

Original Article

Comparison of the Efficacy of Laparoscopic Versus Open High Ligation for Varicocele

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Objective: To evaluate the advantages of laparoscopic and conventional open high ligation of varicocele in terms of post-operative stay and postoperative pain

Materials and Methods: A randomized controlled trial including 80 patients suffering from varicocele was conducted at Surgical Unit I of Benazir Bhutto Hospital in 2012. All the patients underwent high ligation of varicocele. Out of 80 patients 40 underwent open high ligation of varicocele and 40 patients underwent laparoscopic high ligation of varicocele. The outcome of both the techniques was evaluated in terms of post operative pain and length of hospital stay.

Results: The mean age of the patients was 23.2 ± 4.84 years. Out of 80 varicoceles, 69 (86.3%) were on the left side. 23 (28.75%) patients had grade 1, 36 (45%) had grade 2 and 21 (26.25%) had grade 3 varicoceles. Open and laparoscopic high ligation of varicocele came out with similar results with respect to age, side and grade of varicocele ($p > 0.05$). Mean operative time for the open high ligation of varicocele was 38.75 ± 7.8 minutes and that for laparoscopic high ligation of varicocele was 30.48 ± 10.6 minutes ($p = 0.000$). Mean pain score was at 12 hours postoperatively for open high ligation of varicocele was 5.22 ± 1.84 and that for laparoscopic high ligation of varicocele was 3.75 ± 1.05 ($p = 0.000$). The Mean postoperative hospital stay was significantly less in the laparoscopic high ligation of varicocele group as compared to open high ligation of varicocele group ($p = 0.001$).

Conclusion: Laparoscopic high ligation of varicocele had shorter operative time and lesser postoperative hospital and lesser postoperative pain as compared to that of open high ligation of varicocele.

Keywords: Varicocele, Male Sub fertility, Laparoscopic high ligation.

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Introduction

Varicocele develops due to incompetent valve in testicular vein. It refers to the abnormal veins in the pampiniform plexus (PP) which are tortuous and dilated. It presents as scrotal asymmetry, scrotal heaviness and rarely with testicular pain. Many a times, adults are unaware of the varicocele. It is usually discovered accidentally during a regular physical examination or during the recruitment for military service.¹

The incidence of high-grade varicocele is approximately 15% all over the world and found in one third of the males with infertility.^{2,3} It is recognized that varicocele is associated with a time-dependent testicular growth arrest among adolescents and adult males. Therefore, varicocele though to be associated with infertility and testicular growth arrest exists. However, high ligation of varicocele can reverse testicular growth arrest experienced by the adolescents. This knowledge has put a question to the specialists that how best to manage adolescents with varicocele.

Several approaches for the management of clinical varicoceles are being used.^{4,5} These approaches may

include retroperitoneal, microsurgical inguinal or subinguinal approaches, laparoscopic repairs or radiographic embolization. Every approach is associated with variable success and complication rates.⁶ The outcome of the treatment of varicocele depends on the technique used as well as on the skills of the clinician or surgeon performing the procedure. Various randomized controlled trials have compared the efficacy of conventional and the laparoscopic approach.⁷ Studies have shown an early return to daily life and reduced hospital stay in patients undergoing laparoscopic ligation and similarly it has reduced the postoperative use of analgesics. A study⁸ has reported that laparoscopic group has less pain scores than that of the open group (7.34 ± 0.87 vs. 7.82 ± 0.77 ; p -value 0.004 on the first postoperative day). They reported that the mean length of hospital stay in hours was significantly less in the laparoscopic group than the open group (37.2 ± 11.9 vs. 53.3 ± 13.1 ; $p < 0.001$).

Another randomized trial did not reveal any significant difference in analgesic use frequency in both the groups yet it showed faster return daily life and less complication rate with laparoscopic approach. Hence,

varicocele continues to provoke controversies among reproductive experts; however, it is due on fertility specialists to recruit participants or patients to design randomized, controlled trials to reach a proper and definitive conclusion.

