



A PROSPECTIVE STUDY OF HD LAPAROSCOPIC VARICOCELE LIGATION FOR CHRONIC SCROTAL PAIN

Urology

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ABSTRACT

Introduction: The prevalence of varicocele is approximately 15% in the general population, and about 2 - 10 % of them have chronic scrotal pain. Microsurgical or Laparoscopic testicular vein ligations are preferred surgical options for the patient refractory to conservative therapy. Previous studies have proved the superiority of microscopic surgeries in painful varicocele treatment but the newer HD endo-vision system has improved laparoscopic vision quality significantly and testicular veins are identified more precisely than ever before. So there is a need to relook the results of laparoscopic varicocele ligation. We have done a prospective observational study to assess patients' perceived changes in scrotal pain scores pre-and-post HD laparoscopic varicocele ligation.

Materials and Methods: This prospective observational study was conducted at a tertiary care referral center. All patients with scrotal pain were evaluated for varicocele between September 2017 and December 2018. Varicocele patients with normal semen count with chronic scrotal pain not responding to conservative therapy were included in the study. The Laparoscopic varicocele ligation surgeries were done by HD endo-vision system under general or spinal anesthesia. Preoperative and post-operative universal pain scores were compared by Student's pair t-test.

Result: A total of 34 patients (mean age, 26.2±3.9 years) underwent Laparoscopic varicocele ligation for scrotal pain symptoms. Thirty-two patients (94.11%) reported complete or marked resolution of pain at 3 months follow-up. There was no early or late postoperative complication reported in any study patient. There was a marked improvement in the mean universal pain score, from 5.6 preoperatively to 1.1 postoperatively (p=0.00011).

Conclusion: HD Laparoscopic varicocele ligation has a very high success rate with minimal post-operative complications in painful varicocele management.

KEYWORDS

INTRODUCTION

Varicocele is an abnormal dilatation and tortuosity of the internal spermatic veins within the pampiniform plexus of the spermatic cord^[1]. The reported prevalence of varicocele varies; however, it is generally estimated at approximately 15%^[2]. Varicocele is typically asymptomatic although about 2 to 10% of males complain of testicular pain (Orchialgia), mainly in the scrotum or in the inguinal area^[3].

Surgical intervention is indicated for patients with resistance to conservative treatments or persistence of symptoms despite a reasonable period of observation and inability to perform a limited activity.

The etiology of varicocele pain is hypothesized to be due to retrograde filling of pampiniform plexus from the spermatic vein. So all suggested surgical procedures are based on the principle of spermatic vein ligation (varicolectomy) to prevent retrograde filling. There are many techniques to achieve this goal, including the microsurgical subinguinal approach, which is the preferred surgical treatment, offering excellent outcomes while minimizing the risk of complications.

Laparoscopic varicocele ligation evolved in the late twentieth century, but it has not gained popularity due to high recurrence rates and complications like hydrocele as compared to microscopic varicocele ligation. Many studies had proved the superiority of microscopic surgery, over SD (Standard Definition) laparoscopic varicocele ligation due to better optics and magnification of minute testicular vessels under a microscope.

In the modern era, a newer High Definition (HD) endo-vision system has improved our laparoscopic vision quality significantly, and now it is helping surgeons, to identify testicular veins more precisely than ever before. So there is a need to relook the results of laparoscopic varicocele ligation again, empowered with HD endo-vision systems, better optic & magnification. A recent prospective study by Jukic et al in the year 2019, have reported fewer complications and recurrence rates with laparoscopic varicocele ligation as compare to microscopic open varicocele surgeries^[4].

The laparoscopic method is less complex as compared to the open

method because only fewer veins need to be ligated at this level^[5,6]. Additionally, since the testicular artery is not branched at this level, there is no risk of an injury^[7]. Various other advantages of laparoscopic varicocele ligation are lesser learning time, minimal dissection, ultra-fast surgery, early recovery, excellent outcome, and better cosmetic result. Either bilateral varicocele ligation can be approached in the same sitting.

There are only a few published articles on laparoscopic varicocele ligation in the literature using the HD endo-vision system. Most of the studies on varicocele ligation have been done retrospectively and based on infertility problems, but varicocele patients most commonly reported to the healthcare system with scrotal pain, which was unaddressed in these studies. So there was a need for prospective studies for the treatment of painful varicocele using HD laparoscopic endo-vision.

We have done a prospective observational study to assess patients' perceived changes in scrotal pain scores pre-and-post HD laparoscopic varicocele ligation.

