

Evaluation of Laparoscopic Varicocelectomy in Adult Men

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Research

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Abstract

Background

Varicocele is an abnormal dilatation and tortuosity of the testicular veins. Blocking the reflux in the internal spermatic vein is the cornerstone treatment for varicocele. Other treatment options include inguinal, sub inguinal, retroperitoneal, scrotal, and laparoscopic approaches. Laparoscopic varicocele ligation results in lower morbidity, lower analgesic requirements, and more rapid rates of return to work as compared to the standard open surgical approach.

Aim

To evaluate the laparoscopic varicocelectomy (at 3 and 6 months postoperatively) as regards the intraoperative, postoperative laboratory, and radiological data.

Methods

This prospective study included 40 patients who underwent laparoscopic varicocelectomy procedure from March to November 2018.

Results

The study was conducted on 40 patients aged 17–36 years who underwent laparoscopic varicocelectomy. Clinically, only four patients were detected to be bilateral, although radiological assessment revealed 22 patients had bilateral affection. Clinically, the mean grade is 2.15 ± 0.67 for the left side and 0.35 ± 0.74 for the right side, which improved to 0.35 ± 0.57 on the former and 0.1 ± 0.44 on the latter at 6 months postoperatively. Based on ultrasound findings, 11 patients had bilateral affection. The mean grade is 2.25 ± 0.64 for the left side and 0.75 ± 0.78 for the right side, which improved to 0.35 ± 0.67 on the former and 0.35 ± 0.49 on the latter at 6 months postoperatively. In the semen analysis, the sperm count, motility, and abnormal forms significantly improved. The mean operative time and hospital stay were $26.15 + 5.03$ min and 1.15 ± 0.36 day, respectively.

Conclusion

Laparoscopic varicocelectomy is an effective treatment for varicocele. Significant symptom, sperm count, motility, and abnormal form improvements were observed during the postoperative follow-up. Therefore, laparoscopic varicocelectomy is recommended as more beneficial for patients.

Introduction

Varicocele is defined as an abnormal dilatation, elongation and tortuosity of the testicular veins. The incidence of varicocele in the general population is about 15%, while 41% of males presenting for infertility investigations, demonstrate varicocele, however most men with varicocele remain fertile [1].

Varicocele is the most common correctable cause of male infertility that may result in testicular damage in some males causing testicular atrophy with impaired sperm production, while in other males the varicocele may seemingly cause no ill effects[2].

The cornerstone of varicocele treatment is blocking the reflux in the internal spermatic vein while preserving the internal spermatic artery, lymphatics, and *vas deferens*. Treatment options include inguinal, sub inguinal, retroperitoneal, scrotal, and laparoscopic approaches [3].

Several treatment options available include spermatic vein embolization and open surgical ligation of the varix, through a retroperitoneal, inguinal, or sub inguinal approach. Laparoscopic varicocelectomy has been proposed as an alternative surgical procedure to repair varicocele with reported benefits of better convalescence, minimal invasiveness, and less analgesic requirement postoperatively[4].

Laparoscopic surgery has the advantages of reduced morbidity, reduced analgesic requirements, and more rapid rate of return to work [5].

This technique is more advantageous than open surgery because it offers excellent visualization of the spermatic vessels. The number of veins to be ligated and arteries to be preserved is smaller, and their caliber is larger. Spermatic artery preservation is possible in 89–100% of patients[6].

The major advantage of the laparoscopic approach is that it allows a bilateral laparoscopic ligation through the same incisions, instead of two incisions required in an open surgical approach. However, the main disadvantages of laparoscopy are its higher cost and the need for multiple port placements, making it quite inappropriate in treating a unilateral varicocele[7].

