Comparison of Open and Laparoscopic Varicocelectomies in Terms of Operative Time, Sperm Parameters, and Complications

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Introduction: Varicocele is one of the most common causes of infertility. In this study, we evaluated and compared the operative time, sperm analysis results, and complications of three different methods of open and laparoscopic varicocelectomies.

Materials and Methods: From among all bilateral varicocelectomies in our center, we randomly selected 30 of each following cases: laparoscopic varicocelectomy, open subinguinal varicocelectomy under general anesthesia, and open subinguinal varicocelectomy under local anesthesia. We compared the operative time, sperm analysis results, and complications between these three groups.

Results: The mean operative times were 30.0 ± 5.5 minutes for laparoscopies, 27.0 ± 3.5 minutes for open varicocelectomies under general anesthesia, and 38.0 ± 1.8 minutes for open varicocelectomies under local anesthesia (P = .02). Intra-operative complications occurred only in the laparoscopic group, and postoperative complications were seen in 23.3%, 20.0%, and 4.2% of the patients with laparoscopy, open surgery under general anesthesia, and open surgery under local anesthesia, respectively. Semen analysis did not show any significant changes after varicocelectomy except for a slight improvement of sperm morphology in patients who underwent open varicocelectomy under local anesthesia.

Conclusion: Subinguinal varicocelectomy under local anesthesia is better than laparoscopic method in terms of recurrence, hydrocele formation, and operative time. Subinguinal method under general anesthesia has intermediate efficacy regarding less complications than laparoscopic method and shorter operative time than the two other methods.

Keywords: varicocele, laparoscopy, infertility

Urol J. 2009;6:170-5.
www.uj.unrc.ir

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Received May 2008
Accepted April 2009

INTRODUCTION

Varicocele is one of the most common causes of infertility. Different approaches have been applied for treatment of varicocele, including open surgery, sclerotherapy, and recently, laparoscopy.[1-3] In 1991, Aaberg and colleagues[4] introduced laparoscopy as the least-invasive surgical method in the treatment of varicocele. In this study, we evaluated and compared the operative time, sperm parameters, and complications in three different methods of open (subinguinal) and laparoscopic approaches through general anesthesia (GA) and open approach through local anesthesia (LA).

MATERIALS AND METHODS

Patients

A total of 306 unilateral and bilateral varicoceles were operated on by one surgeon, from 2003 July till 2006 September at Ghaem Hospital in Mashhad, Iran. We approached cases of bilateral varicoceles from among this group and randomly selected 30 cases of open varicocelectomy under LA, open varicocelectomy under GA, and laparoscopic varicocelectomy in 3 groups. Group 1 consisted of 30 patients who underwent laparoscopic varicocelectomy; group 2, open subinguinal varicocelectomy through GA; and group 3, open subinguinal varicocelectomy through LA.

Indications for varicocelectomy were the same in all groups and included infertility, scrotal pain, and documented abnormalities in sperm parameters. Diagnostic protocol included physical examination, ultrasonography (especially in obese patients or in those with a thick scrotum), and color Doppler ultrasonography (in patients with a thick scrotum, in obese patients, or for evaluation of the right-side varicocele and venous reflux).

Laparoscopic Varicocelectomy

After placement of urethral catheter and nasogastric tube, the patient was secured in the supine position. Under GA, a 1-cm transverse midline incision was made immediately above the umbilicus. A 10-mm trocar was introduced into the peritoneal cavity after incision of the fascia. Then, the abdomen was inflated with carbon dioxide gas (15 mm Hg), and a 10-mm telescope was inserted through the 10-mm trocar. Under direct vision, the 2nd and the 3rd trocars (both 5-mm) were bilaterally introduced through the incisions located in the two-third internal distance from the umbilicus to the anterior superior iliac spine. A grasper and a scissor were used to put 2 perpendicular incisions into the peritoneum overlying the internal spermatic veins. The vascular mass was lifted to separate the arterial and lymphatic components from the veins. Then, the veins were ligated by clips (suturing or cauterizing veins was avoided to save time). In early cases, the veins were cut, but in the recent cases, we did not cut the veins after ligation. It must be noted that since only 10-mm clips applier were available, the 10-mm telescope was changed with a 5-mm telescope, and introduction of clips applier was through a 10-mm trocar.

