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EFFECT OF SCROTAL VEINS LIGATION ON VARICOCELE GRADE AND DUPLEX PARAMETERS

By

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ABSTRACT

Background: Varicocele is approached by various interventional techniques, none of which is yet considered the best. Some are relatively expensive, time-consuming and require special skills and training especially microsurgical techniques.

Objectives: Evaluation of scrotal veins contribution to varicocele and the effect of its ligation on postoperative varicocele grade and Duplex parameters.

Patients and methods: Sixty patients with clinically and sonographically detectable varicocele grades II and III, abnormal semen, a preoperative diameter of veins of more than three millimeters, and time of regurge more than one second through Valsalva's maneuver, together with dilated and regurging scrotal veins, were randomly divided into 2 equal groups: Group I were treated by subinguinal varicocelectomy only, and Group II were treated by subinguinal varicocelectomy with additional scrotal veins ligation.

Results: Both surgical techniques showed significant improvements in clinical grades of varicocele and Duplex parameters (diameter of veins and time of venous reflux). However, the postoperative improvement in time of venous reflux was significantly higher in group II. Recurrence and complications were comparable with no significant difference between both groups.

Conclusion: The improvement in clinical grades of varicocele and Duplex parameters was insignificant in both surgical techniques. Improvement in time of venous reflux was significantly higher in patients treated by subinguinal varicocelectomy with additional scrotal veins ligation.

Key Words: Varicocele – scrotal Duplex – semen analysis – subinguinal varicocelectomy – scrotal veins.

INTRODUCTION

Treatment of varicocele still causes several complications and recurrences. Each technique has its own advantages and disadvantages, and conflicting results have been obtained from different studies ***(Al Kandari et al., 2007).***

The ideal method for treatment of varicocele is still controversial ***(Gulino et al., 2011).*** There are several therapeutic proposals for varicocele treatment. Subinguinal interruption of dilated veins in adolescent varicocele is an effective treatment and should be considered a gold standard technique ***(Yaman et al., 2000 and Cimador et al., 2003).*** The subinguinal approach has the advantage of causing less pain because less muscle is

involved. Rates of recurrence and hydroceles are rare (2.11% and 0.69%, respectively – ***Cayan et al., 2000)***. Delivery of the testis assures direct visual access to all possible routes of venous return including external spermatic (cremasteric) and gubernacular veins ***(Goldstein et al., 1992).***

The aim of the work was to determine scrotal veins ligation on the results of subinguinal varicocelectomy regarding clinical grades of varicocele and Duplex parameters.

PATIENTS AND METHODS

This prospective study was done over a period of 21 months, from December 2011 to September 2013. Sixty male patients with left varicocele (52 of them were associated with right varicocele) of those attending the Andrology outpatient clinic, Kasr El Eini Hospital, Cairo University, were randomly assigned to two surgical treatment modalities. Selection criteria were clinically detectable varicocele grades II and III and abnormal semen parameters regarding sperm count, motility and abnormal forms. The recruited 60 patients were randomly divided into 2 equal groups:

- **Group I** was treated by subinguinal varicocelectomy only **(*Marmar et al., 1985)*;** 25 bilateral and 5 left unilateral varicoceles.
- **Group II** was treated by subinguinal varicocelectomy with additional scrotal veins ligation including external spermatic (cremasteric) and gubernacular veins; 27 bilateral and 3 left unilateral varicoceles.

All patients were subjected before the operation to history taking, clinical examination, semen analysis ***(WHO, 2010),*** and scrotal color Duplex examination (for detection of diameter and regurge in both cord and gubernacular veins). **Two Duplex criteria were used, i.e.** largest vein diameter > 3 mm, and a time of regurge > 1 second throughout the Valsalva's maneuver.

Follow up after 1 week interval and 4-6 months postoperatively by clinical examination, scrotal Duplex examination and semen analysis to detect complications and compare Duplex changes and semen parameters.

