One-layer vasovasostomy: microsurgical versus loupe-assisted

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Objective: To compare the outcomes of microsurgical versus loupe-assisted technique for vasectomy reversal.
Design: Retrospective comparative study with randomization.
Setting: University hospital male infertility clinic.
Patient(s): Fifty men with obstructive azoospermia after vasectomy.
Intervention(s): One-layer vasovasostomy with microscope (group I) or optical loupe (group II).
Main Outcome Measure(s): Patency, pregnancy, operation time, postoperative stricture.
Result(s): Mean operation time was 106.4 ± 10.3 minutes in group I and 78.3 ± 5.7 minutes in group II, showing a statistically significant difference. Analysis of semen sampled from men, who succeeded in getting vasal patency, was performed finally at the sixth month after surgery and showed sperm concentrations of 21.5 million/mL and 20.7 million/mL and sperm motilities of 32.5% and 30.8% in groups I and II, respectively, without a statistical significance. Patency rates were 96% (24 out of 25) in group I and 72% (18 out of 25) in group II, showing a statistically significant difference. Pregnancy rates were 40% (10 out of 25) in group I and 28% (7 out of 25) in group II. There was no statistically significant difference in pregnancy rate between the two groups. Postoperative vasal stricture occurred in four patients, all of them from group II. There was no operation-related complication, such as hematoma or wound infection.
Conclusion(s): Microscopic technique yielded a higher patency rate than loupe-assisted technique, possibly by reducing the chance of postoperative vasal stricture. (Fertil Steril® 2010;94:2308–11. ©2010 by American Society for Reproductive Medicine.)

Key Words: Vasectomy reversal, vasovasostomy, microscopic, loupe-assisted, patency, pregnancy, operation time, postoperative vasal stricture

Vasectomy has been widely accepted as a male contraception. Increase in divorce/remarriage and increasing desire for more babies after vasectomy have become two major causes of vasectomy reversal in Korea. In 1919, Quinby and O'Conor performed the first vasovasostomy (1). Since then, many techniques for vasovasostomy have been described, with each author suggesting his or her technique as the most effective procedure. Despite the fact that many factors determine pregnancy rates, such as the timing of reversal surgery from previous vasectomy, the presence of sperm granuloma, epididymal obstruction, and sperm antibody (2), the success of vasovasostomy depends greatly on the surgeon's experience with the actual surgical technique.

In the past, most vasovasostomies were performed by a macroscopic technique with the use of an indwelling stent. Recently, the microscopic approach has been popularized such that many surgeons using the technique believe it to be the procedure of choice for restoration of fertility after vasectomy (3). However, some surgeons reported that careful macroscopic surgery with loupes and fine suture material and skillful technique of the surgeon results in good outcomes. It is important to determine the technique of choice for this procedure. In the present study we compared microscopic and loupe-assisted techniques for one-layer vasovasostomy (OLV).

Received July 24, 2006; revised and accepted December 3, 2009; published online January 13, 2010.
S.H.J. has nothing to disclose. Y.K.H. has nothing to disclose.
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MATERIALS AND METHODS

We retrospectively reviewed the charts and surgical records of all surgical procedures performed on a series of 56 patients who had OLV between June 2003 and April 2005. Six out of 56 patients were lost to follow-up, and we analyzed the data of 50 patients. Twenty-five men had microsurgical (×16–×25) vasovasostomy (group I), and another 25 men had loupe-assisted (×4) vasovasostomy (group II) performed in the same time period if the microscope was not available because it was shared with other surgeons. Treatment allocation was determined only by the availability of the microscope, which can be considered to be a kind of randomization process. Each operation was performed under general anesthesia, with the same operative method (OLV) by the same surgeon (Y.K.H.) who was experienced with both techniques.

The primary outcome measure was patency, and secondary outcome measures were pregnancy, operation time, and complication. We compared patients' characteristics, operation time, patency rate, pregnancy rate, and complication between the two groups. Semen analysis was performed at the first, third, and sixth months after surgery. Patency was defined as a presence of motile sperm at the sixth month after surgery. Pregnancy was determined at least 2 years after reversal of vasectomy. Disappearance of motile sperm that had been found on ejaculated semen at the first or third month after surgery was considered to be postoperative vasal stricture. This study was approved by the Institutional Review Board. The comparison of patency and pregnancy rates between the groups was analyzed statistically using the chi-squared test, and the comparison of operative duration used the unpaired t test, with $P<.05$ considered to indicate statistical significance (SPSS version 17).

