Laparoscopic Two Stage Fowler-Stephens Orchiopexy: A Single Center Experience

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Abstract:

Introduction: Cryptorchidism is one of the most common congenital anomalies of testis. Risk of cancer and reduced fertility urge the treatment of this disease in infancy. A technical surgical problem regarding intra-abdominal testes is the existence of short spermatic cords that prevent the testes from repositioning into the scrotum. The Fowler-Stephens method addresses this issue by suggesting the excision of the spermatic artery, yet it is not popular with urologists due to the risk of testicular atrophy.

Patients and Methods: The present study followed a descriptive cross-sectional design where patients with intra-abdominal cryptorchidism were examined through exploratory laparoscopy, and those who were candidates for orchiopexy underwent a two-stage Fowler-Stephens surgery. The first stage included spermatic artery ligation using Weck clips. The second stage, which followed 4-6 months later, included laparoscopic mobilization of testis based on vasa deferential artery. One to three months after the second stage, the patients were re-examined through color Doppler sonography. Success was defined as testis repositioning in the dependent portion of the scrotum with no atrophy.

Results: Out of the 24 patients who underwent surgery, 22 responded well to the operation, but two showed testis atrophy. The average patient follow-up schedule and average interval between the two stages were 2.17 and 4.8 months, respectively. Surgery success rate for our patients was 83.3%.

Conclusions: Two-stage Fowler-Stephens laparoscopic orchiopexy is a safe method for high intra-abdominal testis orchiopexy, where standard orchiopexy might lead to improper positioning of the testis and testis atrophy due to excess tension on spermatic cord.

Introduction

Cryptorchidism or Undescended Testis (UDT) is one of the most common congenital testis anomalies usually diagnosed by examining infants. More than a third of male premature infants are born with undescended testicles. This includes only 3-5% term infants (1) and decreases to 1% during their first year (2, 3). About 20% of infants with cryptorchidism have at least one non-palpable testicle. From all non-palpable testicles, about half are found to be located within the abdomen and the remainder are either vanished or atrophic. The main reason for treating such cases is to avoid potential problems such as testicular neoplasms, infertility, testicular torsion and inguinal hernia (1, 4). Cryptorchidism treatment may involve medical hormonal therapy, surgery, or
both. In case of cryptorchidism, the infant should be carefully observed until 6-12 months after which decisions are made to proceed with surgery. Two methods to search for non-palpable testes are diagnostic laparoscopy and inguinal exploration (5). The restraining factor for successful orchiopexy is the length of spermatic cord which then, three options would be available for orchiopexy: staged or one step Fowler-Stephens orchiopexy (FSO), Koff orchiopexy, and microvascular autotransplantation (6). In FSO, spermatic cord is either transected or clipped and the testes blood flow is maintained by collateral arteries through cremasteric and vasa arteries (Fig. 1). FSO is performed in one or two stages. In the one step FSO, immediately after excising the arteries, the testes are pulled down inside the scrotum on a peritoneum base including the vas deferens and vasa arterios. In the two-stage laparoscopic FSO, the first stage is done at the end of diagnostic laparoscopy and the spermatic cord is either transected or clipped. Four to six months later, when the collaterals have been developed, the testes are repositioned inside the scrotum through open surgery or laparoscopy (6, 7). Based on a study by Docimo, the success rates for open surgery, one-stage FSO, and two-stage FSO have been 74, 63, and 77%, respectively. Others report various rate of success. Such variation is probably due to differences in age, testes position, follow up schedule, and criteria defining success (1, 8).

One notable complication of orchiopexy is testes atrophy. Dissection around testes artery and post-surgery inflammation might cause ischemic injury or testes atrophy. Other complications include the testicular retraction, infection or bleeding (4). Although high ligation orchiopexy for intra-abdominal testes has become the standard of cord transaction surgeries, low-igation of Koff reportedly is also successful(9). Radionuclide studies of the blood flow in the testes have shown that high ligation of the spermatic arteries keeps the blood flow at a good level (1).

![Figure 1](image_url)

Figure 1. The present study aimed to investigate the success rate of laparoscopic orchiopexy using the two-stage Fowler-Stephen method.

PATIENTS AND METHODS

This cross-sectional study was carried out on patients with non-palpable testes who were referred for exploratory laparoscopy. Exclusion criteria included conditions such as vanishing or atropic testis or anomalies that required orchidectomy, intra-abdominal testis close to the internal ring [less than 2 cm] suitable for standard orchiopexy, prior ipsilateral testis or groin surgeries, and internal genitalia anomalies including hermaphroditism. The study protocol was approved by the ethics committee of (Blinded) University of Medical Sciences, (Blinded). The first stage of the surgery included placing a 10 mm umbilical port and two 5 mm ports in the lower abdominal quadrants. Next, the exit of the spermatic cord below the colon was identified and the peritoneum overlying the cord incised longitudinally. Spermatic cord was dissected circumferentially and two 5 millimeters Weck clips laid down 1 centimeter apart on the spermatic cord which then was transected in between. The operation terminated according to laparoscopy standards and the patient scheduled for second stage at 4-6 months later. For second stage, the laparoscopic ports were placed in the same previous configuration. The testes examined laparoscopyally regarding position and size and if amenable for orchiopexy, it was mobilized on a wide swap of peritoneum overlying vasa deferentia with the aim of preserving as much collateral as possible. The gubernaculum was also transected in mobilization procedure. The testes were exteriorized out of abdominal cavity through a new hiatus medial to epigastric arteries and lateral to medial umbilical ligament. The testes was pexed in a subdartus pauch according to standard orchiopexy. One to three months later, the patient scheduled for follow-up examination and scrotal color Doppler sonography was performed.

