DISSERTATION ON

"OUTCOME OF SURGICAL MANAGEMENT OF VARICOCELE IN INFERTILE MEN"

Dissertation submitted for

M.Ch. Higher Speciality Degree Examination

Branch IV – UROLOGY

DEPARTMENT OF UROLOGY

KILPAUK MEDICAL COLLEGE & HOSPITAL

GOVT. ROYAPETTAH HOSPITAL

CHENNAI

THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY

CHENNAI

AUGUST - 2009

CERTIFICATE

This is to certify that this dissertation "**Outcome of surgical management of Varicocele in infertile men**" has been done by **Dr.B.NATARAJAN** under our guidance in the Department of Urology, Kilpauk Medical College Hospital & Govt. Royapettah hospital, Chennai, during the period of Higher Speciality Studies in MCh(Genitourinary surgery) from July 2006 to July 2009. Also certified that this work is original.

Prof.K.Thiyagarajan M.S., M.Ch.,D.N.B.
Professor and Head,
Department of Urology
Govt. Royapettah Hospital

Prof..V.Selvaraj M.S.,M.Ch.
Additional Professor
Department of Urology
Kilpauk Medical College Hospital

Dean,
Kilpauk Medical College Hospital .

Date :

Place : Chennai

ACKNOWLEDGEMENTS

I express my gratitude to **Prof. K. Thiyagarajan** M.S., M.Ch., D.N.B. Professor and Head of the Department of Urology, Govt. Royapettah Hospital and **Prof. V.Selvaraj** M.S., M.Ch. Additional Professor of Urology, Kilpauk Medical College hospital, for the invaluable encouragement, advice and support they have given from the time of conception to the time of completion of this study.

I am deeply indebted to my assistant professors **Dr.Muthulatha, Dr.Leela Krishna, Dr.Jayaganesh, Dr.Sivasankar, Dr.Senthilvel, & Dr.Srikala** for all the encouragement and support they have given to me during my course

I also express my gratitude to all my colleagues in the Department of Urology, Govt. Royapettah Hospital & Kilpauk Medical College Hospital, Chennai, for all the help they have rendered during my entire course here.

I would also like to express my gratitude to **Dr.V.Kanagasabai.MD,** Dean, Kilpauk Medical College hospital for all the help he has rendered during my course here.

Last, but not the least, I thank my **family members** and my **blessed teachers** right from my school days, whose unfailing love, prayers and dedication have always been my source of inspiration for all my endeavours.

I finally dedicate this work in the name of the **Almighty** to all my patients who have been and shall continue to be my greatest teachers.

CONTENTS

AIM OF THE STUDY

1. To analyze the effect of varicocele on the semen composition characteristics by seminal analysis before and after varicocele ligation .

2. To asses the improvement in fertility status after varicocele ligation

INTRODUCTION

Definition

Varicocoele is an enlarged tortous spermatic veins above the testicle

Characteristics

The patient present with a soft mass or swelling above the testis which he usually notes when he stands (or) strains. More commonly cases are detected during a routine clinical examination in the infertility clinics.

Varicocele typically decrease in size and may disappear when the patient is supine. They give a characteristic ‘Bag of Worms’ feeling on palpation and give a characteristic thrill on cough impulse.

Varicocoele and Infertility

Varicocoele is a well established and analyzed cause of male infertility. It produces oligospermia with characteristic morphological changes in the sperms. Similarly, long standing varicocele are known to produce histopathological changes in the testes leading to infertility.

Ligation of varicocele is known to cause marked improvement in semen parameters and also improve the fertility and conception rate.

METHODOLOGY

This study is based on the screening, identification, evaluation and treatment given to the patients attending the infertility clinic at the Urology Department of Government Royapettah Hospital and Kilpauk Medical College Hospital, Chennai, over a period from August 2006 to June 2008

The following is the detailed description of the methodology adopted.

Screening

All patients attending the infertility clinic were clinically screened for varicocoele. Patients with oligospermia and suspected subclinical varicocoele were subjected to more confirmatory investigations (USG scrotum, the Doppler study) before they were diagnosed to have varicocoele and then they were included in the study.

History

Al the patients selected for the study were evaluated by a detailed history exploring all aspects related to fertility. This was necessary in order to exclude other factors which could affect the fertility. Only patients with demonstrable varicocoele (clinically or by investigations) and with no other causes of infertility were taken up for the study.

A summary of the 'History' elicited in all the patients is given below.

Table 1 : History

I. Sexual history

- Duration of married life with and without birth control.
- Frequency and timing of coitus
- Methods of birth control
- Sexual technique – potency, use of lubricants

II. Past history

- Developmental – History of cryptorchidism, age of puberty, gynaecomastia, congenital anomalies of the urinary tract (or) central nervous system.
- Surgical – Orchiopexy, pelvic (or) retroperitoneal surgery, herniorrhaphy, sympathectomy, Vasectomy, injury to genitals, spinal cord injury and testicular tortion.
- Medical – Urinary infections, sexually transmitted diseases, mumps, renal disease, diabetes, radiotherapy, recent febrile illness, epididimitis, tuberculosis, or other chronic diseases, anosmia, midline defects.
- Drugs – Complete list of all past and present medications. Many drugs interfere with spermatogenesis, erection and ejaculation.
- Occupation and habits – Exposure to chemicals and heat, hot baths, steam baths,

radiation, cigarettes, alcohol.

- Past marital history of both partners, including pregnancies and miscarriages, any off spring with other partners.

- Previous infertility evaluation and treatments.

III. Family history

- Testicular atrophy
- Hypogonodotrophism
- Cryptorchidism
- Congenital midline defects

IV. Female reproductive history

Physical Examination

(a) General examination

The patient habitus as well as the pattern of virilisation were noted. The general health and built were noted.

(b) Genital examinations

1. The penis was examined for evidence of any abnormalities like chordae, hypospadias etc.

2. The testes were palpated for their consistency and size.

3. The epididymis (head, body, tail) were palpated for induration (or) any cystic changes (obstruction)

4. The spermatic cords were examined to identify the presence of a varicocoele

The varicocoele were graded clinically as follows:

Grade I : Palpable only during valsalva maneuver

Grade II : Moderate sized varicoceles which are palpable with the patient in the standing position.

Grade III : Large varicoceles which are visible through the scrotal skin

Rectal examination:

Per-rectal examination was done for the examination of the prostate and the seminal vesicles in order to find out any clinical evidence of infection.

Laboratory Evaluation

(A) Routine Investigations

(a) Haemogram, bleeding time, clotting time

(b) Urine – albumin, sugar, microscopic examination

(c) Blood – urea, creatinine, sugar

(d) Urine – Culture and sensitivity

(B) Semen analysis

Three days of sexual abstinence prior to specimen collection was advised. The specimen was examined within two hours of collection. Three specimens from each patient were examined over a period of two months to give an assessment of baseline spermatogenesis. The semen was analysed regarding the following parameters.

I. Physical Characteristics

a. Volume

b. Viscosity

c. Time of liquefaction

d. pH

II. Concentration

A neubauer standard blood cell counting chamber was used. The specimen was diluted in a ratio of 1:20 in a test tube using distilled water. A drop of this specimen is placed on a counting chamber and a coverslip was applied.

Spermatozoa are counted within five blocks containing 16 squares each. All spermatozoa within this area and touching the lower and right hand sides of each block are included. This number, multiplied by 10^6 represents the count per milliliter. Two sets of five blocks were counted and an average calculated.

III. Motility

Motility refers to the number of sperm that have flagellar motion.
A drop of fresh semen was placed on a clean, standard microscopic slide and a coverslip

positioned over the drop. Ten random fields were examined and the percentage of sperms that have motility was calculated. Similarly, timely examinations were done at 20 minutes, 1 hour, 2 hours and 4 hours. The sperm motility were graded as follows:

Grade 0 : No motility

Grade 1 : Sluggish wriggling (or) non progressive movement

Grade 2 : Slow meandering forward progression

Grade 3 : Reasonably straight line movement with moderate speed (forward progressive)

Grade 4 : Straight line movement with high speed (fast progressive)

IV. Morphology :

A drop of semen was placed on a glass slide and a second slide was used to smear the specimen over the slides surface. PAP (papanicolou) staining technique was employed. The percentage of sperms with normal morphology and the percentage of sperms with abnormal and immature morphology (amorphous, tapered, head, large, small headed, immature forms) were noted.

V. Fructose concentration :

This was estimated biochemically for all the semen specimen.