Current study was planned to highlight the differences in immediate postoperative pain and hospital stay of patients with varicoceles managed either laproscopically or vid open method to help setting a standard of care in management of such patients and thus identifying the benefits of one approach over the other.

Materials and Methods

A randomized controlled trial having 80 was carried out at Benazir Bhutto Hospital Rawalpindi in Surgical Unit-1 over a period of 6 months from January to June 2011. All the patients included in the study were suffering from varicocele based on clinical criteria (scrotal asymmetry, heaviness in scrotum and testicular pain), ages between 15-35 years and who had to undergo high ligation of varicocele. Patients with varicocele secondary to malignancy or obstruction, with history of previous lower abdominal surgery, who received narcotic analgesics or ketamine during the induction or maintenance phase of anaesthesia and those with ASA grade above II, were not included in the study. After obtaining the approval from the hospital ethical committee, informed consent was taken from each patient. The diagnosis of varicocele was made by physical examination with the Valsalva maneuver. Doppler ultrasonography was also performed using the probe placed over the spermatic cord in the subinguinal area. Doppler exam could document retrograde blood flow in the spermatic cord, which confirmed the diagnosis. The patients were divided in two groups (Group A and Group B) randomly based on computer-generated table of random numbers. Group A had the patients who had to undergo high ligation of varicocele by open method and the Group B patients undergo high ligation of varicocele by laparoscopic method.

All patients received perioperative intravenous antibiotics, usually ceftriaxone with dose adjusted according to their age. All surgeries were performed under general anasesthesia, by consultant surgeons well experienced in the procedures to minimize bias. Open high ligation was done through Grid iron (muscle splitting abdominal) approach, testicular vessels were approached extraperitoneally, vein was separated from the artery after identification and was divided in ligatures. Wound was closed in layers with absorbable sutures and skin was closed with silk sutures. Laparoscopic high ligation was be done by inserting three ports, testicular vessels were approached intraperitoneally and testicular vein was clipped and divided. Wound was closed with absorbable suture materials and skin was closed with silk sutures.

Operative time for each case was calculated in minutes by the trainee researcher using a standard stop watch who was personally present in the theater from the time of incision or insertion of ports till last skin stitches. Similarly, postoperatively patient pain was assessed by trainee researcher using visual analogue scale at 12 hours after surgery. All patients received analgesia in the form of intramuscular injection Diclofenic Sodium 75mg immediately after surgery and then the injection was repeated after 12 hours. No preoperative or postoperative analgesia was given in any patient. Length of postoperative hospital stay was calculated in terms of hours after which patient were discharged as mentioned in the patients' notes.

All the data were recorded on designed proforma. All the data were entered to SPSS software for windows version 10. Mean and standard deviation were calculated for all quantitative data (age, operative time, length of hospital stay and VAS Score). Means of length of hospital stay and post operative pain were compared by applying independent samples t-test. A p-value < 0.05 was considered statistically significant.

Results

The present study included a total of 80 patients; out of which 40 patients underwent open high ligation of varicocele and the other 40 patients underwent laparoscopic high ligation of varicocele. The age of the patients in open high ligation of varicocele ranged from 15 to 35 years with mean age of 23.25 ± 5.9 years. The age of the patients in laparoscopic high ligation of varicocele ranged from 17 to 29 years with a mean age of 23.1 ± 3.5 years (figure1). This difference was not statistically significant ($p = 0.894$). 69 (86.3%) varicoceles were on the left side and 11 (13.8%) were on the right side. 23 patients had grade 1, 36 had grade 2 and 21 had grade 3 varicoceles. In open high ligation of varicocele group 13, 16 and 11 patients had grade 1, 2 and 3 varicoceles respectively. In laparoscopic high ligation of varicocele group 10, 20 and 10 patients had grade 1, 2 and 3 varicoceles respectively. This difference was not statistically significant ($p = 0.643$).

