Vasectomy reversal

Practice Committee of the American Society for Reproductive Medicine

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The purpose of this Technical Bulletin is to review the perioperative evaluation of men seeking vasectomy reversal and the microsurgical techniques involved in the procedure. (Fertil Steril® 2008;90:S78–82. ©2008 by American Society for Reproductive Medicine.)

Vasectomy is an elective surgical sterilization procedure for men that is intended to obstruct or remove a portion of both vas deferens, thereby preventing sperm from moving from the testes to the ejaculatory ducts. Although intended for permanent sterilization, vasectomy can be reversed in most men seeking to restore their fertility due to a change in marital status or reproductive goals. The purpose of this document is to review the peri-operative evaluation of men seeking vasectomy reversal and the microsurgical techniques involved in the procedure.

PATIENT EVALUATION

Although vasectomy reversal is technically feasible in most men, its indications and ultimate success depend on both male and female fertility factors (1). The age and fertility of the female partner should be considered carefully in discussions regarding prognosis for achieving a successful pregnancy after vasectomy reversal (2). Men who request vasectomy reversal for reasons other than to restore fertility, such as for psychological reasons or relief from pain, should be offered counseling or more conservative methods of pain management before proceeding with vasectomy reversal. Although the pathogenesis of post-vasectomy pain syndrome is unknown, vasectomy reversal may provide effective relief in carefully selected individuals (3).

Physical examination may reveal that large segments of the vas deferens were removed and help to identify those in whom the standard incision may need to be modified. Examination also may reveal testicular abnormalities or epididymal induration. Epididymal fullness suggests obstruction at that level but may not predict accurately which patients will require vasoepididymostomy (4). A predictive model based on age and time since vasectomy may be helpful for identifying men more likely to require vasoepididymostomy (5).

PREOPERATIVE TESTING

No specific or unique preoperative laboratory evaluation is needed before performing vasectomy reversal, beyond any routine preoperative tests that may be required or preferred. Approximately 60% of men develop circulating antisperm antibodies after bilateral vasectomy (6). Some investigators have suggested that such antibodies may decrease the chance for successful pregnancy after vasectomy reversal (7, 8). However, the overall postoperative conception rate is relatively high (50% to 70%) (9), and the presence of antisperm antibodies does not correlate closely with postoperative fecundability. Consequently, the value of preoperative antisperm antibody testing remains controversial and unproven (10–13).

Before vasectomy reversal is performed to restore fertility, evaluation of the female partner's reproductive potential is prudent and recommended, being no less important than evaluating the male partner of a woman seeking elective sterilization reversal. The alternative to vasectomy reversal—epididymal or testicular sperm aspiration or extraction and in vitro fertilization (IVF) or intracytoplasmic sperm injection (ICSI)—also should be presented and discussed. The choice between vasectomy reversal and assisted reproductive technologies (ART) also should consider whether the couple plans to have one or more children as well as the comparative costs of the two strategies. Available data suggest that the cost per live birth achieved with ART can be greater than that associated with vasectomy reversal (14, 15).

OPERATIVE CONSIDERATIONS

Anesthesia

Vasectomy reversal may be performed using local, regional, or general anesthesia; the choice depends entirely on the preferences of the surgeon and patient. Local anesthesia may be administered by infiltration of the spermatic cord at the level of the pubic tubercle and/or by infiltration of peri-vasal tissue immediately above the vasectomy site.

Placement of Incision

A vasectomy reversal usually is performed through vertical incisions in the anterior aspect of the scrotum on each side. When the vasectomy was performed high in the scrotum or removed a large segment of the vas deferens, it may be necessary to extend the scrotal incisions upward into the lower inguinal region or to use an infrapubic incision (16). An infrapubic incision provides ready access to a vasectomy site high in the scrotum and to the abdominal vas when it must be mobilized to bridge the gap between the "vasal" ends and to avoid tension at the anastomotic site.

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General Intraoperative Considerations

When not required to isolate the ends of the vas for vasovasostomy, exposure of the testis and epididymis should be avoided in an effort to prevent adhesions to the tunica vaginalis that could render a later vasoepididymostomy, if needed, more technically difficult. The ends of the vas deferens above and below the vasectomy site generally can be exposed adequately via vertical scrotal incisions measuring 2 to 3 cm in length. When vasoepididymostomy is required, the scrotal contents must be extruded to incise the anterior parietal tunica vaginalis.