VI. Other parameters:

(a) A note was made regarding sperm agglutination during the microscopic examination.

(b) The presence and the number of other cell types – Pus cells and white blood cells were noted.

Table – Semen analysis : WHO standards of adequacy

1.	Volume	2.0 ml or more
2.	Viscosity	Moderately viscus
3.	pH	7.2 or more
4.	Liquefaction time	5 to 25 minutes
5.	Sperm concentration (Density)	>20 X 10^6/ml
6.	Total sperm count	>40 X 10^6 /ml
7.	Motility	>50% (with forward progression)
8.	Morphology	≥ 15% or more by strict criteria
9	Fructose	Present (120 to 450 mg/dl)
10.	Other parameters	a) No significant sperm agglutination b) No significant pyospermia (<1.0 x 10^6 WBCS/ml)

c) Ultrasonography – scrotal

All the suspected subclinical patients were subjected to scrotal ultrasonography in order to confirm the diagnosis of varicocele. Varicocele appear in the ultrasonography as cluster of cysts or a serpigineous tubular structure exhibiting minor to moderate dialatation.

d) Scrotal Doppler Study.

Doppler study was done on suspected subclinical patients during the resting phase and

during valsalva maneuvers. The flow parameter and reflux were noted.

e) Ultrasonography Abdomen

Ultrasonography of the abdomen was done for the patients with the following indication.

1) history of sudden onset of varicocele

2) Rt sided Varicocoele

3) varicocele which did not reduce in size in the supine position.

This investigation was done in order to rule out the presence of a retroperitoneal mass presenting as a varicocele

Surgery

All the patients in the study were subject to repair of varicocele by subinguinal approach. This was done on the side of the varicocele. In cases of bilateral varicoceles, both the sides were operated at the same sitting

Procedure

The inguinal area is prepped and draped in the standard sterile fashion.

A small transverse incision is made just inferior to the level of the external ring

In the case of bilateral varicocelectomies the incision should be symmetrical

The Campers and Scarpa's fascia is divided using electrocautery.

Roux retractors or a self-retaining retractor provides access to the spermatic cord as it traverses the pubic tubercle.

The spermatic cord is then bluntly mobilized.

The retractors are removed and the surgeon's index finger is passed beneath the spermatic cord .This maneuver is facilitated by rolling the spermatic cord over the operating surgeon's index finger with a peanut sponge. Once the cord has been adequately mobilized a Penrose drain is passed beneath the spermatic cord. Gentle traction on the Penrose elevates the spermatic cord to the level of the incision. Care should be taken to avoid overzealous retraction as this may result in occlusion of the spermatic artery.

The ilioinguinal nerve is identified and gently retracted away from the field of dissection, ideally placing it outside of the field behind the Penrose drain.

The external spermatic fascia is then opened in the direction of the fibers using bipolar electrocautery. The use of bipolar electrocautery minimizes the potential for thermal injury to adjacent structures.

The vascular packet within the spermatic cord is immediately visualized. The internal spermatic artery and the surrounding veins are usually easily identified at this point. The venous channels are then encircled with a blue vessel loop If the artery is clearly identified, the

larger veins can be clipped or ligated and then divided This approach prevents the complications of recurrence, testicular injury, and hydrocele formation. It is not unusual to encounter minor bleeding during the dissection of the blood vessels. Local pressure with a peanut sponge or gauze is usually sufficient to control this bleeding. When necessary a bipolar cautery may be employed. This is rarely necessary.

The use of a surgical clip applier significantly reduces operating time, especially when multiple veins are encountered. All venous channels should be either clipped or ligated and then divided.

The spermatic, cremasteric, and deferential arteries are preserved, as are the lymphatics. The lymphatics should be preserved to prevent the formation of a hydrocele Once all the venous channels are ligated, the area external to the spermatic cord is examined for the presence of external cremasteric vessels.Upward traction on the Penrose drain will expose these vessels, which are seen perforating the floor of the canal and entering the cord distally. External cremasteric veins are clipped and divided while the arteries are preserved.

The incision site is then irrigated with normal saline and the cord structures are returned to their normal anatomic position. Gentle traction of the ipsilateral testicle allows the testicle and the cord to return to their normal anatomic position. The Scarpa's fascia is closed using 3-0 plain stitches and the skin is approximated.

Follow-up

Meticulous follow up of all the patients was done. The following parameters were assessed.

(1) History and clinical examination – Every 3 months interval

(2) Semen Analysis – Every 3 months interval

(3) Pregnancy rate

FINDINGS

The following facts are based on the findings of our detailed evaluation of 34 varicocele patients who attended the infertility clinic and the urology clinic at Government Royapettah Hospital and Kilpauk Medical College Hospital over a period from August 2006 to June 2008.

(a) Age:

The majority of the patients presenting with varicocele belonged to the 20-30 years age group with a range from 21 years (youngest) to 39 years (oldest)

(b) Duration of Sterility:

The duration of sterility was taken as the period interval from the date of the marriage to the date of the presentation at the infertility clinic.

The median duration of sterility in our group of patients was 3 ½ years with a range from 2 years to 6 years.

(c) Smoker:

Thirty of the 34 patients (88%) were smokers – six of them were chronic smokers.

(d) Side of the varicocele:

32 patients had varicocele on the left side

1 patient had only on the right side

1 patient had bilateral varicocele

(e) Grade of the varicocele:

Only 24 of the 34 varicocele patients in our study was diagnosed clinically.

Of these 13 patients had clinical – Grade I varicocele

7 patients had clinical – Grade II varicocele

4 patients had clinical – Grade III varicocele

(f) Size of the testis:

The size of the testis (ipsilateral) were above 4 cm in length in 32 patients. In the other two patients they were of 3 cm and 2.5 cm respectively in length and were relatively flaccid.

(g) Semen Analysis:

(1) Volume : This parameter was within the normal range in all the patients in our study. However 17 of our patients (50%) had seminal volumes closer to the lower limit of the normal (1.5 ml)

(2) Viscosity : This parameter was within the normal limits in all our patients.

(3) pH : The pH values were within the normal range in all our patients in our study.

(4) Liquefaction Time : The liquefaction time was within the normal range in all the

patients in our study.

(5) Sperm concentration (Density) : 50% (17) of the patients in our study had a sperm concentration of <20 X 10^6 /ml (oligospermia) 50% (17) of the patients had a sperm concentration of >20 X 10^6/ml.

(6) Total sperm count : 59% (20) of the patients had the total sperm count of <40 million 41% (14) of the patients had the total sperm count of >40 million. 63 % (19 out of 30) of the patients who were chronic smoker fell in the >40 million category.

(7) Motility : 91% (31) of the patients had decreased sperm motility (< 50% forward) 9%, 3 of the patients had good sperm motility (>50% forward)

(8) Morphology : 82% (28) of the patients showed morphological changes in the sperm (amorphous, immature germ cells, tapered forms – "stress pattern").

(9) Fructose concentration : The fructose concentration of all the 34 patients in our study were within the normal range.

(10)Other parameter

(a) There was no significant agglutination

(b) There were no significant leucocytes (WBC < 1 X 10^6/ml) in the semen specimen. One patient who had a significant leucocyte count in the semen (WBC - >3 X 10^6/ml -? Prostalitis) was excluded from the study.

(h) Ultrasonography (Spermatic Cord):

16 patients who were suspected to have subclinical varicocele were subjected to the ultrasonography of the spermatic cord (bilateral). Ten of these patients were shown to have dilated veins in the cord structures in the B-mode. All these patients were shown to have dilated veins both in the resting phase as well as during valsalva maneuver. These 10 patients of subclinical varicocele were included in the study along with 24 cases of clinically detected varicocele.

(i) Doppler study:

All the 10 patients of subclinical varicocele who demonstrated dialated veins in the spermatic cord in the B mode of the ultrasonography were subjected to the Doppler study. All these 10 patients showed normal flow during the resting phase and reflux was present during the valsalva maneuver.

Thus both ultrasonography (spermatic cords) and the Doppler study were done to diagnose subclinical varicocele.

(j) Ultrasonography – Abdomen:

Ultrasonography of the abdomen was done in two of our patients one with right sided varicocele and another with bilateral varicocele. It revealed no abnormalities. Ultrasonography of the abdomen was done to rule out any intra abdominal or retroperitoneal lesions which may cause varicocele by compression on the internal spermatic veins.

FOLLOW-UP

All the patients in our study underwent the subinguinal ligation of the internal spermatic vein.

They were discharged the subsequent day if they had no complications. The following were the complications noted.

