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SOCIETY FOR SCIENCE AND EDUCATION

Laparoscopic Varicocelectomy by Artery Preserving and Mass Ligation Technique-A Comparative Study

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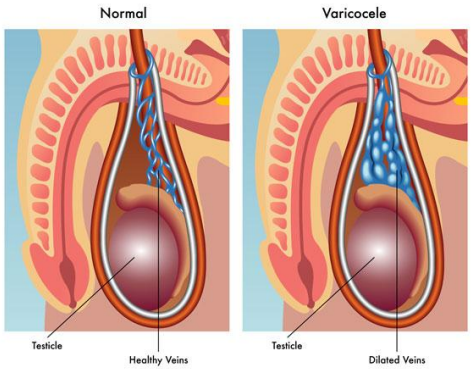

Organized by Medical Education Unit, AWMCH

Journal club
on 18th March,2025 at 8.30 AM
Venue-College auditorium
Speaker-Prof. Sardar Mohammad Rezaul Islam

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ABSTRACT

Background- There are multiple methods of varicocele treatment. No single approach is adopted as the best therapeutic option. Laparoscopic varicocelectomy (LV) is one of them. Artery sparing laparoscopic varicocelectomy was found to have high recurrence in literature. Retroperitoneal mass ligation of testicular vein and artery was first done in original Palomo operation. Chance of missing some veins are also less if mass ligation is done in LV. Testes get blood supply from testicular artery, cremasteric artery and artery to the vas. For this reason ligation of the testicular artery in the abdomen do not cause ischemia to testes. We present our experience on comparative study between LV with mass ligation *(ML)* and *artery preserving (AP) technique.* We compared the operation time, outcome, and complication in two groups of patients. Methods-*Forty*-eight varicoceles, both unilateral and bilateral, were operated *over a period of three years*. Twenty three underwent ligation of veins alone and twenty-five underwent ligation of testicular veins and artery en-mass. They were followed up for a period of three months after surgery. We collected *all* data in a prospective manner. Results: The average operation time for the artery-preserved and the *mass* ligated group w*as* 41±*5* minutes and 27±*3* minutes respectively. Average post-operative hospital stay was 46±*12* hrs. and 32±*7* hours respectively. There were no technical failures in either group. Complications and recurrence were less in the mass-ligation than in the artery-preserved group. On an average follow-up of 3 months all patients *remained* asymptomatic and had complete reduction in the size of the varicoceles. *There were no incidence of testicular atrophy in either group.* Conclusion: Laparoscopic

Keywords: Varicocele, Laparoscopic varicocelectomy, *Artery preserving*, Mass ligation.

INTRODUCTION

Varicocele is an abnormal dilatation of the veins of the pampiniform plexus. It occurs in 6% of children at age of ten, 13% of adolescents and 15% of males in the general population. However, varicocele has been observed in 35% of men with primary infertility and up to 80% of men with secondary infertility. The detrimental effect of varicocele on spermatogenesis in the sub-fertile male is manifested by low sperm count, decreased sperm motility and low percentage of normal sperm morphology together or in different combinations. Although many men with varicocele can father children varicocele causes a progressive time-dependent decline in semen quality. In general, varicoceles do not spontaneously regress. Varicocelectomy is the most common surgical procedure for infertility in males. These include ligation of the veins through the retroperitoneal, inguinal, or sub inguinal open approaches.Other advanced procedure includes percutaneous embolization and laparoscopy. The goal of treatment of the varicocele is to obstruct the refluxing venous drainage to the testis. The potential complications of varicocelectomy are hydrocele, recurrence and testicular atrophy.

MATERIALS AND METHODS

Patients selection-Over a period of 3 years, 41 patients underwent LV for left-sided and bilateral grade II and grade III varicoceles. Age of the patients rage between 15 to 54 years. Twenty three patients were operated with artery preserving method while other twenty five were operated with mass ligation technique.

Patients were selected with symptoms of pain in the testis and visible dilated veins of the pampiniform plexus. Uultrasonography of the scrotum were done for all patients to see dilated testicular veins. And confirm the diagnosis. All patients were operated for symptoms of scrotal pain or dilated ugly veins. No patient was operated for infertility.

Operative technique-Patients are operated in supine position under ggeneral anesthesia.Three trocars weree used for all cases. The first10mm trocar was inserted just above the umbilicus. The second 10mm trocar was inserted on the upper right ileac fossa and the third 5mm trochar on the left midclavicular line slightly below the level of the umbilicus. (Fig-1)12 to 15mm pressure is used for maintenance of pneumo peritoneum.. The internal inguinal ring was identified by slight traction on the testis from outside. The traction on the testis causes visible traction of the peritoneum on the deep ring thus to help identify testicular vessels... Spermatic vessels and vas deferens become clearly visible from the deep ring. (Fig. 2). The retroperitoneum was opened along the internal spermatic vessels for approximately 1cm using diathermy dissection. After that the internal spermatic vessels weree separated from the underlying psoas major with Maryland dissecting forceps. They were clamped with haemoclips. Usually four clips were applied on the vessels two centimeter apart. (Fig-3) The middle section of the spermatic vessel was excised and extracted via the right ileac fossa trocar. In case of artery preserving ligation, the dark coloured testicular vein was isolated from the pulsatile

artery under laparoscopic magnification the vein was then clipped and excised in the same manner. All the extracted specimens were sent for histopathology for confirmation.

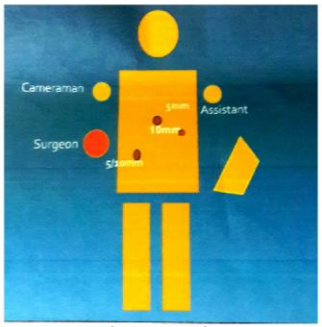

Fig-1 Ergonomics

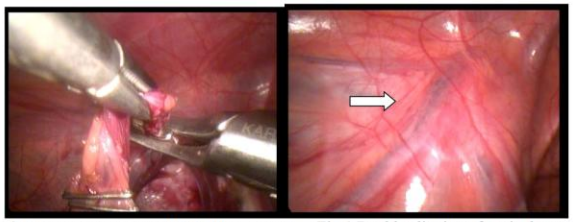

Fig-2.**Laparoscopic view of testicular vessels** Fig-3 Double clipping of testicular vessel

RESULTS

The average operation time was 41±5 minutes for LV with ligation of veins alone and 27±3 minutes for LV with mass ligation. There were no perioperative complications in the study group. Among the postoperative complications, there were 2 hydrocele formation and one recurrence in the artery-preserved group. The hydroceles resolved without further procedure. The recurrence was treated by open method. There was neither hydrocele nor recurrence in the mass ligation group. The average hospital stay was 46±12 hours in AP and 32±7 hours in ML respectively. (Table-1)Within one week of follow up all varicocele had marked reduction in size. At an average follow-up of 3 months, all patients of the artery-preserved and artery-ligated group remained asymptomatic. There were no testicular atrophy nor testicular pain in either group. (Table-2)

Table-1, **Comparison between operative outcome of Artery preserving LV and Mass-ligation LV**

	Artery preserving	Mass ligation
Operating time (Min)	**41±7**	**27±3**
Post op hospital stay (hours)	**46±5**	**32±7**

Table-2-**Comparison between complications of Artery preserving and mass-ligation technique**

	Artery preserving	Mass-ligation
Hydrocele	**2(10.5%)**	**nil**
Recurrence	**1(5%)**	**nil**
Testicular atrophy	**nil**	**nil**

Fig:4, Before surgery

Fig:5 **One week** after surgery

DISCUSSION

Traditional surgical correction of varicoceles has been done by ligation of the testicular veins via an inguinal (low/Ivanissevich) or retroperitoneal (high/Palomo) approach. However, these techniques in adolescents are associated with failure rates of approximately 3% to 37%[1-3]. Embolization of the testicular vein in experienced hands is reported to give better results, but recurrence still occurs in approximately 5%-50%[4, 5]. Also there is a 10 to 20% rate of unsuccessful intervention in the radiologic embolization approach. Venography has shown that the majority of missed vessels lie proximal to the site of vein ligation. In addition, the frequency of missed vessels is higher with a low approach. An approach that enables intraabdominal visualization of the testicular vessels might therefore be expected to reduce the rate of persistent or recurrent varicoceles. Limited data on laparoscopic management of varicoceles in adults give cure rates of 100%. These surprisingly good results may reflect the excellent visibility of the posterior abdominal wall achieved using the laparoscope, which allows a thorough search of sites known to be responsible for recurrent varicoceles, namely renal, vas associated, pelvic, and retro pubic cross-over veins. However, in patients who have recurrent varicoceles, the cause appears to be the presence of cremasteric or contralateral scrotal cross-over vessels, which conventional high and laparoscopic approaches may fail to control.