Statistical analysis: Paired t-test was used for dependent variables. Cross tables and Chi-square tests were performed to compare ordinal data. Statistical analysis was done using SPSS 14.0 for Windows. Significant: p value < 0.05.

RESULTS

The mean age ± S.D of the studied groups was 29.40 ± 4.41years with a range of 22–38 years in group I, and 30.03 ± 4.77 years with a range of 23 – 41 years in group II. No significant difference between groups I and II was observed. Table (1) showed the preoperative abnormal semen analysis; sperm count, motility and abnormal forms. No significant difference in semen parameters was observed between preoperative groups.

Table (1): Preoperative semen parameters of groups I and II (Mean ± SD).

Groups / Semen Parameters	Group I (n= 30)		Group II (n= 30)	
	Mean ± S.D		Mean ± S.D	
Sperm count (million/ml)	20.37	± 19.93	19.52	±18.24
Sperm motility %	35.37	± 18.60	34.31	± 16.40
Progressive motility %	6.85	± 6.67	5.52	± 6.03
Abnormal sperm forms %	36.11	± 11.12	40.69	± 13.28

I. Clinical grades: There was a significant improvement of **clinical grades** of left and right varicocele postoperatively in both groups I and II (Table 2). No significant difference was observed between preoperative groups or between postoperative groups (Tables 3& 4).

Table (2): Preoperative and postoperative clinical grades of both left and right varicoceles of groups I and II.

Groups / Clinical grades of varicocele	Group I (n= 30) 55 Varicoceles (30 Left & 25 Right)				Group II (n= 30) 57 Varicoceles (30 Left & 27 Right)			
	Preoperative		Postoperative		Preoperative		Postoperative	
	N	%	N	%	N	%	N	%
No varicocele	0	0	49	89.1%	0	0	55	96.5%
Grade I	15	27.3%	4	7.3%	13	22.8 %	2	3.5%
Grade II	24	43.6%	2	3.6%	29	50.9%	0	0
Grade III	16	29.1%	0	0	15	26.3%	0	0

Table (3): Preoperative and postoperative clinical grades of left varicocele of groups I and II.

Groups / Clinical grades of left side	Group I (n= 30)				Group II (n= 30)			
	Preoperative		Postoperative		Preoperative		Postoperative	
	N	%	N	%	N	%	N	%
No varicocele	0	0%	26	86.6%	0	0%	28	93.3%
Grade I	0	0 %	2	6.7%	0	0%	2	6.7%
Grade II	16	53.3%	2	6.7%	17	56.7%	0	0
Grade III	14	46.7%	0	0%	13	43.3%	0	0

Table (4):Preoperative and postoperative clinical grades of right varicocele of groups I and II.

Groups / Clinical grades of right side	Group I (n= 30) 25 Right varicoceles				Group II (n = 30) 27 Right varicoceles			
	Preoperative		Postoperative		Preoperative		Postoperative	
	N	%	N	%	N	%	N	%
No varicocele	0	0%	23	92.0%	0	0%	27	100%
Grade I	15	60.0%	2	8.0%	13	48.2%	0	0%
Grade II	8	32.0%	0	0%	12	44.4%	0	0%
Grade III	2	8.0%	0	0%	2	7.4%	0	0%

Table (5): Postoperative recurrence detected by clinical and Duplex examination.

Postoperative Recurrence / Method of detection		Clinical		Duplex time	
		N	%	N	%
Left varicocele	Group 1 (n = 30) 30 varicoceles	4	13.3 %	5	16.7 %
	Group 1 (n = 30) 30 varicoceles	2	6.7%	2	6.7%
	Total	6	**10%**	7	**11.7%**
Associated right varicocele	Group 1 (n = 30) 25 varicoceles	2	8%	3	12%
	Group 2 (n = 30) 27 varicoceles	0	0%	0	0%
	Total	2	**3.8%**	3	**5.8%**

The frequency of occurrence of **persistence or recurrence** of varicocele as detected by duplex time of reflux > 1 second. For the left side varicocele, the total postoperative recurrence according to Duplex time of reflux was 7 (11.7 %) cases and 6 (10 %) cases according to clinical examination. Cases associated with right side varicocele showed postoperative recurrence according to Duplex time of reflux was 3 (5.8%) cases and 2 (3.8%) cases according to clinical examination. There was no significant difference between the numbers of persistent or recurrent cases between both groups (Table 5).

