Percutaneous Coil Embolization in the Management of Spermatic Varicocele

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Introduction

Varicocele is now accepted as an important cause of male infertility, accounting for up to 39% of cases of infertility, although the exact pathogenesis remains obscure\(^1\). Large varicoceles may also induce swelling and pain. The standard therapy of spermatic varicocele has been ligation of the internal spermatic vein (ISV) by the inguinal or retroperitoneal approach; recently, angiographic techniques for retrograde catheterization of the ISV have been described\(^2\)\(^-\)\(^3\). Since then, several nonsurgical methods for occlusion of varicoceles including detachable balloons\(^4\)\(^-\)\(^7\), sclerosing agents\(^8\)\(^-\)\(^9\), and steel coils\(^10\)\(^-\)\(^13\) have been introduced on an outpatient basis, avoiding the increased morbidity and expense of surgery.

We present our preliminary experience with percutaneous coil embolization in the treatment of spermatic varicoceles of selected 10 patients between July 1986 and July 1987 at Capital Armed Forces General Hospital.

Materials and Methods

Over thirty transfemoral venographic studies on varicocele were performed to define the etiology and anatomy of the lesion\(^3\). About 80% of these patients could be the candidates for percutaneous embolization with suitable superselection of the ISV to the distal portion, but limited availability of steel coils restricted the even application. Selected 10 cases whose age ranged from 20 to 24 years and marital status were single were successfully performed percutaneous coil embolization of the left ISV because of left-sided idiopathic varicocele associated with physical complaints of pain and worm-like mass.

After routine left renal venography, the ISV was catheterized with a 6.5 F Cobra catheter (Cook\(^\text{®}\)) or 5 F nontapered polyethylene catheter. On catheterizing the origin of the ISV, selective venography was made using 15ml Hypaque 50% for 2 sec with the patient performing the Valsalva’s maneuver. When a varicocele was identified, the catheter was advanced into the optimal site for occlusion which was assessed according to the venogram. The number of coils placed in each vein depended upon the number of veins present and on the anatomic variations noted. The usual site of occlusion was suprapelvic portion of the ISV where only a single vein was seen. The stainless steel coil of 5cm long and 5mm in diameter was introduced by pushing with straight guide wire (Fig.1). To avoid wedging of the coil within the catheter, we flushed the delivery catheter with saline just before insertion of the coil. If the position of the straight part of the coil butted on the wire was satisfactory, as seen under fluoroscopic observation, it was stripped from the catheter with complete looping. To ensure that no collaterals bypassed the site of the initial occlusion, subsequent hand-injected venogram was taken, and another coil was used into proximal portion of the collateral if needed (Fig. 2). Two coils were used in 8 patients and one and three coils in two patients respectively. Satisfactory occlusion of the ISV was confirmed by hand-injected venography after 10 to 15 minutes from the procedure.

Ultrasonographic evaluation was undertaken before and after this procedure to show the evidence of objective improvement.

Results

The varicocele was classified clinically as grade 2 (visible only during Valsalva’s maneuver) in 6 patients, and grade 3 (visible without Valsalva’s maneuver) in 4. Spermatologic findings revealed a few cases of stress pattern but its relationship with male infertility could not be documented because of unmarried status of these patients, so sper-
matologic evaluation was excluded in our series.

Venographic findings of 10 patients were summarized in Table 1. Coexistent severe proximal and distal nutcracker phenomena were not present in these cases. We obtained selective internal spermatic venography in 26 patients out of 30, so the possibility of percutaneous embolization was approximately over 80%. However, due to the aforementioned restriction, we performed coil embolization in 10 selected cases without much technical difficulties. Overall time required in this procedure was less than one hour. After embolization, it took 10 to 15 minutes for thrombus formation to become complete (Fig. 1, c and Fig. 2, f), which was confirmed by hand-injected venography.

