



Efficacy of Tunica Vaginalis Eversion during open Varicocelectomy to Minimize Postoperative Hydrocele Versus No Eversion

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Abstract

Background: A varicocele is an atypical enlargement and dilatation of the scrotal venous pampiniform plexus, which is responsible for the drainage of blood from each testicle. Although varicoceles are typically asymptomatic, they possess clinical significance due to their high prevalence, which results in anomalous semen analysis, diminished sperm motility, low sperm count, and atypical sperm morphology. Initially, analgesics and scrotal support may be applied to alleviate pain or distress associated with a varicocele. Additionally, it is well-established that varicocele surgery results in the restoration of testicular volumes and semen parameters. The purpose of this study is to compare the outcomes of open varicocelectomy with and without eversion of tunica vaginalis in relation to scrotal oedema, wound infection, postoperative pain, and postoperative hydrocele.

Methods: From October 2017 to October 2021, sixty patients between the ages of 18 and 40 who presented with grade IV or V varicocele participated in this study. The patients were divided into two groups, with 30 patients in each: group A underwent open varicocelectomy with tunica vaginalis eversion; and group B underwent open varicocelectomy without tunica vaginalis eversion. The documented complications of the two groups were contrasted. The duration of the operation, the need for postoperative analgesics, the length of hospitalization, the improvement in semen characteristics of subfertile participants, pain assessed using a visual analog scale, and postoperative complications between the two groups were recorded and compared.

Results: There was no significant difference in postoperative pain between groups A and B, as measured by a numeric analog scale ranging from 1 to 3 after one and two weeks and from number 2 to 5 in the initial three days. In group A, the duration of the operation varied between 40 and 60 minutes for unilateral cases and 60 to 80 minutes for bilateral cases. In contrast, the duration of the operation varied between 30 and 50 minutes for unilateral cases and 70 to 90 minutes for bilateral cases in group B. In seven patients in group A and three patients in group B, mild scrotal edema resolved within one to three weeks after the procedure. Infection of the lesion was absent in both groups. Similar hospital stays spanning one to three days were observed in both cohorts. A case of mild scrotal hematoma was identified in each cohort; it was treated conservatively without any complications. Postoperative monitoring for hydrocele is conducted for duration of six months in both cohorts. A solitary instance of minimal hydrocele was identified in group A, while four instances of moderate hydrocele were detected in group B. In addition, two cases of moderate hydrocele in group B necessitated surgical intervention due to persistent scrotal pain and symptomatic edema, while the remaining two cases were treated conservatively with follow-up and did not present with pain.

Conclusion: In hospitals that perform open varicocelectomy without access to an operating microscope, the eversion of the tunica vaginalis during open varicocelectomy is considered a preventative measure that decreases the incidence of postoperative hydrocele when compared with no eversion, according to the findings of the present study.

Introduction

A varicocele is an atypical enlargement and dilatation of the scrotal venous pampiniform plexus, which is responsible for supplying blood to each testicle. Although typically asymptomatic, varicoceles have clinical significance due to their high prevalence of anomalous semen analysis, diminished

sperm motility, low sperm count, and atypical sperm morphology [1,2].

Varicocele is present in approximately 15% of adult males. Nevertheless, its prevalence can escalate to 40% among patients undergoing infertility evaluations and 80% among those experiencing secondary infertility [3,4].

Varicocele is generally asymptomatic

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and is inadvertently detected during an examination of the intestinal region. Nevertheless, in the event that the varicocele reaches a significant size, the patient might characterize it as a "bag of worms" and exhibit symptoms such as testicular atrophy, pain, edema, or hypofertility. Varicoceles commonly manifest as tender nodules situated above the testicle on the left side of the scrotum. Additionally, right-sided and bilateral varicoceles are conceivable. Varicocele can be confirmed via scrotal ultrasonography if the dilatation of the pampiniform plexus vessels exceeds 2 mm. Doppler ultrasound is a valuable modality that is exclusively recommended in cases of uncertainty following physical examination, such as in cases involving a small scrotum, obesity, or a previous history of scrotal surgery [5].

