

## *Varicocele: Current Treatment Options*

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### **ABSTRACT**

**Objective:** The aim of this review is to present the current varicocele treatment options in medical practice. **Methods:** The authors performed a literature review using Medline regarding treatment of varicocele. A number of 9 papers were considered suitable. Inclusion criteria consisted of papers written in English which described the actual treatment options for this particular affection. **Conclusion:** Varicocele is a common male affection that can be treated surgically (classic open surgery, microsurgery or laparoscopic surgery) or by interventional procedures using solid or liquid agents. Each technique has its advantages and disadvantages and can be suited to certain types of cases. The chosen type of intervention is influenced by the patient's personal option and by the logistics of healthcare center (availability of interventional radiology department, experience of the surgeons).

**Key Words:** Varicocele Treatment, Male Infertility, Testicular Atrophy, Spermatic Vein Embolization

### **Introduction**

Varicocele is defined as an abnormal enlargement of the pampiniform plexus and internal spermatic vein [1,2]. Prevalence in male population can reach up to 20% [3]. Manifestations are not reliable for diagnosis, as most patients are asymptomatic, with less than 10% of patients complaining of discomfort or pain. As a consequence, varicocele might be discovered incidentally at routine checkups or during investigations for infertility [3]. It represents an important cause of infertility, as incidence of varicocele in men with primary infertility is approximately 40%, while incidence in men with secondary fertility can get up to 80% [1]. In most cases varicocele is unilateral, on the left side in 78-93% of cases, rarely being found bilateral or on the right side [3].

There are several factors that can lead to the formation of varicocele and to the left predisposition. From an anatomic point of view, on the left side, the internal spermatic vein is longer,

drains perpendicularly in the renal vein and experiences more variable venous pressure [3]. Other than factors could potentially include a lower number of venous valves or even complete absence of them, which in turn lead to blood reflux and venous insufficiency. But this is in relationship with the individual's genetics. Another cause could be represented by what is known as the "nutcracker phenomenon", compression of the left renal vein between the aorta and superior mesenteric artery leading to increased pressure in the veins, with less force for drainage, blood reflux and dilatations [3]. These changes, in consequence, impair testicular functions such as semen and sperm production and reproductive hormones secretion [1].

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Diagnosis is made by both physical and Doppler ultrasound examinations which evaluate the presence and grade of varicocele [3]. In Table 1 we present the grading system for the physical examination, established by Dubin and Amelar in 1970, and in Table 2, the grading for the ultrasound examination, established by Sarteschi. This review aims to present the current treatment options of varicocele and underline some of the most important differences between them.

### **Materials and Methods**

We performed a MEDLINE search for the following terms: “varicocele surgical approach”, “embolization varicocele”. Only articles in English were selected, which were published after the year of 2000 and that detailed the treatment procedures. A wide selection of articles were manually reviewed by the authors, out of which 9 were selected and were used for inclusion in “Treatment options” section. Selection criteria consisted in studies on point published after 2000 written in English (Figure 1).

### **Treatment options**

Treatment options include surgical and interventional approaches.

There are several types of surgery that can be performed: classic open surgery, microsurgery and laparoscopic surgery [6]. The most common approaches are inguinal or subinguinal, also retroperitoneal access being an option. The intervention can take place with or without microscopical aid, depending on the choice of the operator and the available resources. The aim of the surgical procedure is the ligation of affected veins in order for the blood to flow only through the non-affected vessels [6].

### **Inguinal high approach**

For high inguinal varicolectomy, a 2 to 3 cm incision is made over inguinal canal caudal to the anterior superior iliac spine, followed by incision of external oblique fascia.

Attention should be paid in order to avoid the lesion of the ilioinguinal nerve. The spermatic cord is encircled, dissected and connected to a Penrose drain. If the external pudendal collaterals are identified during this step, they are ligated. Vas deferens is preserved, followed by surgical closure and suture [7].