Once the scarred ends of the vas are excised, patency of the abdominal end of the vas can be evaluated by demonstrating free flow of sterile irrigation fluid introduced through a 24-guage blunt-tipped needle directly into the lumen. Fluid obtained from the testicular end of the vas also is examined microscopically for the presence of sperm; formal vasography rarely is necessary.

Vasal fluid having a thick, creamy consistency should be diluted with normal saline to allow evaluation of sperm otherwise easily overlooked in viscous fluid containing a large amount of cellular debris. The examiner must be alert to the presence of sperm heads having no attached tails. After careful microscopic examination of the testicular vasal fluid, sperm quality generally is categorized as follows (1, 17):

Grade 1—mainly normal motile sperm
Grade 2—mainly normal non-motile sperm
Grade 3—mainly sperm heads
Grade 4—only sperm heads
Grade 5—no sperm

The entire scarred portions of the vas above and below the vasectomy site should be excluded to ensure anastomosis of healthy tissue. The two prepared ends of the vas should be mobilized sufficiently to avoid tension on the anastomosis and approximated, with or without use of a specialized clamp designed to facilitate approximation and anastomosis.

CHOICE OF VASOVASOSTOMY OR VASOEPIDIDYMOSTOMY

The quality of sperm observed in the vasal fluid has important influence on the choice of procedure. Vasovasostomy is performed when sperm of grades 1 to 4 are identified in the fluid obtained from the testicular end of the vas. Although the results of vasovasostomy generally are good even when only sperm heads (grade 4) are observed in the testicular vasal fluid (1, 18), some experienced microsurgeons prefer to perform vasoepididymostomy in such circumstances (19). When no sperm are observed in the vasal fluid, the time elapsed since vasectomy does not predict the likelihood of a return of sperm to the ejaculate after vasovasostomy (20, 21), but the gross characteristics of the fluid can help to determine the best choice of procedure. The likelihood that sperm will return to the semen (patency) and the likelihood of pregnancy are greatest when the vasal fluid appears watery (clear, colorless, and transparent) and are lower when the fluid appears cloudy, and even lower when the fluid appears thick and creamy (1).

When no sperm are observed in the vasal fluid and the fluid does not appear watery, careful inspection of the epididymis using magnification may help to determine whether vasovasostomy or vasoepididymostomy is the best choice of procedure to perform. A discolored or indurated area in the epididymis usually indicates that the epididymal tubule ruptured after vasectomy due to back pressure, resulting in obstruction at the site of rupture. Alternatively, a demarcation in the epididymis may be observed, above which the epididymal tubule appears dilated, and below which it appears collapsed. In both such circumstances, vasoepididymostomy is required (22).

The decision to perform vasovasostomy or vasoepididymostomy hinges on the surgeon's own experience in performing microsurgical vasoepididymostomy. Surgeons not experienced in performing vasoepididymostomy should perform vasovasostomy, thus preserving the possibility to perform a later vasoepididymostomy, if needed. Ideally, vasectomy reversal should be performed by surgeons skilled in both vasovasotomy and vasoepididymostomy because it is seldom possible before surgery to determine with certainty which procedure will be required (23, 24).

Anastomotic Methods

It is generally accepted that microsurgical vasovasostomy yields better results than macrosurgical anastomosis, although some surgeons can achieve satisfactory results using macrosurgical or loupe-assisted techniques that require less operating time (25). Surgeons using microsurgical techniques should have received the requisite formal training.

Most surgeons perform anastomoses using fine monofilament nylon suture. To prevent damage to the vas, only bipolar cautery or a specialized monopolar electrosurgical unit designed for ophthalmic surgery should be used to cauterize vessels located in the adventitia of the vas. The recommended instruments produce minimal tissue damage, compared with traditional monopolar cautery. No cautery should be used on the opposing transected ends of the vas.

Vasovasostomy may be performed using a modified one-layer anastomosis (26), by placing four to eight interrupted 9-0 nylon sutures through the full-thickness of each end of the vas, followed by additional interrupted 9-0 nylon sutures in the outer muscular layer, placed between the full-thickness sutures. Many surgeons prefer to perform vasovasostomy using a two-layer microsurgical anastomosis (17), by first placing five to eight interrupted 10-0 nylon sutures in the inner mucosal edges of the ends of the vas, incorporating a small portion of the inner muscular layer, and then 7 to 10 additional interrupted 9-0 nylon sutures in the outer muscular layer.

Microsurgical vasoepididymostomy yields results superior to those achieved with macrosurgical anastomoses. Microsurgical vasoepididymostomy most commonly is performed using an end-to-side anastomosis (24). Modifications of the technique include the triangulation (27), tubular invagination (28), and tubular intussusception techniques (29). In all

techniques, the epididymal tubule is pulled up into the lumen of the vas deferens.

