ORIGINAL ARTICLE

Comparison of percutaneous embolization of varicocele by steel coils versus surgical ligation in terms of complications

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Abstract

Objective: Gonadal vein embolization is a relatively new technique introduced in the Department of Radiology of one of the tertiary care teaching Hospitals in Pakistan. Purpose of this study was to compare the technique with surgical ligation of varicocele in terms of complications.

Design: This was a retrospective study.

Setting: Department of Radiology, Aga Khan University Hospital, Karachi.

Methodology: Total number of patients who presented for varicocele treatment were 108 and all patients had clinical varicocele. 93 patients out of 108 cases presented with infertility (86%) and 15 patients (14%) with physical complain of scrotal pain, swelling and or scrotal mass. 48 patients (44%), underwent Percutaneous embolization by coil primarily and 60 patients (56%) had surgical ligation of Gonadal vein.

Duration of follow up in embolization group of patients was 1 – 4 years (mean 2.1 years). Follow up period ranged between 1-6 years with mean 3 years in surgical ligation group.

Varicocele diagnosis was made on physical examination and in many cases confirmed on ultrasound and Doppler examination.

Result: In 48 patients who underwent Percutaneous embolization, 32 left sided unilateral varicocele were successfully embolized technically (72%) while 3 bilateral varicocele were also occluded successfully while technical failure seen in 13 cases. Total of patients who underwent surgical ligation were 78, out of which 14 cases showed recurrence. 60 patients primarily underwent surgical ligation, 6 patients showed recurrence. 18 cases of recurrence from embolization group secondarily underwent surgical ligation. 71cases out 78 were successfully occluded at first attempt and 3 in second attempts, while 4 cases lost to follow up. So recurrence rate was 9(%) at first attempt but over all recurrence rate was 5(%) in surgical group.

Complications encountered during venous access, were extravasations in 3 cases and right internal carotid artery puncture in one case but no sequel were found and homeostasis secured.

Conclusion: Our study emphasize that Gonadal vein embolization technique is superior to surgical ligation technique in term of lowest morbidity, and least discomfort, with negligible complications.

Key words: Percutaneous embolization, Varicocele

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Introduction:

The term varicocele denotes an abnormal degree of venous dilatation of Gonadal vein with or without collateral channels. Varicocele diagnosis was made on physical examination as described by Dubin and Amelar[1, 2] and in many cases confirmed on ultrasound and Doppler examination. Gonadal vein emoblization is a mini-

mally invasive technique used to obliterate the varicocele, so as to obviate the need of surgery, thus relieve the symptoms and restore male fertility. This technique is also employed in cases where recurrence of varicocele occurs after surgery or previous Percutaneous Embolization.

Surgical ligation of varicocele can be done at deep inguinal ring level, superficial inguinal ring, and scrotal level. Another way to ligate the varicocele is laparoscopic ligation. Complications associated with surgical approach are general, anesthetic, and due to use of drugs. Embolization technique is cost effective method which can be done as an outpatient basis, no anesthetic complications as no anesthesia required, use of drugs including analgesics and antibiotics usually not required.

No research work has been done on Percutaneous Embolization of Gonadal vein in Pakistan; therefore no local literature is available on this topic.

Materials and methods:

This was a basically a retrospective study. Total patients who presented for varicocele treatment were 108 and all patients had clinical varicocele. 93(86%) patients out of 108 cases presented with infertility and 15 (14%) patients with physical complain of scrotal pain, swelling and or scrotal mass. 48 patients (44%) out of these 108 cases, underwent percutaneous embolization by coil primarily and 60 patients (56%) had surgical ligation of gonadal vein. 18 patients out of 48 cases (after failure to percutaneous embolization in 13 patients and recurrence of varicocele in 6 patients, one lost on follow up), secondarily underwent surgical ligation. Total number of patients who had surgical ligation, were 78. 65 patients under went high inguinal ligation including 12 bilateral high ligation, laparoscopic ligation of Gonadal vein was carried out in 11 cases including 3 bilateral, while in four patients, inguinal ligation was performed.

In 108 patients, age range was 12-65 years with mean age 32 years.

Duration of follow up in embolization group of patients was 1 – 4 years with mean of 2.1 years. Follow up period ranged between 1-6 years with mean of 3 years in surgical ligation group.

Varicocele diagnosis was made on physical examination as described by Dubin and Amelar[1, 2] and in many cases confirmed on ultrasound and Doppler examination.

After all aseptic measures, venous puncture was made using Seldinger technique with Seldinger needle. We have used either right internal jugular vein or right common femoral vein as venous access. Only in one case, left common femoral vein was used as venous access. Venograms were obtained to see the anatomy of Gonadal veins, evidence of collaterals, their level and types or any other anomaly.