We aimed in the current study to evaluate the outcome of laparoscopic varicocelectomy as regards the intraoperative, postoperative laboratory, and radiological data

Patients And Methods

This is a prospective study conducted on 40 patients who underwent laparoscopic varicocelectomy from March to November 2018. Patients were considered appropriate candidates for this study if they were:

- 1- Willing to give consent and comply with the evaluation and treatment schedule
- 2- Have primary varicocele
- 3- Had no history of previous pelvic surgery
- 4- Had no severe chronic illness, e.g., liver, or renal insufficiency

Surgical procedure

Surgical procedures were performed under general anesthesia with the patient in supine position and surgeons standing on the right side of the patient, with the video monitor placed in front of him, on the patient's left side. The patient was placed in a modified Trendelenburg position.

Direct puncture laparoscopy was initiated by elevating the abdominal wall using two towel clips. A small incision was made in the umbilicus, and a Verres needle or port is placed in the abdominal cavity. The abdomen was inflated with a pressure-limited insufflator. Carbon dioxide (CO₂) gas was used, with pressures ranging from 14 to 15 mmHg. After a peritoneal insufflation, direct access to the abdomen was achieved using a 10 mm trocar (**Fig. 1**).

The laparoscope was inserted through the umbilical port, and peritoneal contents were inspected. Optimal insertion sites of the additional operative ports were then determined. Instrument port sites were selected in each lower quadrant so that instruments will easily reach the internal ring.

The posterior peritoneum was then grasped lateral to the testicular vessels and incised to form a window 2–3 cm from the deep inguinal ring (**Fig. 2 A**). The vascular structures were identified and isolated. Attempts were made to preserve the testicular artery and lymphatics (**Fig. 2 B**). Two clips were used on testicular veins (**Fig. 2 C**). In case of bilateral varicocele, the procedure is repeated on the opposite side.

Upon the completion of varix ligation, the ligation site was examined, and the patient was rotated to neutral position. The pelvis was inspected for any blood collection. With the patient returned to supine position, each sheath was removed under direct vision. Before removing the last ports, the insufflation valve was opened, and the CO₂ gas was expelled from the peritoneal cavity. Wounds were closed using simple sutures.

Statistical analysis

The gathered information was examined using IBM Statistical Package for Social Sciences software (SPSS), 21st edition. Continuous data were expressed as mean \pm standard deviation and categorical data as frequencies and percentages.

Results

The study included 40 cases with varicocele aged 17–36 (mean, 25.95 ± 4.36) years (**Table 1**).

Clinically, 32 patients had left-sided affection, and only eight patients were detected to be bilaterally affected, although 22 patients were bilaterally affected based on the radiological assessment.

Pain was found as the most common presentation in the study group (50%), with the mean age of 26 ± 5.88 years, followed by swelling (25%) with mean age of 24.4 ± 2.3 and infertility (25%) with the mean age of 27.4 ± 1.14 .

Regarding the preoperative clinical grading, the mean grade is 2.15 ± 0.67 on the left side and 0.35 ± 0.74 on the right side, which improved to 0.35 ± 0.57 for the former and 0.1 ± 0.44 for the latter at 6 months postoperatively (**Table 1**).

Regarding the preoperative ultrasound, 22 patients were affected bilaterally. The mean grade is 2.25 ± 0.64 on the left side and 0.75 ± 0.78 on the right side, which improved to 0.35 ± 0.67 for the former and 0.35 ± 0.49 for latter at 6 months postoperatively (**Table 2**).

In the semen analysis, the sperm count improved in majority of patients, with the mean spermatic count of $29.08 \pm 17.22 \times 10^6/\text{ml}$, which significantly increased to $39.3 \pm 14.85 \times 10^6/\text{ml}$ at 6 months postoperatively. The spermatic motility improved postoperatively, but not statistically significant. Abnormal forms improved from $34.9 \pm 18.04\%$ to $29 \pm 11.65\%$ at 6 months postoperatively (**Table 3**).

The mean operative time and hospital stay were $26.15 + 5.03$ min and 1.15 ± 0.36 day, respectively.

One patient experienced a scrotal edema that improved after 10 days of conservative measures. During follow-up, none of the patients developed a postoperative hydrocele. Only two patients had recurrence of varicocele.