Three categories of clinical varicoceles have been identified by Dubin and Amelar [6].

(1) Grade I denotes a small size that is only perceptible during the Valsalva maneuver; (2) Grade II denotes a medium size that is discernible at rest; and (3) Grade III denotes a large size that is visible at rest. Furthermore, varicoceles may also be classified according to the degree of reflux detected through the utilization of a color Doppler ultrasound [7]. Grade I reflux is induced by the Valsalva maneuver and has one of the following patterns: pattern 1, which consists of minimal reflux at the onset of the Valsalva, or pattern 2, which consists of reflux throughout its entirety; grade II spontaneous venous reflux is intermittent; and grade III spontaneous venous reflux is continuous.

Varicocele treatment is recommended for patients undergoing infertility evaluation who present with symptoms (specifically, sore scrotum) and for whom no efficacious medical interventions exist [8].

Initially, analgesics and scrotal support may be applied to alleviate pain or distress associated with a varicocele. Restored testicular volumes and semen parameters have been conclusively shown to occur subsequent to varicocele surgery [9].

Sub-inguinal below the groin, intrascrotal, retroperitoneal abdominal laparoscopic, and inguinal incisions are the most frequent surgical approaches. It is imperative to circumvent the vas deferens and the testicular artery throughout the surgical procedure, Irrespective of the approach [10-13].

A minimally invasive procedure, transvenous varicocele embolisation, entails catheterization of the internal spermatic veins in a selective manner, followed by occlusion using solid embolic devices (stainless steel or platinum coils) or sclerosants (sodium tetradecyl sulfate). In light of its safety and efficacy, it is considered a valuable and effective substitute for surgical intervention [14].

The utilization of microsurgical (microscopic) techniques enables the detection of minute anastomosing vessels that would be overlooked otherwise. Furthermore, it facilitates the identification of the testicular artery, thereby decreasing the likelihood of inadvertent injury to it. Intraoperatively, indocyanine green angiography was utilized to aid in the detection of the testicular artery during microsurgical dissection for varicoceles. There have been recent reports of this occurrence. An intravenous administration of the indocyanine green dye is performed throughout the procedure. This results in the infrared fluorescence of arterial vessels, which aids in their detection and consequently prevents unintended arterial

injuries [15].

According to meta-analyses, varicocele repair is associated with an anticipated increase in sperm count ranging from 9.71 to 12.32×10 ml, motility by 10.86%, and morphology by 9.69%. The majority of experts do not advise surgical intervention for subclinical varicoceles associated with infertility, as such procedures generally do not impact fertility or sperm parameters [16]. When bilateral varicoceles are detected, both are surgically repaired simultaneously. There is evidence to suggest that in cases where the right varicocele is subclinical but the left varicocele is clinically significant; it may ultimately be advantageous to repair both varicocele types in order to achieve pregnancy.

A randomized controlled clinical trial conducted by Al-Kandari et al. [17] demonstrated that subinguinal microsurgery yielded superior outcomes in terms of improvement in sperm quality and pregnancy outcome when compared to open inguinal or laparoscopic varicocelectomy.

When combined with varicocele surgical techniques, the likelihood of encountering complications such as hydrocele, wound infection, varicocele persistence or recurrence, and, extremely rarely, testicular atrophy, is minimal [18].

Hydrocele is the most prevalent complication observed in non-microsurgical varicocelectomy, impacting approximately 20% of patients as a result of testicular lymphatic ligation [19].

Hydrocele that develops after varicocelectomy has the potential to hinder testicular function through the obstruction of normal thermoregulation and insulation of the testis [20].

Regrettably, while microsurgical varicocelectomy facilitated by the operating room microscope does prevent the formation of hydroceles after varicocelectomy, it is not universally accessible in all operating rooms.

