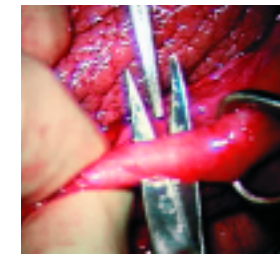
MICROSURGICAL VASECTOMY REVERSAL

TECHNIQUES TO IMPROVE OUTCOME



By Edward Karpman, MD, Daniel H. Williams IV, MD, and Larry I. Lipshultz, MD

In the United States today, men are playing a greater role in couples' decisions regarding permanent contraception than they did in past generations. The latest available data from the Centers for Disease Control show that 13.6% of married men chose vasectomy as a form of contraception, with approximately 500,000 procedures performed annually.[1,2] Of these men, 2% to 6% will desire reversal of their vasectomy at a later time.[3] Reasons include re-marriage, desire for further fertility, loss of a child, and chronic testicular pain.

Vasectomy reversal can be performed in a variety of ways. Both macro- and microsurgical techniques have been described and are currently being used by practicing urologists and male infertility specialists. Owen is credited with the first microsurgical method for reconstructing the vas deferens, and his technique is the predecessor of the modern day 2-layer microscopic vasovasostomy.[4,5]

Variability exists in the size and number of sutures used as well as in the number of layers anastomosed. Recently, attempts have been made to minimize the number of sutures used by placing surgical fibrin glue on the outer layer. While innovative, experience with this new technique is minimal. Adverse consequences include glue leakage into the vasal lumen and associated risks and the inability to adequately reapproximate disproportionately sized lumens.

PREDICTORS OF SUCCESS

Outcomes and predictors of success for vasectomy reversal have been published in the literature. Lee reported one of the largest and most detailed single-surgeon experiences with both macrosurgical and microsurgical vasovasostomy.[6] He found that although initial patency rates appeared similar for the 2 groups (85% and 91%, respectively), pregnancy rates were better for the microsurgical group (52% vs. 35%). Additionally, decreasing postoperative sperm counts and ultimate azoospermia were more commonly associated with the macrosurgical approach, likely due to secondary fibrosis at the anastomosis.

The Vasovasostomy Study Group evaluated predictors of success in 1,469 microsurgical vasectomy reversals and found that the length of the obstructive interval was inversely related to the pregnancy rate.[7] The absence of sperm in the testicular end of the vas at the time of surgery was also inversely correlated with pregnancy. Additional intraoperative findings that correlated with sperm quality at the time of vasectomy reversal included the presence or absence of a sperm granuloma at the vasectomy site and the gross appearance of the fluid from the testicular end of the vas.[8,9]

In our experience, an increased length of the testicular vasal remnant was predictive of the presence of sperm at the time of surgery.[10] Testicular vasal remnants longer than 2.7 cm had a 94% chance of having whole sperm at the time of surgery, whereas smaller vasal remnants had an 85% probability of no sperm in the inspected fluid.

The duration of the obstructive interval, the presence or absence of a sperm granulo-

Microsurgical vasovasostomy and epididymovasostomy are effective means of vasectomy reversal for couples desiring fertility. The key to success—and the hard part—is meticulous reapproximation of the vasal or epididymal segments.

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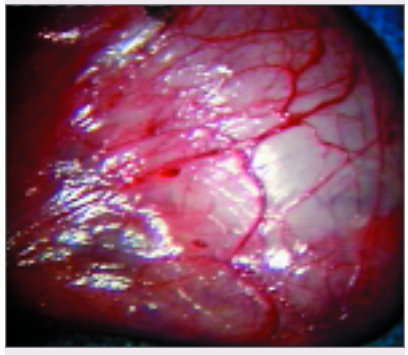
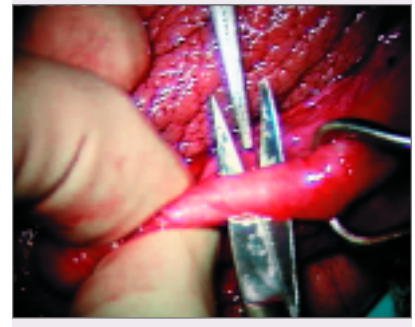
FIGURE 1
Delivering testis



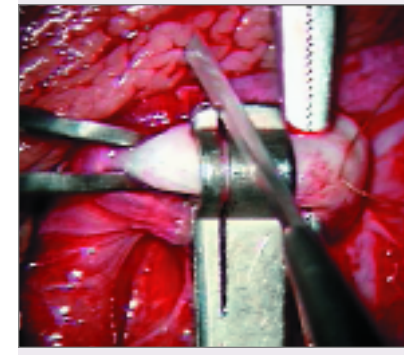
The testicle is delivered with the tunica vaginalis intact.