HYDROCELE FORMATION

Hydrocele formation is related to failure to preserve the lymphatic vessels associated with the spermatic cord. Franco[6] suggests complication rates are relatively low for LVL except for the hydrocele rate, which has been similar to that encountered with the open Palomo approach in case of adolescent male.Al Kandary AM etal[7] compared open Ingunal, laparoscopic and subinguinal microscopic(SMV) approach.They found that recurrence and hydrocele formation are least in the subinguinal microscopic approach. Recurrence rate of SMV, LV and Open technique are 5%,13% and18% respectively.Hydrocele formation of SMV,LV and open are 0%,13% and 20% respectively. Again SMV needs expertise of microsurgical technique, which is not always available. Another study done by Mc Mnnus MC etal,which found that LV has less recurrence than SMV but higher rate of post-op hydrocele formation.[8] Keys et al.[9] had a hydrocele rate of 12.5%, Pini Prato et al.[10] 12%, and Méndez-Gallart et al[11] 13.5% using laparoscopic mass ligation varicocelectomy.

Our study had hydrocele formation in 2 patients (10.5%) when artery preserving was done and in 0% when mass ligation was done. Rate of recurrence in one patient(5.2%) in AP and 0% in ML group. S.Taneja etal[12] has given and excellent comparison of recurrence and complication among all these four tchniques in his book.(Table-3)

Recurrence and Testicular atrophy

Beck et al.[13] suggested that unligated small internal spermatic veins may be a cause of varicocele recurrence. Rothman et al.[14] also concluded that recurrences are due to either collateralization or failure to ligate all branches of the venous plexus. Keys et al[9] had a recurrence rate of 8.3% at their center doing laparoscopic mass ligation. Méndez-Gallart et al.[11] showed that recurrence rates and complication rate of LV are similar to those reported with open surgery.

Testes get their blood supply from 3 sources.They are testicular artery from abdominal aorta , artery to the vas from internal spermatic artery and cremastereic artery from inferior epigastric aryery.So ligation of testicular artery should not cause testicular ischaemia as other two supply reamain present.Cimador et al.[15] demonstrated that ligation of the artery does not impair testicular growth and thus it is more useful and safe to interrupt the artery to avoid recurrence due to periarterial venous network. Agnifilli et al.[16] suggest that laparoscopic high mass ligation of both testicular artery and vein has very low recurrence rates and no incidence of testicular atrophy. Kattan et al.[17] concluded that LVL with internal spermatic artery ligation has lower recurrence rate than without internal spermatic artery ligation with no increase in hydrocele or testicular atrophy rate. Our study also had no testicular atrophy.

Polok et al.[18] also concluded that varicocelectomy using clips gives much less complications than electrocoagulation and should be chosen first. We have also advocated the principle of applying clips throughout. Tong et al.[19] demonstrated that lymphatic-sparing LV is a safe, effective and reliable treatment.

Table-3, Comparison between LV(AP and ML), Open inguinal and SMV(*S* Taneja et al[12])

Technique	Hydrocele %	Atrophy %	Recurrence %
LV-mass ligation	6-7	<1	2
LV-Artery preserving	<6	<1	11
Open inguinal	3-7	<1	6-15
SMV	<2	<1	<2

Table-4-Effect on spermatogenesis and fertility of three procedure-comparative analysis. (Ding et al [26])

	Open inguinal	LV	SMV
Improvement of sperm quantity and concentration	65%	67%	76%
Rate of pregnancy at 1 year	28%	30%	40%

Improvement of semen quality and pregnancy rate

Huk et al.[20] and Parott et al.[21] carried on comparative assessment of artery-ligating and artery-preserving varicocelectomy and found that ligation of vein and artery produced better improvement of semen characteristics and percentage of pregnancies in comparison with artery-sparing technique. Even Student et al.[22] confirmed using color Doppler sonography, that ligation of the testicular artery does not lead to major changes in testicular blood supply or sperm quality. Yamamoto et al.[23] demonstrated the effect of varicocelectomy on post-operative spermatogenesis and showed that sperm density and motility improved significantly in the artery-ligated group. Yamamoto et al.[23], Matsuda et al.[24] and Fielder et al.[25], all of them concluded that in spite of the advocative advantage of artery preservation, there was no significant difference between artery-ligating and artery-preserving groups when improvements in semen quality and pregnancy rates were assessed. Ding et al [26] showed, in their randomized controlled trial with 1015 patient that LV is at intermediate position in improvement of spermatogenesis and rate of pregnancy. (Table-4) SMV was found to be most effective in improvement of semen quality and rate of pregnancy at one year. Open inguinal approach was found to be least effective. But SMV needs expertise in microvascular technique, which is not available in every center.On the otherhand LV is easy to perform, less time consuming and has short learning curve.

CONCLUSION

LV is safe, effective and not very costly. It has minimal morbidity, short learning curve and excellent post-operative results.In terms of semen quality and pregnancy rates it is intermediate position compared to the other techniques .LV should preferably be done with en-bloc mass ligation as it has least chance of recurrence. Clips should be used in place of electrocoagulation for mass ligation.

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GS024

LAPAROSCOPIC VARICOCELECTOMY WITH ARTERY PRESERVING AND HIGH MASS LIGATION TECHNIQUE-A COMPARATIVE STUDY

SARDAR REZAUL ISLAM, KAMAL PASHA, SHAHINUR RAHMAN AND SHAFIQUR RAHMAN

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Backgraound: Varicocele therapy is a controversial issue.No single approach is adopted as the best therapeutic option. Testes get blood supply from testicular artery, cremasteric artery and artery to the vas. So ligation of testicular artery in the abdomen do not cause ischaemia to the testis.En mass ligation of testicular vein and artery is technically easy and fast in laparoscopic varicocelectomy (LV). Chance of missing some veins are also less when en-mass ligation is done in LV. We compared the operation time, outcome and complication in two groups of patient.

Methods: Forty-one varicoceles, both unilateral and bilateral, were operated over a period of three years. Nineteen underwent ligation of veins alone and twenty-two underwent ligation of testicular veins and artery en-mass. They were followed up for a period of three months after surgery.

Results: The average operation time for the artery-preserved and the mass ligated group was 41±5 minutes and 27±3 minutes respectively. Average post operative hospital stay was 46±12 hrs and 32±7 hours respectively. There were no technical failures in either group. Complications and recurrence were less in the mass-ligation than in the artery-preserved group. There were no incidence of testicular atrophy in either group.

Conclusion: Laparoscopic varicocelectomy with mass ligation technique

Royal Australasian College of Surgeons' Annual congress, Brisbane, Australia,2016