Aim of the present study

The purpose of this study is to compare the outcomes of open varicocelectomy with and without eversion of tunica vaginalis in relation to scrotal oedema, wound infection, postoperative pain, and postoperative hydrocele.

Patients and methods

This study enrolled sixty patients with varicocele grades IV or V between October 2017 and October 2021. The patients were divided into two groups of thirty: group A underwent open varicocelectomy with eversion of tunica vaginalis; group B did not undergo open varicocelectomy with eversion of tunica vaginalis. The documented complications of the two groups were contrasted.

The duration of the operation, the need for postoperative analgesics, the length of hospitalization, the improvement in semen characteristics of subfertile participants, pain assessed using a visual analog scale, and postoperative complications between the two groups were recorded and compared.

Inclusion criteria

All of the male participants in this research were between the ages of 18 and 40 and exhibited clinical and radiological diagnoses of grade II or grade III varicocele (scrotal ultrasound). Furthermore, patients volunteered to take part in this research.

Exclusion criteria

Patients who had undergone prior inguinoscrotal surgery or had liver cirrhosis, anticoagulant therapy, cancer, or hemorrhagic maladies were excluded from this study.

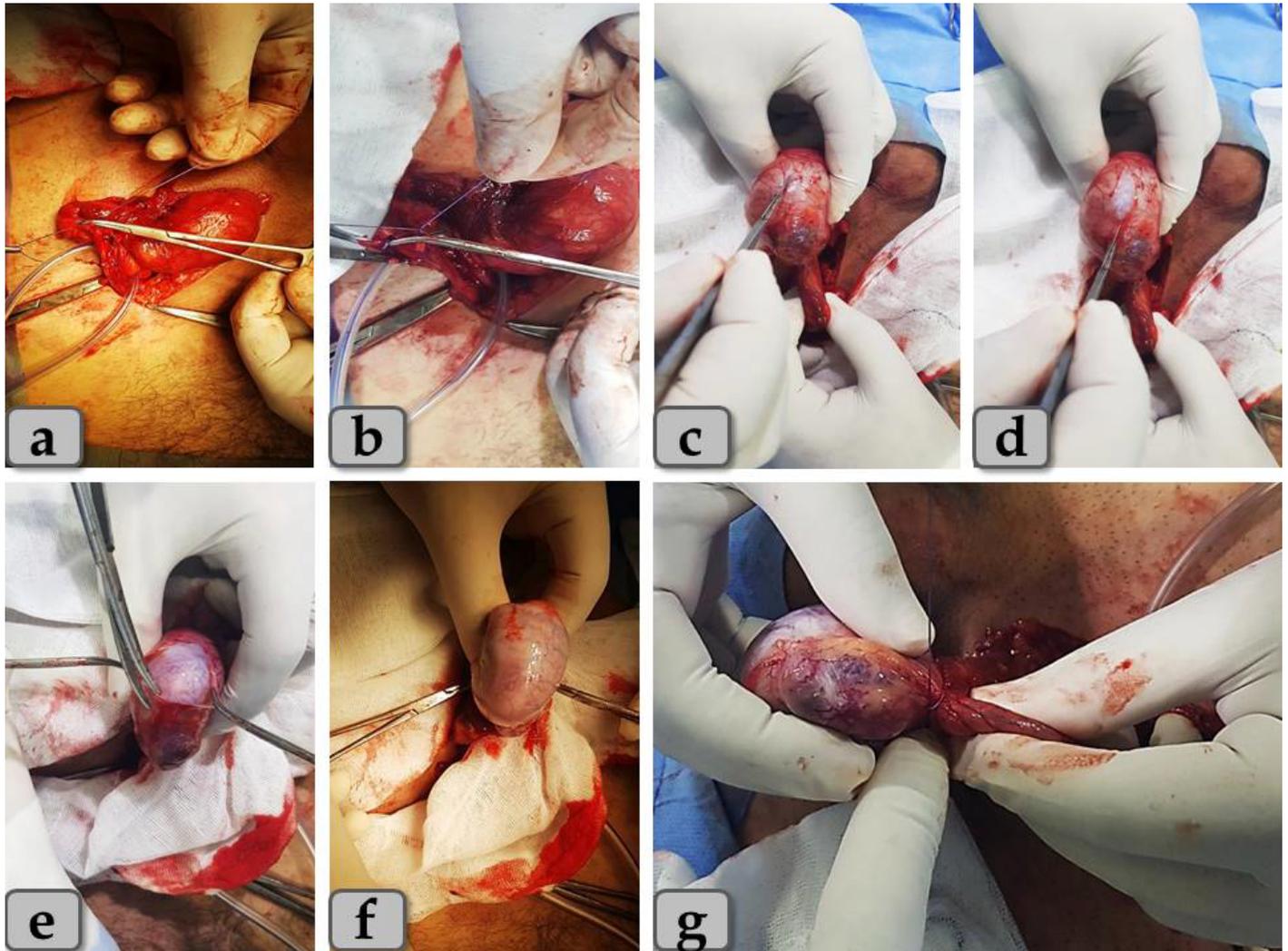


Figure 1. a,b: Photomicrographs showing the division and ligation of the varicoceles after dissection of the pampiniform plexus of veins; c,d,e: showing the division of the tunica vaginalis after delivering of the testes at the wound; f: showing the testes after complete division of the tunica; g: showing the eversion of the tunica vaginalis with fixation of only one vicryle 2 zero stitch

Technique of operation

Varicocele was diagnosed based on the patient's medical history, symptoms, comprehensive physical examination, abdominal ultrasound (to rule out the presence of secondary varicocele), and inguinoscrotal doppler ultrasound (to validate the diagnosis and determine the grading).