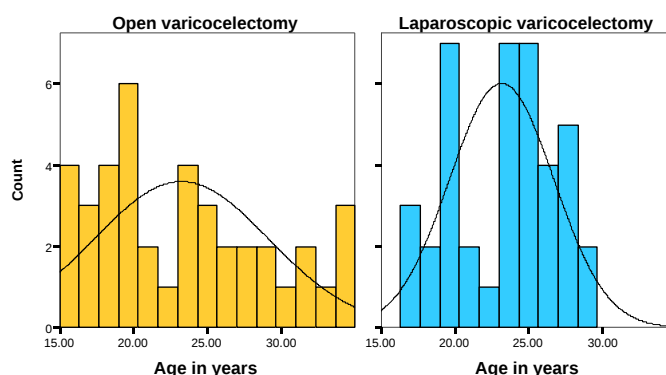


Figure 1: Age distribution of study groups

The operation time was calculated from trocar insertion to trocar extraction and skin closure for laparoscopic high ligation of varicocele, and from incision to skin closure in open high ligation of varicocele. The operative time was not considered from the beginning of anesthesia induction because the preparation of laparoscopic equipment would add to the operative time of laparoscopy. The operative time ranged from 25 to 55 minutes for the open high ligation of varicocele with a mean operative time of 38.75 ± 7.8 minutes. The operative time ranged from 17 to 60 minutes for the laparoscopic high ligation of varicocele with a mean operative time of 30.48 ± 10.6 minutes (figure. 2). The operative time was statistically significantly different between the two groups ($p = 0.000$).

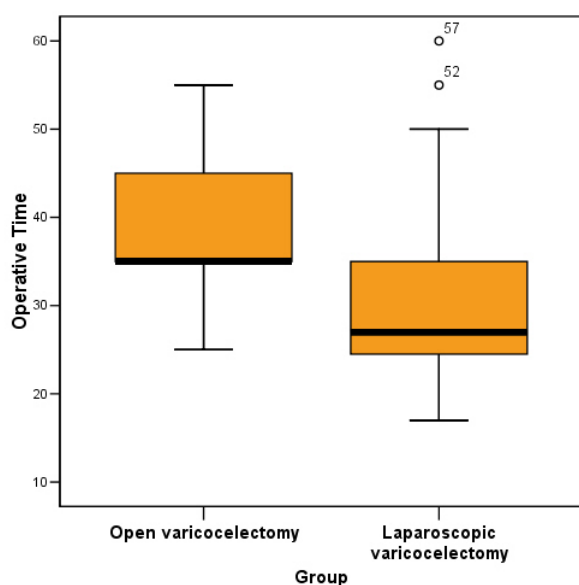


Figure 2: Operative time for the both groups

12 hours postoperatively pain was evaluated on the visual analog scale. The pain scores ranged from 3 to 9 for the open high ligation of varicocele with a mean pain score of 5.22 ± 1.84 . The pain score ranged from 2 to 6 for the laparoscopic high ligation of varicocele with a mean pain score of 3.75 ± 1.05 (figure. 3). The pain score was statistically significantly different between the two groups ($p = 0.000$). The postoperative hospital stay time ranged from 30 to 72 hours for the open high ligation of varicocele with a mean postoperative hospital stay of 45.7 ± 8.7 hours. The postoperative hospital stay ranged from 24 to 66 hours for the laparoscopic high ligation of varicocele with a mean postoperative hospital stay of 38.6 ± 9.6 hours (figure. 4). The postoperative hospital stay time was statistically significantly different between the two groups ($p = 0.000$).

