

OUTCOME OF GONADAL VEIN EMBOLIZATION FOR OBLITERATION OF VARICOCELE

ATEEQUE AHMED KHAN, TANVEER-UL-HAQ

ABSTRACT

Objective To evaluate the technique of gonadal vein embolization by steel coils in obliteration of varicocele in terms of technical success, technical failure and recurrence.

Study design Descriptive study.

Place & Duration of study Radiology Department Aga Khan University Hospital Karachi, from 1990 to 2009.

Methodology All patients with varicocele who underwent percutaneous embolization by steel coil were included. All had clinical varicocele and confirmed by ultrasound and doppler scan. Cannulation of gonadal vein with venograms was attempted. Data regarding technical success rate, failure and recurrence rate was analyzed.

Results In 48 patients of percutaneous embolization, 45 patients had left sided varicocele and in three cases bilateral varicoceles were present. Thirty two (72%) left sided unilateral varicocele were successfully embolized technically. Three bilateral varicocele were also occluded successfully. Technical failure occurred in 13 (27%) cases of unilateral left sided varicocele and recurrence found in 6 (12%), of whom one patient was lost to follow up.

Conclusions The low technical success rate, high failure and recurrence were because of use of common femoral vein as a route of venous access, tight ostium and spasm and tortuosity of veins, and use of single coil especially in cases of aberrantly fed varicocele.

Key words Varicocele, Percutaneous embolization, Technique.

INTRODUCTION:

Term varicocele denotes abnormal degree of venous dilatation of gonadal veins with or without collateral channels. Gonadal vein embolization is non-invasive technique used to obliterate the varicocele so as to obviate the need of surgery. It thus results in relief of symptoms and may restore fertility. This technique is also employed in cases where recurrence of varicocele occurs after surgery or previous percutaneous embolization. Steel coils were first

designed by Gianturco et al for percutaneous embolization of the gonadal veins.^{1,2} First successful trans-femoral treatment of varicocele was reported by Laccarino and Lima et al.^{3,4} Soon after that, procedure got wide acceptance and popularity. While occlusion with detachable balloons or steel coils is preferred in USA,^{5,6} sclerotherapy has gained general acceptance in Europe.⁷

First trans-jugular approach for percutaneous embolization of gonadal vein was made in 1981, and later many others have used this route successfully.⁸⁻¹⁰ Basilic vein has also been used as a venous access for trans-catheter embolization.¹¹ Currently gonadal vein embolization is popular practice as an alternative to surgery using different routes and different embolizing agents.

Correspondence:

Dr Ateeque Ahmed Khan
Department of Radiology
Dow University Of Health Sciences
Civil Hospital Karachi
E. mail: atrafia@hotmail.com

In international literature, it is claimed that technique of percutaneous embolization of varicocele by steel coil has got high technical success rate, low failure and recurrence and can be the first choice for treatment of varicocele. We conducted this study to find out the results of gonadal vein embolization with steel coils in terms of technical success and failure rate and recurrence of the condition.

METHODOLOGY:

This was a descriptive study conducted at Aga Khan University hospital from 1990 to 2009. Detailed history was taken specially the use of anticoagulants, presence of bleeding tendency, renal functions and previous history of contrast media reaction. The purpose, nature, risks as well as possible complications of study were explained to the patients. Written informed consent was taken. Pulse and blood pressure were monitored along with ECG during the procedure. Resuscitation cart was kept ready. In patients who were uncooperative or apprehensive, diazepam 5-10 mg was used through intravenous route. Intravenous hydration was maintained in all cases. Varicocele classified and graded according to Bühren classification.¹²

Salient features of venographic technique and embolization included aseptic measures, Seldinger technique with use of either right internal jugular vein or right common femoral veins as venous access. Only in one case left common femoral vein was used as venous access. J-shaped or straight teflon coated guide wire, 0.036-0.038 inch, was passed through needle into inferior vena cava. Terumo guide wire was used in selective advancement into gonadal vein. Puncture needle was then removed and 5.5 French RDC catheter (visceral catheter) 80 cm long was most commonly used (occasionally Head Hunter 100 cm long 5-6 French catheter) and passed over guide wire into renal vein and then into gonadal vein of right or left side. In case of right internal jugular vein, route was from right internal jugular vein to superior vena cava then through right atrium to inferior vena cava and finally into renal vein.