FIGURE 2
Isolating the vas deferens



The testicular end of the vas is isolated with a penetrating towel clamp and is dissected free.

FIGURE 3
Transecting the vas deferens



A nerve holder is used to stabilize the vas as it is transected.

ma, the gross appearance of the fluid, and the length of the testicular vas are all predictive of whether or not sperm will be found at the time of vasectomy reversal. The presence of sperm at the time of vasectomy reversal is predictive of a successful vasovasostomy procedure.

REASONS FOR FAILURE

Unsuccessful vasovasostomy for vasectomy reversal has been attributed primarily to surgical technique and failure to recognize a secondary epididymal obstruction (SEO), which can develop after vasectomy. Silber characterized the phenomenon of SEO as a result of epididymal extravasation following vasectomy and recommended epididymovasostomy to bypass the obstruction.[11] The need to perform epididymovasostomy has been reported to be as high as 62% in patients undergoing reversal 15 or more years after vasectomy.[12] Unrecognized SEO was the cause of failure in almost half of patients presenting for a repeat vasovasostomy.[13] For these reasons, surgeons performing vasectomy reversal should be experienced at microsurgery and prepared to perform epididymovasostomy based on the intraoperative findings.

CHOOSING A TECHNIQUE

Microscopic epididymovasostomy was first performed in an end-to-end fashion.[14] This technique was succeeded by a microscopic end-to-side approach. A newer technique of triangulation end-to-side intussusception epididymovasostomy has been reported.[15] Variations on the intussusception technique have included transverse and vertical suture placement of only 2 needles.[16,17] Comparable patency (range, 81%-92%) and pregnancy (range, 37%-40%) rates have been reported for all of these approaches. Therefore, technique selection should be based on the individual surgeon's experience and preference.[14-18]

In the literature, significant emphasis is placed on the number of mucosal sutures used and the manner in which they are placed. In our experience, other factors are equally important. Making the appropriate decision to perform a vasovasostomy or an epididymovasostomy, adequate mobilization of the abdominal vas with preservation of the perivasal blood supply, and tension-free advancement of the vas are instrumental for a successful vasectomy reversal. Bridging the defect created by vasectomy in a tension-free manner often represents the most difficult part of the operation.

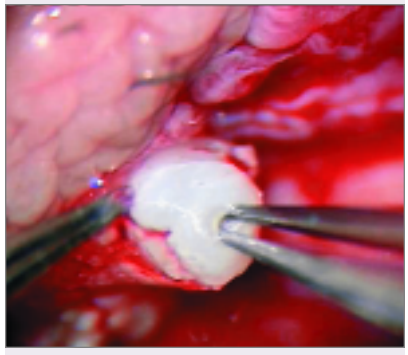
The following descriptions of microsurgical vasovasostomy and epididymovasostomy are based on the experience at our institution. As described above, variations on both techniques exist, and surgeons should use the approach that offers their patients the best chances of pregnancy, in the shortest time, and in the most cost-effective manner. Our tech-

TABLE 1
Vasal fluid appearance and indications for vasovasostomy or epididymovasostomy

Sperm quality	Comments	Reversal technique
Whole sperm	+/- motile	VV
None	Clear fluid, < 5 y since vasectomy	VV
Heads and tails	< 10 y since vasectomy	VV
Heads	Thick fluid	VV or EV
None	Thick, creamy/ pasty fluid	EV

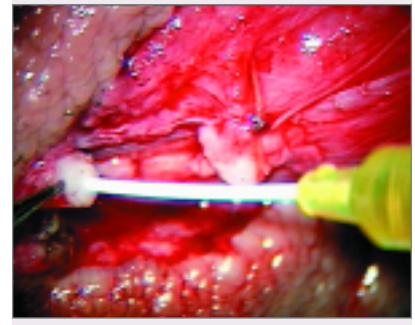
VV = vasovasostomy; EV = epididymovasostomy.