II. Duplex parameters: The postoperative mean **largest vein diameter in the left and right cords** significantly decreased in both groups I and II. There was no significant difference between preoperative groups or postoperative groups. The mean largest scrotal vein diameter on the left and right sides in group II significantly reduced postoperatively (Table 6 – Figs.1 & 2).

The postoperative **mean time of reflux in the left and right cord (pampiniform) veins** was significantly decreased in both groups I and II. The postoperative time of venous reflux was significantly lower in group II. There was no significant difference between preoperative groups.

The postoperative time of reflux in scrotal veins was significantly lower in group II (Table 7– Figs. 3 & 4).

III. Complications: The recorded complications were hematoma, wound infection, hydrocele and orchialgia.

- Hematoma was mild and resolved spontaneously within one month after the operation in 3 cases (2 in group II and 1 in group I).
- Infection was in the form of suture line pyogenic membrane which was managed by dressing and local antibiotic ointments in 2 cases.
- Hydrocele was mild and noticed in one case in group I.
- Orchialgia was observed in 2 cases in both groups (Table 8).

Table (6): Pre-and post operative largest vein diameter on both sides (Mean ± S.D) measured by Duplex for groups I and II.

Parameters / Largest vein Diameter			Preoperative Mean ± S.D (mm)		Postoperative Mean ± S.D (mm)	
Left side (60 Varicoceles)	**Group I** (n= 30) **(30 Varicoceles)**	**Pampin.**	3.53	± 0.47	2.80***	± 0.41
		Scrotal	3.28	± 0.58	3.22	± 0.43
	Group II (n= 30) **(30 varicoceles)**	**Pampin.**	3.73	± 0.55	2.80***	± 0.34
		Scrotal	3.48	± 0.44	2.83*** ◇	± 0.38
Right side (52 varicoceles)	**Group I** (n= 30) **(25 varicoceles)**	**Pampin.**	2.91	± 0.28	2.40***	± 0.31
		Scrotal	2.80	± 0.43	2.63	± 0.37
	Group II (n= 30) **(27 varicoceles)**	**Pampin.**	3.01	± 0.46	2.54***	± 0.34
		Scrotal	2.95	± 0.43	2.38*** ◇	± 0.39

***: Significant compared to preoperative mean diameter.

◇ : Significantly reduced compared to postoperative scrotal group I.

Pampin. : Pampiniform (cord) vein. n = number of cases.

Table (7): Time of venous reflux measured by Duplex on both sides pre- and post operatively (Mean ± S.D) for groups I and II.

Parameters / Duplex time of regurge			Preoperative		Potoperative	
			Mean ± S.D (Seconds)		Mean ± S.D (Seconds)	
Left side (60 Varicoceles)	**Group I** (n= 30) **(30 varicoceles)**	**Pampin.**	2.39	± 0.07	0.94***	± 0.62
		Scrotal	2.21	± 0.22	2.12	± 0.37
	Group II (n= 30) **(30 varicoceles)**	**Pampin.**	2.36	± 0.17	0.61***◇	± 0.35
		Scrotal	2.22	± 0.43	0.58***◇	± 0.52
Right side (52 varicoceles)	**Group I** (n= 30) **(25 varicoceles)**	**Pampin.**	2.19	± 0.28	0.78***	± 0.39
		Scrotal	2.08	± 0.24	2.04	± 0.53
	Group II (n= 30) **(27 varicoceles)**	**Pampin.**	2.25	± 0.26	0.45***◇	± 0.38
		Scrotal	2.10	± 0.34	0.49***◇	± 0.65

***: Significant compared to preoperative group.
◇ : Significant compared to corresponding postoperative group I.
Pampin. : Pampiniform vein. n = number of cases.