CSS, Annual congress, Kandy, Srilanka,2017. Srlanka

ELSA congress, Kualalampur, 2018

Deagu, South Korea,2015

Presentation of Varicocele

- Dragging pain
- Dilated tortuous veins of the pampiniform plexus
- Infertility

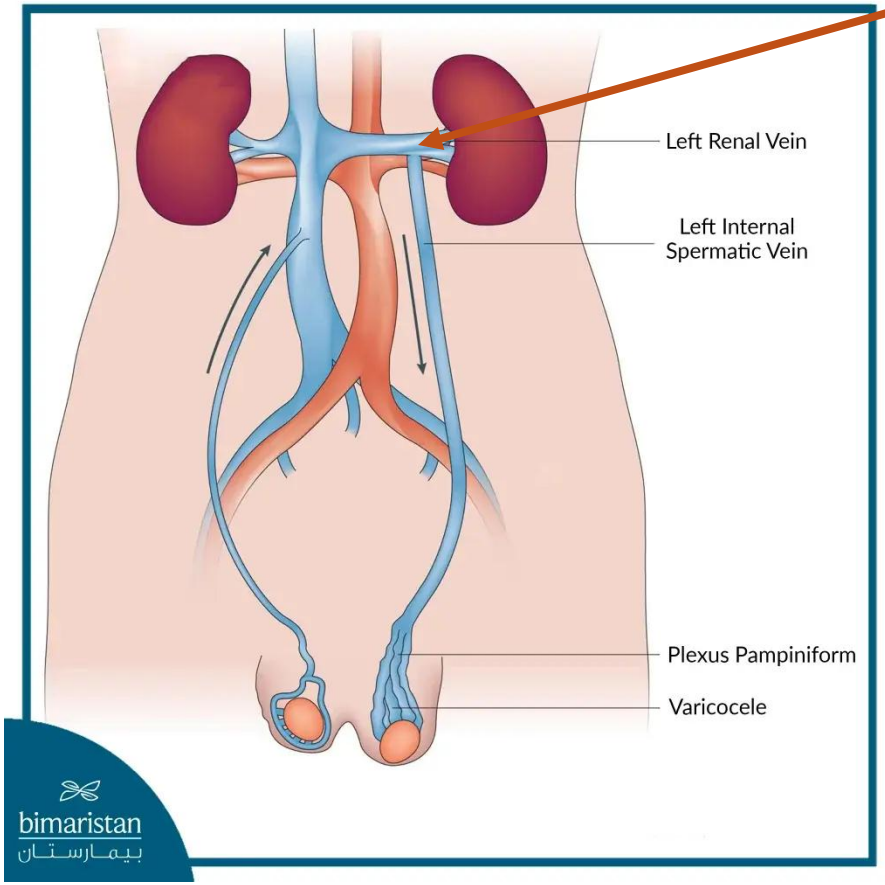
Left varicocele

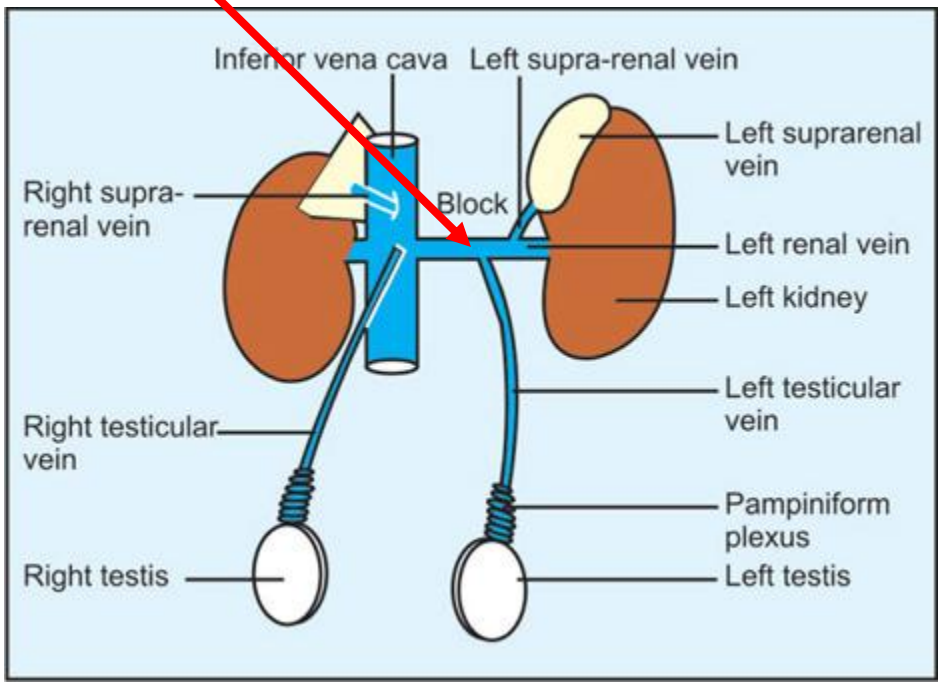
Left varicocele

Left varicocele

Why is varicocele more common on the left side?

High level of adrenalin





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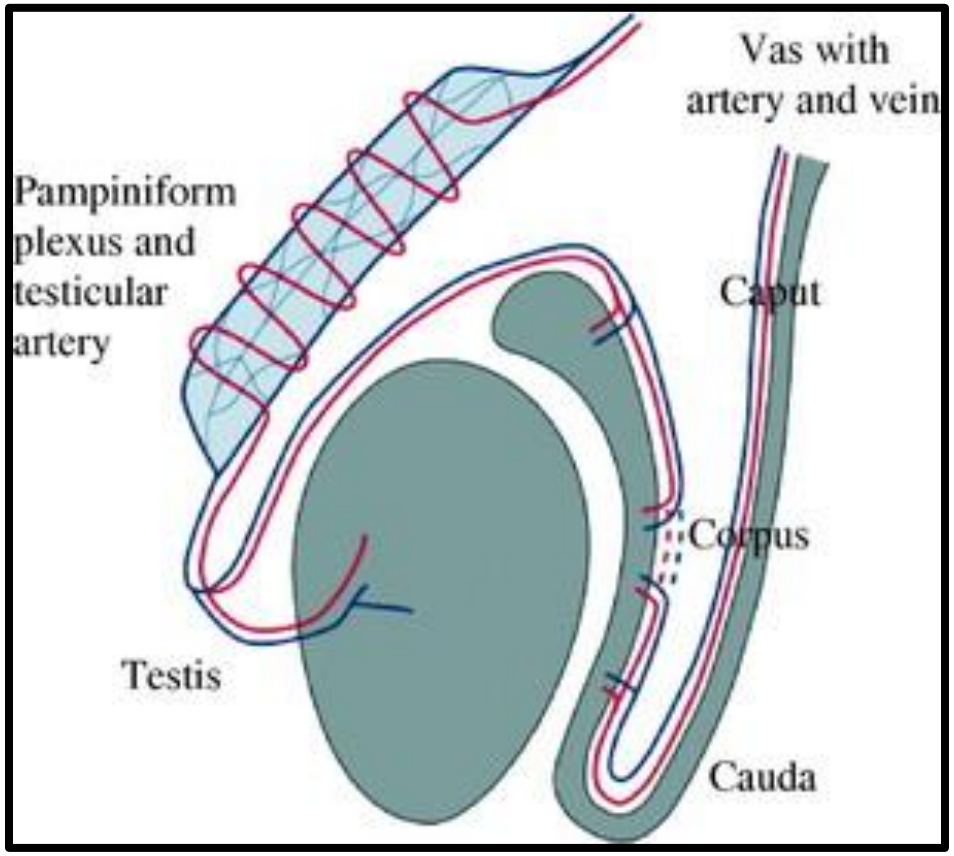
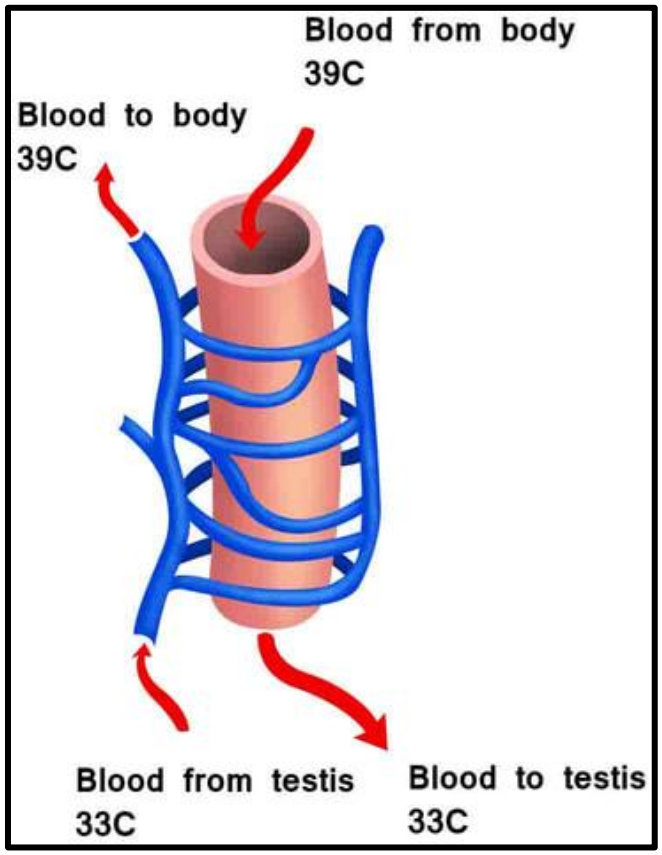
Why infertility in varicocele?





Due to impaired countercurrent heat exchange mechanism

Goal of treatment in varicocele

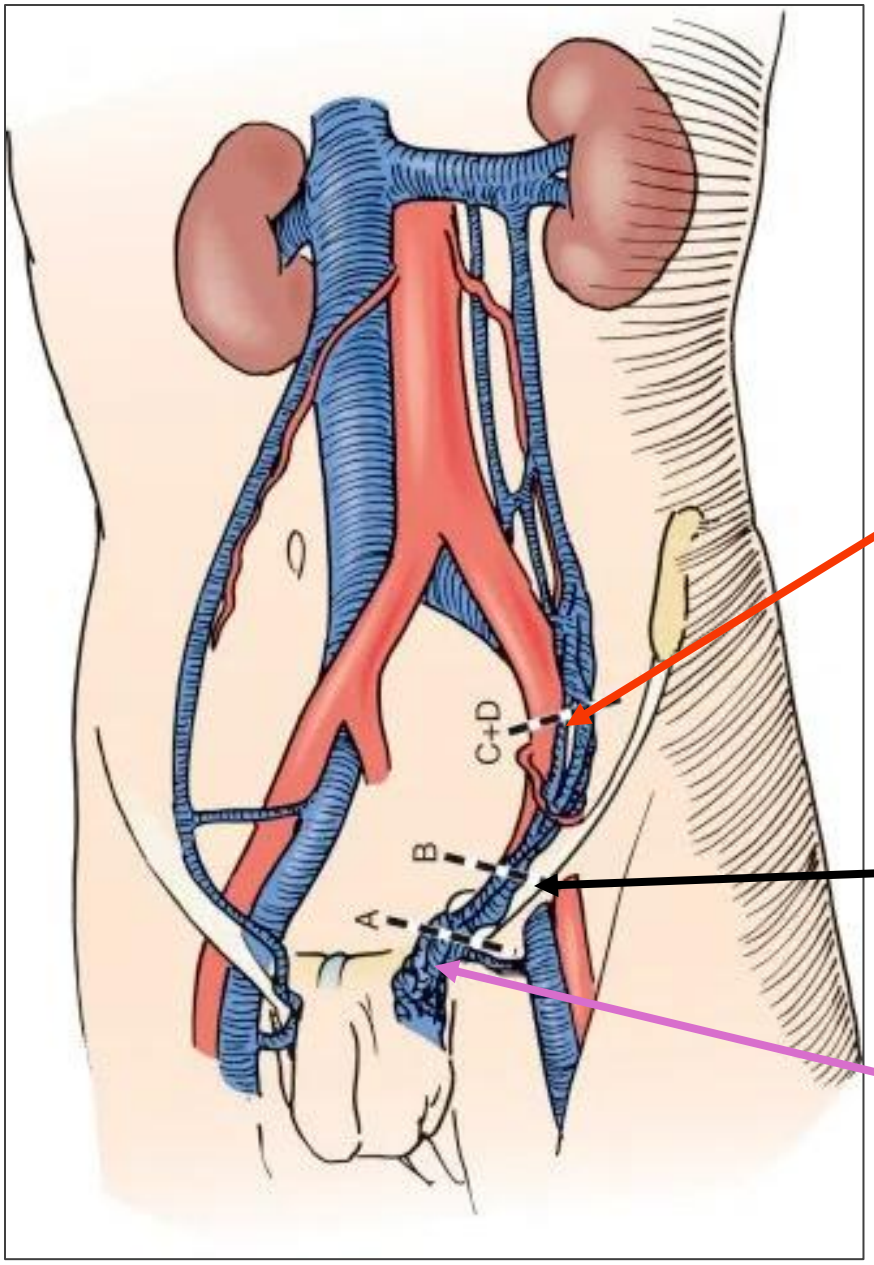
Prevention of venous reflux into the testicular vein

