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Original Research Article

Laparoscopic versus open surgical management of idiopathic varicocele: a study on 100 patients

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ABSTRACT

Background: Idiopathic varicocele is common condition encountered in surgical practice requiring surgical correction. Open surgical technique had been in use for long but laparoscopic varicocelectomy is another choice for its management.
Methods: This is a prospective study on 100 patients. 70 patients were subjected to laparoscopic and 30 to open inguinal varicocelectomy.
Results: Majority of patients were between 16 to 25 years of age. 55% were asymptomatic and 10% had infertility. Grade II varicocele was observed in 50% patients. All patients had left side involvement with bilateral varicocele in 2% patients. Mean operating was 13.8 min in unilateral and 17.3 min in bilateral laparoscopic varicocelectomy whereas it was 27.55 min in unilateral and 49.7 min in bilateral open varicocelectomy. 5.7% and 6.6% had secondary hydrocele and hospital stay was 1.25 and 3.4 days in laparoscopic and open group respectively.
Conclusions: Laparoscopic varicocelectomy is safe, effective procedure with less post-operative pain and analgesic requirement. It also has shorter operating time and post-operative hospital stay. Procedures like opposite varicocele, herniotomy, adhesiolysis or orchiopexy can also be done.

Keywords: Infertility, Laparoscopic, Paloma's varicocelectomy, Varicocele

INTRODUCTION

Varicocele was first recognized as a clinical problem in the 16th century and Ambroise Pare (1500-1590) described this vascular abnormality due to melancholic blood. Varicocele is elongated, dilated and tortuous testicular veins in spermatic cord within the loose bag of scrotal skin that holds testicles. Usually it is asymptomatic and detected during routine medical examination like school health check-up, prior to recruitment or while investigating a male for primary infertility as varicocele is one of the most common cause of infertility.[1] Hence, this is one of the common entity encountered in general surgical practice that requires surgical correction. Clinical examination is usually sufficient to diagnose the condition but specific investigations like colour doppler study and semen examination are required for follow-up study to confirm effectivity of the surgical procedure adopted.

It is more common on left side as compared to right side and various anatomical factors have been postulated for high incidence on left side.

- Joining of left testicular vein to left renal vein at right angle
- Left testicular vein is longer than right testicular vein
- Left testicular vein is liable to get compressed by loaded sigmoid colon

- Left renal vein is often compressed between aorta and SMA.

Only mode of treatment is surgical correction. Indication of surgical intervention are for medical fitness, Grade II and above varicocele, symptomatic patient and treating infertile couple with male partner detected having varicocele with qualitatively poor semen examination findings. Surgical procedure can be performed by open (routine and microsurgical technique), laparoscopic ligation or embolization of testicular vein by intervention radiologist. Open varicocelectomy can be sub inguinal, inguinal or retroperitoneal. Commonly it is retroperitoneal approach through iliac incision. Laparoscopic approach can be performed using the intraperitoneal, pre-peritoneal, and lumbotomy approaches whereas embolization may ante grade or retrograde embolization. Laparoscopic varicocelectomy is a minimally invasive, safe, fast with early return to adtivity.[2,3]

The goal of treatment is to stop the backward flow of blood to the testicular veins (cool off the testicles).

METHODS

This study was carried out in Department of General Surgery, Dr. S.N. Medical College, Jodhpur (Rajasthan). Total 100 patients were included in this study and these patients were divided in two groups.

Group A: (70 patients) operated by laparoscopic method and

Group B: (30 patients) were operated by open surgical techniques

Preoperative clinical examination included symptoms observed by patient, clinical grade of varicocele, size of testes and presence of secondary hydrocele. Besides routine investigations, colour doppler study was performed in all cases and semen examination was done in patients having infertility.

In Group A, 62 patients were operated under general anaesthesia and 8 under regional anaesthesia. All open procedures were carried out under regional anaesthesia.