FIGURE 4
Dilating the vas deferens



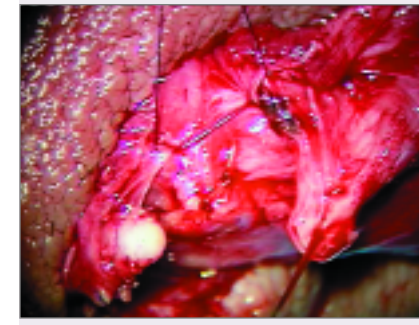
The cut end of the abdominal vas is dilated with a fine jeweler's forceps.

FIGURE 5
Intubation and irrigation



Using a 25-gauge angiocatheter syringe, the abdominal end of the vas is intubated and irrigated with normal saline.

FIGURE 6
Approximating the vas deferens



A 5-0 suture is placed in the adventitial tissue and is used to approximate the cut ends of the vas.

nique of vasovasostomy has been described previously.[19] See "CPT codes for vasectomy reversal and sperm aspiration" on this page for coding information.

PREOPERATIVE PROTOCOL

The preoperative evaluation and setup are similar for both vasovasostomy and epididymovasostomy. All patients are offered sperm aspiration and cryopreservation prior to vasectomy reversal. The preservation of sperm allows the patient to pursue assisted reproductive techniques without undergoing additional surgical procedures in case the reversal is not successful.

Patients are admitted to the ambulatory surgery center, and general anesthesia is administered. The patient is placed in the supine position and is prepared by shaving the scrotum and scrubbing with sterile Betadine. An operative microscope providing variable magnification from 3× to 25× is positioned at the beginning of the case and is used for the entire procedure.

TWO-LAYER VASOVASOSTOMY

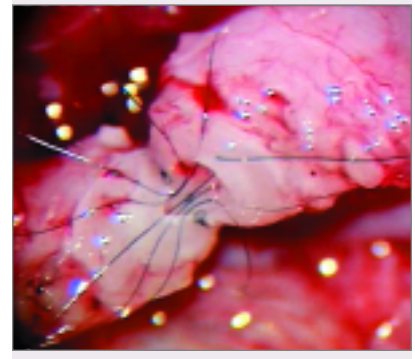
A vertical incision is made in the hemiscrotum, and the testicle is delivered with the tunica vaginalis intact (Figure 1). The site of the previous vasectomy is palpated to identify sperm granuloma, and the testicular end of the vas is measured. The vas is isolated with a penetrating towel clamp and dissected free from the surrounding tissue (Figure 2). Care is taken not to devascularize the perivasal tissue. A 5-0 chromic stay suture is placed in the muscular layer of the testicular vas to prevent retraction. A nerve holder (#3.0 or #4.0) is used to stabilize the vas, and a Dennis blade is used to transect it at a right angle (Figure 3).

Fluid from the testicular end of the vas is grossly inspected for quality. The fluid is collected and plated on a slide and then inspected using light microscopy. The decision to proceed with vasovasostomy or epididymovasostomy is based on the absence or presence of sperm or sperm parts under the microscope as well as the gross quality of the fluid (Table 1). If motile sperm are identified, they are collected and cryopreserved based on patient preference.

When a decision to proceed with a vasovasostomy has been made, a site on the vas above the previous vasectomy site is identified. This site is isolated, dissected out, and transected in a fashion similar to that performed for the testicular end of the vas. Care must be taken not to mobilize an excessive amount of abdominal vas as this may jeopardize the perivasal blood supply. The isolated segment of vas is tied at each end using a 3-0 chromic suture.

The abdominal and testicular ends of the vas are dilated using a fine jeweler's forceps (Figure 4), and the luminal diameter and the discrepancy between the 2 ends are evaluated. The abdominal end of the vas is intubated with a 25-gauge angiocatheter syringe and is irrigated with normal saline to confirm distal patency of the lumen (Figure 5). A 5-0 polydioxanone su-

FIGURE 7
Suture placement



A web-like appearance is created after placement of 10-0 nylon sutures.