Multiple therapeutic option

Ligation of testicular vein

- Retroperitoneal(Palemo operation)
- Inguinal
- Sub-inguinal (microvascular)
- Percutaneous embolization
- Laparoscopic

No clear cut consensus about the best procedure



Level of varicocele ligation

Retroperitoneal

Inguinal canal

Sub-inguinal micro vascular

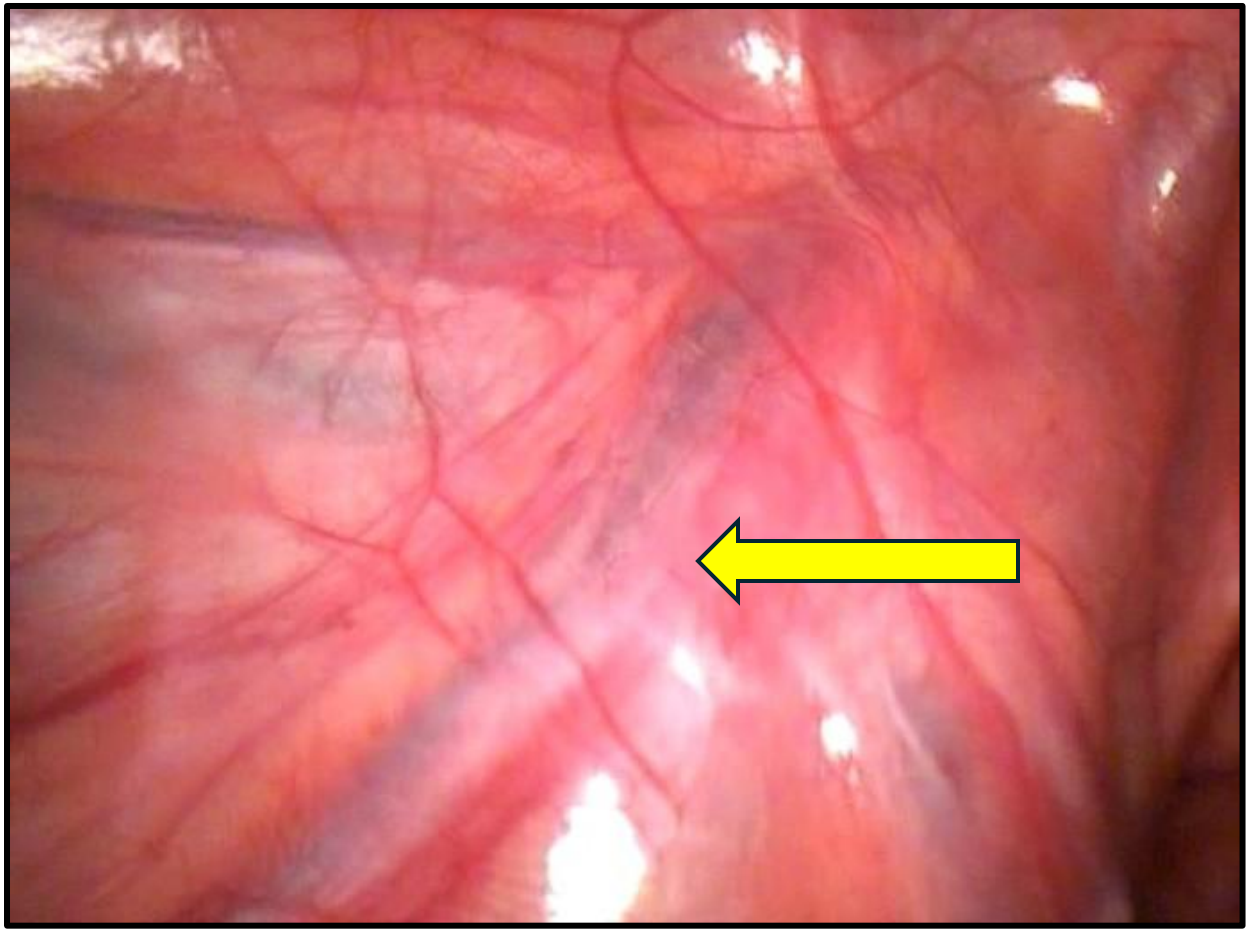
Ligation

- Ivanissevitch-Veins only(Inguinal)
- Palomo-Veins, artery and lymphatics(Retroperitoneal)
- Modified Palomo- veins only (retroperitoneal)
- Microvascular ligation of veins in the scrotum

Laparoscopic ligation

- Artery preserving- ligation of spermatic vein only
- Mass ligation- ligation of both spermatic vein and artery

Testicular vessels seen in the retrperitoneum during laparoscopy



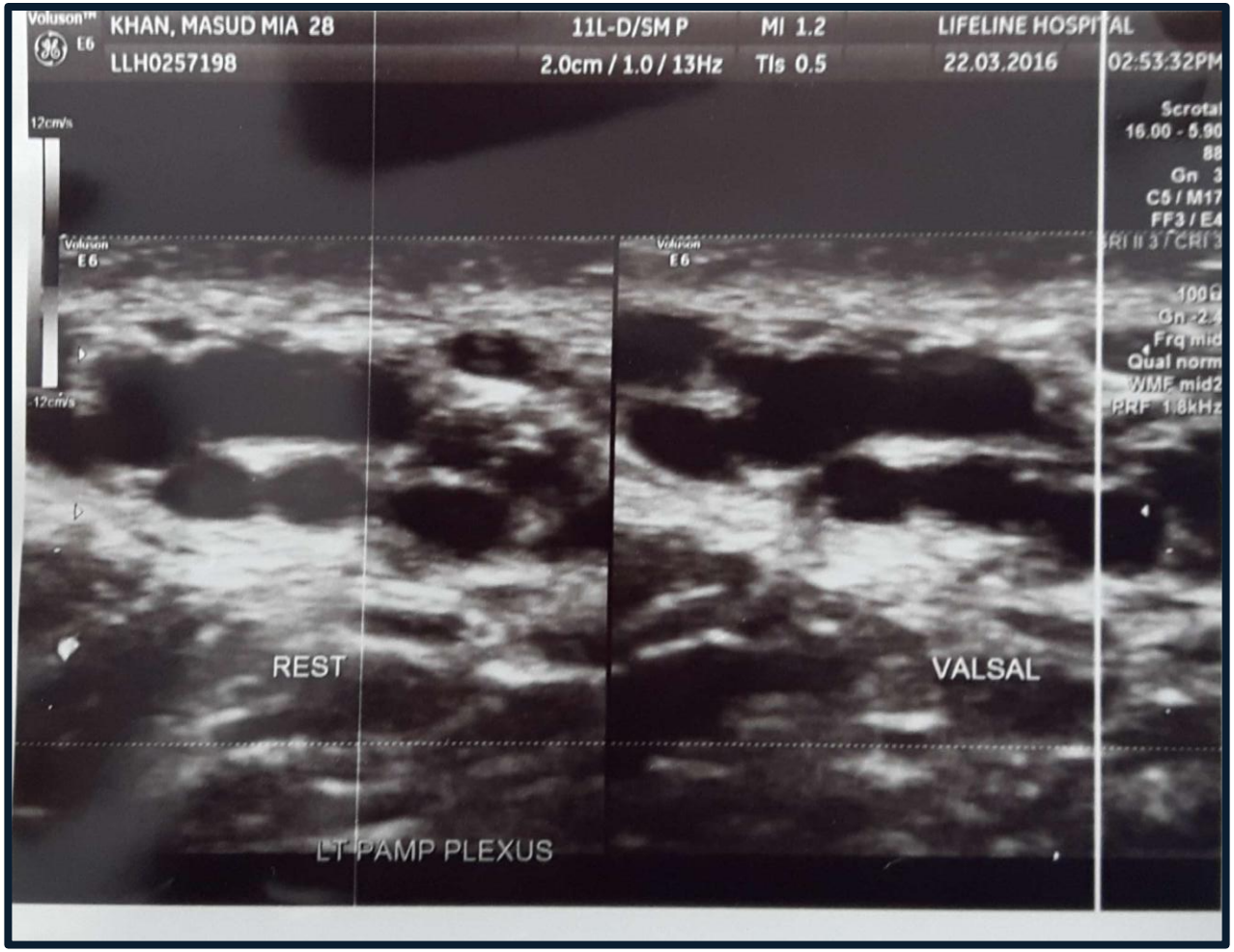
Potential complication after varicocelectomy

