



Recurrence rates in pediatric patients undergoing microsurgical subinguinal varicocelectomy with and without testicular delivery[☆]



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ABSTRACT

Background/purpose: The purpose of the study was to determine if testicular delivery during microsurgical subinguinal varicocelectomy (MSV) reduces varicocele recurrence rates in pediatric patients. Testicular delivery during MSV enables ligation of the gubernacular veins, which is thought to reduce the likelihood of varicocele recurrence. However, recent studies have suggested that testicular delivery during MSV does not offer any beneficial effect and, therefore, may be optional or unnecessary.

Methods: A total of 58 pediatric patients with grade II (nine, 15.5%) or III (49, 84.5%) varicocele met inclusion criteria. Of these 58 patients, 25 (43%) underwent MSV with testicular delivery and 33 (57%) underwent MSV without testicular delivery. Varicocele recurrence, testicular size change, and complications including edema, pain, paresthesia, hydrocele, and testicular atrophy were assessed to evaluate the effects of testicular delivery during MSV.

Results: Recurrence rates were 20% and 6.1% in patients who underwent MSV with and without testicular delivery, respectively. Univariate analysis of primary endpoints demonstrated significantly decreased recurrence, scrotal pain, and temporary paresthesia in patients who underwent MSV without testicular delivery compared to those with testicular delivery. Multivariate analysis also demonstrated that recurrence was significantly associated with testicular delivery.

Conclusions: Testicular delivery to enable ligation of the gubernacular veins during MSV resulted in a higher recurrence rate in pediatric patients. Further investigation including prospective studies with long-term follow-up is needed to determine if testicular delivery during MSV is an unnecessary procedure in pediatric patients.

Level of evidence: 2

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A survey of U.S. Pediatric Urologists in 2014 revealed that the most common surgical approaches to varicocelectomy were laparoscopic (38%) followed by microsurgical subinguinal varicocelectomy (MSV, 28%) [1]. In 1985, Marmor et al. first reported the results of varicocelectomy without testicular delivery via microdissection of the spermatic cord at the external inguinal ring [2]. Seven years later, Goldstein et al. introduced microsurgical inguinal varicocelectomy (MIV) with testicular delivery for ligation of the gubernacular veins to reduce the incidence of testicular artery injury and varicocele recurrence [3]. Since the introduction of the microsurgical technique, microsurgical varicocelectomy (i.e., MIV or MSV) with testicular delivery has been regarded as the treatment of choice in adults for more than two decades. However, ligation of the gubernacular veins

and both the internal and external spermatic veins leaves the deferential veins as the only route for draining venous blood from the testis and epididymis. As a result, the deferential veins can be overloaded following varicocelectomy. In 2006, Ramasamy and Schlegel compared varicocelectomies with and without testicular delivery in adult men, and they found that varicocelectomy without testicular delivery had equivalent, if not more, beneficial effects on semen parameters without affecting varicocele recurrence rates [4]. Controversy still exists regarding the role of the gubernacular veins in varicocele pathogenesis. The gubernacular veins can contribute in part to varicocele recurrence but can also be a beneficial route of venous blood drainage from the testis after ligation of internal and external spermatic veins and prevent overload of the deferential veins. To our knowledge, there are no published studies in pediatric patients comparing the efficacy of varicocelectomy with and without testicular delivery (i.e., with or without ligation of the gubernacular veins). We hypothesized that testicular delivery during MSV in pediatric patients might be unnecessary and detrimental in terms of patient outcomes, namely varicocele recurrence. To test this hypothesis, we compared the results of MSV with and without testicular delivery in pediatric patients with varicocele.

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Table 1
Patient baseline data.

	MSV with TD	MSV without TD	Total	P-value
No of Patients	25	33	58	
Mean Age (years)	12.8 ± 3.08	13.2 ± 3.19	13.1 ± 3.11	0.598
BMI (kg/m ²)	19.6 ± 2.8	20.1 ± 3.1	19.9 ± 2.7	0.551
Grade of Varicocele				0.773
II	4	5	9	
III	21	28	49	

MSV; microsurgical subinguinal varicocelectomy; TD; testicular delivery.

1. Materials and methods

In this prospective comparative study, a total of 70 pediatric patients (from 5 to 18 years old) with grade II (i.e., palpable on routine physical examination without the need for Valsava maneuver) or III (i.e., visible to the eye and palpable on physical examination) varicocele on their left testicle underwent MSV between June 2003 and February 2013. Fifty eight out of 70 patients were followed up for at least 12 months with a mean follow-up duration of 15.8 ± 3.5 months. Indications for surgery were a size discrepancy of more than 15% with grade III varicoceles (25.8%), a size discrepancy of more than 20% with grade II or III varicoceles (53.4%), and testicular pain with grade II or III varicoceles (24.1%). Nine out of 58 (15.5%) and 49 out of 58 (84.5%) patients exhibited grade II and grade III varicoceles, respectively. A single urologist, Dr. Young Kwon Hong, carried out all MSV procedures involving separation of spermatic cord and microdissection of internal spermatic compartment. Great care was taken to preserve the testicular artery and all lymphatics. Testicular delivery was performed after ligation of the external and internal spermatic veins, and the gubernacular veins bigger than 2 mm in diameter were divided and ligated.