Results:

Total number of patients who presented with varicocele were108. In 48 patients who underwent percutaneous embolization, 32 left sided unilateral varicocele were successfully embolized technically (72%) while 3 bilateral varicocele were also occluded successfully. However technical failure was seen in 13 cases (27%) of unilateral varicocele and recurrence in 6(12%) cases. (One case lost in follow-up). So 18 cases out of 48 cases of embolization group secondarily underwent surgical ligation. Total patients who underwent surgical ligation were 78, out of which 14 cases showed recurrence. 60 patients primarily underwent surgical ligation, 6 patients

Table 1: *Shows technical success rate, technical failure, and recurrence rate of Surgical ligation groups and embolization group*

	Technical success		**Technical failure**		**Recurrence**	
	Total numbers	**Percentage**	**Total numbers**	**Percentage**	**Total numbers**	**Percentage**
Embolization group	32	72	13	27	6	12
High ligation group	61	100	Zero	Zero	5	8
Low ligation group	4	100	Zero	Zero	Zero	Zero
Laparoscopic ligation group	11	100	Zero	Zero	2	18

Note: total number of patients under went surgical ligation were 78 and 71 shows success in first attempt and three in second attempts out of 7 recurrent cases. So recurrence rate at first attempt is 9% but over all recurrence rate is 5%.

Table 2: *Complications with Percutaneous Embolization associated with Different Venous Accesses (approaches) in 35 cases*

	Grade I – Varicocele (Idiopathic Varicocele)	Varicoceles associated with collaterals	
	Right CFV	**Right CFV**	**Right IJV**
Pain and extravasations	01	01	01
Puncture of Right ICA	0	0	01

Table 3: *Complication associated with Surgical Ligation of Gonadal vein in 39 cases out of 78 cases*

	High Inguinal Ligation	Laparoscopic Ligation	Inguinal Ligation	Total
Pain	28	05	0	33
Wound Infection	04	0	0	04
Hematoma	02	0	0	2

showed recurrence .18 cases of recurrence from embolization group, secondarily underwent surgical ligation.71 out 78 were successfully occluded at first attempt and 3 in second attempts, while 4 cases were lost to follow up. So recurrence rate was 9(%) at first attempt but over all recurrence rate was 5(%) [Table 1].

In embolization group of 48 patients, notable causes of technical failure were, tight ostium, tortuousity and spasm of left Gonadal vein during attempted embolization.

Complications encountered during venous access, were extravasations in 3 cases and right internal carotid artery puncture in one case but no sequalae were found and homeostasis secured [Table 2].

In 78 patients of surgical ligation group, postoperative pain was experienced in 42 % (8 cases) of patients of high inguinal ligation group, and 45%(5 cases) of laparoscopic group, while wound infection was found in four cases of high inguinal ligation group and hematoma formation in two cases of high ligation group [Table 3].

Discussion:

In 36 cases, common femoral vein was used as a venous access for percutaneous embolization of Gonadal vein by coil [Figure 1]. 23 cases (in 22 cases right common femoral vein while in one case left common femoral vein was used as route of access), showed successful occlusion of Gonadal vein technically with success rate of

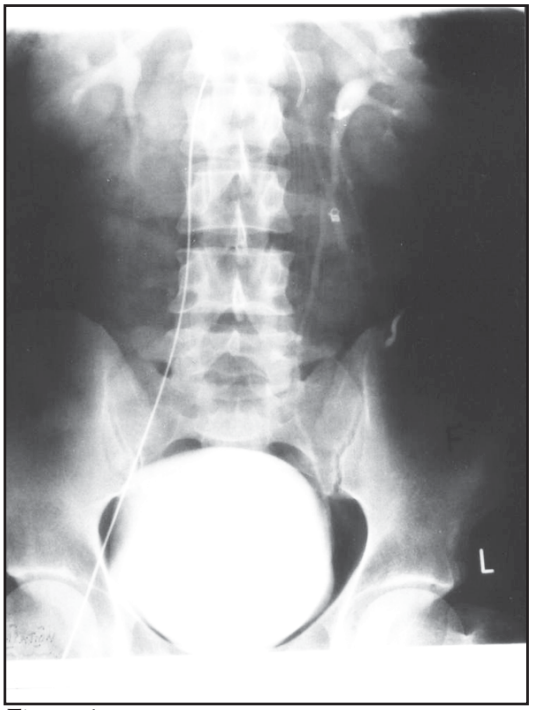

Figure 1: *Right common femoral vein used for venous access. Single coil was used on left side in grade III varicocele. (Gonadal vein venogram)*

Figure 2: *Right internal jugular vein used for venous access. Single coil was used on left side. Lumber collaterals demonstrated in Grade II varicocele on medial aspect. (Gonadal vein venogram).*

63% while reported success rate for this route is 93% and 91% respectively [2,3] . This difference is reflective of our early practice when our technique was not so mature and established. In 12 cases we have used right internal jugular vein for venous access and success rate of embolization by coil was 100% while reported rate of success through this route is 90%[3]. (Figure 2)

Reported technical success rate of Gonadal vein embolization by coil [4,5] was 82%,95%, recurrence rate 7%,10% and technical failure rate 18%,5% respectively, while in our study technical success rate was 73%, recurrence rate 12% and technical failure rate 27%. These differences are because of different groups having different percentages of associated collaterals, number of coils used and type of technique used.