(i) Fever – Post op fever on the 1st day was noted in two patients in our study. The fever subsided by oral antipyretics.

(ii) Wound infection – This was noted on the 4th and 5th post operative days in three patients in our study. This subsided by oral antibiotic and daily dressings.

All the patients were asked to come for follow up investigations at 3, 6, 9 and 12 months after surgery. During the follow up the following parameter were assessed.

(1) Detailed history including the history of conception or pregnancy.

(2) Detailed clinical examination

(3) Investigations

a. Semen analysis

b. Ultrasonography and Doppler study at 6 months post operatively.

The findings of the follow up study is presented below:

(a) Pregnancy Rate : Of the 34 patients in our study only 5 patients (14%) could impregnate

his partner in the twelve month follow-up period.

(b) Testicular size : There was no significant increase in the size of the ipsilateral testis among all the 34 patients in our study.

(c) Semen Analysis : The single best semen analyses parameter for each patient (during the follow up) was rendered for interpretation and comparison. For most of the patients the best semen analysis parameter were achieved 6-12 month after the operation.

1. Volume : This parameter was within the normal range. There was no significant increase in volume of the semen ejaculate in the post operative period.

2. Viscosity : This parameter was normal in all the patients.

3. pH : The value were within the normal limits in all the patients.

4. Liquefaction size : The value was within normal limit in all the patients.

5. Sperm concentration (Density) : There was a significant increase in the sperm concentration in the post operative follow up period in the majority of our patients.

    a. 8 of the 17 patients (47%) in the oligospermic category (< 20 X 10^6/ml) became normospormic (>20 X 10^6/ml).

    b. The remaining 9 patients in the “oligospermia” category continued to remain in that category although all these patient also showed an increase in the sperm concentration compared to their pre-operative levels.

c. The 17 patients in the “normospermia” category had their sperm concentration further improves in the post operative period.

d. 7 of the 9 patients who continued to remain in the oligospermia were chronic smokers.

e. In other word 25 of the 34 patients (74%) in our study come under the “normospermia” category in the post operative follow up period as compared to only 17 of the 34 patients (50%) pre operatively.

VI. Total Sperm Count

(a) Of the 20 patients in the <40 million category, 12 patient (60%) had their total sperm count increases to the ‘>40 million’ category in the follow up period.

(b) The rest of the 8 patients in the ‘< 40 million’ category had their total sperm count remain in the same ‘< 40 million’ category after the operation.

(c) The remaining 14 patients in our study who were already in the >40 million category preoperatively continue to remain in the >40 million category although the majority of men had their total sperm count further increased.

(d) In other words, 26 patients (76%) came under the >40 millions category post operatively as compared to 14 patients (41%) of the 34 patients before the operation.

VII. Motility

(a) 13 of the 31 patients (38%) with decreased sperm motility (<50% of the sperms with >50% forward) had a significant increase in their sperm motility (>50% of sperms with > 50% forward)

(b) 3 patients who had good sperm motility before operation continued to have the same after operation.

(c) In other words only 3 of the 34 patients (9 %) had good sperm motility before operation as compared to 16 of the 34 patients (46%) after operation.

VIII Morphology

(a) 12 of the 28 patients (43 %) who had shown morphological changes in their sperm ("stress pattern") had a change in their sperm morphology to that of a normal pattern after surgery.

(b) In other words only 16 of the 34 patients (47%) continue to showed morphological changes ("stress pattern") in their sperms after operation as compared to 28 of the 34 patients (82%) before operation.

IX Fructose

There were no significant changes in the fructose content of the semen after operation.

X Ultrasonography and Doppler study

Only 15 of the 34 patients had ultrasonography (spermatic cord) and the Doppler study

during 6 month post operative followup.

Ultrasonography B mode showed no dialated vein in the spermatic cord and the Doppler study showed no reflux.

This investigation shows the efficacy of the operation of ligation of the internal spermatic veins in the patients with varicocele of the spermatic cord.

Table 2 : Age Distribution of varicocele

Age Distribution	No. of Cases
20- 25 years	6
25 – 30 years	16
30 – 35 years	10
35 – 40 years	2
40 – 45 years	-