Laparoscopic technique

6 mm sub umbilical port for camera and two 6 mm working ports in midclavicular line at umbilical level were created. Peritoneum over gonadal vessels was incised and after lifting gonadal vessel 5 cm proximal to internal ring, ultrasonic harmonic scalpel in coagulation mode is used to divide them without separate dissection of artery (mass ligation).

Pneumoperitoneum was released and ports were closed.

Open technique

Inguinal approach was used for open varicocelectomy.

Parameters like duration of surgery, analgesic requirement, hospital stay, intraoperative and postoperative complications were recorded.

RESULTS

In both the groups, majority of patients were between 16 to 25 years of age (Group A; 76.6% and Group B; 85%). Extremes of age is infrequently involved in the disease process.

55 % of the patients in both groups were asymptomatic and presented to clinician for the reason of medical fitness as they were rejected by medical board for entry to armed forces. Dragging sensations, lower level of testes and mild pain were other symptoms observed 43%, 30% and 40% respectively. 10% of the patients had infertility and were referred by their consultants due to presence of varicocele as detected on investigation for infertility. Semen examination revealed oligospermia or poor motility or abnormal morphology of sperms.

Left side was involved in all patients and 2% patients in both groups had bilateral involvement. Isolated right sided varicocele was not seen on clinical examination in this study. In all patients, affected side had thicker size cord on examination in standing position as compared to normal side. 10 % in Group A and 13 % in Group B had relatively smaller size of testes on affected side as compared to normal side.

In clinical examination, in Group A, 42.8% had Grade 1, 50% had Grade II and 7.1% had Grade III varicocele. After colour Doppler study in same group 27.1% had Grade I, 60.9% had Grade II and 12.8 % had Grade III varicocele. Similarly, in Group B, 40 % had Grade I, 50% had Grade II and 10% had grade III varicocele but after Doppler study 23.3% had Grade I, 60% had grade II and 16.6% had Grade III varicocele. Incidence of bilateral varicocele also increased from 2 % (clinically) to 6 % in Group A and 4 % in Group B.

The mean duration of surgery in laparoscopic varicocelectomy was 13.8±1.2 minutes in unilateral cases and it was 17.3±1.7 minutes in bilateral cases. The duration of open varicocelectomy was 27.55±2.05 minutes in unilateral and 49.7±3.5 minutes in bilateral cases and the difference was statistically significant (P value <0.0001) in both i.e. unilateral and bilateral varicocele.

Following laparoscopic varicocelectomy, 70% had mild pain and 20% had moderate pain. Remaining patients did not complain of pain and no supplementary analgesics were administered. In open surgery, 91 % patients had moderate pain, 2% had severe pain and remaining had

mild pain once the effect of regional anaesthesia weaned off. More than two doses of strong analgesics (Tramadol) were required after open surgery in patients complaining of moderate or severe pain. In laparoscopic surgery, patients with mild pain were relieved after non-steroidal analgesic Diclofenac injection.

2 patients in Group A had minor surgical emphysema around umbilical port which subsided within 48 hours whereas one patient in Group B had mild intraoperative haemorrhage from pampiniform plexus during dissection. 5.7% in Group A had minor secondary hydrocele detected on ultrasonography whereas 6.6% in Group B had similar complication but in both group, it was asymptomatic. However, the difference was not statistically significant. 3.3% patients of Group B also had wound infection and similar percentage had recurrence of disease. No recurrence was noted in Group A. Both groups were followed up for 18 months.

Mean hospital stay in Group A was 1.25±0.3 days and in Group B it was 3.4±0.5 days. The difference was statistically significant.

Table 1: Comparative parameters of two procedures.