Electrocardiogram and routine laboratory tests (complete blood count, random blood sugar, coagulation profile, renal and liver function tests) were performed on every patient. and comprehensively analyze sperm. All patients who met the criteria for surgery were duly apprised of the procedures involved and provided with written consent. A prophylactic antibiotic, ceftriaxone 1000 mg administered slowly intravenously 10 minutes prior to anesthesia, with a subsequent dose 24 hours post-operatively. Five days of oral levofloxacin 500 mg was then administered.

In a supine position, spinal anesthesia is administered while the lower abdomen, inguinoscrotal region, and upper thigh are sterilized and draped. In group A, an open varicocelectomy was performed on all patients via a sub-inguinal approach with eversion of the tunica vaginalis. Following the varicocelectomy, the testes were delivered into the incision and subsequently returned

to the scrotum following eversion of the tunica. Varicocelectomy was performed on participants in group B without eversion of the tunica or delivery of the testes into the incision. In both groups, a small transverse incision was made at the low inguinal region to divide the skin and subcutaneous tissue. The spermatic cord was then delivered into the wound without opening the external oblique. A fine, blunt, and sharp dissection was performed on the anterior layers of the cord to identify any dilated veins. Three to four individual veins were then separated and ligated individually through excision. Only in group A were the testes inserted into the wound, the tunica was everted, and the testes were reinserted into the scrotum from the same incision. Hemostasis was achieved, and the wound was subsequently closed anatomically through the placement of a suction drain 24 to 72 hours postoperatively.

The duration of each procedure was recorded by an operating nurse, and the amount of blood loss was quantified by the count of saturated gauzes. Soak one square yard of 4x4 gauze to the point of 30 milliliters of blood loss. In addition to administering 400 mg of ibuprofen every 8 hours for 72 hours after surgery and 30 mg of amp IM ketolac every 12 hours for 24 hours after surgery, or as required based on the intensity of pain, postoperative pain management consists of taking 500 mg of oral paracetamol every

8 hours for a week.