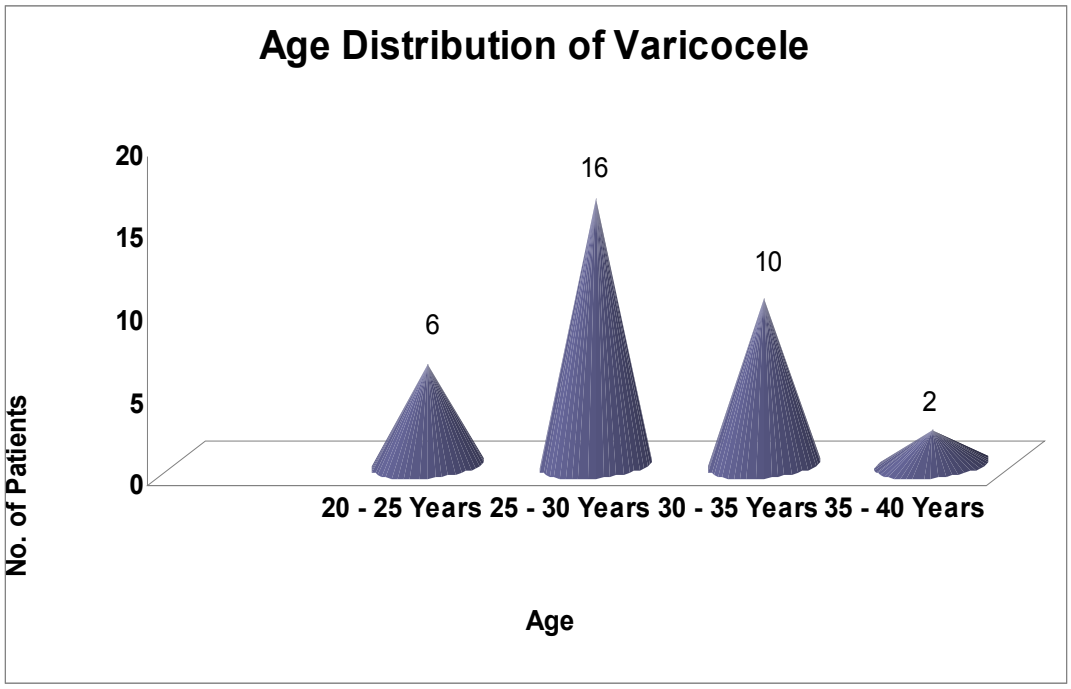


Table 3 : Side of occurence of varicocele

Side	No. of cases	Percentage
Left	32	94%
Right	1	3%
Bilateral	1	3%

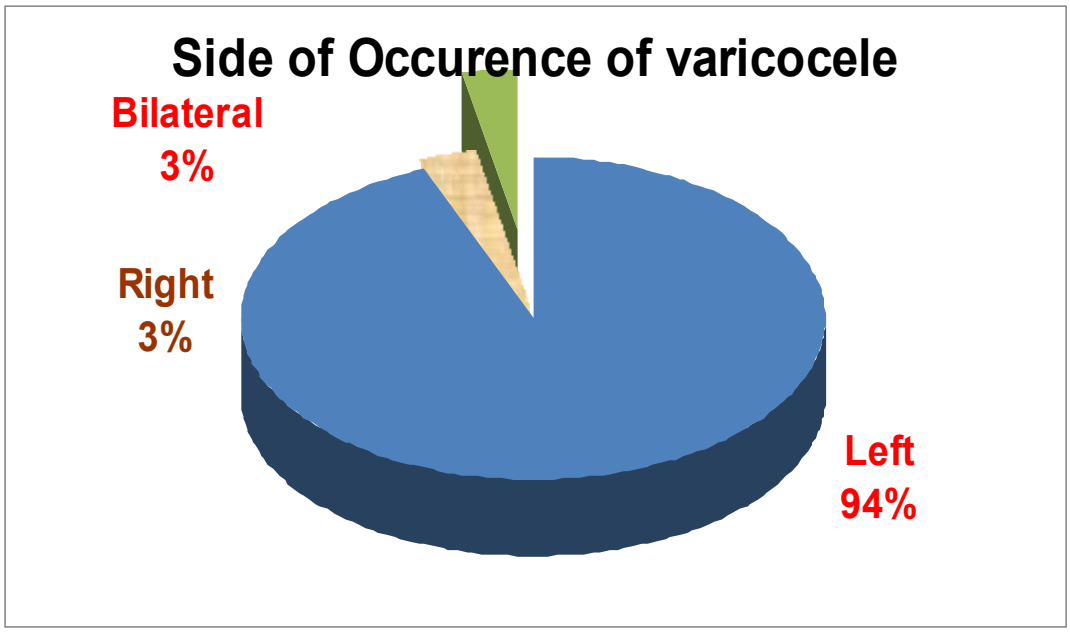
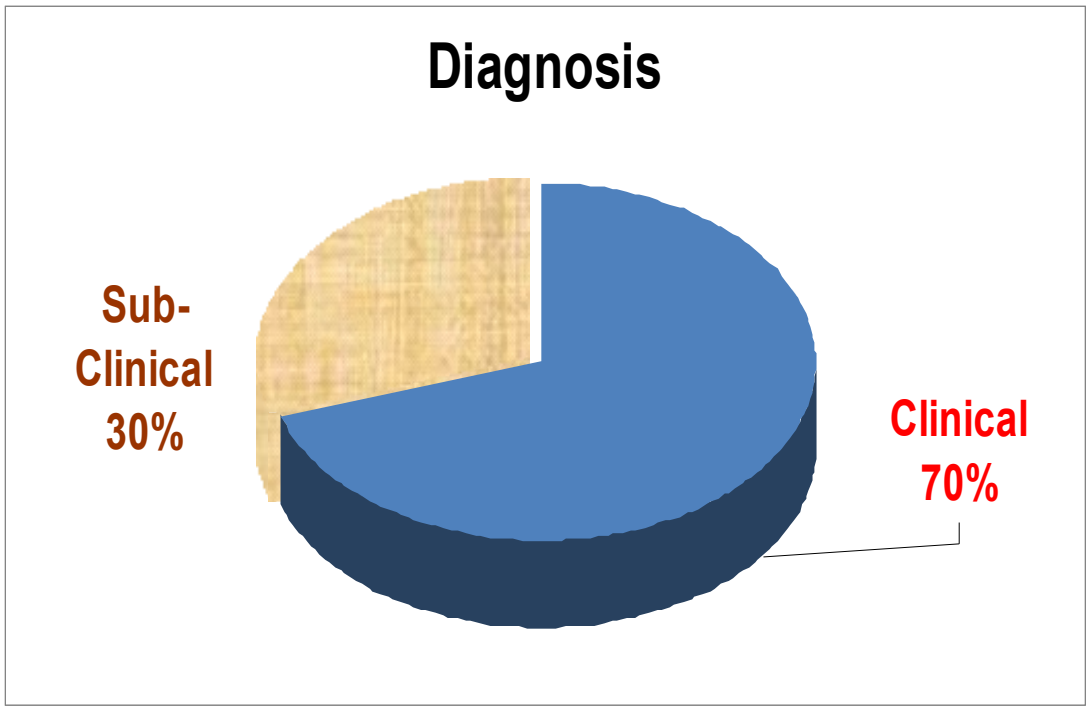
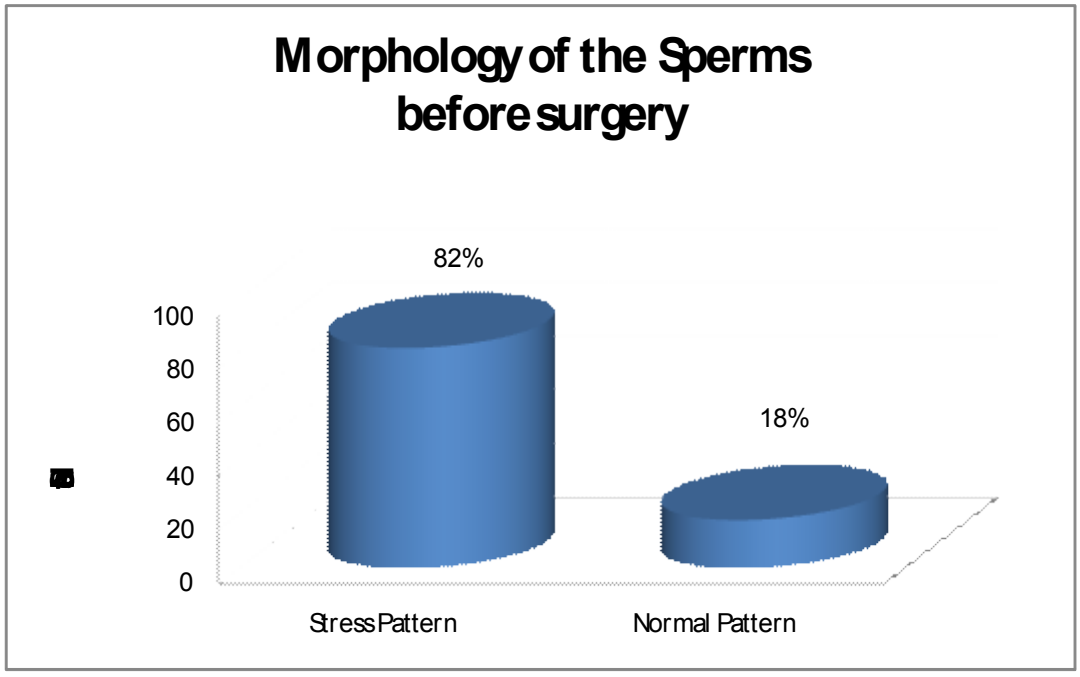
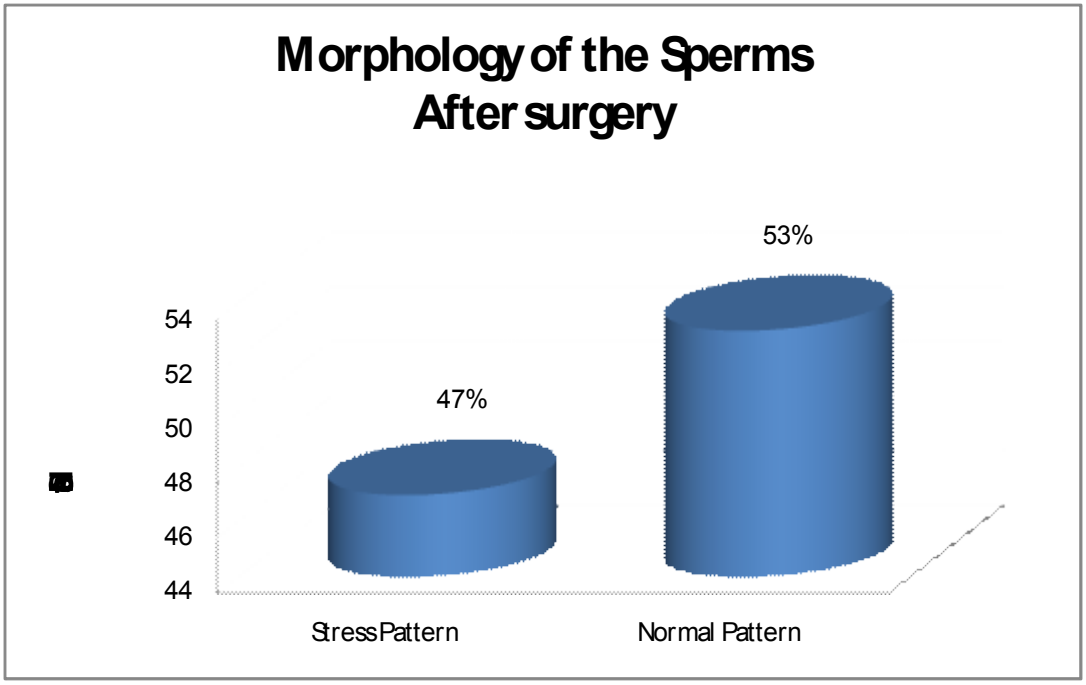