Discussion

This current study included forty cases with primary varicocele. They ranged in age from 17 to 36 years (mean = 25.95 years), which correspond to age of incidence primary varicocele (young adult). The mean duration of the disease was 18.6 months. All the patients were subjected to laparoscopic varicocelectomy.

It was found in this study that pain represented the most common presentation (50%), followed by infertility (25%) and swelling represented (25%). Kolon et al 2015, reported that pain represent the commonest presentation of varicocele [8].

It was noticed that the mean age of the patients with pain (26 years), those with infertility (27.4 years) and those with swelling (24.4 years).

Physical examination in a warm room is the mainstay of diagnosis of varicocele, but this is affected by a low sensibility and specificity, especially in cases of low-grade varicocele. Color Doppler ultrasound is a reliable and non-invasive diagnostic method for the evaluation of varicocele which allows the detection of even subclinical varicocele due to its capacity for measuring the size of the pampiniform plexus and blood flow parameters of the spermatic veins[9].

Color flow Doppler ultrasound optimized for low-flow velocities which confirms the venous flow pattern, with phasic variation and retrograde filling during a Valsalva maneuver. The sensitivity and specificity of varicocele detection approaches 100% with color Doppler ultrasound[10]. In this study, color Doppler study revealed additional fourteen cases with bilateral disease that were not detected clinically.

Primary varicocele, by far is more common on the left side in approximately 90% of cases, it is bilateral in 8 to 9% and is right sided in 1 to 2%[11]. The etiology is related to the unique anatomy of the left testicular vein, which is longer than the right and enters the left renal vein perpendicularly instead of the vena cava (in the right side) with acute angle[12].

In this study, all the patients had left varicocele, 20% of cases were clinically bilateral and no cases had isolated right varicocele. However, radiological measurements revealed additional seven cases (55%); most of them were grade I.

Comparing the preoperative to postoperative status, it was found that only four case that showed residual affection i.e. 10% recurrence rate.

Several studies have reported an improvement in sperm parameters and pregnancy rates after surgical treatment of varicocele [13–15]

Comparing the preoperative & postoperative semen parameters, The mean spermatic count was $29.08 \pm 17.22 \times 10^6/\text{ml}$, that increased significantly to $35.35 \pm 16.138 \times 10^6/\text{ml}$ postoperatively (3M) and to $39.3 \pm 14.85 \times 10^6/\text{ml}$ (6M) The overall improvement was about (38.3%).

Al-Kandari and his colleagues (2007)

reported improvement in spermatic count in 67% of cases with laparoscopic varicocelectomy [16].

In this study spermatic count improved in 38.3% of cases. Lower improvement percentage in this study can be explained by the fact that only 10 cases of 40 presented with infertility and low sperm count.

Will MA et al. (2011) reported improvement in spermatic motility after one hour from $28.42\% \pm 23.22\%$ – $39.92\% \pm 22.06\%$ in their patient's post-varicocelectomy [17].

In current study, it was observed that the spermatic motility improved postoperatively after 1st, 2nd, and 3rd hours; although, the improvement was statistically insignificant. The mean spermatic motility after one hour was $45 \pm 9.73\%$, the mean spermatic motility after two hours was $33.75 \pm 8.717\%$, and the mean spermatic motility after three hours was 16%. The spermatic motility improved postoperatively, but not statistically significant.

Regarding abnormal forms, it was observed that there was improvement $34.9 \pm 18.04\%$ (preoperative) to $31.75 \pm 15.66\%$ (3M post-operative) and to 29 ± 11.65 (6M post-operative). The overall improvement was about (16.9%).

In this work, all the procedures were completed satisfactorily, with no intra-operative complications. The mean operative time, it was $26.15 + 5.03$ minute.

Borruto F and his colleagues (2010) reported that operating time was 15 minutes for the laparoscopic varicocelectomy. The more time taken in the laparoscopic group could be explained by that 20% of those

patients had bilateral varicocele and were subjected to bilateral intervention [18].

