ORIGINAL RESEARCH

Microsurgical Subinguinal Varicocelectomy - Technique and Preliminary Results

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Introduction: Varicoceles represent the most common attributable cause of primary and secondary infertility in the male. A number of studies have established the effect of performing varicocelectomy in order to improve semen parameters. Several techniques of varicocelectomy has been described in literature, however, the microsurgical technique has been considered as the gold standard in doing this procedure.

Objectives: The study primarily aims to establish the effect of microsurgical varicocelectomy on postoperative semenalysis when compared to baseline semenalysis. It also aimed to establish the impregnation rate and the span at which impregnation occurs following varicocelectomy. Lastly, the study also describes the technique and modifications of microsurgical subinguinal varicoelectomy performed by a single surgeon using an operating microscope and microdoppler throughout the procedure.

Materials and Methods: Microsurgical subinguinal varicocelectomy was performed on 37 patients in SLMC from June 2015 to May 2017 by a single microsurgeon (DGL). Patient age, varicocele grade, operative time, intraoperative findings, postoperative complication, and 3-month follow-up semenalysis results were recorded and compared. Successful impregnation of the partner and the number of months from the operation to the successful impregnation were also recorded.

Results: Three months postoperative semenalysis parameters were compared to the baseline semenalysis. The total sperm motility was noted to have increased from 27.95± 15.02 to 50.95±12.60, postoperatively with p-value of 0.010. There was no significant difference observed in the total count, concentration, and percent immature forms. Eleven or 30% of patients were able to successfully impregnate their partners in an average span of 9 months from the time of surgery.

Conclusion: In their experience, Microsurgical subinguinal varicocelectomy has improved the semen analysis after 3 months with a 30% chance of impregnation at an average span of 9 months, postoperatively. Furthermore, the use of microdoppler ultrasound in microsurgical varicocelectomy facilitated better identification of the testicular arteries.

Key words: microsurgical subinguinal varicocelectomy

Introduction

Varicocele are present and can be detected in at least 15% of the general male population and up to 35% of men with primary infertility and in 75% of men with secondary infertility. The pregnancy rate was estimated to be 38.4% after varicocele repair through the pooled analysis.[1] There are several approaches for varicocelectomy including retroperitoneal and conventional

inguinal open techniques, microsurgical inguinal and subinguinal approaches, laparoscopic repairs and radiographic embolization. The microsurgical varicocelectomy is considered to be the "gold standard" because it is associated with the lowest risk of complications (varicocele recurrence, hydrocele formation and testicular atrophy) with a higher success rate (disappearance of varicocele) and a lower complication rate (recurrence rate and hydrocele formation) compared with non-microsurgical techniques.[2-5] The subinguinal approach is also associated with less operative and postoperative pain than inguinal approaches. However, the subinguinal approach is more challenging owing to the greater number of vessels (arteries and veins) encountered at this level, compared with the inguinal canal.[6-9]

The study primarily aims to establish the effect of varicocelectomy on postoperative semenalysis when compared to baseline semenalysis. It also aimed to establish the impregnation rate and the span at which impregnation occur following varicocelectomy. Lastly, it aimed to described the technique and modifications of microsurgical subinguinal varicoelectomy performed by a single surgeon using an operating microscope and microdoppler throughout the procedure.

Materials and Methods

Patient Cohorts

Microsurgical subinguinal varicocelectomy was performed on 37 patients in SLMC from June 2015 to May 2017. All procedures were performed by a single microsurgeon (DGL). Preoperative evaluation consisted of physical examination for varicocele grade, and testis volume measured by orchidometer or ultrasonography, semen analysis. Indications for surgical treatment included varicocele with infertility and abnormal semen parameter. Patient age, varicocele grade, operative time, intraoperative findings (number of internal spermatic arteries and veins), postoperative complication, and 3-month follow-up semenalysis results were recorded and compared. Successful impregnation of the partner and the number of months from the operation to the successful impregnation were also recorded.

Technical Aspects of Microsurgical Subinguinal Varicocelectomy

An operating microscope (Zeiss OPMI, NC4 or Pentero) allows for X6 to X25 magnification of the operating field, considerably enhancing the urologist's visual acuity. Magnification allows for meticulous hemostasis, identification of all veins and preservation of testicular arteries and lymphatics and avoidance of inadvertent iatrogenic injuries. The subinguinal approach allows elevation of the spermatic cord for improved visualization of the cord structures, provides access to external spermatic and gubernacular veins and allow delivery of the ipsilateral testicle in case a biopsy is needed. The subinguinal incision obviates the need for opening any fascial layer, which is theoretically associated with faster and less painful recovery.