Parameters		Laparoscopic	Open
Operating time (min)	Unilateral	13.8	27.5
	Bilateral	17.3	49.7
Post-operative Pain	Mild	70 %	7 %
	Moderate	20 %	91 %
	Severe	Nil	2 %
Hospital stay (days)		1.25	3.4
Secondary hydrocele		5.7 %	3.3 %
Recurrence		Nil	6.6 %

DISCUSSION

Celsus, in the first century, found that varicocele leads to testicular atrophy. Abol-ghasem mentioned this subject and added to his teacher and suggested orchidectomy for testicular atrophy due to varicocele through scrotal incision parallel to the penis. Varicocele is present in 15% of the general male population, presumably an evolutionary consequence of men's upright posture. Several theories have been proposed to explain their occurrence including anatomical factors, poorly functioning valves and increased resistance to blood flow where the varicocele veins drain, creating a dam-like effect and increasing venous pressure.

Clinically varicocele have been graded as:

- Sub clinical: Varicocele detected only on imaging study.
- Grade 1: Varicocele palpable only during/after Valsalva manoeuvre.
- Grade 2: Varicocele palpable on physical examination.
- Grade 3: Varicocele visible on inspection and palpable on examination.

Although age of patient in present study varied from 13 to 55 years, most common age group affected (76.6% in Group A and 85% in Group B) was between 16 to 25 years. Other authors have reported mean age of 27.4 years (range 17 to 45 years) and 29 years.[1,2]

Most varicoceles are asymptomatic and common presentation is lower level of affected testes as compared to opposite site. However, few patients present with mild pain after long periods of sitting, standing or other activities and the pain is relieved by lying down. However, nearly 55% patients in both groups were asymptomatic largely due to fact that they were referred to surgical clinic for correction of varicocele being detected during medical examination for recruitment. 10% patients had associated infertility and varicocele was detected during course of investigation for infertility. These patients have either bilateral varicocele or they have grade 3 varicocele in unilateral cases. All these patients were above the age 22 years.

Barfield, a British surgeon, first proposed the relationship between infertility and varicocele in the late 19th century. The mechanism by which a varicocele on one side can affect the fertility of both testicles is not clearly understood. But temperature of the scrotum is normally several degrees cooler than body temperature, which is important for normal sperm production and testis function. The dilated veins in varicocele may decrease the effectiveness of this natural cooling mechanism and "overheat" the testis, thus reducing its ability to function as increased oxidative stress reduces the fertility in varicocele patients. Further, sperm DNA fragmentation rates, a measure of sperm quality, can be elevated in men with varicocele and that varicocele repair can significantly lower these rates.

On clinical examination 50% of patients had grade II varicocele in both study groups. 7.1% in Group A and 10% in Group B had grade III varicocele. Following colour doppler study, it was found 60% of patients had Grade II varicocele. Presence of bilateral varicocele also increased from 2% to 6% in Group A and 4% in Group B patients. Therefore, present study indicates that colour doppler study is useful in evaluation of grade of varicocele which is usually of lower grade on clinical examination. It will also detect subclinical varicocele in patients who are either asymptomatic or symptomatic but clinical examination fails to appreciate initial varicocele. Colour doppler is especially useful in patients with a thick scrotum, for evaluation of the right-side varicocele, to see venous reflux and to assess the testicular size.

Incidence of bilateral varicocele following ultrasonography study varies in different studies. In study of 100 patients, suspected to have varicocele, ultrasonography revealed that bilateral varicocele was present in 87% patients, left side varicocele in 12% and right sided varicocele in 1% patients.[1] In another study 72% patients had left sided lesion and 27% had bilateral varicocele and only 1% right sided varicocele.[3]

All varicocele patients do not require surgical intervention. Most of asymptomatic patients and those with minor discomfort can be treated with conservative management like scrotal support with elevation and low dose analgesics. No medicine has proved effective, however, Calcium dobesilate, Diosmin and Pentoxifylline have been used.

Surgical correction can be achieved by conventional open technique, laparoscopic/robotic or microsurgical technique. Radiological intervention and embolization of vessels is another mode of treatment of varicocele. Open varicocelectomy can be performed through retroperitoneal, inguinal or sub-inguinal approach and veins draining testes are ligated under regional anaesthesia.