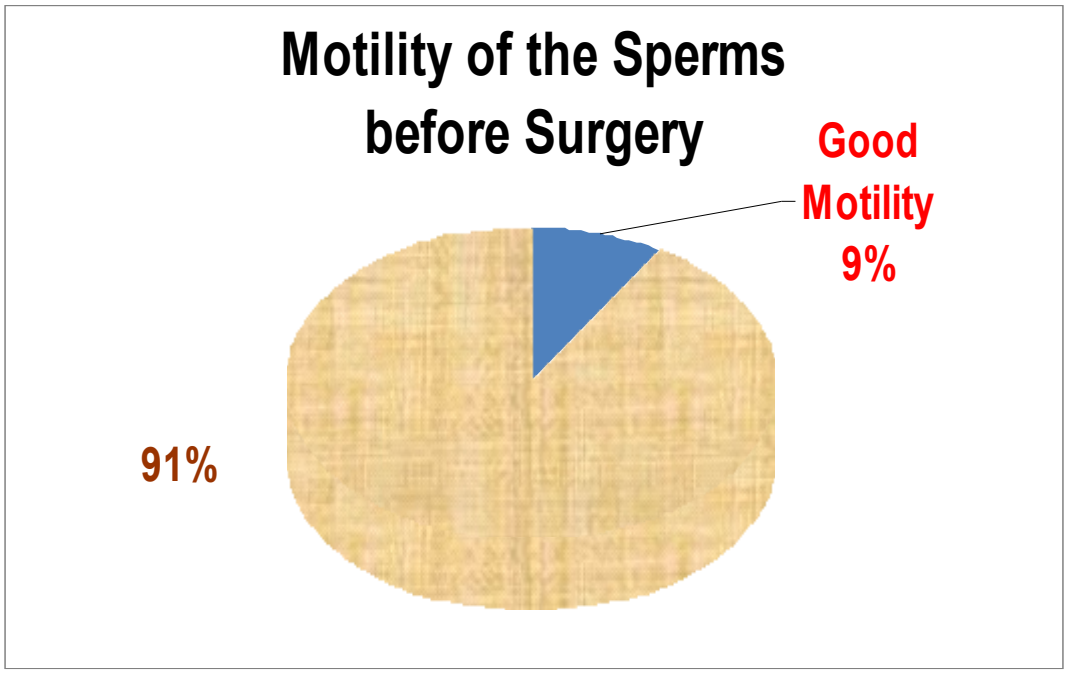
Table 4 : Diagnosis of varicocele – Clinical versus subclinical

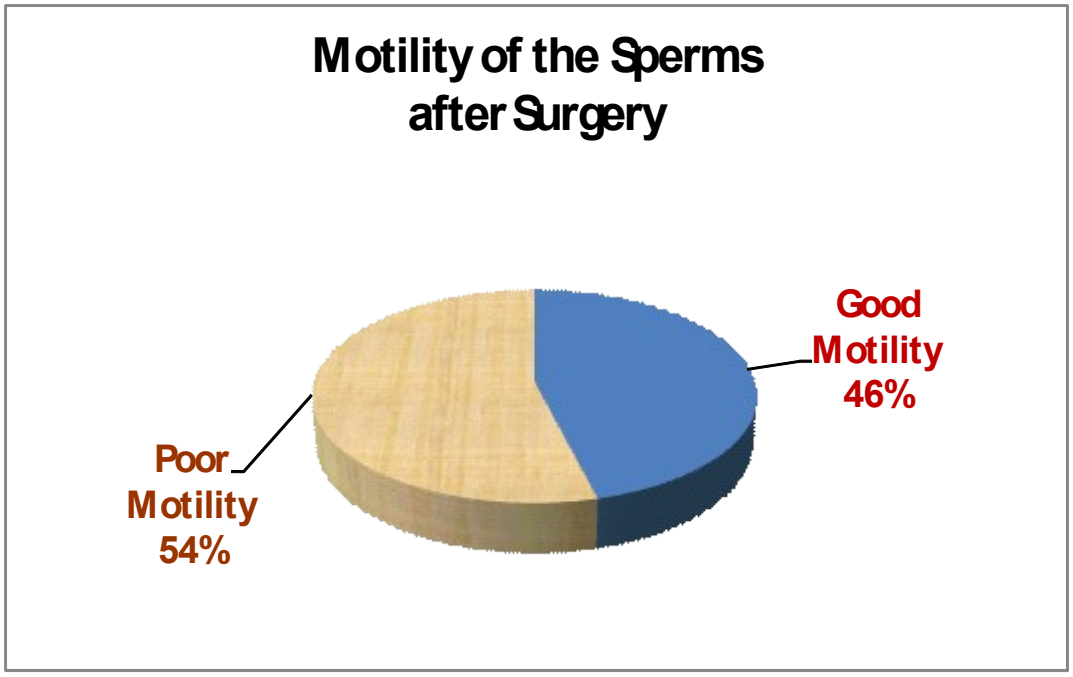
Diagnosis	No. of patients	Percentage
Clinical diagnosed varicocele	24	70%
Subclinical varicocele	10	30%
Total	34	100%

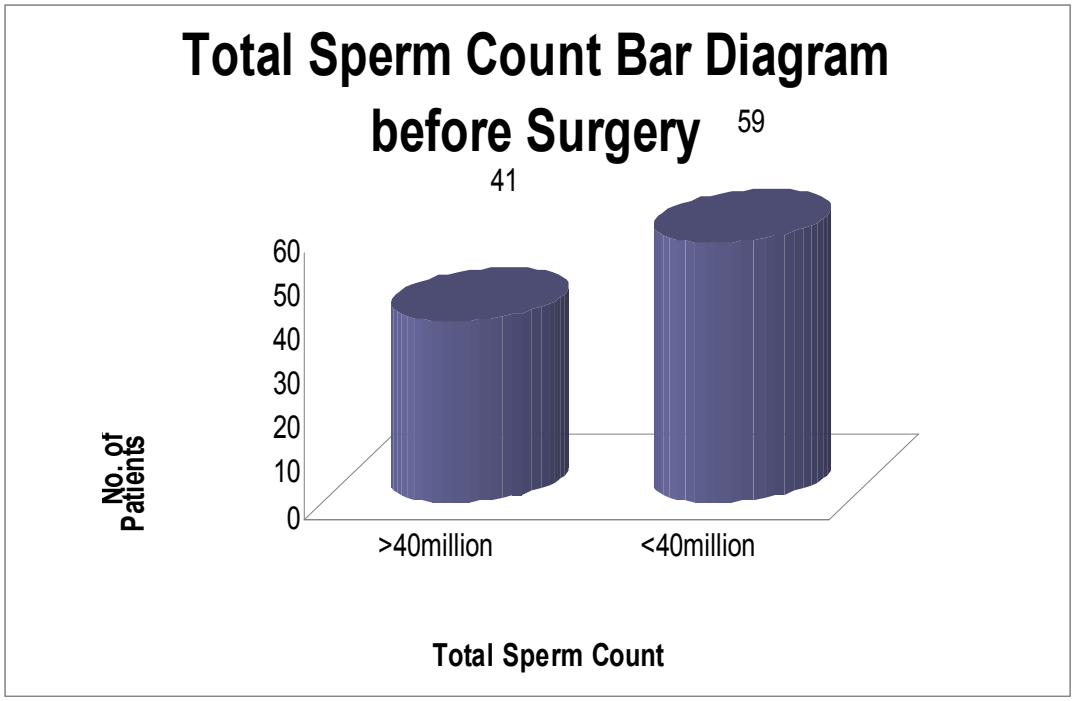

Diagnosis
Sub-
Clinical
30%
Clinical
70%

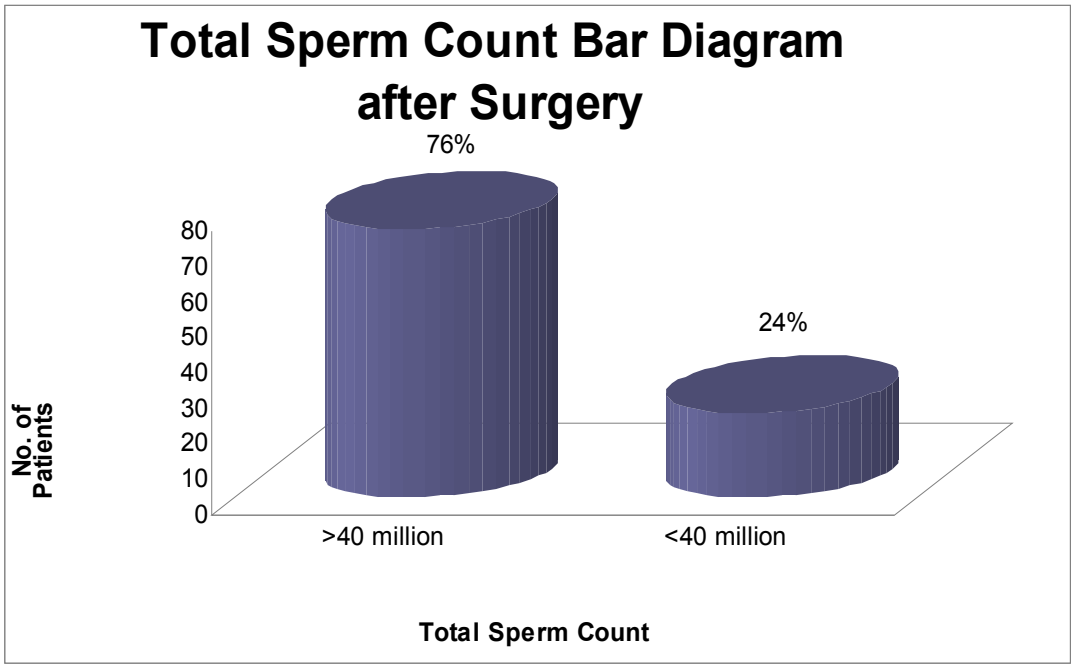

Morphology of the Sperms
before surgery
82%
18%
100
80
60
40
20
0
Stress Pattern
Normal Pattern