Open Surgery Under Local Anesthesia

Twenty-five milliliters of lidocaine (1%) was infused around the spermatic cord and the illioinguinal nerve, 15 minutes before the operation. Then, a standard subinguinal varicocelectomy was preformed. Using this method, there was no need to incise the fascia. After controlling the spermatic cord, gentle pressure was applied onto the ipsilateral hemiscrotum in order to engorge the spermatic veins. The veins were separated and ligated, while preserving the arterial and lymphatic components.

Statistical Analyses

The collected data were analyzed using the SPSS software (Statistical Package for the Social Sciences, version 13.0, SPSS Inc, Chicago, Illinois, USA). Comparisons of continuous variables were done with the paired *t* test and the 1-way analysis of variance test, where appropriate. A *P* value less than .05 was considered significant.

RESULTS

Patients

The mean ages of the patients were 27.4 ± 6.6 years (range, 17 to 43 years), 30.7 ± 5.3 years (range, 20 to 45 years), and 28.4 ± 4.4 years (range, 20 to 35 years) in groups 1 to 3, respectively. Of the patients, 22, 28, 29 were married in groups 1 to 3, respectively. There were 22, 26, and 26 infertile patients, respectively ($P = .33$), of whom 2, 4, and 1 had secondary infertility. The follow–up duration was 3 to 36 months. Follow-up visits were at the first and second postoperative weeks and every 3 months, afterwards

Operative Time

The operation time was calculated from trocar insertion to trocar extraction and skin closure

for laparoscopic varicocelectomy, and from incision to skin closure in open varicocelectomy. The operative time was not considered from the beginning of anesthesia induction, because placement of the urethral catheter and nasogastric tube and preparation of laparoscopic equipment would add to the operative time of laparoscopy. The mean operative times were 30.0 ± 5.5 minutes (range, 17 to 60 minutes) for laparoscopies, 27.0 ± 3.5 minutes (range, 20 to 40 minutes) for open varicocelectomy under GA, and 38.0 ± 1.8 minutes (range, 32 to 43 minutes) for open varicocelectomy under LA (1-way analysis of variance, $P = .02$).

Intra-operative Complications

In group 1 with laparoscopy, no vascular or intestinal complications occurred while introducing the first trocar. Conversion from laparoscopic to open approach due to hemorrhage or other causes did not occur, either. In 1 patient, however, abdominal wall emphysema was encountered due to morbid obesity, but varicocelectomy was successful. No intra-operative complications were seen in groups 2 and 3.

Postoperative Complications

The patient with abdominal wall emphysema in group 1 complained of shoulder pain, which was alleviated by nonsteriod anti-inflammatory drugs. Four patients in group 1 developed scrotal edema, which were treated by rest, nonsteriod anti-inflammatory drugs, and scrotal supports. Also, 1 patient in this group had mild hydrocele, which was managed by conservative treatment. Two left varicocele recurrences developed in group 1, and the patients underwent open varicocelectomy under GA. No hernias occurred after laparoscopic varicocelectomy. In group 2, there were 3 patients with wound infection, 3 with scrotal edema, and 1 with left orchitis, all of which were managed by medical therapy. No recurrence was noted in this group. In the patients of group 3, the only complication was bilateral scrotal hematoma in 1 that was managed medically. Overall, 22, 23, and 29 patients in groups 1, 2, and 3 had an uneventful operation, respectively. Complications of these three methods are summarized in Table 1.

Sperm Parameters

Semen Analysis results are summarized in Table 2. The paired *t* test showed no significant changes

Table 1. Varicocelectomy Complications With Different Surgical Methods*

Complication	Laparoscopy	Open With General Anesthesia	Open With Local Anesthesia
Hydrocele	1 (3.3)	0	0
Scrotal edema	4 (13.3)	3 (10.0)	0
Orchitis	1 (3.3)	1 (3.3)	0
Wound infection	0	3 (10.0)	0
Hematoma	0	0	1 (3.3)
Recurrence	2 (6.7)	0	0

*Values in parentheses are percents.