Laparoscopic varicocelectomy was introduced in the early 1990s as an alternative to the open Paloma's varicocelectomy and has been performed using the intraperitoneal, preperitoneal, or lumbotomy approaches Trans-peritoneal approach to ligate retroperitoneally placed gonadal vessels under general or regional anaesthesia is most commonly used technique. The procedure can be done through conventional three ports or single port (SILS).

Ligation can be done either by dissecting veins from artery and ligation of veins only (modified Paloma's) or there can be mass ligation (classical Paloma's).[4] Arterial sparing needs dissection and is time consuming. Various studies have shown higher incidence of recurrence (2.2% versus 3.5%) and secondary hydrocele after Modified Paloma technique as compared to Classical Paloma.[5] Even classical Paloma technique is associated with better pregnancy rate as compared to artery preserving group.[6] Mass ligation is not associated with testicular atrophy as feared.[7] Following dissection, veins can either be clipped or coagulated using bipolar cautery, harmonic scalpel or vessel sealer.

The mean duration of laparoscopic varicocelectomy was 13.8±1.2 minutes (range 11 to 21.3 minutes) in unilateral and 17.3±1.7 minutes in bilateral cases. In 90% of patients the duration of laparoscopic varicocelectomy was less than 20 minutes irrespective of being unilateral or bilateral procedures. While the mean duration of operation in open varicocelectomy was 27.55±2.05 minutes in unilateral and 49.7±3.5 minutes in bilateral cases (range 22 to 45 minutes). In 70% patients of open varicocelectomy, the duration of operation was between 27 to 30 minutes and the difference was statistically significant (p value <0.0001). Similar finding were reported in another study with statistically significantly shorter time after laparoscopic varicocelectomy as compared to open varicocelectomy.[1] Average operative time of 40 minutes (range 25 to 85 minutes) for bilateral and 24 minutes (15-65 minutes) for unilateral laparoscopic varicocelectomy have been observed.[2] Operating time of 61.4 minutes (56.6% for unilateral and 75.8 for bilateral procedures) was also reported.[3] Relatively shorter operating time of 34±11 minutes for unilateral and 47±9 minutes for bilateral varicocelectomy was reported.[8] However, different observation were made in study on 39 patients with bilateral laparoscopic varicocelectomy and average operative time was 96.6 minutes which was much higher as compared to any study including present one.[9]

Results of present study indicates that post-operative pain was much less in laparoscopic group as compared to open group and therefore, post-operative analgesic requirement was also less. The average number of analgesic doses in laparoscopic group was 2.5 whereas in open group, average number of doses required were 4.5. None of patient in laparoscopic group required opioid analgesics while in open group patients with severe pain required 1 to 2 doses of opioid analgesic. Similar finding was also observed by other author stating that in laparoscopic group, requirement of analgesics was much less as compared to open group.[7]

Complications of varicocele surgery were compared after laparoscopic and open varicocelectomy. None of the case in laparoscopic group was converted to open and 2.8% patients had minor surgical emphysema. No other complications were observed in present study during laparoscopic approach. During open varicocelectomy, 1 patient (3.33%) had minor intraoperative bleeding. in this study. Surgical emphysema in morbidly obese patients have been reported after laparoscopic varicocelectomy.[1]

In a large series of 1344 laparoscopically treated patients versus 496 patients subjected to open Paloma's procedure, it was concluded that the rate of hydrocele in laparoscopic group and open group were 6.9% and 9.7% respectively and recurrence rate was 4.4% in laparoscopic group and 2.9% in open group. Both group had improvement in the quality of semen examination postoperatively.[4]

In comparative study on complications of different varicocelectomy techniques: open inguinal, laparoscopic, and sub inguinal microscopic, none of the patients of the microscopic group developed postoperative hydrocele as observed in 13% patients of open and 20% in the laparoscopic group.[8]