Morphology of the Sperms
After surgery
53%
47%
54
52
50
48
46
44
Stress Pattern
Normal Pattern


Motility of the Sperms
before Surgery
Good
Motility
9%
91%


Motility of the Sperms after Surgery
Good Motility 46%
Poor Motility 54%


Total Sperm Count Bar Diagram before Surgery
59
41
60
50
40
30
20
10
0
No. of Patients
>40million
<40million
Total Sperm Count



DISCUSSION

A varicocele is an abnormal tortusity and dilatation of the testicular veins around the spermatic cord.

In our study of varicoceles majority of the patients belonged to the 20-30 years age group with a median duration of infertility of 3 ½ years.

94 % of the varicoceles in our study belong to the left side. Differences in the venous drainage of the left and right testicular vein may account for the left side predominance. The left testicular vein drains into the left renal vein whereas the right testicular vein drains into the inferior vena cava. In addition there is a higher incidence of abnormal venous valves on the left side than on the right side. The left renal vein may be compressed between the superior

mesenteric artery and the aorta.

Majority of various patient in our study were diagnosed clinically (70 %) whereas 30% of the patients with subclinical varicocele were diagnosed by ultrasound and Doppler study. Among the clinically diagnosed varicocele majority were G II Majority of patient who were smokers had impaired spermatogenesis in the presence of varicocele.

Majority of patient in our study had normal testicular size and semen volume, viscosity. there by implying that there is no correlation between them and varicocele.

Over all semen concentration (density) less than 20milliom/ml and the total sperm count of less than 40 million were seen in about 50-60% in our patients with varicocele. Similarly decreased sperm motility and altered sperm morphology were seen in more than 90 % of our patients. There was a significant improvement in these parameters after varicocelectomy.

However only 5 of 34 patients could impregnate there partners during the follow up periods of 12 months. Further follow up of these patients would show whether there is any significant in increase in pregnancy rate following the surgical repair of varicocele.

REVIEW OF LITERATURE

History of varicocele

Varicoceles were first reported as "…… veins (that) are swollen and twisted over the testicle, which becomes smaller than its fellow……" by the Roman writer Celsus in the 1st Century A.D. and contemporarily as an abnormal dilatation of the veins of the pampiniform plexus."

A surgical pioneer, Sabuncuoglu published 3 medical textbook in 15th century, namely Akrabadin (Pharmacology), Mucerrename (The Book of Experience) and Cerrahiyyeti' I Haniyye, of which there are 3 knows copies, including 1 in Paris and 2 in Istanbul. The text was written in Ottoman, the Turkish language of the time, with an alphabet that is Arabic in origin, in which Sabuncuoglu described varicocele or devali as the "bending of testicular veins like a bunch of grapes."The cause of this disease, he said, was "filthy blood." He used an upper scrotal incision in his varicocelectomy approach. After incising the skin and locating the veins he separated the veins from the vas deferens and then isolated them longitudinally with a wide scalpel or sharp razor where they were dense. With a large needle and curved silk thread he ligated the veins Completely from the lower and upper parts. He then dissected the veins between the 2 ligation sutures. He ended the procedure by medicating and dressing the wound.

Following Tallocir's report in 1952 of improved fertility in a patient following varicecelectomy, clinicians have become increasingly aware of an association between male subferitility and varicocele. Although impaired bilateral seminiferous tubular morphology is well documented in unilateral varicocele, it is unclear whether there is a causal relationship

between the venous abnormality and the testicular dysfunction. The literature is replete with poorly documented spermatogenesis by various mechamsins. What remains emigrate is an adequate explanation for the bilateral effects of the unilateral venous lesion. The demonstration of collateral venous circulation to the right tests in humans has been the accepted, but improven explanation. Although it is possible that there is venous hypertension in the right testicular vein secondary to crossover between the left testicular venous systems, most venographic studies in patients with varicocele have shown venous crossover that is limited to superficial veins of the pubis and upper scrotum.

Anatomy of the gonadal vein:

Absent or incompetent valves within the internal spermatic vein have long been thought to contribute to the pathophysicology of varicocele. Standard anatomy texts describe valves within the internal spermatic vein. Intact valves prevent reflux of blood against the intended direction of flow. While some autopsy studies have demonstrated the presence of internal spermatic vein valves, Wishahi discovered complete bilateral absence of valves in 40 men." In another study of 659 consecutive patients who underwent venography for evaluation of idiopathic left varicocele 73% had absent internal spermatic venous valves while 26% demonstrated competent valves or absent insertion of the left spermatic vein at the typical point on left renal vein plus retrograde flow over persistent collateral anastomoses. The complete absence of valves, presence of dysfunctional valves or presence of functional valves in conjunction with additional aberrant anatomical features appears to be associated with the pathophysicology of varicocele.

In an autopsy series A. Lechteret al looked at anatomy of 200 gonadal veins (100 cadavers) and found average length of gonadal vein was 23cm (12-33cm) with an SD of 2.70. The diameter ranged from 1-8mm averaging 3mm with SD of 3.70. Valves were present in 62% and 48% of cases in left and right side respectivey. Analyzing collateral circulation they found 67% of veins on the left side and 49% on right had collaterals. They found that the collaterals that drain in the upper third come often from Gerota's perirenal fat and those draining into the lower third usually come from the retroperitoneal tissues. Termination of the gonadal vein has a classic pattern. of 78% on the right and 79% in left side. There may be termination in right renal vein in 8% cases.

A double or multiple terminations is found in 16% veins on the right side. On the left side there is a double system going to the renal vein in 19% and triple system in 1%. In the analysis of the number of venous trunks they found that these veins that originated than one to 50% trunks in the lower third as they ascended merged to form lower trunks in the upper third. Comparing the length in each side, it was found that the left side was longer than the right side (1.4cm average). No communication in other venous systems of the abdomen was found.

The location of the left renal vein between the aorta and the superior mesenteric artery may predispose the vein to compression (the "Nutcracker" phenomenon) resulting in potential development of collateral drainage and increased venous pressure within the internal spermatic vein. Two additional mechanisms of venous compression have been described. Coolsaet demonstrated a distal compression of the left common iliac vein by the common iliac artery, thereby impeding flow through the deferential and external spermatic veins, facilitating dilatation of the affected veins ("distal nutcracker" phenomenon). Anomalies of the renal vein

may also impede venous return from the pampimiform plexus.

Pathophysiology

Several theories have been proposed to explain the harmful effect of varicoceles on sperm quality, including the possible effects of pressure, oxygen deprivation, heat injury, and toxins. Despite considerable research, none of the theories has been proved unquestionably, although an elevated heat effect caused by impaired circulation appears to be the most reproducible defect. Supporting this hypothesis is the fact that a varicocele created in an experimental animal led to poor sperm function with elevated intratesticular temperature. Regardless of the mechanism of action, a varicocele is indisputably a significant factor in decreasing testicular function and in reducing semen quality in a large percentage of men who seek infertility treatment.

Although unproved, a varicocele may represent a progressive lesion that can have detrimental effects on testicular function. An untreated varicocele, especially when large, may cause long-term deterioration in sperm production and even testosterone production. If an infertile male has bilateral varicoceles, both are repaired to improve sperm quality.

Presentation

A patient with a varicocele is usually asymptomatic and often seeks an evaluation for infertility after failed attempts at conception. He may also report scrotal pain or heaviness.

Careful physical examination remains the primary method of varicocele detection. An obvious varicocele is often described as feeling like a bag of worms. Scrotal examination for varicocele should be a facet of the standard urologic physical examination because of the potential for varicoceles to cause significant testicular damage.