MATERIALS AND METHODS

This prospective observational study was conducted at a tertiary care referral center at the Department of Urology, Safdarjung Hospital New Delhi. All patients with scrotal pain were evaluated for varicocele and other differential diagnoses between September 2017 and December 2018. Radiological investigations by color Doppler scrotum and semen analysis were done after thorough clinical examination. Only patients with normal semen count with chronic scrotal pain not responding to conservative therapy were included in the study. Patients with other pathologies like hydrocele, torsion, previous hernia surgery, inguinal hernia, men with lower urinary tract symptoms were excluded from the study. Patients whose cause of scrotal pain was ambiguous and who had a previous history of scrotal trauma or surgery were excluded from this study. Patients who needed varicocele ligation only for infertility indication were also excluded from the study. Written consent from each patient was obtained. Patients were classified into different grades of varicocele based on clinical examination and color Doppler findings. Varicocele was classified into the following grades: grade I, varicocele palpable during a Valsalva maneuver when upright;

grade II, varicocele palpable when upright without Valsalva maneuver; and grade III, varicocele palpable and visually detectable^[8].

Patients demographics [age, height, weight, body mass index (BMI), etc.], grade (I, II, III) location of varicocele (right, left or bilateral), duration (months), and quality (dull, dragging, aching) of pain were recorded. To evaluate the quantity of pain, we used a universal pain score, where 0 indicated no pain and 10 indicated the worst pain imaginable (0, 1-3, 4-6, 7-10: none, mild, moderate, severe; respectively)^[9].

All the Laparoscopic varicocele ligation surgeries were done by HD endo-vision surgery under general or spinal anesthesia by an experienced surgeon of the urology department. Testicular vessels were identified above the superficial inguinal ring and vein separated from lymphatic's & artery by minimal dissection. Veins were clamped by Liga clips and transected by scissors after preserving the testicular artery. A similar procedure was performed on the other side in bilateral varicocele patients.

All patients were asked to visit the hospital at 1 month & 3 months after surgery, at which time they were evaluated with a careful symptom review, scrotal examination at supine and standing positions, and a Universal pain score to assess the quantity of postoperative pain. Also, Doppler USG was performed when deemed clinically necessary for the discovery of varicocele recurrence.

Our primary objective was to determine pain resolution by the surgery, so pain scores were compared pre and postoperatively by Student's t-tests. A 5% level of significance was used for statistical testing. Analysis was performed using the statistical software MedCalc version 12.0.0.0.

RESULT

One hundred and ten patients presented with scrotal pain in the urology outpatient department between September 2017 to December 2018. A total of 34 patients (mean age, 26.2±3.9 years) underwent Laparoscopic varicocele ligation for scrotal pain symptoms after failed conservative therapy. Baseline characteristics of the 114 men are illustrated in Table 1. Clinical examination showed Grade 1, 2, 3 varicocele diseases in 4, 26, and 4 patients respectively. Of the 34 patients, 32 (94.11%) reported complete or marked resolution of pain at follow-up 3 months after surgery. Only 2 (5.88%) had recurrent or

persistent pain (≥3 points in universal pain scores). One patient had initial improvement in pain followed by the reappearance of a similar pain score, while another patient had no relief since the beginning, although post-operative color Doppler had shown improvement in varicocele diameter in both cases. No perioperative pain and wound infection was reported in any patient in the study. All patients were discharged on the first post-operative day. There were no early or late postoperative complications, such as orchitis, infection, scrotal hematoma, hydrocele, testicular atrophy, or progressive hypotrophy in any patients in the three-month follow-up. All recorded data were analyzed by statistical software MedCalc version 12.0.0.0. There was a marked improvement noted in the mean universal pain score, from 5.6 preoperatively to 1.1 postoperatively at three months follow-up. Analysis of pain score by Student's pair t-test has shown a *p*-value of 0.00011 with SD ±1.5. It was statistically significant and proving high efficacy of HD Laparoscopic varicocele ligation in painful varicocele treatment.

Table: 1 Patients Characteristic

Characteristic	Result
Mean age,	26.2 (22-38)
Mean body mass index, kg/m2	22.2 (17.1-26.6)
No. with varicocele location (%)	Left 17 (50%), Right 0 (0.0), Both 17 (50%)
Median pain duration before surgery, months (range)	36 (9-120)
No. with varicocele grade (%)	Grade I 4(11.7) Grade II 26 (76.5) Grade III 4 (11.7)
Median preoperative Pain scale (range)	6 (3-9)
No. with preoperative pain scale (%)	Mild (1-3) 1 (2.9) Moderate (4-6) 23 (67.64) Severe (7-10) 10 (29.4)
No. with preoperative pain quality (%)	Dull nature pain 24 (70.58) Dragging nature pain 1 (2.9) Aching nature pain 9 (26.4)
Mean operation time, minutes (range)	25 (22-32)
Mean hospitalization time, days	1 day for all
No. with anesthesia (%)	Spinal 10 (29.4) General 24 (70.5)