Patients were released to their residences on the initial postoperative day, unless there were clinical indications to the contrary. All patients undergo postoperative follow-up in the ambulatory clinic on the first, second, third, fourth, and eighth weeks after discharge, and then monthly for the following six months. In the first three days, one week, and two weeks postoperatively, patients were instructed to register their maximum pain score for the day during rest and after ambulation using a numeric analog scale from one to ten at home prior to bedtime.

Documenting for one month postoperatively any instances of scrotal retention, early or late wound bleeding, wound infection, aberrant wound swelling, scrotal edema, or scrotal haemangioma; and for six months postoperatively any instances of late scrotal swelling. In addition to administering 400 mg of ibuprofen every 8 hours for 72 hours after surgery and 30 mg of amp IM ketolac every 12 hours for 24 hours after surgery, or as required based on the intensity of pain, postoperative pain management consists of taking 500 mg of oral paracetamol every 8 hours for a week. Regular follow-up scrotal ultrasound examinations are performed at three and six months postoperatively on all patients in order to detect abnormalities, most notably postoperative hydrocele.

Results

All sixty male participants in this study were between the ages of 18 and 40. On the basis of their symptoms and following a comprehensive physical examination and investigation, they were identified as having primary varicocele of the second or third degree. Group A underwent open varicocelectomy via sub-inguinal approach with eversion of the tunica vaginalis for all patients. Following varicocelectomy, the testes were delivered into the incision and subsequently returned to the scrotum following eversion of the tunica. Varicocelectomy was performed on participants in group B without eversion of the tunica or delivery of the testes into the incision.

Postoperative pain, as measured by a numeric analog scale ranging from one to ten, was not statistically significant in either group A or group B during the initial three days, one week, and two weeks postoperatively. The numerical analog scale ranged from two to five in the first three days, and from one to three after one and two weeks. In unilateral cases, the operative duration in group A varied between 40 and 60 minutes, with an average of 50 minutes. The operative time in group A varied from 30 to 50 minutes for unilateral cases and 40 minutes for bilateral cases, with a range of 60 to 80 minutes for bilateral cases and a mean of 70 minutes for the procedure. In contrast, the operative time in group B for bilateral cases was 70 to 90 minutes, with a mean of 60 minutes.

Postoperative urine retention was observed in one male patient in group A and one male patient in group B. All patients with urinary catheter-removed postoperative urine retention did so two hours prior to hospital discharge. Blood loss during the operation was minimal in both group A and group B, totaling less than 30 ml, which is equivalent to one piece of soaked 4x4 gauze. Achieved in three cases in group B and seven patients in group A, mild scrotal edema resolved within one to three weeks following the procedure. Without a single instance of wound infection in either group, the duration of hospitalization for both groups ranged from one to three days. A case of mild scrotal hematoma was identified in each cohort; it was treated conservatively without any complications.

Both groups were monitored for hydrocele for six months following the procedure. A minimal hydrocele case was identified in group A, while four cases of moderate hydrocele were detected in group B using clinical and scrotal ultrasound. In addition, two cases of moderate hydrocele in group B necessitated surgical intervention due to persistent scrotal pain and symptomatic edema, while the remaining two cases were treated conservatively with follow-up and did not present with pain.

Discussion

Postoperative hydrocele (PH) represents the most prevalent and consequential adverse effect resulting from varicocele surgical intervention. Hydrocele that develops subsequent to varicocele surgery or a varicocelectomy is attributed to iatrogenic disruption of the lymphatic vessels in, around, and along the spermatic cord during the varicocelectomy procedure [21].

Numerous surgical techniques, including laparoscopic varicocelectomy, open surgical ligation of the spermatic vein, and microsurgical varicocelectomy, have been utilized to treat varicocele. Every technique possesses its own set of merits and demerits, and numerous studies have documented contradictory findings [22-24].

Following varicocelectomy, the implementation of any procedure employed for varicocele ligation may give rise to the development of hydrocele and the subsequent production of high-protein fluid. Hydrocele formation is the most prevalent postoperative complication subsequent to varicocele maintenance, manifesting in 3–33% of cases [25].