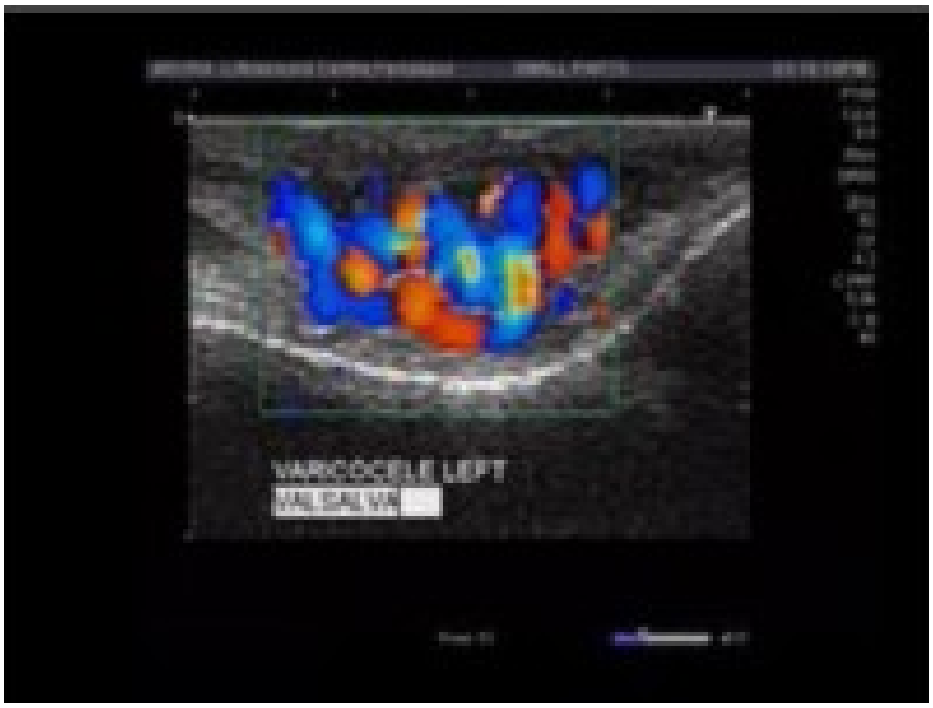
Diagnosis of Varicocele

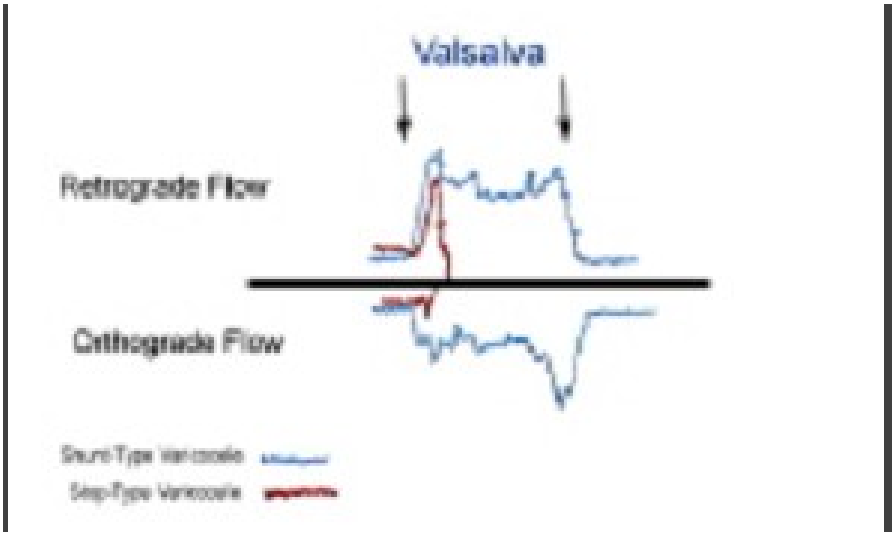
Varicocele is diagnosed by through examination of the scrotal contents and relaxation of the dartos muscle, facilitated by a warm scortum. This is essential for proper examination of the spermatic cord between the thumb and forefingers for palpable veins. The patient is first examined in the upright position without and then with a Valsalva maneuver, and finally in the supine position in assess for collapse of internal spermatic veins if necessary. Varicoceles are graded based on findings at physical examination and are classified as follows: Grade 0 – Subclinical varicocele cannot be detected on physical examination, generally identified by ultrasonographic study or venugraphic. Grade 1 – Detected by palpation with difficulty, increase in size with Valsalva, Grade 2 – Easily detected without Valsalva, Grade 3 – Detected visually at a distance. If a varicocele remains prominent with the patient supine, mechanical obstruction to testicular venous outflow is suggested. Because sarcoma, lymphoma and renal cell carcinoma with venous thrombus may cause this type of obstruction, abdominal ultrasound or computerized tomography is indicated for thorough evaluation of the retro-peritoneum.

Trans-scrotal ultrasound with color flow Doppler imaging may be used to look foe a varicocele if physical examination cannot be adequately accomplished or findings on physical examination are equivocal. With this

Doppler left varicocele at rest

Doppler left varicocele at valsalva





Typical bi directional Doppler recording in varicoceles

modality, the diameter of the internal spermatic vein and direction of blood flow through the most prominent veins during Valsalva may be documented. A study internal spermatic vein physical characterized showed that the internal spermatic vein becomes palpable when the vein diameter exceeds 3.0 to 3.5mm.

Treatment

Medical Therapy

A varicocele is an anatomic abnormality that can impair sperm production and function. No effective medical treatments for varicoceles have been identified. While some investigators are evaluating the role of antioxidants for the treatment of elevated levels of reactive oxygen species, this treatment approach is still experimental.

Indications for surgery

Reasons for surgical correction of a diagnosed variocele include relieving significant testicular discomfort or pain not responsive to routine symptomatic treatment, reducing testicular atrophy (volume <20 mL, length <4 cm), and addressing the possible correctable cause to unexplained male infertility. A varicocele may cause progressive damage to the testes, resulting in further atrophy and impairment of seminal parameters.

The Male Infertility Best Practice Policy Committee of the American Urological Society recommends that varicocele treatment should be offered to the male partner of a couple attempting to conceive when all of the following are present:

- A varicocele is palpable.
- The couple has documented infertility
- The female has normal fertility or potentially correctable infertility
- The male partner has one or more abnormal semen parameters or sperm function test results.

In addition, adult men who have a palpable varicocele and abnormal semen analyses findings but are not currently attempting to conceive should also be offered varicocele repair.

Scrotal varicocele is the most correctable factor in a male with poor semen quality; therefore, varicocele repair should be considered a viable choice for appropriately selected individuals and couples with otherwise unexplained infertility because varicocele repair has been shown to improve semen parameters in most men and possibly improve fertility; in addition, the risks of varicocele repair are small.

The results of treating varicoceles in adolescents are not as clear as the results of treating varicoceles in adults. Although varicoceles first become apparent in adolescence, their natural

history and its timeline for the onset of detrimental effects on testicular function remain unclear. Varicoceles occur in approximately 10-15% of the fertile male population, but not all varicoceles impair sperm function, overall semen quality, or fertility.

Important determinations to be made regarding varicoceles in adolescents are whether

(1) the varicocele is a progressive lesion and

(2) early repair of the varicocele would prevent infertility.

The indications for repairing varicoceles in adolescents include the presence of significant testicular asymmetry (>20%) demonstrated on serial examinations, testicular pain, and abnormal semen analysis results. Very large varicoceles may also be repaired; however, in the absence of atrophy, this indication is relative and controversial. Young men with varicoceles but normal ipsilateral testicular volume should be offered follow-up monitoring with annual objective measurements of testicular volume, semen analyses, or both.

Surgical Therapy

The primary form of treatment for varicocele is surgery.

The presence of a varicocele does not mean surgical correction is necessary. The ultimate goals of varicocele repair should include occlusion of the offending varicosity with high success, preservation of arterial flow to the testis, and the minimization of patient discomfort and morbidity. Viable options for repair include radiographic obliteration and surgical repair of various approaches. The efficacy of the myriad techniques is nearly equivalent. Therefore, special attention must be paid to the morbidity of the individual procedure and the expertise of the operating surgeon.

Preoperative Details

Varicocele surgery in done as an outpatient setting using one of various anesthetics (eg, general, regional, local). A general anesthetic provides maximal patient comfort.

Intraoperative Details

The 3 most common surgical approaches used to correct a scrotal varicocele include the inguinal (groin), retroperitoneal (abdominal), and infrainguinal/subinguinal (below the groin) approaches. With all 3 approaches, all abnormal veins are tied permanently to prevent continued abnormal blood flow. Avoid the vas deferens and the testicular artery during the

surgery.