Most of patients had moderate postoperative pain. 26 of 40 patients received NSAIDs as a post-operative analgesic which was satisfactory to relieve post-operative pain. The remaining 14 patients received paracetamol as analgesics. Two patients experienced a scrotal edema that had improved after 10 days of conservative measures. The hospital stay was $(1.15 \pm 0.36 \text{ day})$. Barry J and his colleagues (2012) reported that the hospital stay was 1.3 day[19].

The most frequent complication of varicocelectomy is hydrocele formation, occurring in as many as 30% of the patients. The etiology is likely that of lymphatic obstruction, evidenced by the high average protein content of post varicocelectomy hydroceles compared to that of edematous fluid produced by venous obstruction. [20]

However, none of the patients in current study developed a postoperative hydrocele. This can be explained by that the testicular artery and lymphatics could be easily identified in most of the cases during this study.

In most cases, identification of the testicular artery could be done successfully. In a study made by Nyirady P (2002) aiming to determine if laparoscopic varicocelectomy with preservation of the testicular artery is a satisfactory alternative to standard open surgical techniques in adolescents. He reported complete correction of the varicocele in 83% of patients. He concluded that the laparoscopic technique with preservation of the testicular artery is an acceptable alternative to open surgical treatment of varicoceles [21].

Although could improve semen parameters in almost all patients, the sample size of the present study was not large enough to demonstrate that possible improvement. Another limitation of the present study was the absence of a control group of observation or no treatment to add to the debate on the real value of varicocelectomy in treating male infertility.

On follow up the patients included in the study in the clinics, it was observed that patients with laparoscopic varicocelectomy were satisfied with their treatment. Laparoscopic approach carries lesser postoperative morbidity; less post-operative pain with early return to work and in case of bilateral varicocele opposite side is dealt through the same ports. Therefore, if facilities are available for this procedure and once perfection occurs in this minimally invasive technique, this is the procedure that gives lot of satisfaction to the patients as well as the operating surgeon.

Conclusion

Laparoscopic varicocelectomy is an effective treatment for varicocele, especially on spermatic count abnormal forms. Significant symptom, sperm count, motility, and abnormal form improvements were observed during the postoperative follow-up.

With laparoscopic varicocelectomy, identification and preservation of the testicular artery and lymphatics can easily be performed. Patients who underwent laparoscopic varicocelectomy had lower overall adverse events, shorter hospital stay, lower morbidity, lower analgesic requirements, and more rapid rate of return to work than those who underwent the standard open surgical approach.

Declaration

Ethical approval and consent to participate

All procedures performed in our study involving human participants was in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards

Consent for publication

We obtained consent from all the patients included in our study with institutional consent forms.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request. All data generated or analyzed during this study are included in this published article [and its supplementary information files].

Competing interests

The authors declare that they have no competing interests.

Funding

No funding was received.

Authors' contributions

All authors carried out and participated in the surgical procedures, **AH, MF** conceived the study, participated in study design and sequence alignment, and drafted the manuscript. **AG** helped to draft and critically revise the manuscript. **AH& MF** participated in data collection and performance of the statistical analysis. **AG &MF** participated in study coordination, and critical revision. All authors have read and approved the final manuscript.

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Tables

Table 1: Data of clinical findings

	Mean Grade (left)	Mean Grade (right)
Preoperative	2.15 ± 0.67	0.35 ± 0.74
Postoperative (3M)	0.25 ± 0.44	0
Postoperative (6M)	0.35 ± 0.57	0.1 ± 0.44

Table 2: Data of duplex findings

	Mean Grade (left)	Mean Grade (right)
Preoperative	2.25 ± 0.63	0.75 ± 0.78
Postoperative (3M)	0.25 ± 0.44	0.35 ± 0.49
Postoperative (6M)	0.35 ± 0.67	0.35 ± 0.49

Table 3: Comparison between preoperatively, 3 months postoperatively, and 6 months postoperatively according to the semen analysis results.