Venogram was obtained by injection of 10 ml. (non ionic contrast) at the rate of 3 ml/second with Valsalva maneuver, to find out the anatomy of gonadal veins, evidence of collaterals, their level and types or any other anomaly. The RDC catheter was further advanced up to desired level in gonadal vein depending upon level, number and types of collaterals. Stainless steel coil (William Cook) was used to embolize the gonadal vein. One to three coils were used in single or multiple sites with

diameters ranging from 3-8 mm depending upon size of varicocele and collaterals. In case of collaterals, coils were placed proximal and distal to the level of collaterals joining the gonadal vein in most cases. Coils were delivered down to desired level by distal delivery guide wire system. Finally contrast was injected to see whether embolization has occurred or not. After embolization, catheter was removed and hemostasis achieved by manual compression. Patient was observed for bleeding or hematoma formation at site of puncture.

RESULTS:

Forty-eight patients underwent percutaneous embolization by coil primarily. All patients had varicocele on physical examination. Most commonly grade I varicocele was found in 42% of cases. Grade III varicocele was present in 28%. In 45 (94%) cases left sided unilateral varicocele and in 3 (6%) cases bilateral varicocele were present. Venous access was made from right common femoral vein in 35 cases and technically successful embolization rate was 62.85%. In one case left femoral vein was used for venous access successfully. Right internal jugular vein route was employed in 12 cases and 100% successful embolization rate was acquired.

Thirty two (72%) left sided unilateral varicoceles were successfully embolized technically. Three bilateral varicocele were also occluded successfully. Technical failure occurred in 13 (27%) cases of unilateral left sided varicocele. The reasons for technical failure were tight ostium, tortuosity and spasm of left gonadal vein during attempted embolization.

Twenty nine cases of embolization group were followed from 1-4 years with mean follow up duration of 2.1 years. No recurrence was noted in these cases. In 6 cases of unilateral varicocele recurrence occurred within six months of follow up.

In 16 cases single steel coil was used to occlude gonadal vein, out of which, in two cases 3 mm coil, in 12 cases 5 mm coil and in two cases 8 mm coil was used. In 16 cases in which single coil was used all were successful initially however later on 5 cases showed recurrence. Out of these 16 cases, 8 were idiopathic (Grade I) varicocele and 8 cases showed varicocele with collaterals (aberrantly fed varicocele).

In 15 cases two coils were used to embolize gonadal vein, out of which in eight cases 3 mm, in six cases 5 mm and in one case 8 mm coils were used. In seven technically successful occlusion of idiopathic (Grade I) varicocele was seen while in six cases of

Table I: Embolization Success Rate in relation to Coil Size in 35 Cases									
	Single Coil			Two coils			Multiple Coils		
	3 mm	5 mm	8 mm	3 mm	5 mm	8 mm	3 mm	5 mm	8 mm
Success	0	09	02	05	07	01	01	04	01
Recurrence	02	03	0	0	0	0	0	0	0

Table II: Comparison of Embolization Success Rate between Idiopathic and Aberrantly Fed Varicocele in 35 cases							
	Idiopathic Varicocele (Grade I varicocele) Left unilateral n=15			Varicoceles with collaterals (Aberrantly fed varicocele) (Grade II – V) Left Unilateral n=14			Bilateral varicoceles with collaterals (Aberrantly fed varicocele) N=3
	Single Coil	Two Coils	Multiple Coils	Single Coil	Two Coils	Multiple Coils	Multiple Coils
Technical Success	05	07	0	05	06	03	03
Recurrence	03	0	0	03	0	0	0

aberrantly fed varicocele (Grade 2-5 varicocele) also showed successful occlusion.

In six cases of aberrantly fed varicocele, multiple 3-5 mm coils were used and successful occlusion occurred. All these cases of aberrantly fed varicocele were left sided, out of which 3 were unilateral and 3 were part of bilateral varicoceles (3 right sided idiopathic grade1 varicocole were found as part of bilateral varicocole). Most common level of coil placement was lumbar vertebra 4, in eleven cases of single coil, while lumbar vertebra (L4) and sacral vertebra (S 1) in ten cases where 2 or more coils were used (table I & II).

DISCUSSION:

In 36 cases common femoral vein was used as a venous access to percutaneous embolization by coil. Twenty three cases including one case where left common femoral vein was used, have shown successful occlusion of gonadal vein technically with success rate of 63% while reported success rate for this route is 93% and 91% respectively.^{6,11} This high difference in success rate is because of anatomical variation and technical problem encountered in our patients. In 12 cases we have used right internal jugular vein (IJV) for venous access and success rate of embolization by coil was 100% while reported rate of success through this route is 90%.⁸ This significantly high success rate through this route can be explained on basis that catheter from right internal jugular vein can be

introduced deeply into both gonadal veins and occluding device can safely be placed. Three complications out four (pain in two cases, hematoma in one case) occurred during femoral puncture while only one during ICA puncture (hemostasis secured without any consequence).