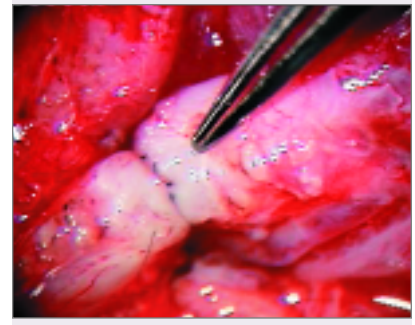
CPT codes for vasectomy reversal and sperm aspiration

Vasovasostomy	55400
Epididymovasostomy	54900
Sperm aspiration	55899

ture is placed in the adventitial tissue at the base of each cut end of the vas and tied. This maneuver approximates the cut ends of the vas (Figure 6).

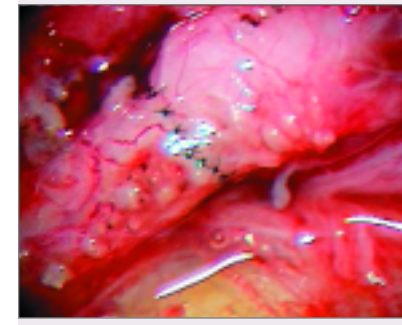
Prior to creating the anastomosis, a fine-tip marking pen is used to mark the 6-o'clock position. A 9-0 nylon suture is used to reappose the serosal layer at the 5-, 6-, and 7-o'clock positions. Next, double-armed 10-0 nylon sutures are placed in the vasal mucosa at similar positions and tied. Five additional double-armed 10-0 nylon sutures are then placed at the 1-, 3-, 9-, 11-, and 12-o'clock positions of the vasal mucosa prior to tying, creating a web-like appearance (Figure 7). The mucosal sutures are then tied to provide a watertight mucosal apposition (Figure 8). An adequate number of 9-0 nylon sutures are placed in the serosa to create a tension-free anastomosis (Figure 9).

FIGURE 8
Completed inner layer



Appearance of completed vasal mucosa layer, demonstrating watertight mucosal apposition.

FIGURE 9
Completed outer layer



Appearance of completed vasal serosa layer, demonstrating a tension-free anastomosis.

END-TO-SIDE EPIDIDYMOVASOSTOMY

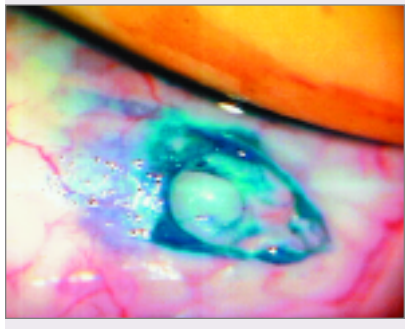
When a decision to perform an epididymovasostomy has been made, a segment of the abdominal vas is mobilized in a manner similar to that used when performing a vasovasostomy. This segment must be longer than that used in the vasovasostomy procedure to bridge the gap created by the vasectomy.

The tunica vaginalis is opened, and the testicle and epididymis are delivered. The epididymis is inspected, and an area proximal to the presumed site of obstruction is identified. The tunic of the epididymis is opened with a pair of dissecting microscissors. Using a pair of fine jeweler's forceps, a single epididymal tubule is carefully dissected (Figure 10). Methylene blue is used to better outline the single tubule. Next, using the dissecting microscissors a circular opening is cut tangentially at the apex of the epididymal tubule.

Fluid is collected from the tubule with a 25-gauge angiocatheter syringe and is plated on a slide. When motile sperm are not identified, a similar exploration is performed on the epididymis more proximal to this location. When motile sperm are identified and if the patient has requested it, the sperm are harvested for cryopreservation. After the tubule is prepared and sperm are confirmed on light microscopy, double-armed 10-0 nylon sutures are carefully placed at the 3-, 6-, 9-, and 12-o'clock positions in the lumen of the epididymal tubule (Figure 11).