Table (8): Recorded complications.

Complications / Groups	Hematoma		Infection		Hydrocele		Orchialgia	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Group I (n= 30)	1	3.3 %	1	3.3 %	1	3.3 %	2	6.7 %
Group II (n = 30)	2	6.7%	1	3.3 %	0	0	2	6.7 %

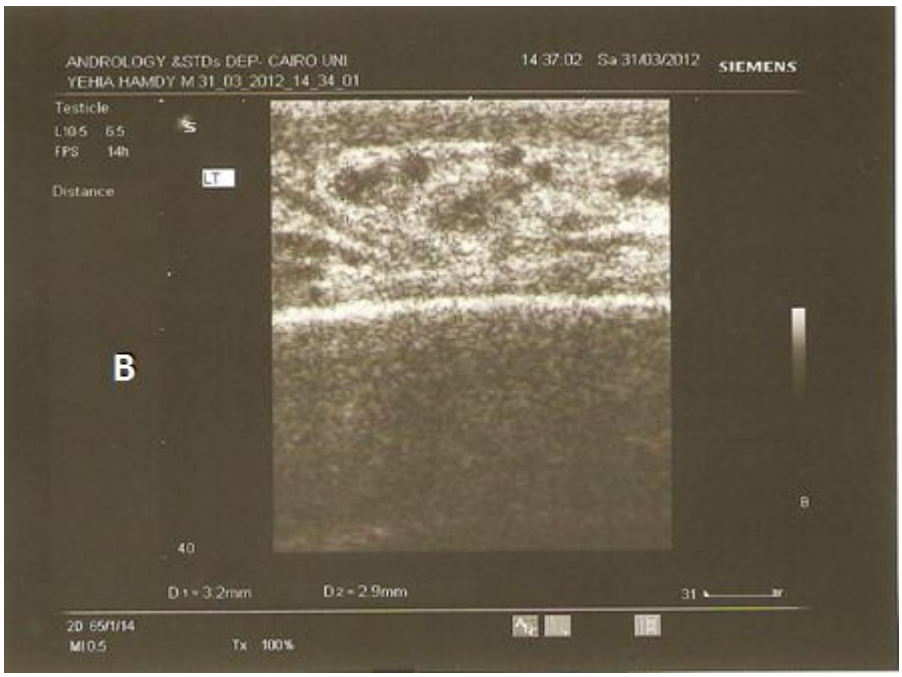

Figure (1): Effect of subinguinal varicocelectomy with additional scrotal veins ligation (group II) on the largest vein diameter in the left cord measured by Duplex. A: Preoperative largest vein diameter was 4.1 mm. B: Postoperative largest vein diameter was 3.2 mm.