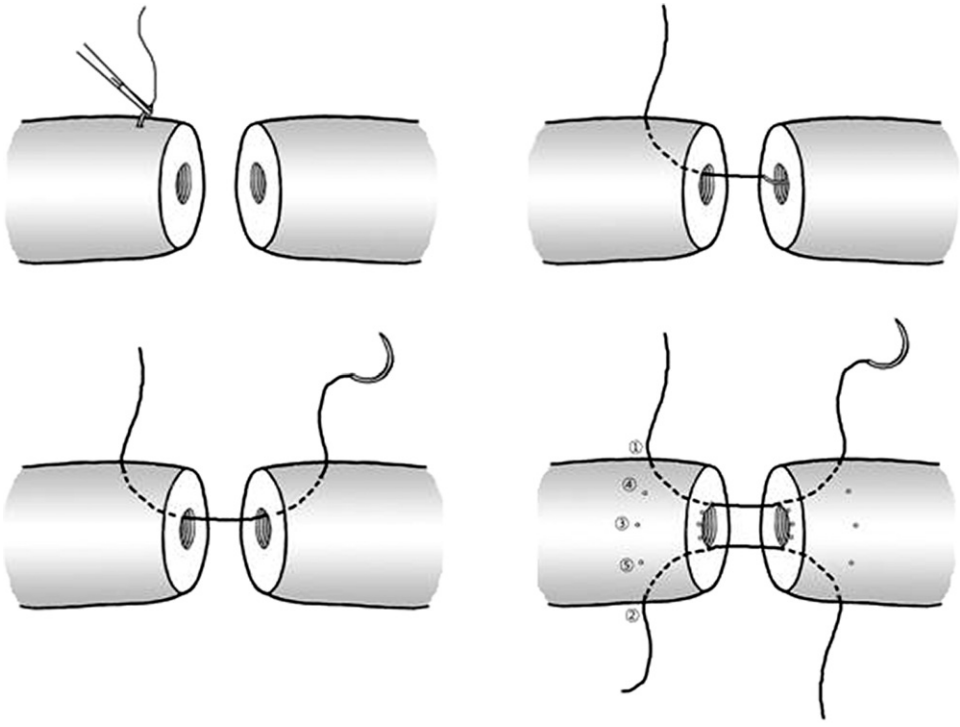
Microscopic Approach (Fig. 1)

Bilateral scrotal incisions were made with localization of the previous vasectomy site using penetrating towel clamps. The scar tissue was excised, and a patent vas was identified both proximally and distally, and the distal vas

0015-0282/$36.00
doi:10.1016/j.fertnstert.2009.12.013

FIGURE 1

Technique of one-layer vasovasostomy. All sutures were interrupted, approximating the full layers of vas including the margin of vasal mucosa, to minimize an intraluminal exposure of suture material, with five sutures at the front. The vas was turned over and a further three sutures were placed at the back.



Jee. Microscopic OLV vs. loupe-assisted OLV. Fertil Steril 2010.

was spatulated or dilated with fine lacrimal probes. Milky fluid oozing from the proximal vasal lumen was considered to be encouraging evidence of patency, but microscopic analysis was not done routinely. An approximating clamp held the two divided ends together and white background material was placed behind to improve visibility. The vas deferens were viewed by magnification from ×16 to ×25 using a microscope (Universal S3; Carl Zeiss) with foot controls for focusing and zooming and a double-head unit. A 9-0 nylon suture material was used to create one-layer anastomosis (Fig. 1). All sutures were interrupted, approximating the full layers of vas including the margin of vasal mucosa to minimize an intraluminal exposure of suture material, with five sutures at the front. The vas was turned over and a further three sutures were placed at the back. In some cases, a few perivasal approximating sutures were added to reduce an anastomotic tension and to improve a circulation. There were no difficulties in obtaining a sufficient length of vas to create a tension-free anastomosis and to retain the testis in the scrotum. The patients remained in bed until the next morning and then were allowed to get up and move about. Ice packs were used only for undue swelling or discomfort.

Macroscopic Approach

Surgical procedures of macroscopic vasovasostomy were identical to that of the microscopic procedure except for the use of optical loupes (BLS-3; Neitz) and 8-0 nylon suture material.