Stainless steel coils were used for percutaneous occlusion of gonadal vein in this study. Maximum technical success rate achieved with single 5 mm coil in 12 cases and in 12 cases with two coils of 3 and 5 mm. Aberrantly fed varicoceles (varicocele with collaterals) should be embolized by placing coils both proximal and distal to level of collaterals, otherwise chances of recurrence are high.

Reported technical success rate of gonadal vein embolization by coil was 82%, recurrence rate 7% and technical failure rate 18% while in our study technical success rate was 73%, recurrence rate 12% and technical failure rate 27%.¹¹ The difference between this study and one reported could be because of basilic vein use for venous access. It is difficult to place coil deeply with femoral approach, as anatomical course of gonadal vein, advancement of guide wire and or injection of contrast usually result in recoiling of catheters. This may be the reason of high technical failure rate in our study. Reported technical success rate; failure rate and recurrence rate of percutaneous embolization by sclerosing agents are 94%, 6.2%, and 3.8% respectively.¹²

Another study reported technical success rate of gonadal vein embolization by coil as 95%, recurrence rate 10% and technical failure rate 5%.¹³ 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 employed. In recently published literature technical success rate by steel coil, is 92-96%.^{14,15} Hence significant difference was again observed in terms of technical success rate in various studies.

CONCLUSIONS:

This study has shown low rate of technical success in obliteration of varicocele by steel coils with high rate of failure and recurrence. The internal jugular vein as a route of venous access and use of two or more coils of 3-5 mm resulted in higher technical success rate with significant reduction in failure and recurrence.

REFERENCES:

1. Wallace S, Gianturco C, Anderson JH, Goldstein HM, Davis LJ, Bree RL. Therapeutic vascular occlusion, utilizing steel coil technique. Clinical application. *Am J Radiol* 1976; 127:381-87.
2. Anderson JH, Wallace S, Gianturco C, Gerson LP. "Mini" Gianturco stainless steel coils for transcatheter vascular occlusion. *Radiology*;1979:132:301-3.
3. Lima SS, Castro MP, Costa OF. A new method for treatment of varicocele. *Andrologia* 1978;10:103-6.
4. Fobbe F, Hamm B, Sorensen R, Felsenberg D. Percutaneous transluminal treatment of varicocele: Where to occlude gonadal vein. *Am J Radiol* 1987;149:983-7.
5. White RI, Kadir S, Walsh PC. Occlusion of varicocele with detachable balloons. *Radiology* 1981;139:327-34.
6. Kaufman SL, Kadir S, Barth K, Walsh PC, White RI. Mechanism of recurrent varicocele after balloon occlusion or surgical ligation of gonadal vein. *Radiology* 1983;143:435-40.
7. Seyferth W, Jecht E. Percutaneous sclerotherapy of varicocele *Radiology* 1981;139:335-40.
8. Formanek A, Rusnak B, Zollikofer L, et al. New approach for embolization of gonadal vein. *Radiology* 1981;139:315-21.
9. Rholl KS, Cragg AH, Castaneda AK. Transcatheter thermal venous occlusion, A new technique in progress. *Radiology* 1982;145:333-7.
10. Gonzalez R, Narayan P, Castaneda-Zuniga WR, Amplatz K. Trans venous embolization of gonadal vein for treatment of varicocele scroti. *Uol Clin North Am* 1982;9:177-84.
11. Kuroiwa T, Hasuo K, Yasumori K, Mizushima A, Yoshida K, Hirakata R, et al. Transcatheter embolization of testicular vein for varicocele. *Acta Radiologica* 1991;32:311-4.
12. Johan WP. Aberrantly fed varicocele, frequency, venographic appearance, and results of transcatheter embolization. *Am J Radiol* 1995;167:649-57.
13. Alqahtani A, Yazbeck S, Dubos J. Percutaneous embolization of varicocele in children: A Canadian experience. *J Pediatr Surg* 2002;37:783-5.
14. Beecroft JRD. Percutaneous varicocele embolization. *Can Urol Assoc J* 2007;1: 278-80.
15. Cocuzza M, Cocuzza MA, Bragais FMP, Agarwal A. The role of varicocele repair in the new era of assisted reproductive technology. *Clinics* 2008;63:395-404.