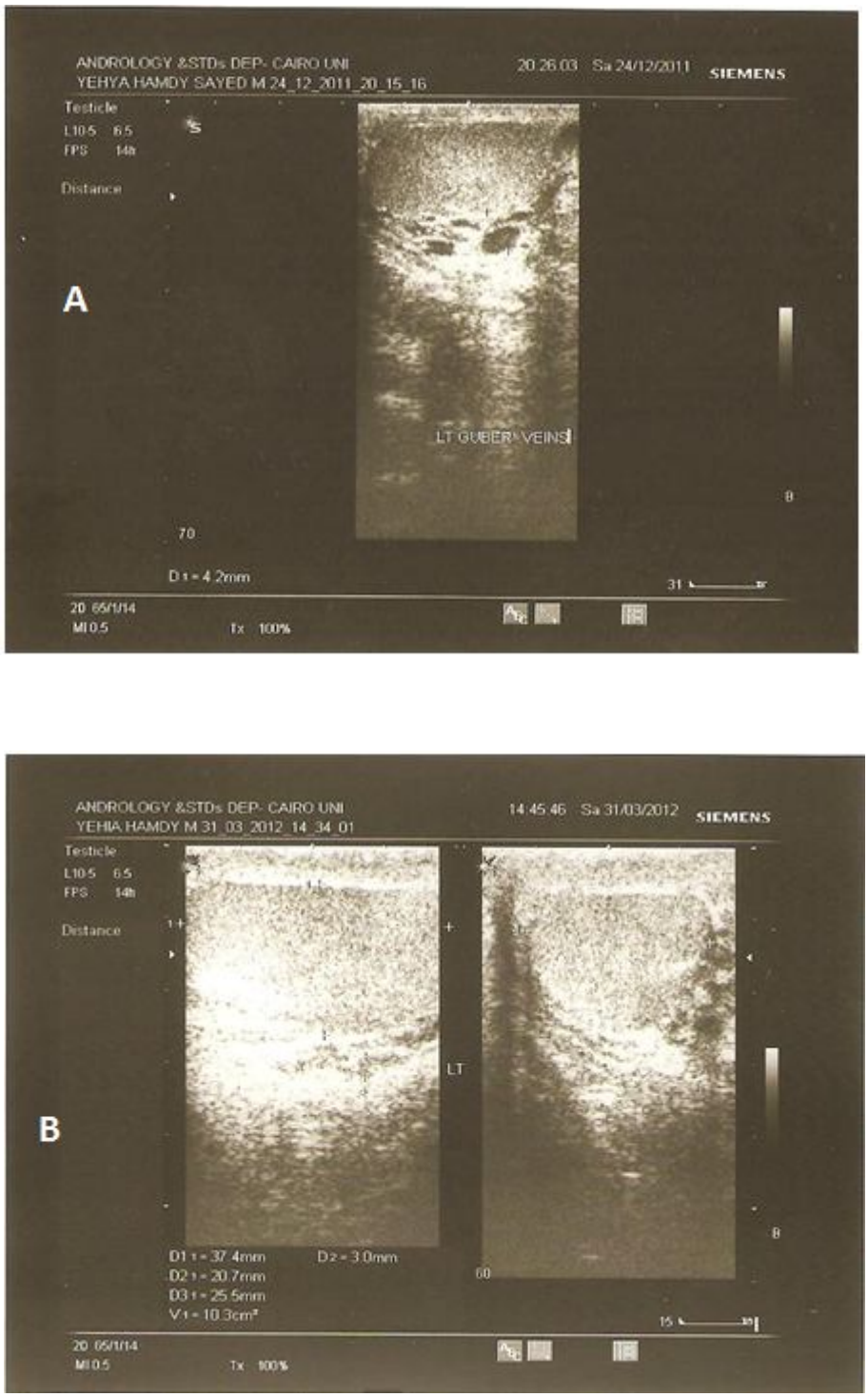

Figure (2): The largest left scrotal vein diameter of the same case in Fig.1 (group II) measured by Duplex. A: Preoperative diameter was 4.2 mm. B: Postoperative diameter was 3.0 mm.

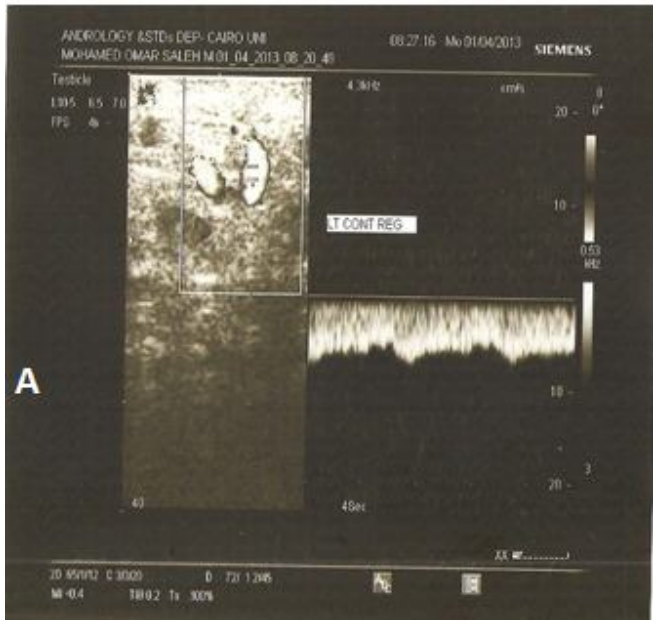

Figure (3): Effect of subinguinal varicocelectomy (group I) on the time of venous reflux in seconds, in the left cord vein measured by Duplex.