Table 2. Semen Analysis Results With Different Varicocelectomy Methods

Varicocelectomy	Before Treatment	After Treatment	*P*
Laparoscopy			
Sperm count, × 10^6/mL	58 ± 42	54 ± 33	.65
Sperm motility, %	73 ± 49	92 ± 100	.26
Sperm morphology, %	69 ± 52	74 ± 41	.31
Open with general anesthesia			
Sperm count, × 10^6/mL	40 ± 25	34 ± 20	.26
Sperm motility, %	35 ± 20	35 ± 20	.91
Sperm morphology, %	31 ± 16	38 ± 18	.07
Open with local anesthesia			
Sperm count, × 10^6/mL	51 ± 23	47 ± 25	.31
Sperm motility, %	55 ± 19	58 ± 19	.18
Sperm morphology, %	51 ± 27	57 ± 22	.045

in sperm count, motility, and morphology after the treatment, except for sperm morphology in group 3. The 1-way analysis of variance test demonstrated no significant differences in parameters' changes between the three approaches.

DISCUSSION

There are different surgical methods for varicocele treatment. The first surgical method for varicocele was explained by Celsus in the first century (ipsilateral orchidectomy which consisted of an atrophic testis).[5] Currently, popular varicocelectomy methods include: the Ivanissevich method (retroperitoneal), Palomo method, subinguinal method (with or without testicular delivery), laparoscopic method, and sclerotherapy (internal spermatic vein embolization). The most effective and least invasive method is yet unknown. We compared open varicocelectomy under GA and LA with laparoscopic approach. We found that although the three methods had comparable results, regarding the costs and complications, laparoscopic method was not superior.

We found that the operation time in patients with open surgery under GA lasted shorted compared to those who underwent laparoscopy or open surgery under LA. Ghanem and colleagues[6] reported the operative time to be 45 minutes on average for unilateral subinguinal method and 25.6 minutes for the high retroperitoneal method. Watanabe and coworkers[7] reported an operative time of 111.8 ± 21.1 minutes for unilateral high retroperitoneal varicocelectomy and 86.3 ± 28.4 minutes for unilateral subinguinal varicocelectomy under LA. The operative time in our group of open surgery with LA was 38 minutes on average. The operative time for laparoscopic varicocelectomy ranged from 17 to 60 minutes in our study. Watanabe and colleagues reported a mean operative time of 109 ± 27 minutes, although their operations were unilateral.[7] Kwon and associates reported a mean of 102 minutes for this parameter.[8] They did not mention whether this was for unilateral or bilateral varicocelectomy. Ogura and colleagues performed bilateral laparoscopic varicocelectomy on 39 patients with an operative time of 96.6 minutes.[9]

Varicocele recurrence is a complication of varicocelectomy. Misseri and coworkers reported 3% recurrence with the Palomo method and 14% recurrence with the high retroperitoneal method.[3] Al-Kandari and colleagues[10] studied 120 patients with 147 varicocelectomies in three different methods. The recurrence rate was 2% (1 patient) with microscopic subinguinal varicocelectomy and 13% (7 patients) and 18% (9 patients) with open inguinal and laparoscopic methods, respectively. This report was statistically significant in favor of microscopic subinguinal varicocelectomy. Al-Said and coworkers[11] observed the same results (the recurrence rate was 2.6%, 11%, and 17% in microsurgical, open, and laparoscopic groups, respectively). Hirsch and colleagues[12] concluded in their study on 41 patients with varicocele that laparoscopic varicocelectomy has no advantage over open subinguinal technique with respect to hospitalization, seeking analgesic, and going back to work. Moreover, laparoscopic varicocelectomy was longer and had more complications than open subinguinal approach. Watanabe and colleagues reported 6.1% recurrence in 33 patients with bilateral laparoscopic varicocelectomy. They mentioned a recurrence rate of 12% in 50 patients with unilateral varicocelectomy by high retroperitoneal method.[7] Varicocele recurrence after laparoscopic method was reported to be 8.9%, but stood at 6.7% when the lymphatic vessels were preserved.[2] Recurrence in our laparoscopic group was 6.6% (2 cases).