The Operating Microscope was brought in the field. An incision was made along Langer's lines just below the external ring. The size of the incision varied between 1.5 cm and 3 cm, depending on whether or not delivery of the testicle was planned, and on the testicular size. Following skin incision, Camper's and Scarpa's fascia were divided using electrocautery. Blunt dissection using the surgeon's index finger or the back handle of the Adsons forcep was performed distally and proximally along the cord, deep to Scarpa's fascia, following which the cord could be easily grasped with a Babcock clamp. The testicle was delivered through a 2cm to 3cm. inguinal incision, and all external spermatic and gubernacular veins were ligated. The testis was returned to the scrotum and the spermatic cord was dissected under the operating microscope.

The external and internal spermatic fascias were opened under ×10 magnification. Dissection of the cord structures was performed using a non-locking microsurgical needle holder and smooth microsurgical forceps. The cord was inspected for visible arterial pulsations under ×25 magnification, along with a microprobe 20 mHZ

Doppler. Suspected arteries were tested by elevating them until they were near-occluded, and then slowly lowered until pulsatile blood flow had been reestablished. Once identified and dissected free, the arteries were encircled with small vessel loops. In approximately 50% of cases, the testicular artery was adherent to the undersurface of a large vein. Veins were stripped free of associated lymphatics, doubly ligated with 4-0 silk ties and divided. Small veins were controlled with bipolar electrocautery. Lymphatics, cremasteric fibers, vas deferens and associated vasal vessels were preserved. If the vas deferens was accompanied by veins larger than 3mm in diameter, ligation was done in order to prevent varicocele recurrence. The vas is typically accompanied by two sets of vessels; as long as one of these remains intact, adequate venous return is ensured. The external spermatic fascia was closed with a continuous absorbable suture. Scarpa's and Camper's fascia were similarly re-approximated with interrupted monofilament absorbable suture. The incision was infiltrated with local anesthetic, and the skin was then closed with a 4-0 monofilament absorbable running subcuticular suture.

Statistical Analysis

Statistical analysis was performed with SPSS. Student's t-test and Mann- Whitney U-test was used for parametric and non-parametric variables, respectively. Differences between proportions were compared using Fisher's test or x^2 test. A p-value of less than 0.05 was considered statistically significant.

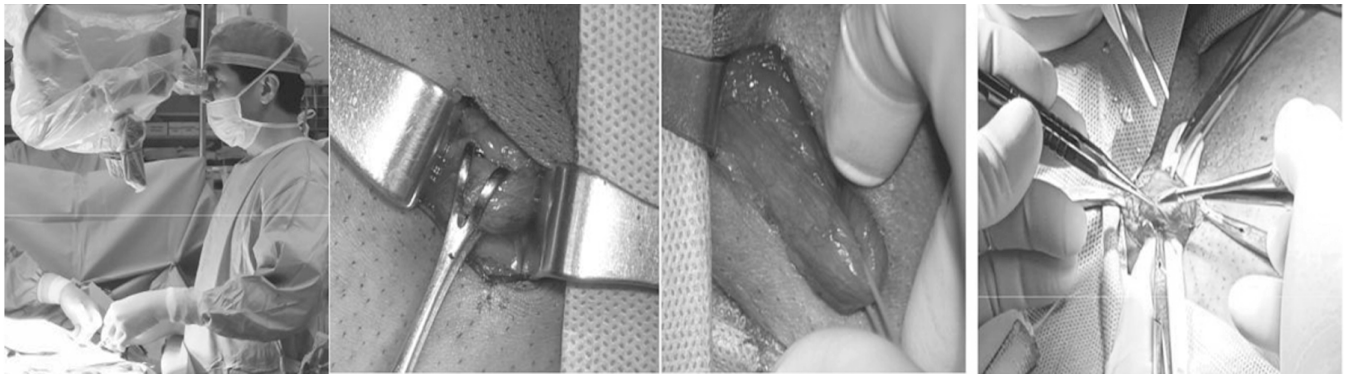

Figure 1. Operating Microscope (Zeiss OPMI, NC4 or Pentero, Leica OPMI) allows for X6 to X25 magnification of the operating field. Blunt dissection using the surgeon's index finger or the back handle of the Adsons forcep is performed distally and proximally along the cord, deep to Scarpa's fascia, following which the cord can be easily grasped with a Babcock clamp