RESULTS

Mean age of the men was 39.1 ± 5.3 years in group I and 38.7 ± 4.5 years in group II. Mean age of the wives was 34.4 ± 4.7 years in group I and 33.6 ± 4.3 years in group II. Time period from vasectomy to reversal varied from 1 to 18 years with a mean of 7.1 years in group I, and from 1 to 16 years with a mean of 6.9 years in group II. The most common reason for reversal was divorce and remarriage. There were no significant differences in factors affecting the ejaculate of sperm, such as time period from vasectomy to reversal, presence of sperm granuloma, character of vasal fluid, and degree of vasal dilation. Mean operation time was 106.4 ± 10.3 minutes in group I and 78.3 ± 5.7 minutes in group II, showing a statistically significant difference (P=.026), as shown in Table 1.

Analysis of semen sampled from men who succeeded in getting vasal patency was performed finally at the sixth month after surgery and showed sperm concentrations of 21.5 million/mL and 20.7 million/mL and sperm motilities of 32.5% and 30.8% in groups I and II, respectively. These differences were not statistically significant. Patency rates were 96% (24 out of 25) in group I and 72% (18 out of 25) in group II. There was a significant difference in patency rate between the two groups (P=.021). Pregnancy rates were 40% (10 out of 25) in group I and 28% (7 out of 25) in group II. There was no statistically significant difference in pregnancy rate between the two groups (P=.319). One subject from group I and three subjects from group II did not have a motile sperm on the postoperative semen analysis at any visit. On the other hand, four subjects from group II had motile sperms in their first semen analysis after surgery but lost them in the follow-up semen analysis performed. There was no operation-related complication, such as hematoma or wound infection.

TABLE 1

Outcomes of microsurgical versus loupe-assisted vasovasostomy.

Measure	Microsurgical	Loupe-assisted	*P* value
Mean operation time ± SD (min)	106.4 ± 10.3	78.3 ± 5.7	.026
Sperm concentration (10^6/mL)[a]	21.5	20.7	.821
Sperm motility[a]	32.5%	30.8%	.744
Patency rate[a]	96%	72%	.021
Pregnancy rate[b]	40%	28%	.319
Postoperative stricture (n)[c]	0	4	.037

[a] Based on semen analysis performed at 6 months after surgery.
[b] Minimum follow-up of 2 years.
[c] Defined as a condition of change from presence of motile sperm at first or third month to absence of motile sperms at sixth month after surgery.

Jee. Microscopic OLV vs. loupe-assisted OLV. Fertil Steril 2010.

DISCUSSION

Since the first successful vasovasostomy was reported in 1919, various techniques of anastomosis have been developed (1–4). The two-layer anastomosis under microscope has the advantage of precise mucosal approximation between the smaller lumen of the distal vas and the larger lumen of the proximal vas. However, a potential disadvantage of the two-layer vasovasostomy is that many knots of suture are left just outside the lumen, which theoretically may cause fibrosis and lead to stricture. Also, from a technical point of view, the two-layer vasovasostomy is more difficult and time consuming. A modified one-layer vasovasostomy (MOLV) therefore was advocated by some surgeons, because fewer sutures pass through the lumen, and more importantly it is easier to perform and saves operating time (5, 6). The results of this technique have been compared favorably with the two-layer technique in terms of patency and pregnancy rates (7). A theoretic disadvantage of MOLV is that mucosal approximation may not be adequate for avoidance of sperm leakage and granuloma formation. A truly randomized study of the modified microscopic single-layer versus two-layer vasovasostomy, performed by surgeons facile in both techniques, has not yet been reported. Our choice in the present study was a "true, not modified" one-layer method of suturing the full thickness of the vas in a stitch including a minimum of mucosa, to prevent not only knot-induced fibrosis which may be induced in the two-layer method, but also sperm leakage which may be induced in the modified one-layer method.

Macroscopic technique with the use of a stent is a classic method of vasovasostomy. Because of the problems produced by the stent, many surgeons recommend to omit them in macroscopic vasovasostomy. Schmit (5) suggested that stents are unnecessary to support the anastomosis or allow for mucosal alignment. Amelar and Dubin (8) used a nonstented full-thickness anastomosis with 6-0 polypropylene and ×4 magnification, and reported an 88% return of spermatozoa and a 53% pregnancy rate. Schmidt (9) used a full-thickness anastomosis with ×2.5 magnification and reported an 80% return of spermatozoa and a 31% pregnancy rate.

Microsurgical vasovasostomy was first popularized in 1975 when Silber (10) described his technique; subsequently, he published improved results suggesting the superiority of this technique (11). He reported that macroscopic surgery led to an inaccurate alignment of vas mucosa, with resultant leakage of sperm, granuloma formation, obstruction and stricture at the site of anastomosis, and inhibition of spermatogenesis with obstruction to its flow (12). Histologic section of a failed vasovasotomy in this setting showed extensive granuloma formation with multiple channels and decreased sperms (13).