Patients were followed up to 12 months. Follow up colour doppler study showed negligible venous reflux in both groups. 5.7% patient in laparoscopic group had

secondary hydrocele and 7.7% patient after open varicocelectomy had secondary hydrocele formation.[1] Patient from open group underwent surgical intervention for hydrocele. Hydrocele (3.3%) after laparoscopic technique was reported by other authors.[1,7] Post-operative hydrocele formation was 13% and 20% in open and laparoscopic group.[8] Kocvara reported hydrocele formation in 17.9% with conventional laparoscopic varicocelectomy and 1.9% with their own method (preservation of lymphatic vessels and postulated that aetiology of post varicocelectomy hydrocele is due to ligation of the lymphatic vessels that are colourless.[10] Hassan observed hydrocele in 29.8% patients after 6 months of follow up with unilateral laparoscopic varicocelectomy. They concluded that hydrocele formation rate is high in long time follow up and when spermatic veins are ligated and cut instead of ligation alone.[11]

Varicocele recurrence is one of the complication after varicocelectomy. In present study, 3.33% had recurrence after open varicocelectomy with one year follow up and none of patients in group A had recurrence. 6.6% recurrence after laparoscopic varicocelectomy and no recurrence after open varicocelectomy have been reported.[1] Low recurrence rate was observed in the microscopic varicocelectomy as compared to laparoscopic varicocelectomy.[8] Various authors attributed high mass ligation of both testicular artery and vein in laparoscopic varicocelectomy as a cause of very low recurrence rate.[12,13] Recurrence rate from nil to 18% have been reported after laparoscopic and open varicocelectomy.[2,8,14-16]

In present study, none of patients had post-operative testicular atrophy during follow up period. Classical Paloma's technique i.e. mass ligation having no effect on testicular growth or testicular atrophy is reported in literature.[7,13] Average post-operative hospital stay after laparoscopic varicocelectomy was much shorter as compared to open group and the difference was statistically significant. Similar results were reported by another author.[7]

Only 60% of the patients presenting with infertility and varicocele reported for three follow-ups and there was improvement in the quality of semen but due to lack of long term follow-up visits, result of varicocele surgery in terms of positive pregnancy could not be assessed.

Increasingly the open general surgical procedure is being replaced by laparoscopic surgery because of the advantages like minimal postoperative pain, shorter hospital stays, early return to normal activity, feasibility in recurrent varicocele, simultaneous bilateral approach, ability to deal associated problem like herniotomy etc. ease to deal obese patient. Various authors have also reported laparoscopic varicocelectomy a safe, effective, procedure with minimum discomfort with early return to activity.[3,7,17]

Apart from the advantages of early recovery early return to work and pain free post-operative period, the distinct advantages of laparoscopic approach is that both sides can be operated with same port/ports.[2,3] Patients with obesity or history of previous surgery in inguinal region can also be treated by laparoscopic technique. Other procedures like herniotomy, adhesiolysis or testicular mobilization for orchiopaxy in Undescended tests can also be done through same approach along with varicocelectomy.

However, different observation has also been made. In a prospective study comparing the postsurgical outcome parameters of both laparoscopic and open sub inguinal techniques for varicocele ligation found no superiority of laparoscopic techniques over the standard open sub inguinal technique with respect to hospital stay, analgesic requirements, or return to work. Laparoscopic techniques require longer operative time and general anaesthesia.[18]

In study on 161 paediatric patients, it was observed that the results of the laparoscopic approach are comparable to open approach. However, the important advantages of laparoscopy were its minimal invasiveness, precision of intervention and feasibility of performing other procedures like herniotomy and adhesiolysis required in 16% patients in this multicenteric study.[5]

CONCLUSION

It is concluded from the present study that laparoscopic varicocelectomy is a safe, simple with minimum morbidity and have less post-operative pain and hence less analgesic requirement. Early recovery and return to work with fewer intra-operative and post-operative complication have been reported. Therefore, it is a viable alternative to open varicocelectomy.

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