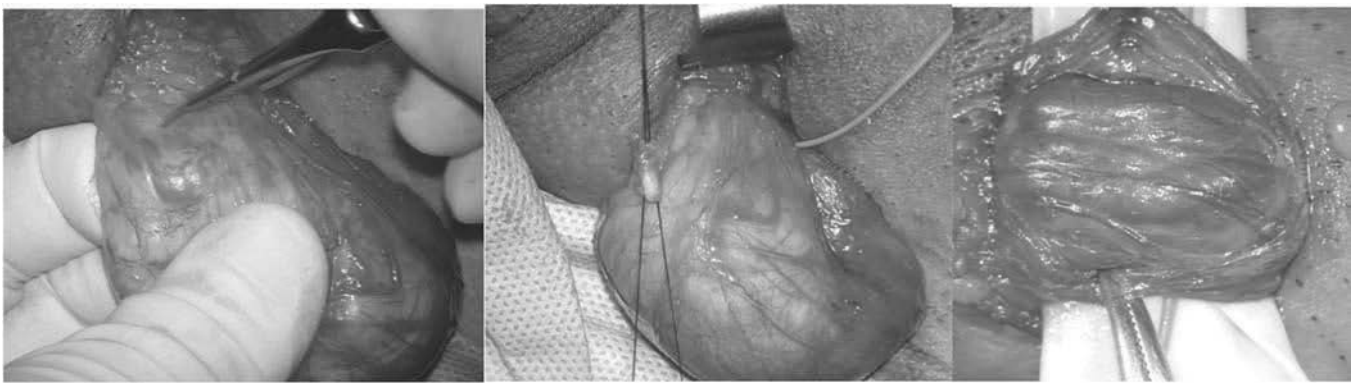

Figure 2. The testicle is delivered through a 2 to 3 cm. inguinal incision, and all external spermatic and gubernacular veins are ligated.

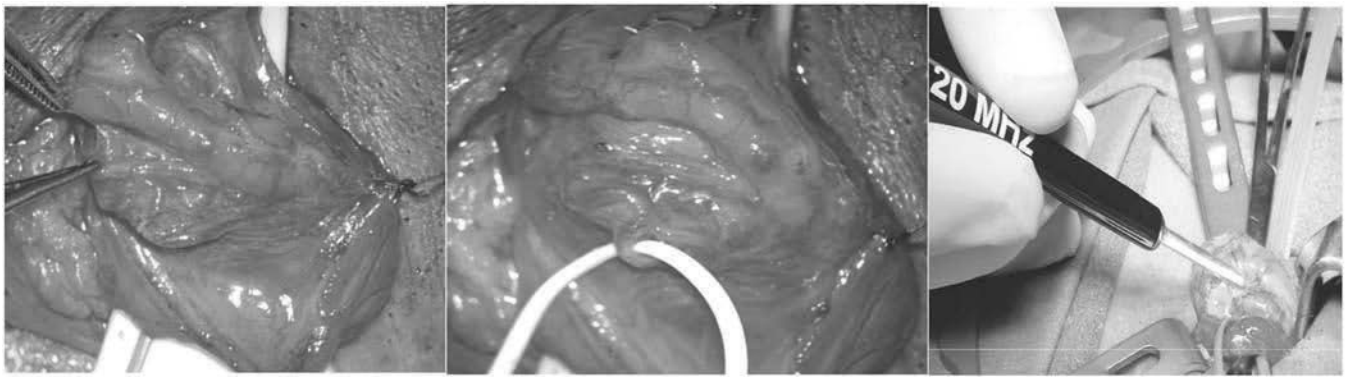

Figure 3. The cord is inspected for visible arterial pulsations under ×25 magnification., along with a microprobe 20 mHZ Doppler. Suspected arteries can also be tested by elevating them until they are near-occluded, and then slowly lowering them until pulsatile blood flow is noted to have been reestablished. Once identified and dissected free, the arteries are encircled with small vessel loops

Figure 4. Veins are stripped free of associated lymphatics, doubly ligated with 4-0 silk ties and divided. Small veins are controlled with bipolar electrocautery. Lymphatics, cremasteric fibers, the vas deferens and associated vasal vessels are preserved

Results

A total of 37 patients were enrolled in the study for analysis. Table 1 summarizes the baseline characteristics of all patients included in the study with a mean age of 32.19± 4.86 years. The average volume of the right testicle is 19.12mL and the left testicle 17.35. Majority of the included patients had grade 3 varicoceles. The preoperative semenalysis are also summarized in Table 1.