There is a consensus in the literature that microscopic vasovasostomy is technically superior to the macroscopic one. Lee and McLoughlin (14) reported their comparison of macroscopic and microscopic vasovasostomy techniques: a 90% return of spermatozoa and a 46% pregnancy rate for macroscopic anastomosis with nonabsorbable monofilament internal stent, and a 96% return of spermatozoa and a 54% pregnancy rate for a two-layer microscopic

TABLE 2

Results of vasectomy reversal: comparison of previous studies.

	No. of patients	Patency rate	Pregnancy rate	Method
Lee and Mcloughlin (14)	61	90	46	One-layer macroscopic
	26	96	54	Two-layer microscopic
Cos et al. (15)	—	80	51	Macroscopic
	—	87	57	Microscopic
Hsieh et al. (4)	32	89	39	One-layer macroscopic
	42	93	43	Microscopic
Amelar and Dubin (8)	—	88	53	Macroscopic
Feber and Ruiz (19)	160	87	38	Macroscopic
Phadke and Phadke (20)	76	83	55	Macroscopic (stent)
Schmidt (9)	—	80	31	Macroscopic

Jee. Microscopic OLV vs. loupe-assisted OLV. Fertil Steril 2010.

anastomosis. Cos et al. (15) reported that macroscopic vasovasostomy resulted in an average patency rate of 80% and an average pregnancy rate of 51% and microscopic vasovasostomy had an average patency rate of 87% and an average pregnancy rate of 57%. Hsieh et al. (4) compared patency rate and pregnancy rate of MOLV according to the use of a microscope or optical loupes, and reported a 89% patency rate and 39% pregnancy rate for the macroscope group and a 93% patency rate and 43% pregnancy rate for the microscope group. They reported that there was no significant difference in the patency and pregnancy rates between loupe-assisted and microscopic surgery.

There are several different findings between the present study and Hsieh et al.'s. First, the definition of patency was different. In the report by Hsieh et al., patency was defined as the presence of motile sperm in the ejaculate at follow-up. There was no comment about follow-up period. But we defined patency as a presence of motile sperm at the sixth month (third visit) after surgery and introduced the concept of "postoperative vasal stricture," defined as disappearance of motile sperm that had been found on ejaculated semen at the first or third month after surgery. Second, the operation methods were different. We choose a "true" (not modified) one-layer method by suturing the full thickness of the vas in a stitch including a minimum of mucosa, whereas Hsieh et al. choose a modified one-layer method.

In the present paper, we report a 72% patency rate and 28% pregnancy rate in the loupe-assisted group, and a 96% patency rate and 40% pregnancy rate in the microscope group. In this study, patency rate and pregnancy rate of the loupe-assisted group were lower than those previously reported (Table 1, 2). The lower patency rate in the loupe-assisted group in the present study could be due to the concept of postoperative vasal stricture. Defining patency simply as return of sperm after surgery, the patency rate of the loupe-assisted group in the present study would be 88%, because four cases of postoperative vasal stricture would have been classified as patent. Furthermore, the size of suture material differed in this retrospective study between the two groups. However, there is no convincing data whether 9-0 nylon would yield a better or worse result than 8-0 nylon.

In the present study, the mircoscopic group showed a statistically higher patency rate and a numerically higher pregnancy rate compared to macroscopic group. The patency rate of the microsurgical group was 96%, consistent with other studies reported. The establishment of a watertight anastomosis between the two divided ends of the vasa with no stricture formation is essential for a successful vasectomy reversal. This is not easy to achieve without a microscope, because the inner lumen of the thick-walled vas deferens is <1 mm in diameter and there is often a disparity between the two ends, owing to dilatation of the obstructed testicular part. The passage through the anastomotic site must be free and unobstructed to facilitate a large number of the most active sperm to emerge from the epididymis during intercourse (16). Unobstructed flow of semen from the testis in a thick-walled structure with dissimilar narrow lumen ends cannot be achieved consistently with anything other than the most accurate microsurgical technique (17). Disadvantages of the microscopic technique include need for mastery of microsurgery and variation in surgical time, with microsurgery taking $\sim$2.5 hours and macrosurgery taking $\sim$1.25 hours (17, 18).

In conclusion, microscopic technique yielded a higher patency rate than loupe-assisted technique, possibly by reducing the chance of postoperative vasal stricture. Microsurgical vasovasostomy still seems to be a standard method for restoration of fertility after vasectomy.

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