Recurrence rate in our study was 12% for embolization group, 8% for high inguinal ligation group, 18% for Laparoscopic group and zero percent for inguinal ligation group while reported rate of recurrence [6,7] in embolization group 24%, for high inguinal ligation group 37%, for inguinal ligation group 35% while 7% for Laparoscopic ligation group. So in our study, high inguinal ligation and embolization groups have shown significantly low rate of recurrence as compared to above-mentioned figures[6, 7]. In one study,[5] however, recurrence rate is comparable (10%) with our study.

Minor complication were seen in 50% of surgical ligation group, while reported complication rate is 11-15%[5] and 16-18%.[8,9,10] This is a significant difference but no major complications were noted in our study as reported in journals[11,12,13] ie. testicular infarction and atrophy, vessel injury, large hematoma. Pain was seen in 42.5% of cases, wound infection 5% and hematoma in 2.5% of our surgical ligation group. Pain was observed in 42% cases of high inguinal ligation group and 45% of Laparoscopic ligation group.

In a local study,[14] hematoma developed in two cases and testicular atrophy in one case of inguinal ligation group while no testicular atrophy was observed in our inguinal ligation group.

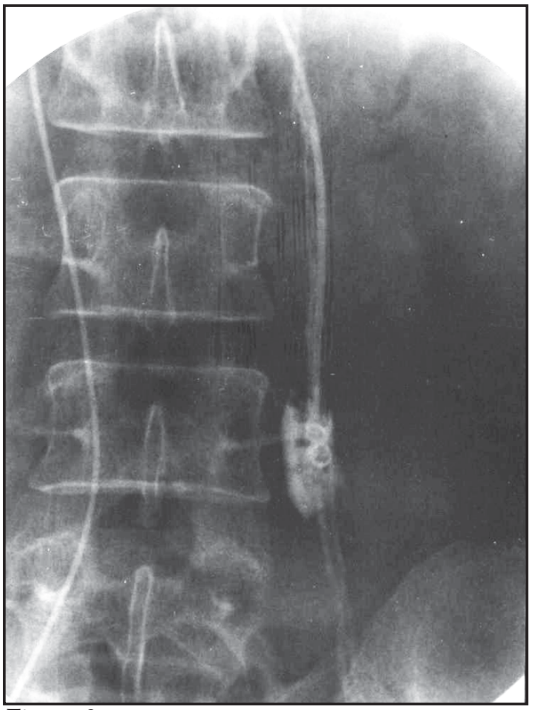

Figure 3: *Extravasations of contrast from left gonadal vein on venogram.*

Complication rate in our study in Gonadal vein embolization group was 8.3% while reported[4, 5], rate of complication was 10 %(3 cases out of total 28 cases, showed extravasations) and 12% respectively so results are comparable in the two studies.

In another study[15] in which percutaneous embolization of Gonadal vein was done by sclerotherapy, perforation, extravasations and pain was observed in 6.2% of cases, while phlebitis in 3.1% of cases and puncture of Femoral artery in 3 cases. In our study only 3 cases showed extravasations (Figure 3) and pain while in one case accidental puncture of right internal carotid artery was observed.

In another study[16] (conducted on large scale) 580 patients underwent venography and 260 patient had embolization by sclerotherapy, anaphylactic reaction was seen in one patient, mild side effects to contrast in 17 patients, showed complication rate of 26% with extravasations in 17% and spermatic vein spasm in 10% cases (this difference in rate of complication in our study and above, could be due to large number of patients) while in our study no serious reaction to contrast media were seen. Reported complica-

tions[17, 18, 19] ie thrombophlebitis, hydrocele and displacement and migration of coils, were not seen in our group of embolization.

Our study was conducted in order to evaluate whether embolization by coil has advantages over traditional surgical ligation practiced locally or internationally and also to compare local embolization practice with that of internationally practiced percutaneous embolization technique in respect to complications.

The study demonstrates significant advantages of percutaneous embolization by coils over others in terms of less discomfort as well as low rate of complications.

The benefits of percutaneous embolic therapy for varicocele extend beyond its high technical and clinical success rates, equivalency to surgical therapies in terms of outcomes and very low complication rates. It is a minimally invasive, outpatient procedure with, minimal discomfort when compared with surgery.

It is also showed that patients who underwent both embolization and surgical ligation expressed a strong preference for embolization. Additional advantages to the embolization approach are that bilateral varicocele can be treated at a single setting via the same venous access, and that it has a high technical success rate in treating recurrent Varicocele post surgical ligation .Our surgical results are either comparable or show advantages over published data in terms of severity of complications[11,12,13].

Conclusion:

Although surgical group has given better results as compared to embolization group in term of technical success rate, however, Gonadal vein embolization technique is still superior to surgical ligation technique in term of lowest morbidity, and least discomfort, with only negligible mild complications.

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