Table 2 shows the perioperative and successful impregnation outcome of the included patients. Eleven or 30% of patients were able to successfully impregnate their partners in an average span of 9 months from the time of surgery. An average of 8 dilated veins and 9 dilated veins were identified

Table 1. Patient demographics

Age (years)	32.19± 4.86
Grade of Varicocele	
I	0
II	5
III	32
Testicular Volume (mL)	
Left	17.35
Right	19.12
Preoperative Semenalysis	
Volume (mL)	3.17± 1.09
Count (Million/ejaculate)	26.12± 36.13
Concentration (Million/mL)	7.86± 9.61
Total motility (%)	27.95± 15.02
Immature Forms (%)	91.89± 18.51

in the left and right, respectively with 100% preservation of the testicular artery. The mean operative time was 91.76± 15.14 minutes. No complication was observed among the included set of patients.

Table 2. Perioperative and successful impregnation outcome.

Variable	
Operative Time (minutes)	91.76±15.14
Number of Dilated Veins	
Left	8
Right	9
Testicular Artery Preservation (%)	100
Successful Impregnation of Partner	11 (30%)
Complications	0

Three months postoperative semenalysis parameters were compared to the baseline semenalysis as summarized in Table 3. Significant difference was observed in change in semen volume and percent total motility. Furthermore, the total sperm motility was noted to have increased from 27.95± 15.02 to 50.95±12.60, postoperatively with p-value of 0.010. There was no significant difference observed in the total count, concentration and percent immature forms.

Discussion

Varicoceles represent the most common attributable cause of primary and secondary infertility in the male. The pathophysiology of varicocele is the turbulent venous flow related to the right angle insertion of the left testicular vein in the left renal vein.[10] It is present in 11.7% of men with normal semen analysis and 25.4% of men with abnormal semen.[11] The exact association between reduced male infertility and varicocele is unknown, but a meta-analysis showed semen improvement after surgical correction.[12] Current hypothesis is that varicocele is associated with progressive testicular damage from adolescence onwards and a consequent reduction in fertility.[13-15] It is associated with bilateral spermatogenic abnormalities and Leydig cell dysfunction. Most studies reported increases in germ cell apoptosis brought about by hyperthermia and low testosterone levels in the testicle.[11] MacLeon and other investigators observed that most semen samples from infertile men with varicocele have poorer sperm parameters (low sperm counts, increased number of spermatozoa with abnormal forms and decreased motility than fertile men).[11]

Several techniques of varicocelectomy have been described: open, microscopic, and laparoscopic. According to meta-analysis of >5000 patients from 33 studies, microsurgical subinguinal or inguinal techniques offer the best outcomes. Pregnancy rates at 1 year after surgery were comparable for open inquinal, laparascopic and subinguinal microscopic varicocelectomy. However of these techniques, microscopic varicocelectomy is associated with fewer complications such as hydrocele because the lymphatics can be more easily identified and preserved[18-19], but it requires more operating time and microsurgical training.[4-5] At present, the American Urological Association (AUA) and Europian Association of Urology (EAU) do not recommend any technique of varicocelectomy because of insufficient data in relation to improving sperm parameters.

Table 3. Comparison of semenalysis results at baseline and at 3 months postoperation.

Semenalysis Variable	Preoperative	Postoperative	p-value
Volume (mL)	3.17±1.09	2.97±1.09	0.039
Count (Million/ejaculate)	26.12±36.13	58.03±40.14	0.424
Concentration (Million/mL)	7.86±9.61	20.77±14.56	0.258
Total Motility (%)	27.95±15.02	50.95±12.60	0.010
Immature Forms (%)	91.89±18.51	97.13±1.99	0.896

In the local setting, varicocelectomy is mainly performed loupe-assisted inguinally and subinguinally. There is currently no published data on experience in microscopic varicocelectomy here in the Philippines. On this basis, the authors prospectively collected and reviewed a single-surgeon experience with microsurgical varicocelectomy in infertile men.

This procedure has shown to improve multiple semen parameters in infertile men with varicocele 6 months after the surgery.[20] Another study showed improvement in sperm density but not sperm motility at 12 months after varicocelectomy and 56.4% at 5 years post microscopic varico-celectomy.[20] With these findings, it is assumed and expected that varicocelectomy will improve these semenalysis parameters. The present study showed an increase in the sperm count, concentration, and total motility at 3 months postoperatively. Furthermore, significant increase was noted in the sperm total motility (27.95± 15.02 vs 50.95±12.60, p=0.10).

Many reports suggest that microsurgical varicocelectomy has the advantage of lower incidence of varicocele recurrence, better improvement of sperm quality compared with open and laparascopic varicocele treatment. Similar findings were noted in the present study as none of the patients developed any complication at 3-months follow up.

Conclusion

Microsurgical subinguinal varicocelectomy has improved the semen analysis after 3 months with a 30% chance of impregnation at an average span of 9 months, postoperatively. Furthermore, the use of microdoppler ultrasound in microsurgical varicocelectomy facilitated better identification of the testicular arteries.

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