The inguinal and subinguinal approaches are those most commonly used by the vast majority of adult urologists and infertility specialists. The familiar anatomy, low morbidity, and high efficacy make these approaches almost ideal. Inguinal ligation is achieved by incising the inguinal canal down to the external inguinal ring. After cord isolation, the testicular artery is preserved and the veins of the cord are ligated and divided.

The subinguinal approach is performed in a similar fashion, but access is achieved through an incision at or near the pubic tubercle that obviates the opening of the external oblique aponeurosis. The advantages of subinguinal varicocele ligation, especially with use of magnification, include decreased pain and easier access to the spermatic cord, especially among obese men and those with a history of inguinal surgery. However, at this level, a greater number of veins are present, especially periarterial anastomosing veins, that make subinguinal ligation technically challenging. The use of the microsurgical technique has advanced the surgical treatment of this disorder by allowing optimal visualization. While the approach to cord isolation is no different, the 6-25X magnification facilitates the identification of small anastomosing veins that might otherwise be missed. Furthermore, the risk of testicular ischemia and testis atrophy due to inadvertent ligation of the

Varicocelectomy – Operative Pictures

testicular artery is greatly reduced with this improved visualization. This risk of arterial ligation can be further reduced by using a mini-Doppler ultrasound probe . The retroperitoneal approach offers great proximal control of the spermatic vein near its insertion at the renal vein, this approach may be accomplished laparoscopically. This technique, however, carries a high recurrence rate (nearly 15%) due to inguinal and retroperitoneal collateral veins, failure to ligate fine periarterial veins when the testicular artery is preserved, an inability to preserve lymphatics, and potential hydrocele formation when the artery and vein are ligated en bloc. This approach to varicocele ablation remains popular among pediatric urologists.

Percutaneous embolization represents the least invasive means of varicocele repair. The internal spermatic vein is accessed primarily via cannulation of the femoral vein through a retrograde approach with subsequent balloon and/or coil occlusion of the varicocele. The advantages of percutaneous embolization include preservation of the testicular artery and the relatively noninvasive nature of the technique. However, the percutaneous approach can be fraught with troublesome access to the vein, and postoperative complications such as contrast allergies, arterial injury, thrombophlebitis, and coil migration are uncommon but tangible risks. This approach is often reserved for recurrent varicoceles after open surgical repair.

Postoperative Details

Complications

The prevalence of adverse effects following varicocele repair is remarkably low. Hydrocele or increased fluid around the testicles occurs in 2-5% of patients. Successful surgery often increases conception rates in infertile couples. The overall recurrence rate for varicoceles has been reported as high as 10%.

Injury to the testicular artery has been reported in 0.9% of microsurgical varicocele repairs. This incidence may be higher when optical magnification is not used for varicocele repair. Because the testis typically has additional arterial supplies from the vasal and cremasteric arteries, testicular atrophy is uncommon (5%) after division of the testicular artery. Smaller atrophic testes may be at greater risk for accidental testicular artery injury because of the smaller size of the artery in these cases.

Follow-up

Check the patient's semen 3-4 months after surgery. Because spermatogenesis requires approximately 72 days, any effects from the varicocele repair on semen analysis results are delayed.

CONCLUSION

A varicocele – which is an abnormal tortuosity and dilatation of the testicular veins within the spermatic cord – is the most common surgically correctable cause of male infertility. All the patients attending the infertility clinic should be screened, evaluated and treated for varicocele, if any.

The surgery of the 'Subinguinal Ligation' of the internal spermatic vein is a simple operation with minimal morbidity which is followed by a marked improvement in semen- analysis parameters. This operation is thus indicated in all subfertile or infertile men with significant varicocele and abnormal semen – analysis findings. However, varicocele is also found in healthy, fertile, asymptomatic men for which no treatment may be necessary.

MASTER CHART

s.no	name	age	lp no	diagnosis	side	Pre op Semen count	Post op Semen count	pregnancy
1	Raja	27	8231	clinical	lt	oligospermia	normal	nil
2	kumar	22	7834	clinical	lt	oligospermia	normal	nil
3	Gopi	26	3456	subclinical	lt	normal	normal	nil
4	Thirumal	33	17890	clinical	lt	normal	normal	nil
5	Sadayandi	22	16578	clinical	lt	oligospermia	oligospermia	nil
6	.Murugan	31	15678	clinical	lt	normal	normal	positive
7	Syed basha	28	3453	subclinical	rt	oligospermia	oligospermia	nil
8	Krishnareddy	27	16756	clinical	lt	oligospermia	normal	positive
9	Mani	21	2348	subclinical	lt	normal	normal	nil
10	Balamurugan	28	18567	clinical	lt	oligospermia	normal	positive
11	Saivaraj	32	15432	subclinical	lt	normal	normal	nil
12	Gnanasekar.	21	27564	clinical	lt	normal	normal	nil
13	Parthasarathy	33	1432	subclinical	lt	oligospermia	oligospermia	nil
14	Ponnusamy	28	27651	clinical	lt	oligospermia	normal	nil
15	Muneeswaran	32	17564	subclinical	lt	normal	normal	nil
16	.Jayakumar.	23	7654	clinical	lt	normal	normal	nil
17	Krisnamoor	29	3543	clinical	lt	normal	normal	nil

s.no	name	age	lp no	diagnosis	side	Pre op Semen count	Post op Semen count	pregnancy
	thy							
18	Arumugam	27	16432	subclinical	lt	oligospermia	oligospermia	nil
19	Kumar	24	14532	clinical	lt	normal	normal	nil
20	.Xavier	34	6543	clinical	lt	normal	normal	nil
21	prabu .	32	12634	clinical	lt	oligospermia	oligospermia	nil
22	Munusamy	38	2765	clinical	B/L	oligospermia	normal	nil
23	.Pitchandi .	34	3425	clinical	lt	oligospermia	normal	positive
24	Chinnatambi	32	18456	clinical	lt	normal	normal	positive
25	.Gopi .	28	13497	subclinical	lt	normal	normal	nil
26	Srinivasan	26	10345	clinical	lt	normal	normal	nil
27	. Ravindran .	30	2534	subclinical	lt	oligospermia	oligospermia	nil
28	Shunmugam .	27	14756	clinical	lt	normal	normal	nil
29	Kasi	25	1098	subclinical	lt	oligospermia	normal	nil
30	.Rajini	28	1860	clinical	lt	normal	normal	nil
31	Prabakaran	29	27532	clinical	lt	oligospermia	oligospermia	nil
32	Rajendren	36	17654	clinical	lt	normal	normal	nil
33	Kutti	28	5432	clinical	lt	oligospermia	oligospermia	nil
34	Karthik	27	4673	clinical	lt	oligospermia	oligospermia	nil

BIBLIOGRAPHY

1. Campbell urology 9th edition

2. Glenn"s urologic surgery 6th edition

3. Subclinical varicocele: the effectiveness of varicocelectomy. *J Urol*. Apr 1991;145(4):789-91.

4. Vazquez-Levin MH, Friedmann P, Goldberg SI, Medley NE, Nagler HM. Response of routine semen analysis and critical assessment of sperm morphology by Kruger classification to therapeutic varicocelectomy. *J Urol*. Nov 1997;158(5):1804-7.

5. Chan PT, Wright EJ, Goldstein M. Incidence and postoperative outcomes of accidental ligation of the testicular artery during microsurgical varicocelectomy. *J Urol*. Feb 2005;173(2):482-4.

6. Hopps CV, Lemer ML, Schlegel PN, Goldstein M. Intraoperative varicocele anatomy: a microscopic study of the inguinal versus subinguinal approach. *J Urol*. Dec 2003;170(6 Pt 1):2366-70.

7. Gerardi SK., Goldstein M. Mini-incision Microsurgical Inguinal or subinguinal varicocelectomy. In Atlas of the Urological clinics of North America, 1996;4(2):83-94.

8. Kim ED, Leibman BB, Grinblat DM, Lipshultz LI. Varicocele repair improves semen parameters in azoospermic men with spermatogenic failure. *J Urol*. Sep 1999;162(3 Pt 1):737-40.

9. Marks JL, McMahon R, Lipshultz LI. Predictive parameters of successful varicocele repair. *J Urol*. Sep 1986;136(3):609-12.

10. Marmar JL, Kim Y. Subinguinal microsurgical varicocelectomy: a technical critique and statistical analysis of semen and pregnancy data. *J Urol*. Oct 1994;152(4):1127-32.