	Preoperative	Postoperative (3 months)	Postoperative (6 months)
Mean spermatic count in million/ml	29.08 ± 17.22	35.35 ± 16.138	39.3 ± 14.85
Mean motility(1st h) %	45 ± 9.73	49 ± 9.54	50.25 ± 6.97
Mean motility (2nd h) %	33.75 ± 8.717	34.5 ± 8.72	34.75 ± 8.95
Mean Motility(3rd h) %	18.55 ± 9.94	19 ± 8.67	18.3 ± 9.07
Abnormal forms %	34.9 ± 18.04	31.75 ± 15.66	29 ± 11.65

Figures

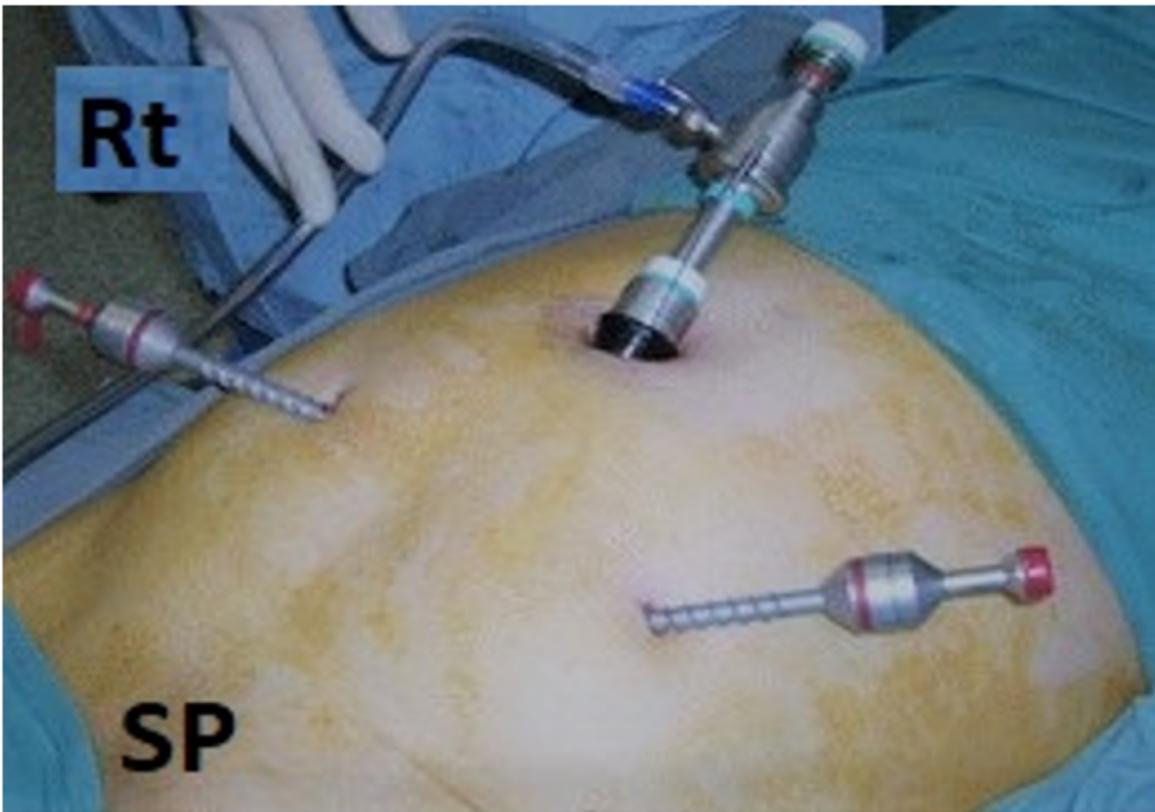


Figure 1

Site of ports

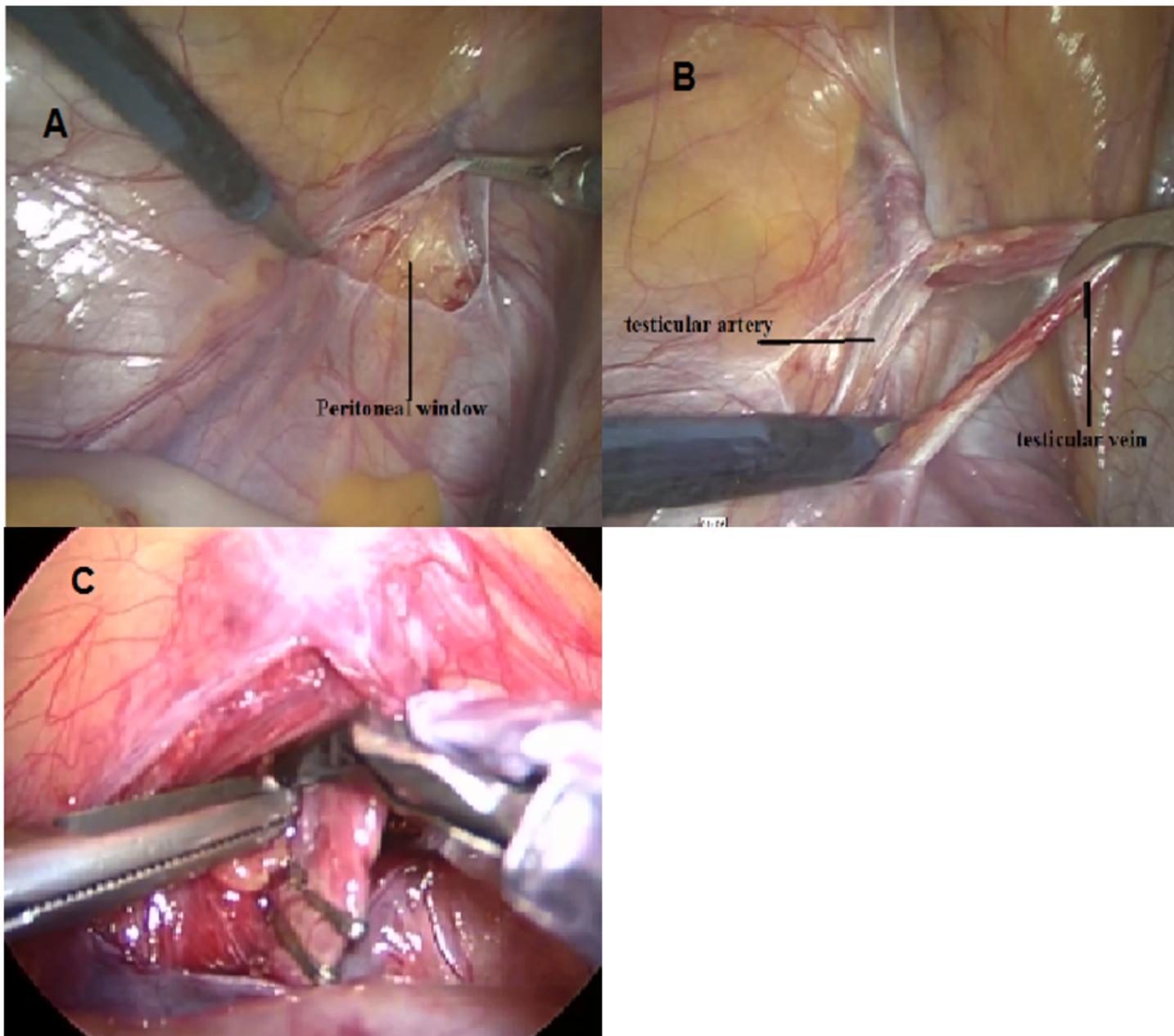


Figure 2

(A) Peritoneal window opening. (B) Dissection and isolation of testicular vein. (C) Clips were applied on the testicular vein.