Hydrocele is another complication of varicocelectomy. Incidence of this complication is 0.3% to 40.4% as reported by Kocvara and coworkers.[2] Etiology of postvaricocelectomy hydrocele is ligation of the lymphatic vessels that are colorless and sometimes are mistaken for veins.[10] Schwentner and colleagues reported hydrocele in 16% of patients operated by conventional microscopic method.[13] In several studies, hydrocele after varicocelectomy has been reported in 3% of cases in expert hands.[13] Kocvara and colleagues[2] reported hydrocele formation 17.9% with conventional laparoscopic varicocelectomy and 1.9% with their own

method (preservation of lymphatic vessels). Hassan and coworkers[1] observed hydrocele in 29.8% of 79 patients after 6 months of follow-up with unilateral laparoscopic varicocelectomy. They concluded that hydrocele formation rate is high in long-time and/or internal spermatic veins are ligated and cut (instead of ligated alone). In the study of Al-Kandari and associates, hydrocele formation was none, 13%, and 20% in microscopic, open, and laparoscopic groups, respectively,[10] according to Al-Said and colleagues, hydrocele formation was none, 2.8%, and 5.4% in those groups, respectively.[11]

CONCLUSION

Our study demonstrated that although sooner return to work is achieved by laparoscopic varicocelectomy, complications of this method are more frequent than the open method (under either GA or LA). Although sperm analysis results were the same for all the three methods, subinguinal method under LA was better than laparoscopic method in terms of recurrence, hydrocele formation, and operative time. Subinguinal method under GA has intermediate efficacy, ie, less complications than laparoscopic method and better results in operative time than the two other methods.

CONFLICT OF INTEREST

None declared.

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EDITORIAL COMMENT

I read with interest the article by Shamsa and colleagues. The authors have tried to compare 3 different techniques of varicocelectomy by one surgeon, possibly with different levels of expertise in each technique. We have done a similar study previously comprising 50 laparoscopic varicocelectomies compared with 50 open varicocelectomies in a randomized controlled trial and found different results.[1] In our study using bipolar cautery instead of clips (which is a foreign body), operative time was significantly less with laparoscopy compared with open varicocelectomy (17.2 ± 9.8 minutes versus 31.02 ± 12.8 minutes). Since there is an 8-time magnification during laparoscopic procedure, the lymphatic vessels as well as the

testicular artery are better preserved. That is why hydrocele formation was significantly less in our laparoscopy group. We also disagree with routine bilateral varicocelectomy since varicocele occurs 90% only in the left side.[2]

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REPLY BY AUTHOR

I appreciate the remarkable comments of professor Simforoosh on our article. He pointed out to the following: first, laparoscopy provides a magnified vision of the operation site. We also agree this influential fact. Second, he compared the operative times in their experience; the operative time was 17.2 ± 9.8 minutes for laparoscopic varicocelectomy and 31.0 ± 12.8 minutes for open varicocelectomy as reported by Simforoosh and colleagues.[1] In our study, these were 30.0 ± 5.5 minutes and 27.0 ± 3.5 minutes, respectively. The difference between the two studies is that we had bilateral varicocelectomies, while Simforoosh and colleagues reported their open surgery in unilateral varicocelectomy, for which an operative time of 31.0 minutes is too long, unless the patients had been obese or had had a previous surgical operation on the inguinal areas.

Third, hydrocele was quite more frequent in their study (14% for laparoscopy and 24% for open surgery).[1] We faced hydrocele in 3.3% of patients with laparoscopy and none of the patients in the open group. Al-Said and colleagues and also Cayan and coworkers have compared the three options of laparoscopy, microsurgery, and open surgery.[2,3] Al-Said and colleagues had no cases of hydrocele in the microsurgery group, and Cayan and coworkers reported a rate of 0.44% of hydrocele with this treatment method.

Fourth, professor Simforoosh disagrees with routine bilateral varicocelectomy, as in 90% of the cases, only left-side varicocele is present. Our response is that in bilateral cases, the treatment is simply bilateral varicocelectomy. Consistent with the experiences of Al-Said and colleagues[2] and the report by Glassberg and associates,[4] we believe that bilateral varicocelectomy results in superior outcomes. Further, Simforoosh and colleagues indicated an incidence of 15% to 57% for bilateral varicocele.[1] Also, they reported bilateral varicocelectomy in 16 patients in their study.

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