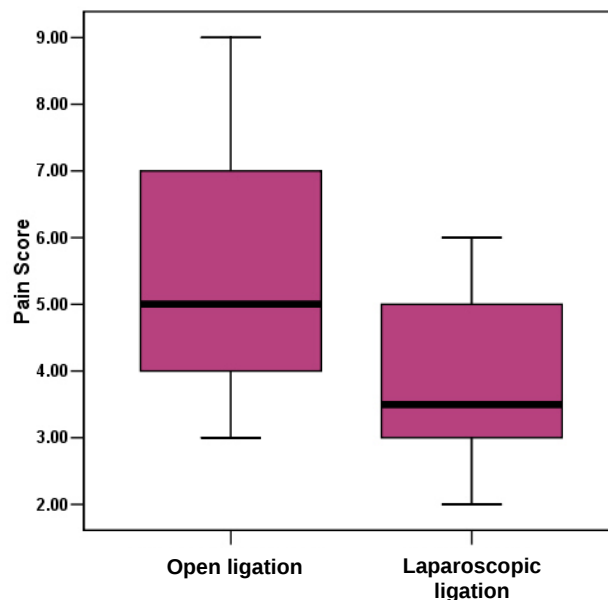


Figure 3: Pain score of the both groups

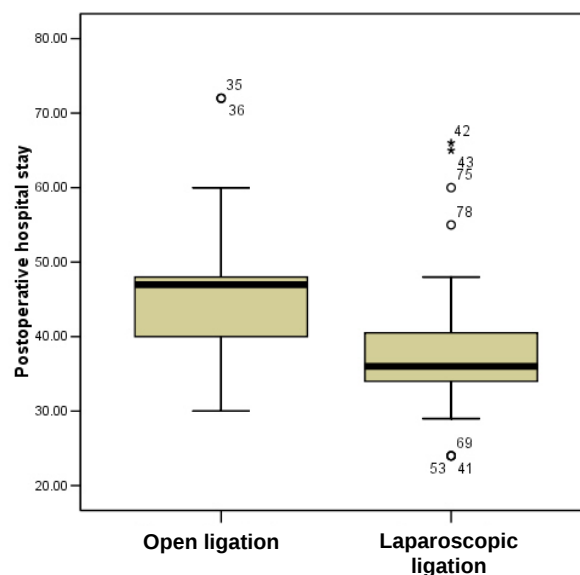


Figure 4: Postoperative hospital for the patients of both groups

Discussion

The present study conducted a study at Surgical Unit-I of Benazir Bhutto Hospital revealed that laparoscopic high ligation of varicocele is superior to open high ligation of varicocele in terms of operative time, postoperative pain and postoperative hospital stay. However, the two groups (open and laparoscopic high ligation of varicocele) were similar with respect to age, side and grade of varicocele ($p > 0.05$). Mean operative time, mean pain score and hospital stay for open high

ligation of varicocele were 38.75 ± 7.8 minutes, 5.22 ± 1.84 and 24 to 66 hours respectively. Mean operative time, mean pain score and hospital stay for laparoscopic high ligation of varicocele were 30.48 ± 10.6 minutes, 3.75 ± 1.05 and 38.6 ± 9.6 hours respectively.

The finding of more left sided varicoceles in our study matched to the previously published results. In a study conducted at Dow University of Health Sciences, Karachi revealed that 95.45% patients had varicocele on the left and 4.54% had it on the right side.⁹

The use of high ligation of varicocele for the treatment of sub-fertility seems to be irrefutable. However, there are different opinions regarding the proper surgical method of varicocele ablation. At present, inguinal and high retroperitoneal approaches are most commonly performed methods. However, postoperative morbidity is common with delayed return to normal activity. At the same time, bilateral operations are also performed commonly. These considerations have made a base for search of alternative techniques. The laparoscopic procedure is as simple and effective as more traditional methods. In addition, it offers reduced morbidity, helps preserve the spermatic artery allowing the microscopic dissection and is amenable to bilateral ligation without a second incision.

However, the best treatment for varicocele is still a puzzling debate whether ligation of a unilateral varicose spermatic vein is worth performing by laparoscopy or not. Mandressi et al¹⁰ conducted a study having 280 patients with palpable left varicoceles who were treated with spermatic vein ligation either by open surgery including 120 patients or by laparoscopy having 160 patients. They reported the same effectiveness and intraoperative safety for both the groups, shorter operating time for open surgery, shorter hospital stay in the laparoscopic group, and more postoperative complications in the open surgery (7.5%) than in the laparoscopic group (0.6%). But, they concluded that laparoscopy was not a worthy method to treat unilateral because it costs about 60% more than open surgery. There is one difference between study by Mandressi et al and the present study that is intraoperative time. It may be due to difference in expertise and method of time recording.