A: Preoperative, continuous regurge during Valsalva maneuver (> 2.4 seconds).

B: Postoperative, residual reflux (1.6 second) was detected.

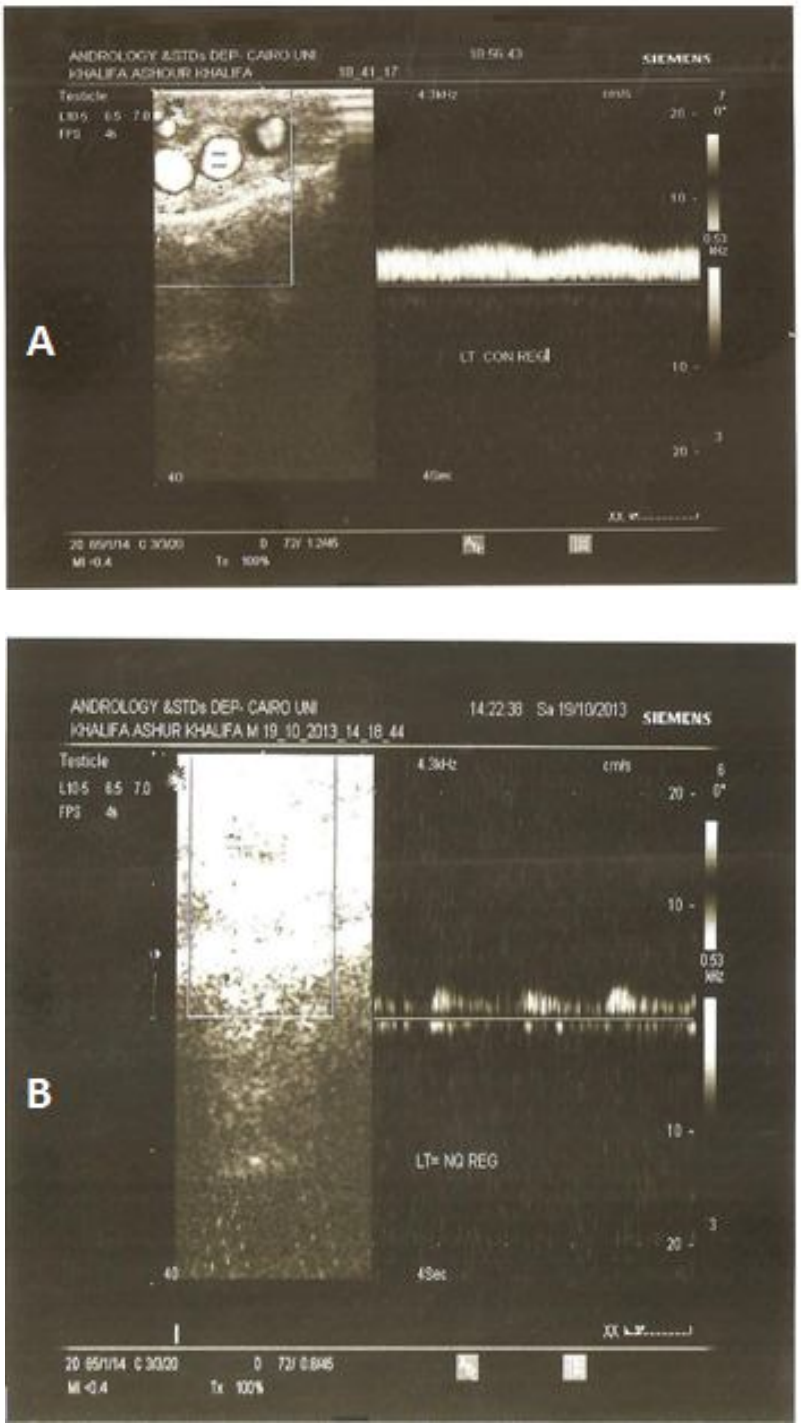

Figure (4): Effect of subinguinal varicocelectomy with additional scrotal veins ligation (group II) on the time of venous reflux in seconds in the left cord vein measured by Duplex. A: Preoperative, continuous reurge during Valsalva maneuver (> 2.4 seconds). B: Postoperative, no venous reflux was detected.

DISCUSSION

Although significant advances have been made in the understanding of varicocele, a clear pathophysiologic mechanism remains elusive. Most likely, a varicocele is the result of a multifactorial process. Appreciation of the complex venous drainage of the testis remains a key to maximizing the chances for treatment success ***(Peter and Matthew, 2002).***

The ideal method for treatment of varicocele is still controversial ***(Gulino et al., 2011).*** The subinguinal approach is similar to the inguinal approach, with the difference being the location of the incision (below the external inguinal ring). The subinguinal approach is preferred because the subinguinal incision obviates the need for opening any fascial layer. It is associated with a faster and less painful recovery ***(Mehta and Goldstein, 2013)***. The subinguinal approach allows for ligation of vessels before branching or crossing over ***(Peter and Matthew, 2002).*** Subinguinal interruption of dilated veins in adolescent varicocele is an effective treatment and should be considered a gold standard technique ***(Yaman et al., 2000 and Cimador et al., 2003).***

The aim of the present work was to determine scrotal veins contribution to varicocele and the effect of its ligation on the results of subinguinal varicocelectomy. This was done through the evaluation of the outcome of two surgical approaches to varicocele: subinguinal varicocelectomy only, and subinguinal varicocelectomy with additional scrotal veins ligation (including gubernacular, external spermatic, and cremasteric veins).