### **Subinguinal approach**

The surgery starts with a subinguinal incision below the external inguinal ring. After passing through Scarpa’s fascia, spermatic cord should be identified and clamped. A Penrose with a sterile tongue depressor should be placed underneath the cord. The external spermatic fascia should be assessed for any dilated cremasteric veins which are ligated, sparing any spermatic arteries (ideally identified via intraoperative Doppler assessment). External spermatic fascia is opened and a blunt dissecting sponge is used to free the internal cord structures from the external spermatic fascia. Next, Penrose is being repositioned in order to drop the external fascia and the cremaster below. It is important to separate the deferens vessel from the dissection area, because of it becoming the main testicular venous drainage. After separating veins from arteries, the veins are ligated with silk free ties. After ligating all of the internal veins, a proximal spermatic cord and peri-incisional subcutaneous block with 0.25% bupivacaine is performed prior to closure of Scarpa’s fascia followed by a running subcuticular closure of the skin with absorbable suture [8].

### **Retroperitoneal approach**

The present technique implies making an incision over the internal inguinal ring, followed by a division of the internal and oblique muscles. After penetrating through the transversal fascia, peritoneum is tractioned medially. Ligation of the spermatic vessels will be made lateral to the ureter [8].

### **Laparoscopic approach**

Laparoscopic technique is performed with the patient in a 20/30 degrees head down or supine

position. Pneumoperitoneum is created using a Veress needle, usually introduced into the abdominal cavity at a supra-umbilical level. After gaining intraperitoneal access, pneumoperitoneum is induced by insufflating carbon dioxide. Next step consist of replacing the Veress needle with a 5 mm trocar connected to the CO<sub>2</sub> insufflator and insertion of a laparoscope. For unilateral varicoceles (most of the cases) another two 5 mm trocars are inserted. After the identification of spermatic vein, the vascular structure is dissected using endo-scissors. The testicular veins are clipped above the internal inguinal ring. Final steps consist of dessufflating the pneumoperitoneal cavity, removal of trocars and suture [9]. An important detail which mostly depends on the choice of the surgeon is sparing the testicular artery (Ta). There are controversial results regarding the Ta mostly in laparoscopic approach. Non-sparing Ta technique has a smaller rate of recurrence than the sparing technique, but a higher rate of postoperative hydrocele [10]. However, not sparing the Ta can lead to testicular atrophy which in turn impairs the hormonal functions and can have various consequences in younger patients. Thus, most surgeons opt for sparing Ta [6,11]. Out of the surgical options, microsurgical subinguinal varicocelectomy is considered to have the lowest rate of varicocele recurrence and of postoperative complications (hydrocele, infection, testicular atrophy, recurrent pain) [6,12].

### **Interventional approach**

Interventional embolization, compared to the surgical approach, is minimally invasive, requires only day-hospitalization and local anesthesia. It is more precise because of the clear identification using venography of the internal spermatic vein and possible collaterals. Also, due to the intravenous approach, the risk of damaging the testicular artery is being avoided [13].

The usually preferred intravascular access is obtained through the right common femoral vein, due to the convenient provided angle for vascular navigation using the catheter trough the left renal and internal spermatic veins. For right side varicocele, access is mainly preferred through internal jugular vein. After advancing with the catheter until the limit between internal spermatic vein and pampiniform plexus, venography is performed with patient undergoing Valsalva maneuver. This is particularly important for noticing the existence of any possible venous collaterals, which could lead to persistence or recurrence of varicocele. After embolization, patient should still be kept under observation for a couple of hours. Routine activities can be resumed after 48h and physical activity should be avoided in the first week after intervention [13]. A solid or liquid embolic agent can be used, chosen by the surgeon's preference. Choices are represented by coils, vascular plugs and detachable balloons in terms of solid, and liquids such as polidocanol, sodium tetradecyl sulfate, and adhesive polymers which behave like glue in terms of sclerosant agents. The success rate is not influenced by the alternative used [14]. Complications that can arise from interventional approach are represented by: failure to treat (by not gaining access to the spermatic vein), coil migration, vein perforation, hydrocele, groin hematoma, testicular atrophy and phlebitis [6,14]. Patients who do not wish to undergo surgical procedure have the option to choose interventional approach, especially in cases of left varicocele. On the other hand, for right varicocele there is a higher risk of treatment failure with an interventional procedure, and surgical approach is recommended as first option [6]. The two main approaches, surgical and interventional differ at many levels which are to be taken into consideration, regarding the patient's particularities, when choosing the right method. In Table 3 we present a comparison of these aspects.