Hagood et al¹¹ presented a preliminary report on ten patients who underwent laparoscopic ligation of the spermatic veins at the internal inguinal ring, reporting that this new method was a viable alternative for conventional high ligation of varicocele.

This was followed by many studies and meta-analyses on the subject. To determine the safety and efficacy of laparoscopic high ligation of varicocele in the treatment of symptomatic varicocele, Tan et al¹² conducted a study on 108 varicocelectomies. The operation was performed on a day surgery basis with an average operative time of 61.4 min (56.6 min for unilateral and

75.8 min for bilateral high ligation of varicocele). They reported low morbidity, pneumoscotum in 2 patients and wound infection in the other 2. Sixty-one patients showed improved sperm count and their motility. Hence they concluded that laparoscopic high ligation of varicocele is beneficial and effective that causes least discomfort and offers an early return to the usual life.

The present study showed a significantly shorter operative time with laparoscopic high ligation of varicocele. Ghanem and colleagues¹³ came up with the operative time of 45 minutes using unilateral subinguinal method and 25.6 minutes using high retroperitoneal method. Watanabe and coworkers¹⁴ reported an operative time of 111.8 ± 21.1 minutes for unilateral high retroperitoneal high ligation of varicocele and 86.3 ± 28.4 minutes for unilateral subinguinal high ligation of varicocele under LA. The operative time in the present study for open surgery was 38 minutes on average. The operative time for laparoscopic high ligation of varicocele ranged from 17 to 60 minutes in our study. Watanabe and colleagues reported a mean operative time of 109 ± 27 minutes, although their operations were unilateral. Kwon and associates reported a mean of 102 minutes for this.¹⁵ Ogura and colleagues performed bilateral laparoscopic high ligation of varicocele on 39 patients with an operative time of 96.6 minutes.¹⁶ Hirsch and colleagues¹⁷ concluded in their study on 41 patients suffering from varicocele and reported that laparoscopic high ligation of varicocele has no advantage over open subinguinal technique in terms of hospital stay, use of analgesic, and going back to activity. Moreover, laparoscopic high ligation of varicocele was longer and had more complications than open subinguinal approach.

Laparoscopic high ligation of varicocele was first performed by Sanchez-de-Badajoz et al.¹⁸ in Spain in 1990 and has since been reported by other authors.^{19,20,21,22} The principle of laparoscopic high ligation of varicocele is the same as that of open high ligation; the internal spermatic veins are occluded cephalad to the internal inguinal ring. Sanchez-de-Badajoz used electrocoagulation of the internal spermatic vessels but a high recurrence rate after electrocoagulation of the spermatic vessels has been reported and occlusion of the veins with metal clips is commonly preferred. The internal spermatic vessels are easily identified using a laparoscope at the umbilicus through the peritoneal cavity. The surgical procedure, which includes insertion of two working trocars, creation of an opening in the retroperitoneum to access the spermatic vessels, and clipping the internal spermatic veins, is easy to perform in less than 30 minutes when the veins and artery are occluded. Even though it is not necessary to cut the testicular artery during high ligation of varicocele, artery ligating high ligation of varicocele has been popular since the first report by Palomo²³ and the procedure has

no deleterious effect on testicular function or postoperative fertility. High ligation of varicocele that preserves the artery is also technically easy even though it requires a meticulous surgical technique and longer surgery (about 100 minutes).²⁴ A laparoscopic Doppler probe is useful for finding arterial pulsation. Because laparoscopic procedure uses a magnified surgical field, identification and preservation of the artery is easier than in open surgery. Although a high recurrence of postoperative varicocele has been reported in adolescent patients after artery-preserving open surgery²⁵, recurrence is rare after laparoscopic procedure even when the artery is preserved.²⁶ The effects of laparoscopic high ligation of varicocele on fertility are about the same as those of open high ligation.^{27,28} The usefulness of laparoscopic procedures for minor surgery, such as high ligation of varicocele or appendectomy, remains a matter of controversy because open procedures are similarly performed through a small skin incision.