Our study showed a significant improvement of clinical grades of left and right varicoceles postoperatively in both groups I and II. No significant difference was observed between postoperative groups. The postoperative mean time of venous reflux in the pampiniform vein significantly reduced in groups I and II on both sides. The postoperative mean time of venous reflux was significantly lower in group II on both sides.

The incidence of varicocele recurrence following inguinal surgical repair (Ivanessivich's operation) varies in literature from 0.6 % to 45 % ***(Goldstein, 1995).*** In our study, the total clinical postoperative recurrence rate for both groups studied was 6 (10 %) varicoceles on left side and 2 (3.8%) varicoceles on right side. The incidence of recurrence on both sides was 6 (10.9%) varicoceles in group I, and 2 (3.5%) in group II. The incidence of varicocele recurrence as detected by Duplex time of reflux was 7 (11.7 %) varicoceles on left side and 3 (5.8%) varicoceles on the right side The incidence of recurrence on both sides was 8 (14.5%) varicoceles in group I, and 2 (3.5%) in group II. The change in findings between the clinical examination and Duplex is related to the ability of the later to diagnose varicocele more accurately than clinical examination, the so called "subclinical varicocele". ***Goldstein et al. (1992)*** have suggested that varicocelectomy with testicular delivery markedly reduces the incidence of varicocele recurrence and postoperative hydrocele. However, ***Ramasamy and Schlegel (2006)*** suggested that ligation of gubernacular veins does not offer any benefit in varicocele recurrence or pregnancy rates.

The postoperative mean largest vein diameter in the cord significantly reduced in groups I and II on both sides. No significant difference was observed between postoperative groups. The postoperative mean largest scrotal vein diameter significantly reduced in group II on both sides.

Traditional surgery is associated with a postoperative hydrocele rate of 5 – 33%. Hydrocele represents the most frequent complication of this kind of surgical technique and requires surgical correction in half of the patients ***(Szabo and Kessler, 1984). Cayan et al. (2000)*** reported a rate of hydroceles of 0.69%. In the present study, it was experienced in one case only in postoperative group I (0.89% of all varicoceles). Other complications as hematoma, wound infection, orchialgia were simple and subsided spontaneously.