- Hydrocele formation
- Recurrence
- Testicular infarction (atrophy)

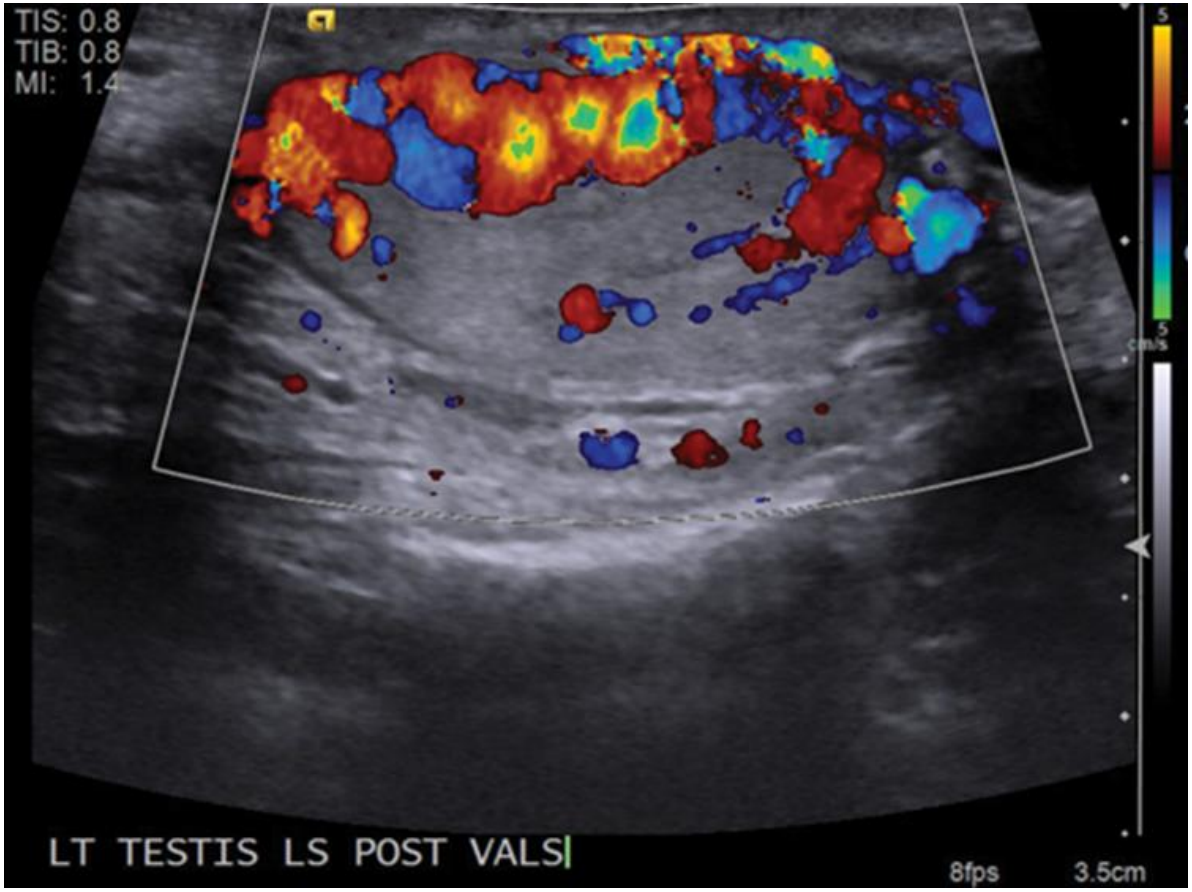
Investigation

1. USG of the scrotum may be needed to confirm the diagnosis
2. Color doppler for detection of venous reflux

USG showing dilated veins



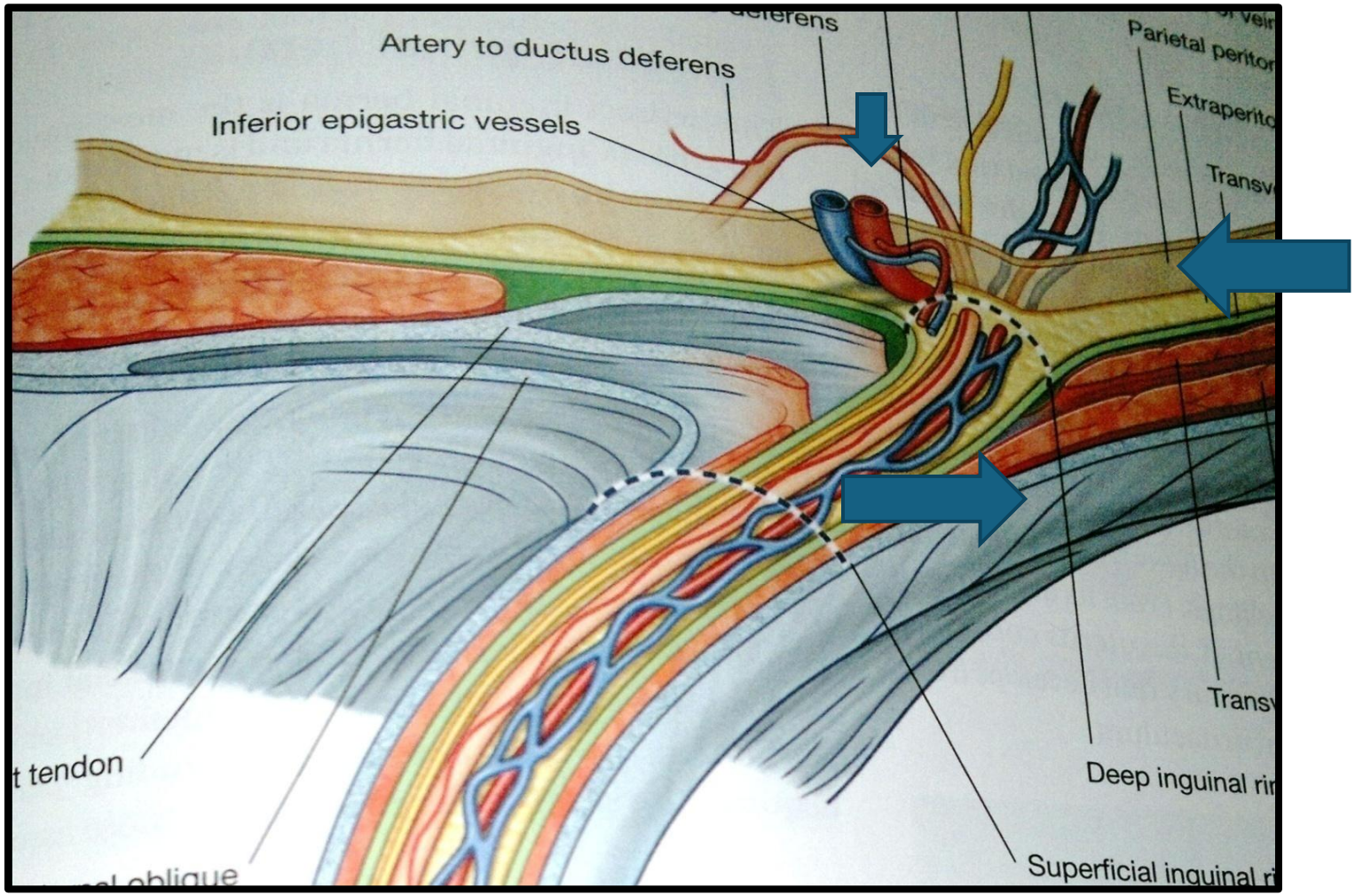
Color doppler showing dilated veins



Blood supply to the testis

- Testicular artery-Abdominal aorta
- Cremasteric –Inf. epigastric
- Artery to the vas-Internal ileac

Blood supply to the testis



Technique	Hydrocele (%)	Atrophy (%)	Recurrence (%)
LV-mass ligation	6-7	<1	2
LV-Artery saving	<6	<1	11
Open Inguinal	3-7	<1	6-15
Sub inguinal Microvascular	<2	<1	<2

Complications of Urology surgery,4th Edition, S Taneja, Elsivier publication

Comparative study between mass ligation and artery preserving technique

Prospective study

Study period-4 years

- 48 laparoscopic varicocelectomy

- 23-Artery preserving technique
- 25-En-mass ligation technique

Materials and method

- Patients age 15-54 yrs
- One isolated right
- Two bilateral
- Remaining left varicocele
- Grade II and Grade III varicocele