Meta-analysis and literature analysis reveal that the outcome of laparoscopic high ligation of varicocele and open surgical procedures are comparable. One of the advantages of laparoscopic approach is that it offers to treat bilateral varicocele as well. A meta-analysis of 37 studies brought to light that there were not much statistical differences between laparoscopic surgery and open surgery in terms of complications such as recurrence rate and postoperative hydrocele rate.

Local studies on the subject are sparse. At Postgraduate Medical Institute, Lahore²⁹ a study of 84 high ligation of varicocele cases presented with mean age of 24.3 years. Varicoceles were present on left side in 96% of cases. 85% presented with dragging pain and swelling and 14% with infertility. Improvement in semen morphology observed in 28%. Wound infection 2.5% and recurrence rate 5% of cases without any mortality.

At Jinnah Hospital, Lahore³⁰ a prospective comparative study between open and laparoscopic techniques of high ligation of varicocele was carried out. Laparoscopic high ligation of varicocele (LPV) was performed on 26 patients (Group A) and open Palomo high ligation of varicocele (OPV) was performed on 26 patients (Group B). The recurrence rate of varicocele was 3.8% in-group A versus no recurrence in-group B ($p < 0.001$). Postoperative hydroceles formation was 7.6% in group A versus 11.4% in group B ($p < 0.003$). Wound complication was 3.8% in group A versus 7.6% in group B ($p < 0.001$). Testicular or scrotal edema was 7.6% in group A versus 11.4% in group B. Postoperative hospital stay was 24 hours in group A versus 72 hours in group B ($p < 0.001$). Operating time was 20 minutes in group A versus 30 minutes in group B ($p < 0.001$). Postoperative analgesia required was almost half in group A as compared to group B ($p < 0.005$). Conclusion: The study shows that clinical efficacy of

laparoscopic high ligation of varicocele is superior to traditional open high ligation of varicocele.

A study at Liaquat University of Medical and Health Sciences, Jamshoro³¹ compared the postsurgical outcome of laparoscopic and open inguinal high ligation of varicocele. They reported that average operative time was 34.8 ± 7.89 minutes for open inguinal and 43.8 ± 8.95 minutes for laparoscopic group. The analgesic requirement was 16.3 ± 1.58 tablets in the open inguinal and 11.3 ± 2.23 in the laparoscopic group. Postoperative pain was observed significantly reduced among the patients included in the laparoscopic group. They concluded that open inguinal procedure had a shorter operating time while laparoscopic high ligation of varicocele required less analgesic and short hospital stay. In a nutshell, laparoscopic technique is one of the best procedures for the treatment of varicocele.

Conclusion

Laparoscopic high ligation of varicocele had shorter operative time and lesser postoperative hospital and lesser postoperative pain as compared to that of open high ligation of varicocele.