CONCLUSION

Both surgical techniques showed significant improvements in clinical grades of varicoceles and Duplex parameters (diameter of veins and time of venous reflux). However, the postoperative improvement in time of venous reflux was significantly higher in patients treated by subinguinal varicocelectomy with additional scrotal veins ligation. Postoperative recurrence and complications were comparable with no significant difference between both groups.

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خلفية البحث: تعالج دوالي الخصية بتقنيات تداخلية مختلفة ولا يعتبر أى منها الأمثل ، فبعضها مكلف نسبيا ويستهلك وقتا ويحتاج مهارة خاصة وتدريب خصوصا التقنيات المجهرية.

الهدف من البحث: تقييم إسهام الأوردة الصفنية في الدوالي وتأثير ربطها على نتائج الربط تحت الإربي للدوالي، وتأثير طريقتي العلاج على درجة دوالي الخصية ومعايير الفحص بالدوبلكس.

المرضى وطرق البحث: تم توزيع ستين من المرضى بطريقة عشوائية على طريقتي العلاج. وكانت معايير الإختيار كالآتى: وجود دوالي بالخصية ظاهرة بالفحص الإكلينيكى وفحص السونار من الدرجتين الثانية والثالثة ، ووجود خلل بتحليل السائل المنوي، وتم أيضاً إختيار معيارين للتشخيص بالموجات فوق الصوتية وهما قطر وريدى يزيد على ٣ مم وزمن إرتجاع تيار تدفق الدم يزيد على ثانية واحدة بأوردة الحبل المنوى والأوردة الصفنية أثناء إجراء فالسالفا.

وتم إجراء التدخل العلاجى على مجموعتين: المجموعة الأولى : تم الربط تحت الإربي للأوردة فقط (٣٠ حالة : ٢٥على الجانبين و٥على الجانب الأيسر) والمجموعة الثانية : تم الربط تحت الإربي للأوردة بالإضافة لربط الأوردة الصفنية (٣٠ حالة : ٢٧على الجانبين و ٣ على الجانب الأيسر) ، وتم متابعة الحالات بعد الجراحة لمدة من ٤-٦ أشهر.

النتائج: تبين من الدراسة تحسنا ذو دلالة إحصائية فى درجة دوالي الخصية على الجانبين بالفحص الإكلينكى فى المجموعتين الأولى و الثانية. كذلك حدث إنخفاضا ذو دلالة إحصائية فى متوسط زمن الإرتجاع فى أوردة الحبل المنوى بالدوبلكس للمجموعتين الأولى والثانية على الجانبين، وكان الإرتجاع أكثر إنخفاضا وذو دلالة إحصائية فى المجموعة الثانية. وأظهر البحث انخفاضا ذو دلالة إحصائية فى متوسط زمن الإرتجاع فى أوردة الصفن بالدوبلكس للمجموعة الثانية على الجانبين.

كما أظهرت النتائج إنخفاضا ذو دلالة إحصائية في متوسط أكبر قطر لأوردة الحبل المنوى بالدوبلكس للمجموعتين الأولى والثانية على الجانبين. كذلك حدث نقصا ذو دلالة إحصائية فى متوسط أكبر قطر لأوردة الصفن للمجموعة الثانية على الجانبين.

ولم يوجد إختلاف ذو دلالة إحصائية فى نسبة تكرار الإصابة بالدوالى والمضاعفات في المجموعتين على الجانبين.

الإستنتاج: وجد تحسن فى درجة دوالي الخصية ذو دلالة إحصائية فى كلا التقنيات الجراحية. وكان التحسن فى زمن الإرتجاع فى أوردة الصفن بالدوبلكس ذو دلالة إحصائية أعلى للمرضى الذين عولجوا بالربط تحت الإربي للأوردة بالإضافة لربط الأوردة الصفنية.