Patients were allocated to MSV with or without testis delivery using simple randomization. Testicle size was measured on every visit before and after surgery with a Prader testicle orchidometer. Postoperative outcomes were assessed in terms of varicocele recurrence, changes in testicular size, and complications including edema, pain, paresthesia, hydrocele, and testicular atrophy. Reappearance of palpable or visible varicoceles with physical examination during the follow-up was defined as varicocele recurrence. Statistical analyses were performed using independent sample t-test to evaluate variables (age, BMI, testis size, varicocele grade), chi-square tests for comparison of postoperative complications (recurrence, edema, scrotal pain, temporary paresthesia, hydrocele, atrophy) and logistic regression analyses to evaluate multiple factors associated with varicocele recurrence with Microsoft Excel and IBM SPSS statistics V21.0 (Statistical Package for Social Sciences™, Chicago, IL, USA).

2. Results

The mean age and BMI of patients who underwent MSV with testicular delivery were 12.8 ± 3.0 years and 19.6 ± 2.8 kg/m², respectively. The mean age and BMI of patients who underwent MSV without testicular delivery were 13.2 ± 3.1 years and 20.1 ± 3.1 kg/m²,

Table 2
Postoperative complications, testicular growth, and recurrence.

	MSV with TD	MSV without TD	Total	P-value
Edema	4 (16%)	2 (6.1%)	6 (10.3%)	0.227
Pain	8 (36%)	3 (9.2%)	11 (18.9%)	0.050
Scrotal Paresthesia	3 (12%)	0 (0%)	3 (5.2%)	0.031
Hydrocele or Testicular Atrophy	0 (0%)	0 (0%)	0 (0%)	Not significant
Size Change	3.9 ± 2.7 cm ³	4.4 ± 3.4 cm ³	4.2 ± 3.2 cm ³	0.547
Recurrence	5 (20%)	2 (6.1%)	7 (12.0%)	0.034

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respectively. There were no statistically significant differences in mean age ($P = 0.598$) or BMI ($P = 0.551$) between treatment groups (Table 1).

Of the 25 patients who underwent MSV with testicular delivery, 5 patients (20%) exhibited varicocele recurrence. Postoperative edema developed in four patients (16%) and resolved spontaneously within two months of surgery. Nine patients (36%) experienced scrotal pain postoperatively, which resolved after a short course of ibuprofen administration. Three patients (12%) experienced temporary paresthesia that resolved gradually over time. The mean size increase of the ipsilateral testicle after surgery was 3.9 ± 2.7 cm³.

In contrast, of the 33 patients who underwent MSV without testicular delivery, only two patients (6.1%) exhibited varicocele recurrence. Postoperative edema developed in two patients (6.1%). Three patients (9.2%) experienced scrotal pain postoperatively. None of the patients experienced postoperative paresthesia. The mean size increase of the ipsilateral testicle after surgery was 4.4 ± 3.4 cm³ (Table 2).

While there was no significant difference in size change of the ipsilateral testicle between patient groups ($P = 0.547$), significant differences were found in varicocele recurrence ($P = 0.034$), scrotal pain ($P = 0.050$), and temporary paresthesia ($P = 0.031$) favoring MSV without testicular delivery. There were no hydrocele and testicular atrophy in either group. Logistic regression analysis revealed that there were no significant differences in variables associated with varicocele recurrence (age, BMI, varicocele grade, follow-up duration) except the surgical technique utilized ($P = 0.041$).

Of the seven patients who experienced varicocele recurrence, three underwent redo surgery (MSV), one underwent varicocele embolization, and three with grade II varicoceles were monitored over time with follow-up visits.

3. Discussion

Clinical varicoceles are present in approximately 15% of the general male population, in up to 35% of men with primary infertility, and up to 75% of men with secondary infertility [5,6]. Varicocele is the primary cause of correctable male infertility. Indications for varicocelectomy include infertility, persistent pain, and significant testicular asymmetry in children or adolescents. The ideal method of varicocele treatment remains controversial. Varicocele embolization is a nonsurgical option. In a retrospective study conducted by a Canadian group, including 41 pediatric patients who underwent varicocele embolization, the success rate and recurrence rates were 95% and 10%, respectively [7]. In a most recent study done by a Switzerland group [8], the results were comparable, yielding a technical success of 93% and a recurrence rate at 13%. Compared to the main surgical methods, embolization has an equivalent technical success rate. Given the idea that the testis remains in situ without testis delivery in varicocele embolization, we can also compare the results of that procedure with our results without testicular delivery, finding that the recurrence rate is slightly higher in embolization group (10%–13% versus 6.1%).

Surgical options for varicocele repair include the traditional inguinal (Ivanissevich) or high retroperitoneal (Palomo) approaches, laparoscopic repair, and microsurgical repair via an inguinal or

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