To study the data, descriptive analyses including normal distribution tables, charts, mean values, and scatterplots were employed using SPSS [v. 20].

RESULTS

Twenty four patients [24 testes] underwent laparoscopic orchiopexy surgery, using the two-stage Fowler-Stephen method, in faculty hospitals of (Blinded). Descriptive statistical analyses were carried out on clinical details of the patients whose average age in the first stage was 4.5 ± 3.2. Table 1 shows the demographic and clinical details of the patients.
There were no bilateral UDT patients in our series. The average interval time between the first and the second stage was 4.83 ± .7 months. All patients underwent laparoscopic surgery in the second stage. Out of the 24 patients, two testes complicated at postoperative day 2 and the patients developed scrotal pain and signs of testis ischemia. Doppler sonography confirmed testis inflammation and ischemia and the patients scheduled for orchiectomy.

The average follow-up for the patients was 2.16 months ranging from one to three months. Follow-ups were based on physical examinations and color Doppler sonographies. Table 2 shows important clinical factors and surgery results.

### DISCUSSION

Developments in surgical treatments of abdominal testes lowered the risk of cancer and improved the fertility and endocrine function of the affected patients. Although cord transecting methods like Fowler-Stephen is well known and fully described, urologists do not apply it so frequently, mostly because of concerns regarding testis atrophy. They might select standard orchiectomy which is less risky but in the face of short cord length come to an end with testis located well in high inguinal position. This is not only aesthetically undesirable but also exposes the testis to trauma. Excessive tension on the spermatic cord can also cause testis atrophy and even avulsion during procedure. By removing the descent-restraining factor, Fowler-Stephen orchiectomy can position the testes in their natural place in the dependant portion of the scrotum, and in most cases, maintain sufficient blood supply from the collaterals.

Bearing in mind that the present study was the surgeons first experience, the results were quite satisfactory. Nevertheless, by picking up a number of technical hints, superb results are obtainable. For example, it seems advisable to use only bipolar cautery for dissection and other heat producing equipments such monopolar hook should be avoided. This helps to preserve the collateral arteries as much as possible. In addition, testis discoloration to blue during mobilization should not cause major concern as long as sticking to standard methods. We encountered two cases of testis discoloration in our series which had normal follow up and successful results post operation. It is needless to say that for low lying intra-abdominal testes, the feasibility of standard non cord transecting operation must first addressed and to avoid the unnecessary use of Fowler-Stephens technique in this settings.

In a systematic literature review, 61 articles comparing one- and two-stage FSOs were examined and with success rate of 85% and 80% respectively. According to these studies, open surgery and laparoscopy showed the same success rates (10, 11).

Two-stage laparoscopic FSO was utilized in a study of 35 cases intra abdominal testes. The results indicated that all testes were successfully positioned inside the scrotum. After 30 months of follow up examinations using clinical symptoms and Doppler...
sonography, all the testes demonstrated good blood supply except for one that became atrophic two months after FSO (10, 12).

Another study on 13 intra-abdominal testes using two-stage laparoscopic FSO showed satisfactory results for 8 cases. The researchers concluded that laparoscopy was an effective method for locating non-palpable testes and that two-stage FSO was a successful treatment (12). Other researchers using the two-stage FSO technique on patients with intra-abdominal testes have also reported satisfactory results despite the risk of atrophic testes (9, 10).

Bittencourt et al. investigated the results of 5 years of experience with laparoscopy for the diagnosis and treatment of non-palpable testes through two-stage orchiopexy with ligation of spermatic arteries. For 13 (17%) testes which were more than 2 cm away from the internal ring, satisfactory success rates of 77% were obtained. The study identified laparoscopy as a safe method for the diagnosis and treatment of non-palpable testes (5). Another study used the two-stage FSO on 65 intra-abdominal testes from which 5 were removed during the second stage due to atrophy. The study showed an 80% success rate for the two-stage FSO (13).

Abolyosr compared laparoscopic and open orchiopexy and concluded that laparoscopy had lower morbidity. The patients [9-31 months old] were examined for testes size and location. Five atrophic cases [3 resulting from open orchiopexy and 2 from the FSO second stage] occurred in one year follow up (14). Although the present study involved few patients, the success rate of 83.3% almost paralleled larger studies.

Standard orchiopexy for high lying intra-abdominal testes would mostly cause the testes to remain in the upper inguinal part, causing patient dissatisfaction in terms of aesthetic issues and exposure to trauma. The two-stage Fowler-Stephen method is, therefore, a suitable, highly successful rival for standard orchiopexy.

Fowler-Stephen orchiopexy usually positions the testes in the dependent part of the scrotum, hence resulting in successful treatment. Urologists are therefore advised to consider the two-stage Fowler-Stephen method for treating intra-abdominal testes.

**Conflict of Interests**

The authors declare that there is no conflict of interests regarding the publication of this paper.

**REFERENCES**