In 9 patients, clinical and ultrasonographic improvements (Fig. 3) were documented at least one month after the procedure. Recurrence was observed in one patient using single coil whose palpation finding and ultrasonographic feature were compatible.
Fig. 2. Procedure of coil embolization using three coils.
A. Venogram taken prior to embolization shows fine collateral at suprapelvic portion of the ISV (arrow).
B. Using Cobra catheter, one coil was deposited at the proximal site of the small collateral vein shown at A. Arrow = another collateral vein lateral to the ISV at abdomino-pelvic junction.
C. Second coil was placed into the previous site of collateral shown at B. Curved arrow indicates the catheter tip.
D. A hand-injected venogram reveals one medium-sized collateral vein (large arrow) which bypassing the two occluding coils (small arrows). This collateral vein should be occluded to prevent recurrence.
E. Third coil was placed at the site of collateral vein (curved arrow).
F. Final venogram taken after 15 minutes from the procedure shows complete occlusion of the ISV (arrows).
Fig. 3. The diminution of varicocele itself measured by ultrasonography.
A. Preembolization longitudinal scrotal scan shows dilatation of left pampiniform plexus in clinical grade 3 varicocele.
B. Disappeared the tubular multicystic structure after 11 days.

with persistence of varicocele. Venographic follow-up studies were not performed in all cases.

No major complications has been encountered. Contrast extravasation from the ISV secondary to guide wire and catheter manipulation occurred in one patient.

Discussion

Clinical significance of varicocele is mainly related to its well established association with male infertility\(^1\). It may also induce swelling and inguinal dragging pain and walking disturbance in physically active young adults. Once it is decided that the varicocele should be treated, nonsurgical occlusion may be the alternative to surgical ligation immediately after diagnostic venography.

A variety of embolic agents have been used to occlude the ISV, including detachable balloons\(^4-7\), sclerosants \(^8-9\), hot contrast material\(^14-15\), and stainless steel coils \(^10-13\). Although many authors preferred balloons with coaxial catheter delivery system for its easy placement to optimal site, this method has some disadvantages of its high cost, technical complexity and potential balloon dislodgement. Sclerotherapy of varicocele has the essential merit of complete obliteration of all collateral veins and cross connections of the ISV, but it often induces perforation of the venous lumen, testicular thrombophlebitis, and scrotal hematoma. Recently, a developed technique of sclerotherapy was introduced by Berger et al., which utilized a coaxial balloon catheter system with an inner catheter and only 2-3 ml of the sclerosant\(^16\). A trial of balloons plus sclerosant may be able to improve clinical results\(^9\), but it seems troublesome to radiologist. Insertion of Gianturco stainless steel coils has become the most convenient and widely used occlusion technique \(^17\). Its original drawback of the recoil of the catheter during introduction of the coil was overcome by removeable core guide wire with stainless steel coil mounted over the straight wire \(^18\). We used MWCE-38-5-5 occluding spring emboli (Cook\(^8\)) which were suitable to the internal diameter of the ISV in our series. It seemed relatively simple to use this material. We performed hand-injected venogram 10 to
15 minutes after initial coil placement. When persistence of reflux is seen by way of the collaterals, bypassing the coil, we try to block these routes by placing additional coils higher up in the ISV. Usually it takes 10 to 15 minutes to form a thrombus by lodged coils. In some patients with a profoundly disordered coagulation capability or those with an extremely high-flow state has precluded the effective use of the occlusion coil, so the topical application of thrombin has been advocated by McLean et al. to permit a rapid vascular occlusion.

The choice of the transfemoral or transjugular approach has been discussed. Formanek et al. have claimed that the right ISV catheterization is difficult from the femoral approach. But success rate of superselection of the left ISV by transfemoral approach is equal to that of transjugular approach in our experience of unilateral left-sided varicoceles. And we are most comfortable with the right femoral approach for the left ISV particularly in operating the fluoroscopic table.

The recurrence rate of percutaneous embolization is approximately 10 to 15%, also comparable to that of surgery. The mechanisms of recurrent varicocele were elucidated by Kaufman et al., they revealed collateral veins that bypassed the occlusion site by venography in five patients of recurrent varicocele. Ultrasonography and thermography can be used as posttherapeutic evaluation in these recurrent patients.

Although this nonsurgical occlusion of the ISV can be performed by radiologists with much advantages, urologic and radiologic cooperative planning is important to achieve better results.

REFERENCES