Table: 2 Comparison of painful varicocele improvement in other studies so far with different Techniques

Studies	Study type	Surgical methods (n)	Patients recruited (n)	Complete resolution of pain (%)	Improvement of pain (%)	Persistent pain (%)	Note (n)
Kaushal et al 2021	Pros	HD Laparoscopic	34	94.1	94.1	5.9	None
Peterson et al (1998) [3]	Retro Inguinal or subinguinal (24)	High ligation	35	86 89 11 Quality of pain Wound infections (2), hydroceles	89	11	Hydrocele 3, loss of testis 1
Yeniyoğlu et al (2003) [17]	Retro	High inguinal ligation	87	83	92	8	Wound infection (6), hydrocele (5)
Tung et al (2004)[18]	Retro	Subinguinal	31	90	100	0	4 patients had both pain and infertility
Karademir et al (2005) [19]	Retro	Inguinal or subinguinal	121	61	84	16	Symptoms worsened in a single case.
Abd Ellatif et al (2012) [20]	Pros	Inguinal or subinguinal	130	84	89	11	While waiting for surgery, 7 patients (4.6%) resolved their pain with conservative management. Hydrocele (4), wound infection (3), hematoma (1)
Maghraby (2002) [5]	Retro	Laparoscopic	58	84	94	6	Hydrocele (3), persistent varicocele (2)
Kachrilas et al (2014)[21]	Retro	Laparoscopic	48	88	98	2	Hydrocele (4), recurrences (5)
Yaman et al (2000) [22]	Retro	Subinguinal, microscopic	81	88	93	7	Recurrences (2)

Altunoluk et al (2010) [23]	Retro	Subinguinal, microscopic	237	86	92	8	
Kim et al (2012) [24]	Retro	Inguinal, microscopic	81	72	91	9	Recurrence (1), no hydrocele, no testicular atrophy
Chen (2012) [25]	Retro	Subinguinal, microscopic	76	55	72	28	Inclusion of only patients with left painful varicocele and normal semen quality
Park et al (2011) [26]	Retro	Inguinal or subinguinal, microscopic	53	50	94	6	
Lv et al (2016) [27]	Pros	Laparoscopic	84		60.7	39.3	Scrotal edema 8 Testicular atrophy 7.
Jukic et al (2019) [4]	Pros	Laparoscopic	142		91.1	8.9	Hydrocele 2, wound hematoma 1.

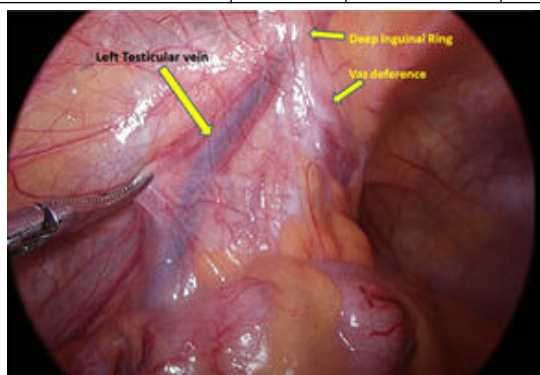


Image 1: Left Testicular vein HD Laparoscopic Image

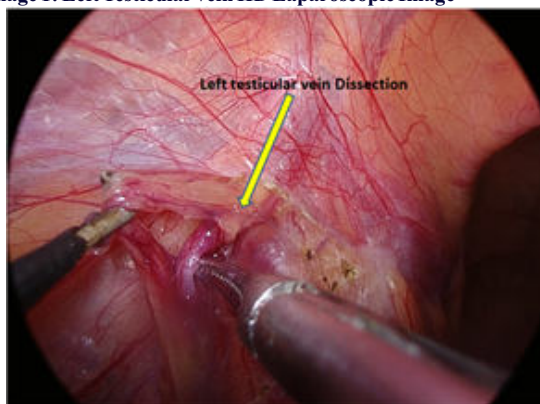


Image 2: Left Testicular Vein Dissection under HD Vision

DISCUSSION

Testicular pain associated with varicocele is typically described as a dull, aching, or throbbing pain in the testicle, scrotum, or groin; rarely, it can be acute, sharp, or stabbing. Varicocele is also described as scrotal heaviness that worsens with exercise, activity, or after standing for a prolonged duration.