A documented complication of varicocelectomy, whether performed laparoscopically or openly, is hydrocele. During the period from January 2000 to December 2003, laparoscopic ligation of the spermatic vessels was performed on 89 males who presented with clinically palpable varicoceles [26].

Nine of the eighteen patients (22.8%) who developed hydrocele following surgery required hydrocelectomy. Two of these nine patients, in addition, necessitated additional hydrocelectomy. Hydrocele developed in 29.8% of the 57 patients who underwent follow-up for a duration exceeding six months [26].

In their ten-year retrospective analysis, Beutner et al. compared 356 patients who underwent retrograde embolization, antegrade sclerotherapy, or laparoscopic varicocelectomy. They found that laparoscopic varicocelectomy was more effective in treating varicoceles, whereas antegrade sclerosis was associated with higher recurrence rates. Nonetheless, the efficacy increase was accompanied by [27]

Certain investigations have been conducted regarding microsurgical subinguinal varicocelectomies carried out at a solitary pediatric facility. In 96 patients, pre-emptive hydrocelectomy was performed, combining varicocelectomy with tunica vaginalis excision and eversion [28]. Conversely, in the remaining 46 cases, the vaginalis was left intact.

The rate of hydroceles was substantially reduced (4.3 vs. 13%; $p = 0.04$) when a preemptive hydrocelectomy was performed, as opposed to when the vaginalis was left intact. Hydrocele was observed in 3 out of 54 patients (5.5%) who underwent unilateral vaginalis excision, but in only 1 out of 42 patients (2.4%) who underwent prophylactic hydrocelectomy with eversion of the vaginalis. No indications of testicular complexity were present [28].

There are a number of technical adjustments that can be implemented to safeguard the lymphatic vessels throughout the process of spermatic cord dissection. Sclerotherapy of the internal spermatic veins and other techniques that circumvent dissection of the spermatic cord are virtually risk-free in terms of hydrocele formation [29].

It is widely acknowledged that optical magnification is an indispensable element in lymphatic-sparing varicocelectomy. As a result, the incidence of hydrocele following microsurgical subinguinal varicocelectomy is extremely low, approaching 0% [30].

The implementation of techniques that preserve the integrity of the internal spermatic artery, such as elevated ligation of the internal spermatic vessels (Palomo procedure), may potentially reduce the development of hydrocele following varicocelectomy [31].

To reduce the risk of hydrocele formation in patients undergoing varicocelectomy without microsurgery, preventative hydrocelectomy has been proposed [32].

This study compared the outcomes of group A patients who underwent open varicocelectomy via sub-inguinal approach and tunica vaginalis eversion subsequent to varicocelectomy (testes were delivered into the wound and subsequently returned to the scrotum following tunica eversion). Varicocelectomy was performed on participants in group B without eversion of the tunica or delivery of the testes into the incision.

There is no significant difference between the two groups in terms of post-operative pain, length of hospital stay, or complications from wounds. Group A had a slightly longer operative time, and there were seven cases of mild scrotal edema compared to three cases in group B. However, all cases resolved within one to three weeks postoperatively, and neither group experienced any testicular complications. Infection of postoperative wounds was absent in both groups.

Group A patients had one case of moderate scrotal hematoma, which was treated with wound exploration under general anesthesia and complete hemostasis; group B patients had one case of mild scrotal hematoma, which was conservatively managed with no complications in the subsequent two cases.

Clinical postoperative follow-up and scrotal ultrasound reveal one case of mild collection in group A and three cases of mild to moderate collection in group B (one mild collection and two moderate collections). This indicates that patients in group A had a lower incidence of postoperative hydrocele formation than those in group B.

Conclusion

As a prophylactic measure, the eversion of the tunica vaginalis during open varicocelectomy reduces the incidence of postoperative hydrocele compared with no eversion in hospitals that perform open varicocelectomy without access to an operating microscope.

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