### **Discussion**

Varicocele is a disease which can affect and require treatment in young males and for this reason the possibility of choosing an interventional approach can increase the rate of successfully treated patients. There are a number of reasons why younger patients are more open towards interventional approaches and that is mainly the fast recovery time as it could make it easy for them to avoid uncomfortable social situations and discuss the reason for their hospitalization.

Surgical options are not to be neglected as there are a large number of experimented surgeons which successfully complete the intervention. An advantage is also that it does not require more than basic surgical equipment and that this procedure can be performed by the generalist surgeon and the urologist. This could make it easier for the patient to find a suitable doctor compared to finding an interventional radiologist as only in the last decade their profession started being in the spotlight.

### **Conclusions**

It is to be kept in mind that even though varicocele is an important cause of infertility, it is correctable. The possibility of choosing through a broad range of treatment alternatives can give a certain degree of reassurance to the patient. Each technique has its advantages and disadvantages and can be suited to certain types of cases. The chosen type of intervention is influenced by the patient's personal option and by the logistics of healthcare center (availability of interventional radiology department, experience of the surgeons).

### **Conflict of interests**

The authors declare that they have no competing interests.

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None

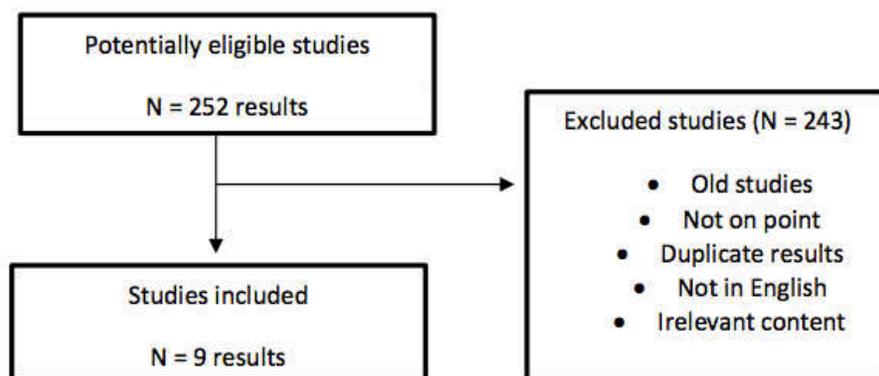


Figure 1. Selection criteria for eligible studies

Table 1. Varicocele grading in physical examination. Dubin criteria [4]

Grade 1: Palpable with the patient standing, during Valsalva maneuver
Grade 2: Palpable with the patient standing, without a Valsalva maneuver
Grade 3: Visible and palpable with the patient standing

Table 2. Doppler Ultrasound varicocele grading. Sarteschi criteria [5]

Grade I: Groin reflux during the Valsalva maneuver. No scrotal deformation or testicular hypotrophy
Grade II: Reflux at the level of the proximal segment of the pampiniform plexus only during the Valsalva maneuver. No scrotal deformation or testicular hypotrophy
Grade III: Reflux in the distal vessels at the level of lower scrotum only during the Valsalva maneuver. No scrotal deformation or testicular hypotrophy
Grade IV: A spontaneous reverse flow, increasing during the Valsalva maneuver. Scrotal deformation present and possible testicular hypotrophy
Grade V: Resting reflux in the dilated pampiniform plexus, possibly increasing during the Valsalva maneuver. Testicular hypotrophy present

	<b>SURGICAL APP.</b>	<b>INTERVENTIONAL APP.</b>
<b>RECOVERY TIME</b>	2-3 weeks	1-2 days
<b>ANESTHESIA</b>	General	Local
<b>HOSPITALIZATION AFTER INTERVENTION</b>	1-2 days	Not required
<b>SCARRING</b>	Present	Absent
<b>SEXUAL ACTIVITY REPAUS</b>	4 weeks	1-2 weeks
<b>RISKS</b>	<ul style="list-style-type: none"> <li>- Infection</li> <li>- Damage to other anatomic structures</li> <li>- Recurrence due to collateral veins</li> </ul>	<ul style="list-style-type: none"> <li>- Pain during embolization -</li> <li>- Embolization material migration</li> <li>- Small risk of infection</li> <li>- Allergy to contrast substance</li> </ul>

Table 3. Surgical vs interventional approach. APP. = Approach

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