maryland felt the testicular vessels.

There was no stress on the testis when it was approaching the other side of the abdominal wall. After removing the suture, a traction test was performed to ensure that the testis could reach the internal ring on the opposite side.

We mobilized the vas and vessels on the wide peritoneal flap starting at the testis and moving proximally as high as possible. This was the same technique used in vessel intact laparoscopic orchiopexy, which was how we performed the transperitoneal releases. The ipsilateral internal auditory canal (IIR) was used to guide a 5 mm bowel grasper all the way to the scrotum. A subdartos pouch was produced by making an incision at the ipsilateral hemiscrotum. An artery forceps was held by the bowel grasper guiding it through the inguinal canal until reaching the abdominal cavity through the IIR. Opening the forceps to make good tract through the inguinal canal for easy descent of the testis to the scrotumThen under scope vision holding the testis by the artery forceps from the lower pool pulling it down to the scrotal pouch in straight way to avoid torsion of the pedicle during descent.

This was the stage where any additional mobilization, whether trans-scrotal or trans-peritoneal, was performed to bring the testis to the scrotum.Verifying the testicular size using a measuring tape.

A rounded needle was used to fix the testis in the sub-dartos pouch using the 3-point fixation technique with 4/0 vicryl. Afterwards, a cutting needle was used to stitch the scrotal incision closed with 6/0 vicryl undyed.

The initial stage included releasing the pneumoperitoneum, removing the instruments, and closing the abdominal wounds. On the very same day, patients were sent home with a 5-day supply of oral acetaminophen.

Follow up

Patients then followed up at 1 week,1 month, 3 months, 6 months. postoperatively. In the follow up we examine the testis position also check the wounds for possible wound complications, do doppler ultrasound to check the size and vascularity of operated testis. Success was defined as a good positioned testis in a low or mid scrotal position with good sized testis (75-100%) in relation to the

intraoperative size or of the normal control for age measured by ultrasound during follow-up and normal doppler study of the vascularity of the testis. Failure was defined as testis at high position not felt in the scrotum or higher inguinal position, absent vascularity by Doppler ultrasound, or the testis getting smaller size less than 75% the intraoperative size

STATISTICAL ANALYSIS

Utilized Microsoft Excel for data coding, entry, and analysis pertaining to medical history, basic clinical examination, laboratory investigations, and outcome measures. After that, the data was loaded into SPSS version 20.0, which is software for the social sciences, to be analyzed. time and time again One way ANOVA to compare multiple measures taken from the same group is with an analysis of variance.

RESULTS

Table 1 shows that Mean ± SD of age of studied group was 2.6 ± 1.8 years. The majority of them (85.7%) were impalpable testis, 14.3% peeping testis. More than half (53.5%) of them had left side lesion. In 25% of them, testis was detected by US done preoperative. The duration of first stage was 34.7± 7.3 min, the duration of second stage was 66.3± 11.9 min and the time interval between 2 stages was 115.8± 15.8 days.

The intra-operative average testicular size was 0.97 ± 0.19 cm (Table 2). Only 2 cases (3.6 %)of the operated 1st stage cases had slipped ligature, needed redo 1st stage. All the cases had 1 day post-operative hospital stay.

The mean hospital stay was 1 day. 8.9% of the studied group had superficial skin infection of scrotal wound. 3.6% of them had surgical emphysema of the anterior abdominal wall at port site , both complications were managed conservatively without affecting the final outcome of the cases. (Table 3).

The majority of cases had mid scrotal position of the testis after 1, 3 and 6 months, one case became in low scrotal position after being in mid scrotal position, after resolution of post operative edema in the 3 months follow up. According to the table success rate after 6 months is 91% ,51 cases the testis position is mid and low scrotal position. The failure rate after 6 months is 8.9 %, 5 cases the testis found to be in high position (not in the scrotum) (Table 4).

the mean size after 1 month was 0.95± 0.19, that after 3 months was 0.95± 0.19 and that after 6 months was 0.95± 0.19 cm, there was no statistically significant difference between intra-operative size and size after 6 m, P>0.05. (Table 5).

All cases had normal Doppler after 1. 3 and 6 months (Table 6).