The etiology of pain associated with varicocele is not completely understood. Oxidative stress, hormonal imbalances, and/or the reflux of toxic metabolites of adrenal or renal origin are proposed causes of testicular injuries^[10-11]. These testicular injuries not only lead to infertility but also testicular pain. Compression of surrounding neural fibers by the dilated venous complex is an additional factor causing pain associated with varicocele^[12]. Usually, adult men with varicocele are diagnosed during the evaluation of infertility & chronic scrotal pain, and varicocele in adolescents is discovered incidentally on physical examination. Therefore, physical examination is the most important diagnostic test for varicocele.

Conventional treatment of painful varicocele is a conservative treatment followed by surgery. Generally used conservative methods include scrotal elevation, non-steroidal anti-inflammatory medication, and decreased physical activity that often leads to unacceptable lifestyle restrictions^[13].

Varicocele surgeries are primarily indicated for infertility. Surgical treatment of painful varicocele is only recommended in men who have specific pain complaints and in whom conservative treatment has failed^[14]. The principle of all varicocele surgeries is ligation or obliteration of testicular veins to prevent the retrograde filling of pampiniform plexus along with preservation of testicular artery and lymphatics to minimize complications.

There is no consensus on the surgical method that is most appropriate for varicocele treatment, although microsurgical techniques have gained popularity with minimal complication rates and satisfactory outcomes in older studies. Almost all previous studies that compared microscopic surgeries with laparoscopic varicocele ligation, used SD laparoscopic endo-vision systems which had poor vision optics & magnification. Recently developed advanced HD laparoscopic endo-vision systems have improved laparoscopic vision quality significantly; it gives excellent magnification and optics, similar to an operating microscope. So there is a need, to re-evaluate the results of HD laparoscopic varicocele ligation and compare them with microscopic surgeries.

In the present era, HD laparoscopes are more easily available than microscopes, and laparoscopic varicocele ligation is one of the simplest laparoscopic procedures to learn. Laparoscopic high vein ligation also has some other advantages like less operative time, few testicular veins at the level, minimal dissection requirement, contralateral side surgery in the same sitting, better cosmetics results, and early recovery of the patients. However, it is more invasive and requires general or spinal anesthesia.

Shehata and Zahng in their studies have suggested that the HD operative field is positive for better postoperative outcomes^[15-16]. As there was no published prospective study on Laparoscopic varicocele ligation with HD endo-vision system in literature, so we had planned a prospective observational study for painful varicocele treatment, using an HD endo-vision system. Maghra et al and Kachrilas et al reported pain relief in 94% and 98% of patients respectively, while Lv et al had reported only 60.7% in their laparoscopic varicocele ligation studies, but they rejected laparoscopic varicocele ligation due to high recurrence rate and hydrocele complications. More recently Jukic et al compared laparoscopic and open varicocele ligation prospectively; he had observed similar pain relief in both procedures 91.1% and 90.4% respectively, but 27 cases of hydrocele were reported in an open microsurgery group while only two in the laparoscopic group. All 16 varicocele recurrences were reported only in the open microsurgery group. These studies are suggesting that improvements in surgical outcomes in recent laparoscopic studies are due to improvements in the endo-vision system.

Microscopic surgeries by Peterson, Yenyol, Tung, Kerademir, Abd Ellatif, Yaman, Altunoluk, Kim, Chan, and Park reported pain relief in 89, 92, 100, 84, 89, 93, 92, 91, 72, and 94 percent of participants. Our HD laparoscopy varicocele ligation surgery markedly reduced scrotal pain in 94.11% of patients. It is better than the previously reported success rate of SD laparoscopic varicocele ligation, and comparable to microsurgical technique, as shown in table 2. Pre and post HD laparoscopic varicocele ligation universal pain score also improved significantly and showed a p-value of 0.0001 in student's pair t-test analysis. In our study, we had found only two out of thirty-four patients, had persistent scrotal pain after surgery, which is comparable

to microsurgical varicocele ligation results from the literature. None of our patients had a recurrence of varicocele or complications like hydrocele formation in three months follow-up, which was commonly seen after SD laparoscopic varicocele ligation. The findings of our small prospective study have shown better surgical outcomes with HD laparoscopic endo-vision system in painful varicocele treatment.

Because the present study covered only a 3-month follow-up period and only a limited number of patients, a large prospective randomized controlled study with long-term follow-up are needed to compare microscopic and HD laparoscopic varicocele ligation for painful varicocele.

In conclusion HD laparoscopic varicocele ligation has shown a high success rate (94.11%) for scrotal pain relief with no recurrence, in this prospective study.

CONCLUSION

HD Laparoscopic varicocele ligation has a very high success rate with minimal post-operative complications in painful varicocele management.

Conflict of interest

The authors have no conflicts of interest concerning this manuscript.

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