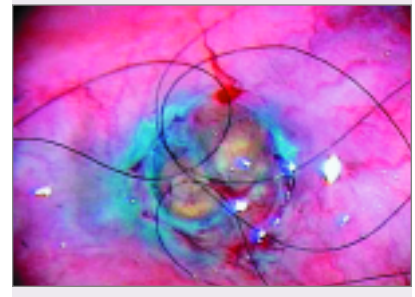
Next, the previously mobilized abdominal end of the vas is brought through an opening created in the tunica vaginalis. The adventitia of the vas is secured to the tunic of the epididymis using a 5-0 polydioxanone suture at a point approximately 1 cm below the cut edge (Figure 12). An additional 7-0 Prolene suture can be placed in a similar manner, but more distally, on the vas to advance it closer to the anastomotic site. This step-wise progression

FIGURE 10
Isolated epididymal tubule



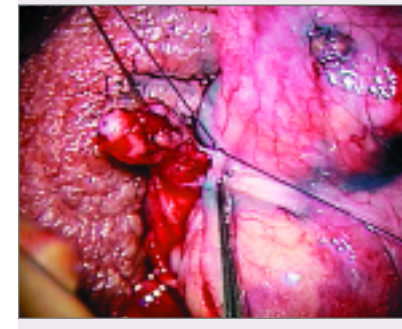
A single epididymal tubule is isolated from the epididymis.

FIGURE 11
Creating the mucosal anastomosis



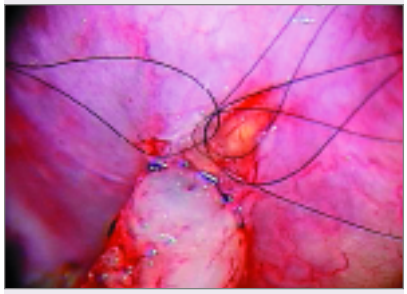
Four 10-0 nylon sutures are used to create the mucosal anastomosis.

FIGURE 12
Securing the vas deferens



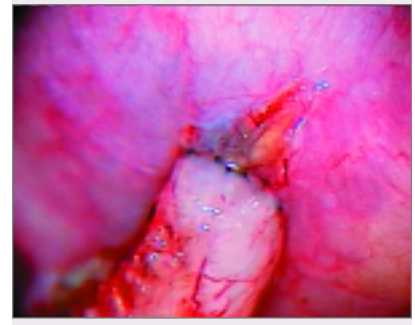
The abdominal vas is secured to the epididymal tunic using a 5-0 suture.

FIGURE 13
Securing the serosal edge



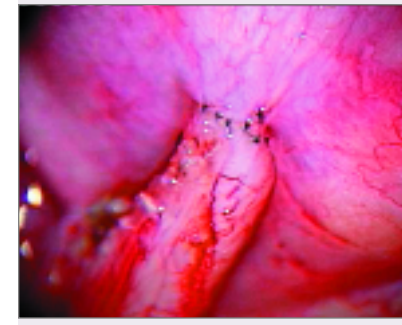
The serosal edge of the vas is secured to the epididymal tunic with 9-0 nylon sutures at the 5-, 6-, and 7-o'clock positions.

FIGURE 14
Completed inner layer



Appearance of the completed mucosal anastomosis, demonstrating a watertight mucosal apposition.

FIGURE 15
Completed outer layer



Appearance of completed serosa-tunic anastomosis, demonstrating a tension-free anastomosis.

of the securing sutures from 5-0 to 7-0 to 9-0 allows the vas to be incrementally advanced closer to the anastomosis for ultimate placement of the mucosal sutures. The serosal edge of the vas is then secured to the opened edge of the epididymal tunic using 9-0 nylon sutures at the 5-, 6-, and 7-o'clock positions (Figure 13).

The previously placed double-armed 10-0 nylon sutures are individually placed through the vasal mucosa. The sutures are tied to create a watertight mucosal apposition between the vas and the epididymal tubule (Figure 14). Additional 9-0 nylon sutures are placed through the serosal edge of the vas and the epididymal tunica, releasing tension off of the mucosal sutures (Figure 15). Next, the testicle is replaced inside the tunica vaginalis, which is then closed.

CONCLUSION

Vasovasostomy and epididymovasostomy are effective means of reversing a vasectomy for couples desiring fertility. The microsurgical approach appears to offer the best results for these patients when microsurgical principles are meticulously adhered to, permitting the creation of a watertight, tension-free anastomosis. Microsurgical reconstruction remains the most natural and cost-effective way of achieving pregnancy with a better chance of success than proceeding directly to sperm aspiration and assisted reproduction. Success rates are higher even when the more complex epididymovasostomy procedure or a repeat vasectomy reversal is performed or when the patient's partner is an older female.[20-23] CU

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