Table (1): Baseline data among the studied group:

	N=56	**%=100**
Age (years)	***Mean ± SD***: 2.6 ± 1.8 ***Range:*** 0.83- 9	
Diagnosis: ***Peeping testis*** ***Impalpable testis***	 8 48	 14..3 85.7
Side: ***Right*** ***Left***	 26 30	 46.4 53.5
Ultrasound: ***Testis detected by US*** ***Testis not detected by US***	 14 42	 25 75
Variable	**Mean ± SD**	**Range**
Duration of first stage (min):	34.7± 7.3	20-60
Duration of second stage (min):	66.3± 11.9	40-120
Time interval between 2 stages (days):	115.8± 15.8	96-150

Table (2): Intra-operative testicular size, Percentage of slipped fixation ligature after 1st stage among the studied group**:**

Variable	N=56	%=100
average Size intra-operative (cm)	***Mean ± SD***: 0.97 ± 0.19 ***Range:*** 0.7- 1.44	
Variable	**N=56**	**%=100**
Slipped ligature : ***NO*** ***YES***	 54 2	 96.4 3.6

Table 3: Complications among the studied group:

Variable	N=56	%=100
Wound infection: ***No infection*** ***Infection of scrotal skin wound***	 51 5	 91.1 8.9
Surgical emphysema: ***No*** ***Yes***	 54 2	 96.4 3.6

Table 4: Site of the testis at follow-up among the studied group:

Variable	N=56	%=100
Site after 1 m: ***Mid scrotal*** ***Low scrotal*** ***High position***	 34 17 5	 60.7 30.4 8.9
Site after 3 m : ***Mid scrotal*** ***Low scrotal*** ***High position***	 33 18 5	 58.9 32.1 8.9
Site after 6 m: ***Mid scrotal*** ***Low scrotal*** ***High position***	 33 18 5	 58.9 32.1 8.9

Table 5: Size at follow-up among the studied group and Comparison between average size in intra-operative & follow-up data**:**

Variable	Mean ± SD	Range
Size after 1m (cm):	0.95± 0.19	0.04-1.44
Size after 3m (cm):	0.93± 0.20	0.04-1.44
Size after 6m (cm):	0.95± 0.22	0.06-1.44
Intra-opera size (cm)	0.97 ± 0.19	0.7-1.44
Size after 6m (cm):	0.95± 0.22	0.6-1.44
P#	**0.142*** **(S)**	

P#, paired measure ANOVA test

Table 6: Ultrasound Doppler at follow-up among the studied group:

Variable	N=56	%=100
Doppler after 1 m: ***Normal vascularity***	56	100
Doppler after 3 m: ***Normal vascularity***	56	100
Doppler after 6 m: ***Normal vascularity***	56	100

DISCUSSION

Cryptorchidism is a prevalent condition affecting the male reproductive system. It affects about 3% of full-term male infants and 33-45% of preterm male infants with a birth weight less than 2.5 kg [7].

Cryptorchidism retards the production of spermatozoa. The fertility of patients with bilaterally retained testes is generally very poor. The higher and longer the testis resides away from the scrotum the greater the likelihood of damage to the seminiferous tubules [8].

Laparoscopy is gaining popularity as diagnostic and therapeutic technique at the time of orchidopexy to demonstrate whether the testis is present or not and to aid to find the best modality in management of such cases, the major problem of abdominal testis is short testicular vessels preventing its descent in the scrotum [9].

If the gonadal vessels are long enough to allow for tension-free mobilization of the testis into the scrotum, single stage orchiopexy may be performed by laparoscopic assisted technique. This is often feasible when the testis can reach the opposite internal ring without tension, we excluded cases with long gonadal vessels from our study [10].

Separating the testicular arteries from the vasal arteries was detailed in 1959 by Fowler and Stephens. An atrophy rate of about 50% was one of the first discouraging findings. Staged surgery that left the testis in place after ligation of the vessels yielded better outcomes [4].

We excluded cases with very short gonadal vessels that needed staged Fowler Stephen operation from our study.

The 2-stage laparoscopic FS procedure has an 80-85% success rate. According to Esposito's analysis of the FS technique's 10-year follow-up, the position success rate was 83%, but the operated testis was often much smaller than the normal one [4].

Despite keeping a good position, there have been worries about the potential for histological damage. Six months following ligation and division of the TV, Rosito et al. demonstrated a marked decrease in the quantity of spermatogonia and seminiferous tubules; nevertheless, testicular volume remained unaffected [11].