References

- Cooper CS, Joudi FN, Williams RD. Urology. In: Doherty GM (ed) Current diagnosis and treatment: Surgery. 13th ed. USA: McGraw-Hill Companies, Inc. 2010;902-65.
- Çayan S, Shavakhabov S, Kadioglu A. Treatment of palpable varicocele in infertile men: A Meta-analysis to define the best technique. *J Androl* 2009;30:33-40.
- Chen C. Varicocele in male factor infertility: role of laparoscopic high ligation of varicocele. *Int Surg*. 2006;91:90-4.
- Barroso U, Andrade DM, Novaes H, Netto JM, Andrade J. Surgical treatment of varicocele in children with open and laparoscopic Palomo technique: a systematic review of the literature. *J Urol* 2009;181:2724-8.
- Zini A. Zini's rebuttal. *Can Urol Assoc J* 2007;1:281.
- Simforoosh N, Ziaee SA, Behjati S, Beygi FM, Arianpoor A, Abdi H. Laparoscopic management of varicocele using bipolar cautery versus open high ligation technique: a randomized, clinical trial. *J Laparoendosc Adv Surg Tech A*. 2007;17:743-7.
- Al-Kandari AM, Shabaan H, Ibrahim HM, Elshebiny YH, Shokeir AA. Comparison of outcomes of different high ligation of varicocele techniques: Open Inguinal, Laparoscopic, and Subinguinal Microscopic High ligation of varicocele: A Randomized Clinical Trial. *Urology* 2007;69:417-20.
- Sangrasi AK, Leghari AA, Memon A, K. Talpur KA, Memon AI, Memon JM. Laparoscopic Versus Inguinal (Ivanissevich) High ligation of varicocele. *J Coll Physicians Surg Pak* 2010;20:106-11.
- Syed Nizamuddin, Khadim H Sial Varicocele: treatment options. *Med Channel* 2006;12:60-2.
- Mandressi A, Buizza C, Antonelli D, Chisena S. Is laparoscopy a worthy method to treat varicocele? Comparison between 160 cases of two-port laparoscopic and 120 cases of open inguinal spermatic vein ligation. *J Endourol* 1996;10:435-41.
- Hagood PG, Mehan DJ, Worischek JH, Andrus CH, Parra RO. Laparoscopic high ligation of varicocele: preliminary report of a new technique. *J Urol* 1992; 147:73-6.

- 12 Tan SM, Ng FC, Ravintharan T, Lim PH, Chng HC. Laparoscopic high ligation of varicocele: technique and results. *Br J Urol* 1995; 75:523-8.
- 13 Ghanem H, Anis T, El-Nashar A, Shamloul R. Subinguinal microhigh ligation of varicocele versus retroperitoneal high ligation of varicocele: comparative study of complications and surgical outcome. *Urology* 2004;64:1005-9.
- 14 Watanabe M, Nagai A, Kusumi N, Tsuboi H, Nasu Y, Kumon H. Minimal invasiveness and effectivity of subinguinal microscopic high ligation of varicocele: a comparative study with retroperitoneal high and laparoscopic approaches. *Int J Urol* 2005;12:892-8.
- 15 Kwon ED, Sandlow JL, Donovan JF. Varix ligation. In: Smith AD, Badlani GH, Bagley DH, editors. *Smith's textbook of endourology*. 1st ed. St Louis: Quality Medical Publishing; 1996. p. 894-903.
- 16 Kwon ED, Sandlow JL, Donovan JF. Varix ligation. In: Smith AD, Badlani GH, Bagley DH, editors. *Smith's textbook of endourology*. 1st ed. St Louis: Quality Medical Publishing; 1996. p. 894-903.
- 17 Hirsch IH, Abdel-Meguid TA, Gomella LG. Postsurgical outcomes assessment following varicocele ligation: laparoscopic versus subinguinal approach. *Urology* 1998;51:810-5.
- 18 Sanchez-de-Badajoz E, Diaz-Ramirez F, Vara-Thorbeck C. Endoscopic varicocelelectomy. *J Endourol* 1990;4:371-74.
- 19 Liu QZ, Tian K, Zhang YX, Wang YL, Zhao PY. Comparison between laparoscopic and open surgical high ligation of the internal spermatic vein. *Zhonghua Nan Ke Xue* 2009 Jul;15(7):625-7.
- 20 Chan P. Management options of varicoceles. *Indian J Urol* 2011; 27(1): 65–73.
- 21 Choi WS, Kim SW. current issues in varicocele management: a review. *World J Mens Health*. 2013; 31(1): 12–20.
- 22 Moreira-Pinto J, Osorio AL, Carvalho F, de Castro JL, de Sousa JF, Enes C, et al. Varicocelelectomy in adolescents: laparoscopic versus open high ligation technique. *Afr J Pediatr Sur* 2011;8(1):40-3.
- 23 Palomo A. Radical cure of varicocele by a new technique: preliminary report. *J Urol* 1949;61:60A24.
- 24 Matsuda T, Ogura K, Uchida J, Fujita I, Terachi T, Yoshida O. Smaller ports result in shorter convalescence after laparoscopic high ligation of varicocele. *J Urol* 1995;153:1175-7.