Results

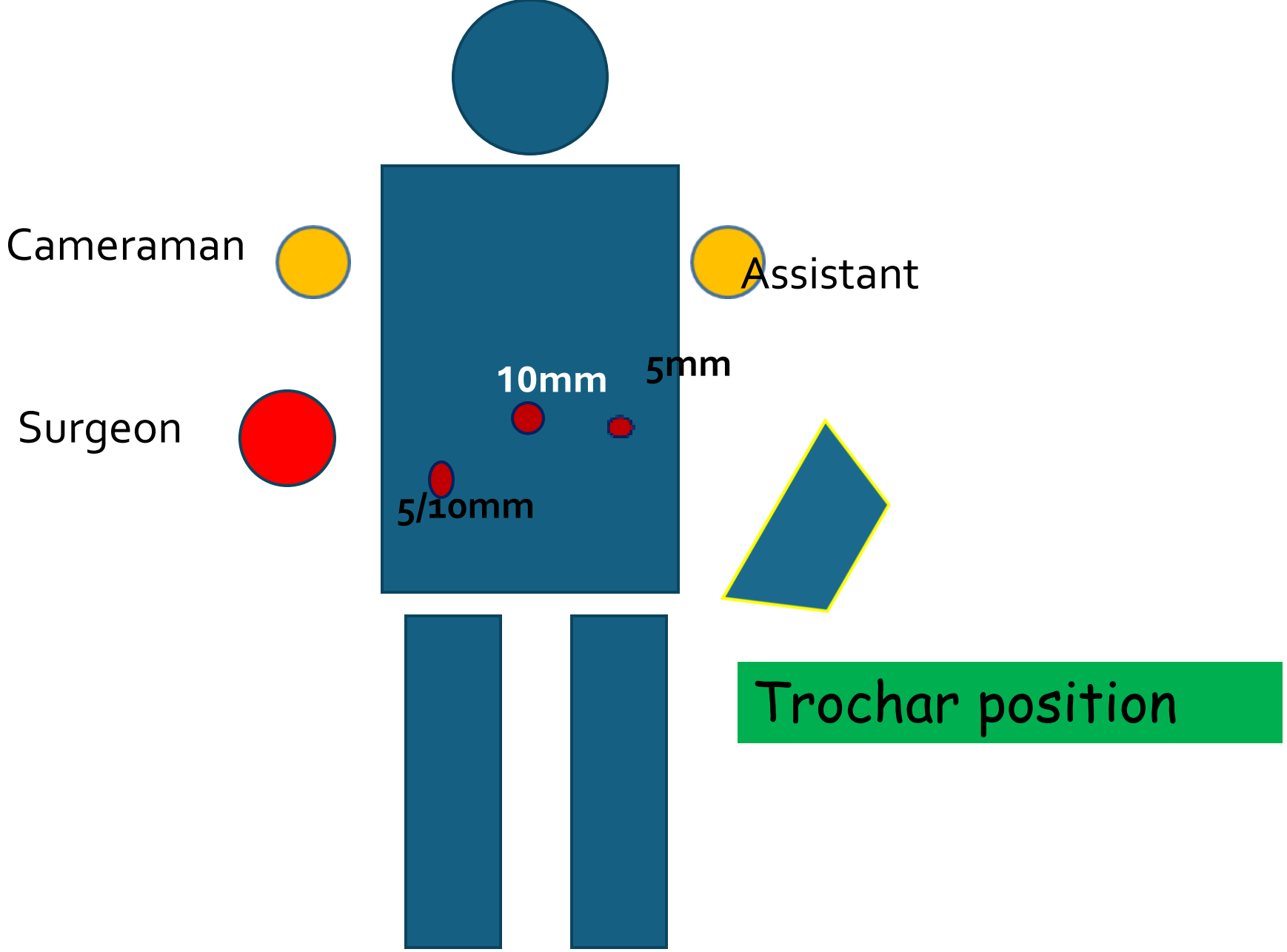
	Artery preserving	En-mass ligation	
Operation Time(min)	41 ±7	27±3	
Average post op hospital stay(Hrs)	46±12	32±7	

3 months follow up

Outcome

	Artery presrving	Mass ligation	
Hydrocele	2(10.5%)	nil	
Recurrence	1(5%)	nil	
Testicular atrophy	nil	nil	

The procedure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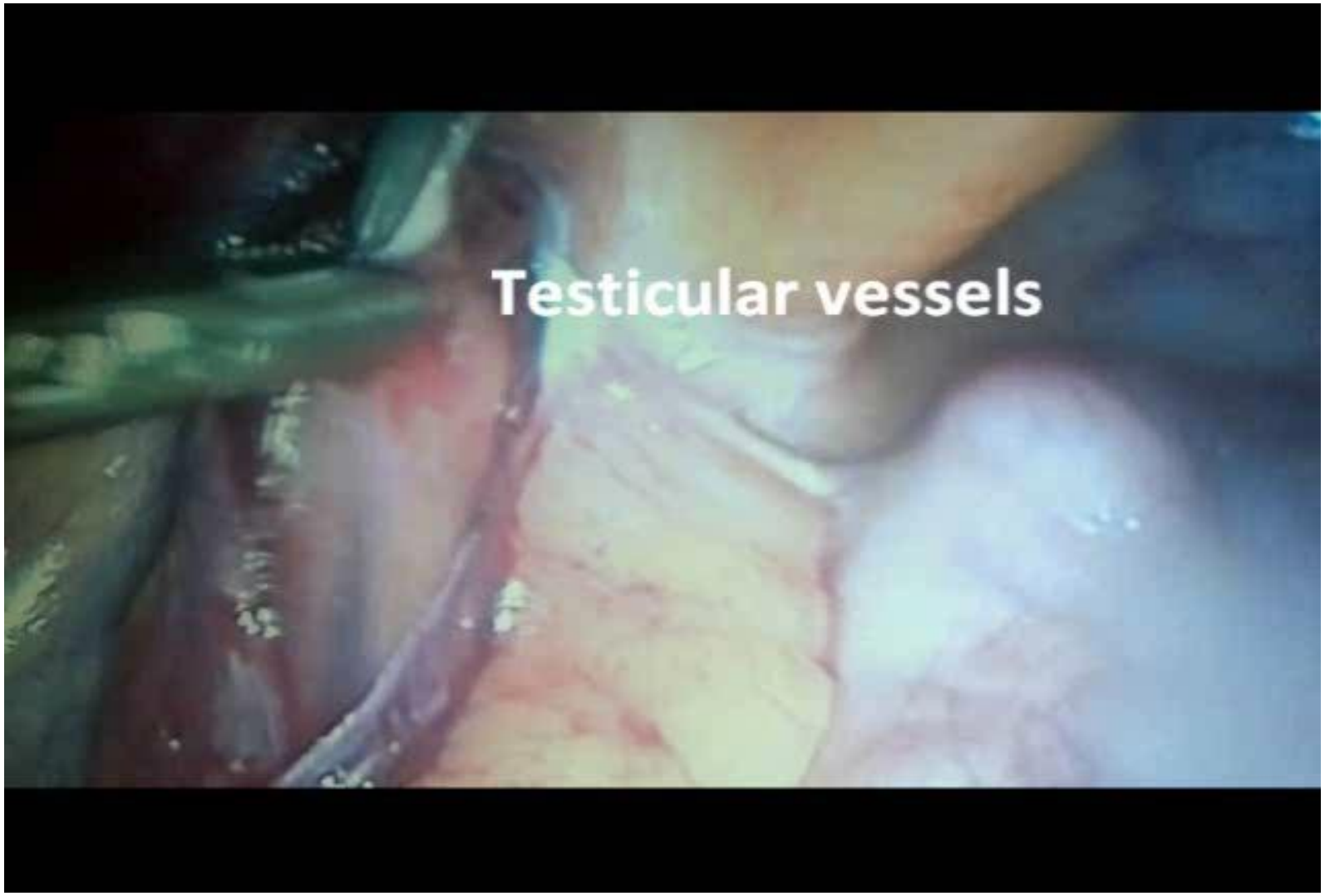
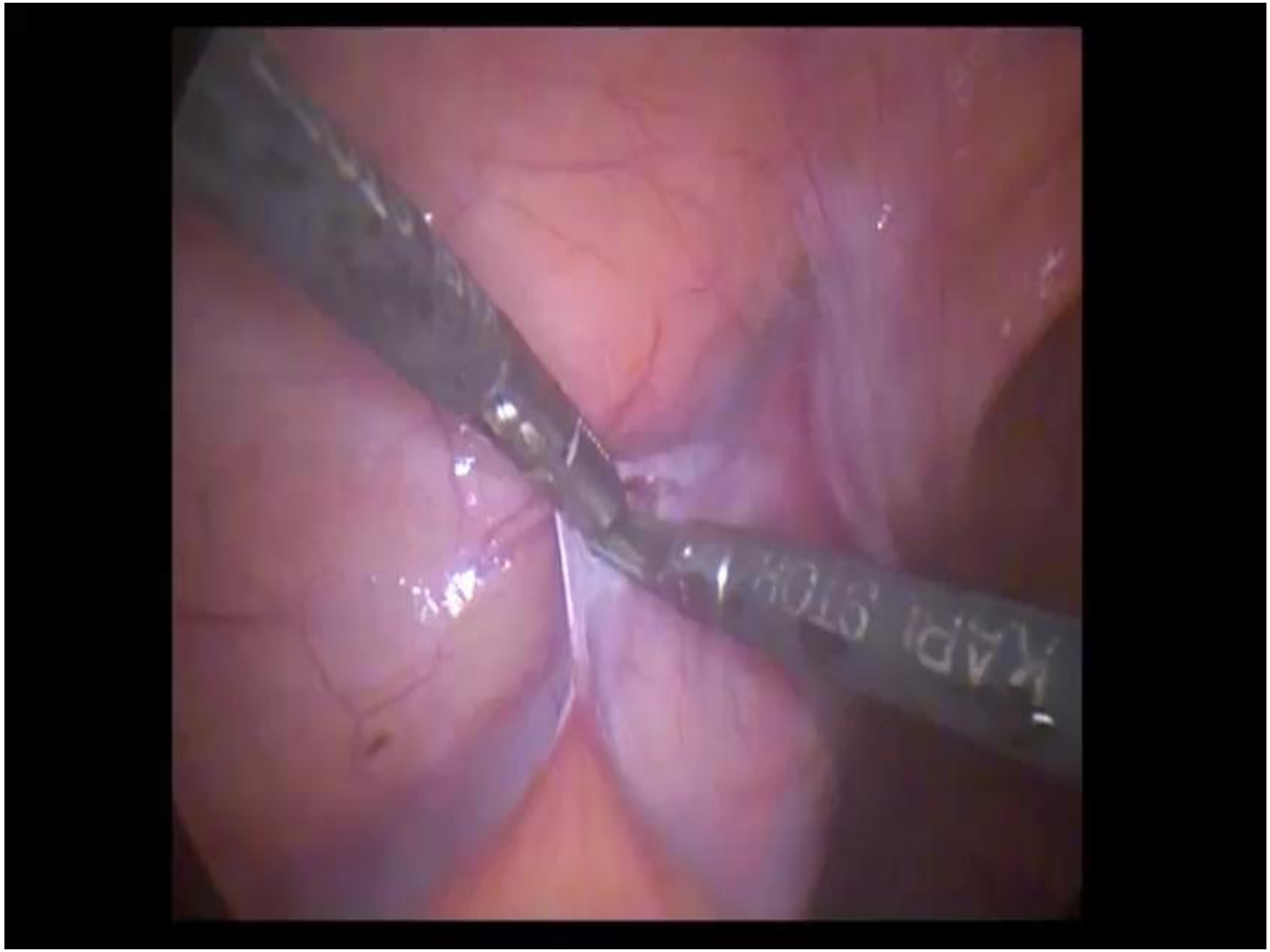
Assistant
Surgeon
10mm
5mm
5/10mm
Trochar position