Recently the concept of laparoscopic traction of testicular vessels to gain length has been described Laparoscopic traction technique (Shehata technique) that involves two stages, first stage includes laparoscopic fixation of testis in the contralateral side abdominal wall one inch above and medial to anterior superior iliac spine. Second stage occurs after around 12 weeks by dividing the testicular fixation stitch by laparoscopy and refixation of the testis in scrotum in sub-dartous pouch [5].

Mechanism of elongation is probably due to intestinal weight that gently make pressure on testicular vessels without tension or spasm. the initial results of technique are encouraging [6].

The main difference between traction technique and past techniques (Stephen fowler) is that the recent technique saves the testicular vessels which is the main blood supply of the testis through very gradual and gentle traction allowing elongation of testicular vessels preserving testicular viability [11].

We believe that the mechanism of elongation is achieved by intestinal movement and regular movement of abdominal muscles during respiration.

Our study was done on 56 patients with 56 abdominal testis after exclusion of cases with atretic testis, cases the traction technique isn't appropriate for them. the Mean ± SD of age of studied group was 2.6 ± 1.8 years. The majority of them (85.7%) had impalpable testis, 14.3% peeping testis. More than half (53.5%) of them were left sided, (46.4%) right sided. In 25% of them, testis was detected by US preoperatively.

The time interval between the 2 stages of the procedure was 115.8± 15.8 days, duration of the procedure (surgery time) in the first stage was 34.7± 7.3 min, the duration of second stage (surgery time) was 66.3± 11.9 min, post operative hospital stay was 1 day in all cases.

Two cases (3.6 %) of the operated 1st stage cases had slipped fixation ligature, needed redo 1st stage.The results of our study showing that the majority of cases postoperative had mid and low scrotal position of the testis after 1-, 3- and 6-months follow-up. with success rate after 6 months is (91%),51 cases the testis position is mid and low scrotal position with preserving the vascularity in all cases as detected by ultrasound doppler done in the post-operative follow-up, with no statistically significant difference between intra-operative size and size after 6 m, P>0.05.

In comparison with Fowler Stephen technique result, successful outcome was seen amongst 82 of 96 testes (85%) undergoing LFSO, [4]**,** Also the comparative study done 2021 revealed a success rate (proper lower scrotal position with no testicular ascent or atrophy) of 66.7% [12]**,** we have higher success rate.

Failure rate in our study was 9% (5 cases) had high position of the testis (not in the scrotum), while failure rate was higher (15%) and more in Fowler Stephen technique in the previously mentioned studies. In comparison with fowler Stephen technique, our technique (laparoscopic staged traction) with preserved testicular vascularity detected by post operative doppler ultrasound, the blood flow assessment in prepubertal testis following LFSO can be difficult, unclear and undetectable in cases postoperative as proved by the study done 2020 to detect the role of ultrasound in the follow-up of intra-abdominal testes post Fowler-Stephens orchiopexy [13].

Low complications rate during the study, 5 cases (8.9%) of the studied group had superficial skin infection of scrotal wound. 2cases (3.6%) had surgical emphysema of the ant abdominal wall at port site, both complications were managed conservatively without affecting the final outcome of the cases. The failure rate after 6 months in our study is 8.9 %, (5 cases) the testis found to be in high position (not in the scrotum), while in laparoscopic Fowler Stephen technique the failure rate about 15% [4]**,** Also the comparative study done 2021 the failure rate wase about 32% [12]**,** so we have lower failure rate.

Failure to achieve adequate lengthening in our study group is correlated higher age group patients, this indicates the importance to operate early, because when the patient gets older the distance from internal inguinal ring to the scrotum gets longer with high failure rate.

Limitations:

The current follow-up needs to be longer to determine possible complications of the technique. Also, our study is retrospective, with a small sample size and short follow-up. Larger and longer studies are needed to validate the current study findings.

CONCLUSIONS

The technique of staged laparoscopic traction is successful and safe for management of abdominal undescended testis. It can be used in cases of abdominal undescended testis which cannot undergo one stage laparoscopic assisted orchidopexy. With a success rate up to 91% and the benefit of saving the testicular vessels (without any microvascular effect on the testicular tissue) staged laparoscopic traction technique is considered superior to the laparoscopic Fowler Stephen technique (success rate 80-85%) with debate about microvascular effect on testicular tissues due to division of the main blood supply in management of abdominal undescended testis.

No potential conflict of interest was reported by the authors.

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