Lap varicocelectomy –Artery preserving

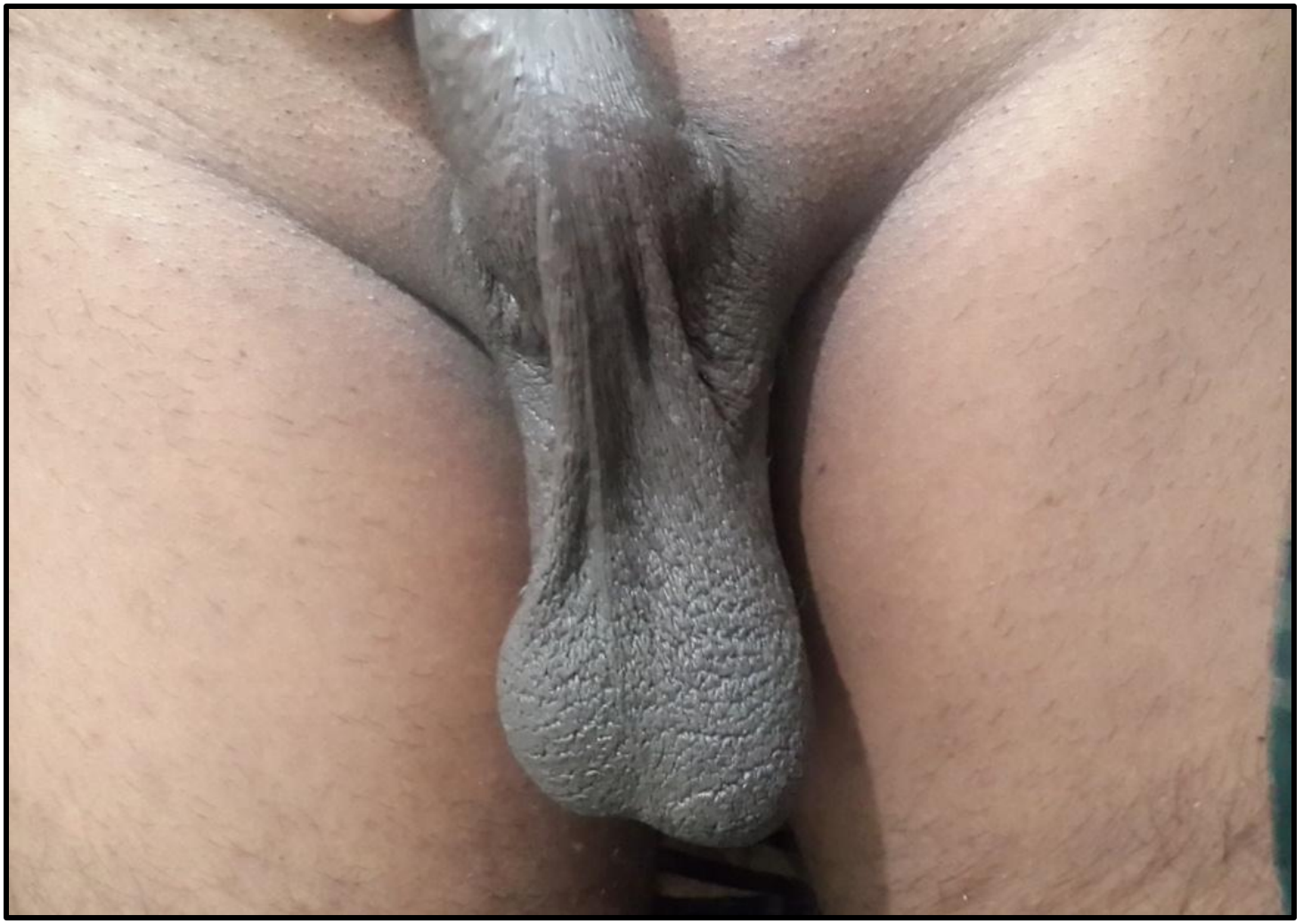


Lap varicocelectomy
Mass ligation



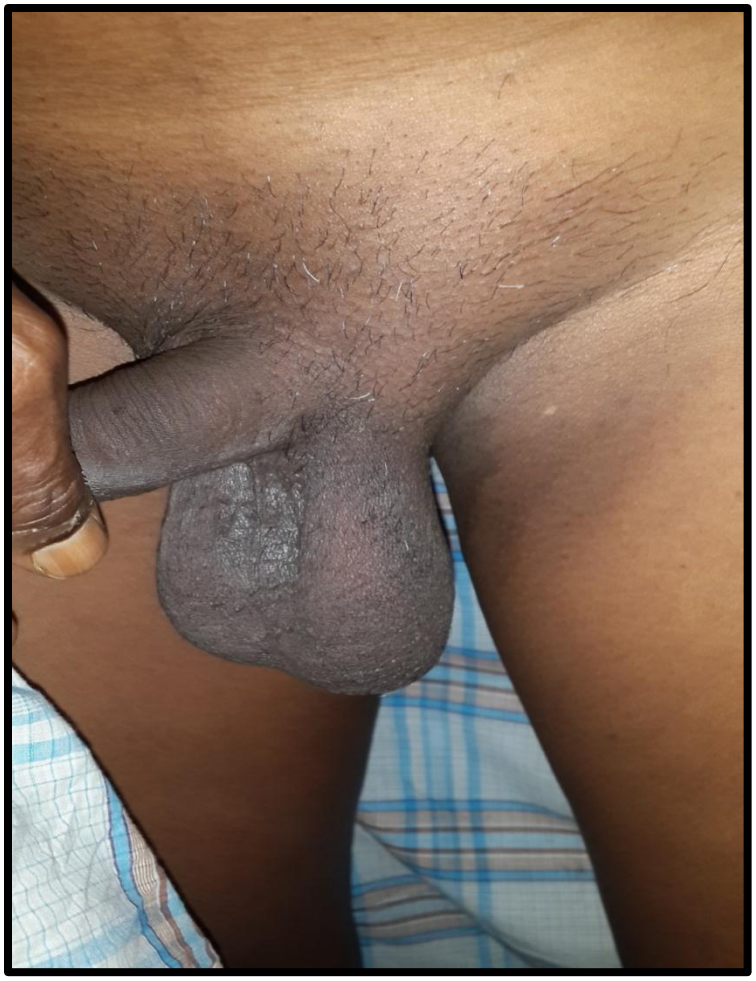
Before operation

7 days after Lap varicocelectomy(ML)

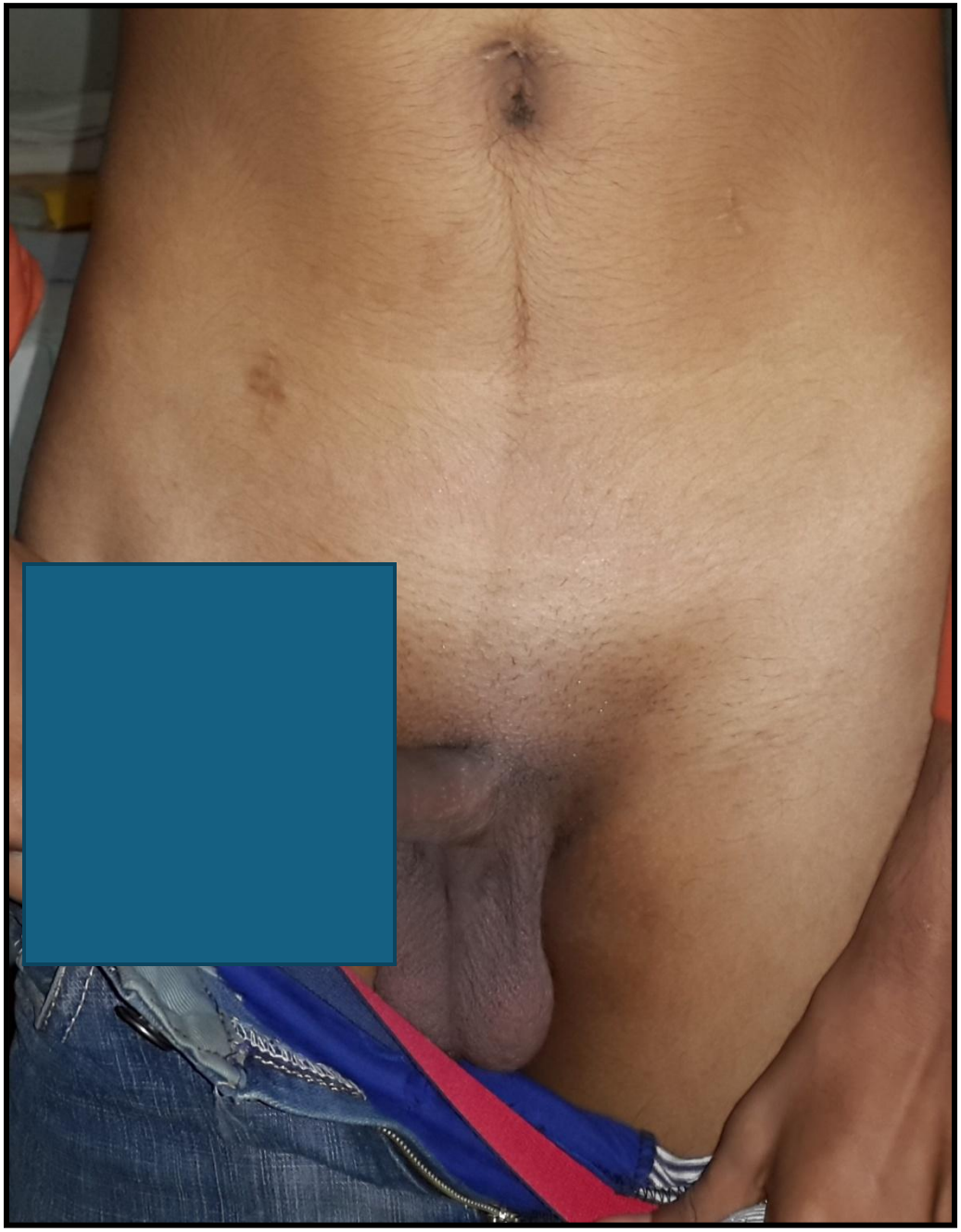


After LV-(ML)

Before LV

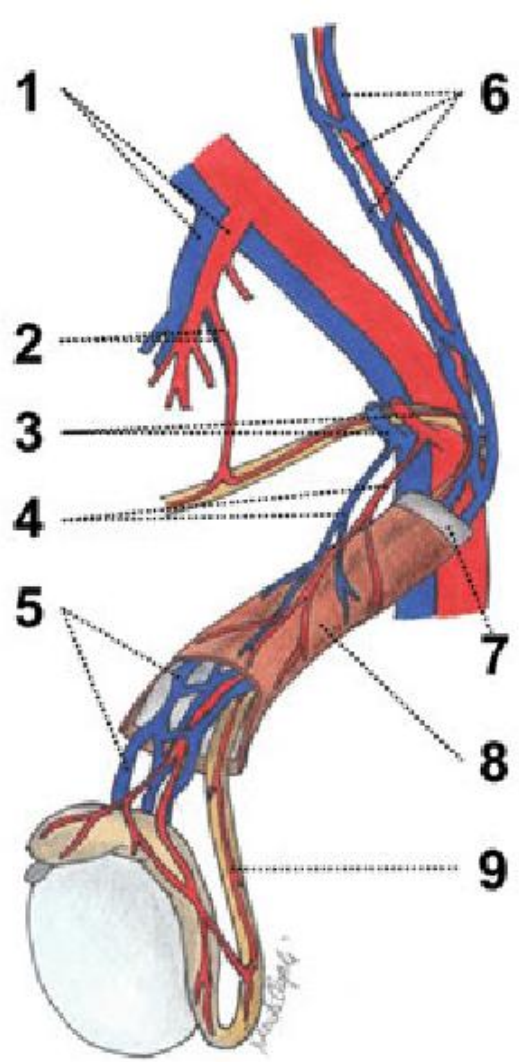


2 yrs post-op



Why recurrence in artery saving LV?

Due to failure of ligation of intimate venous network around testicular artery



Testicular ischaemia

Is there any chance of ishchemia to testes due to ligation of testicular artery?

Using color doppler sonography it was found that there is no major change of testicular hemodynamics after ligation of testicular artery after laparoscopic varicocelectomy .

Student V, Zatura F.....Testicle hemodynamics in patients after laparoscopic varicocelectomy evaluated by color Doppler sonography. Eur Urol; 1998;33:p91-3

Semen quality

Ligation of vein and artery produced better improvent of semen quality and percentage of pregnancy than artery sparing group.

Ymatto M, Tsuji Y, Ohmura M, Comparison artery ligating and artery preserving varicocelectomy: Effect on post operative spermatogenesis; Andrologia; 1995;27:p37-40

Parrot TS, Hewatt L: Ligation of testicular artery and veins in adolescent varicocele. J Urol;1994;152:791-3

Improvement of semen quality

91 lap varicocelectomy-mass ligation

- Significant improvement of semen volume, sperm count and % of motility .
- Mild hydrocele-5%
- Recurrence-nil

Agnifili A, Guilliani A, Venturoni A, Ammicucci G
Chir Ital,2008,60(4),p549-54

Fertility and sperm count

Meta-analysis of 4 randomized controlled trial of 1015 patients

	Open	LV(ML)	SMV
Improvement sperm motility and conc.	**65%**	**67%**	**76%**
Rate of pregnancy at1 yr	**28%**	**30%**	**40%**

BJU int-2012,110(10), Ding.H et al.

Abstract

Background: Varicocele therapy is a controversial issue. No single approach is adopted as the best therapeutic option. Testes get blood supply from testicular artery, cremasteric artery and artery to the vas deference. So ligation of testicular artery in the abdomen do not cause ischemia to the testis. This was already demonstrated in many studies. Classical Palomo varicocelectomy also consists of open ligation of testicular vessels in the retroperitoneum. En mass ligation of testicular vein and artery is technically easy and fast in laparoscopic varicocelectomy (LV). Chance of missing some veins are also less. Henceforth recurrence is also less. Recurrence and post-operative complications are high when only testicular vein is ligated by laparoscopy in the retroperitoneum. We wanted to see the outcome of laparoscopic varicocelectomy by mass ligation technique.

Methods: 56 patients of symptomatic varicoceles were included in the study from the outpatient services. Symptomatic varicoceles of grade 2 to grade 3 were operated from January 2012 till January 2019 over a period of 7(seven) years in Jahurul Islam Medical college Hospital. The patients were selected for dull pain and ugly veins not for infertility. All were operated by laparoscopy with en-mass ligation of testicular vein and artery in the retroperitoneum. They were followed up for a period of six months after surgery. We collected all the data in a retrospective manner.

Results: The average operation time was 27±3 minutes. Average post-operative hospital stay was 32±7 hours. There were no technical failures requiring conversion to open varicocelectomy. There was no incidence of hydrocele formation nor testicular atrophy. One patient of bilateral varicocele had 50% reduction of his varicocele. We considered this a recurrence. All other patient had complete reduction of varicocele. One patient developed hemo-peritoneum due to dislodgement of hemo-clip, which required laparotomy. He did not require any further surgery for his varicocele.

Conclusion: Laparoscopic varicocelectomy with mass ligation technique is safe, effective, less time consuming and easy to perform. Recurrence and post-operative complications are minimum. Plastic hemo-lock should be used rather than titanium heom-clip for ligation of testicular vessels. There is no incidence of testicular atrophy or any adverse effect on testis.

Keywords: Varicocele; Laparoscopic varicocelectomy; Mass ligation; Recurrence

Introduction

Varicocele is an abnormal dilatation of the veins of the pampiniform plexus. It occurs in 6% of children at age of ten, 13% of adolescents and 15% of males in the general population. However, varicocele has been observed in 35% of men with primary infertility and up to 80% of men with secondary infertility [1]. The detrimental effect of varicocele on spermatogenesis in the sub-fertile male is manifested by low sperm count, decreased sperm motility and low percentage of normal sperm morphology together or in different combinations. Although many men with varicocele can father children varicocele causes a progressive time-dependent decline in semen quality. In general, varicoceles

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THANK YOU!