The standard end-to-side vasoepididymostomy is performed by first incising the epididymal tunic and then, into a single isolated epididymal tubule, starting caudally and progressing superiorly until reaching a level at which sperm appear in the epididymal tubular fluid. The vas mucosa is approximated to the opened edges of the epididymal tubule with four to six interrupted 10-0 nylon sutures, and the outer muscular layer of the vas is approximated to the incised edges of the epididymal tunic with 7 to 10 interrupted 9-0 nylon sutures. In the tubular intussusception technique, two double-armed 10-0 nylon sutures are placed in parallel in the epididymal tubule. After tubulotomy, the sutures are passed through the mucosa and a portion of the adjacent muscularis, spaced evenly in each quadrant of the vas deferens. As the sutures are tied, the epididymal tubule is drawn into the lumen of the vas. A second, outer layer of 9-0 nylon sutures completes the anastomosis.

Taking care to first confirm the presence of intact sperm in the epididymal tubular fluid ensures that the vasoepididymal anastomosis is at a level above the epididymal obstruction. However, to maximize postoperative fertility rates, the anastomosis also should be performed at the most caudal level that sperm are found in the epididymal tubular fluid.

POSTOPERATIVE CARE

Postoperatively, the use of drains and antibiotics is the option of the surgeon. Patients should be advised to use a scrotal supporter and to avoid heavy physical activity for approximately 3 to 4 weeks, and to avoid sexual intercourse for at least 2 weeks after surgery. Postoperative pain generally can be controlled adequately with oral analgesics.

COMPLICATIONS

Vasectomy reversal procedures have relatively few postoperative complications. Hematomas and both superficial and deep infections are rare; they can be managed with standard methods and rarely require surgical drainage.

POSTOPERATIVE PATIENT MONITORING

After either vasovasostomy or vasoepididymostomy, semen analyses should be obtained approximately every 2 to 3 months until sperm concentration and motility return to normal or until a pregnancy occurs. Once sperm concentration and motility normalize, subsequent semen analyses may be obtained at approximately 4-month intervals until pregnancy occurs. Careful monitoring of semen quality after surgery ensures that those who may again become obstructed, due to scar formation at the anastomotic site, are identified promptly; the incidence of postoperative reobstruction ranges between 3% and 12% after vasovasostomy and is approximately 21% after vasoepididymostomy (30, 31).

When sperm do not return to the semen by 6 months after vasovasostomy or by 18 months after vasoepididymostomy, the procedure has failed (32). When semen quality returns to normal but pregnancy does not occur, and evaluation of the female partner provides no clear explanation, a test to detect antisperm antibodies on the sperm surface (direct immunobead test) (33) may help to guide the couple in choosing a treatment strategy. Most pregnancies that are achieved without further intervention occur within 24 months after surgery (1).

RESULTS

After macrosurgical vasovasostomy, sperm return to the semen in approximately 80% of men, and 20% to 40% of their partners conceive (9). After microsurgical vasovasostomy, sperm return to the semen in 85% to 90% of men, and 50% to 70% of their partners achieve pregnancy (9).

The prognosis for success after microsurgical vasectomy reversal declines progressively as the interval between vasectomy and its reversal increases. A large study conducted by the Vasovasostomy Study Group observed that both patency rates (return of sperm to the semen) and pregnancy rates after vasovasostomy decrease as the time since vasectomy increases (Table 1) (1).

Others have found no relationship between patency rates and the interval between vasectomy and reversal, but have observed significantly lower pregnancy rates when reversal was performed 15 years or more years after vasectomy (34). The inverse relationship between success rates and the interval of obstruction may reflect progressive testicular damage (35). The age of the female partner has important prognostic value (36), and success rates are higher in men having proven fertility with the same female partner than in men having a different partner (37, 38). Success rates after bilateral vasovasostomy also relate directly to the quality of sperm observed in the vasal fluid at the time of vasectomy reversal (Table 2) (1).

The Vasovasostomy Study Group (1) and others (39) have confirmed an earlier report (40) that the microsurgical modified one-layer anastomosis and the microsurgical two-layer technique yield comparable results. In a large case series,

TABLE 1

Patency and pregnancy rates after vasovasostomy in relation to the interval between vasectomy and reversal.

Interval between vasectomy and reversal (years)	Patency rate (%)	Pregnancy rate (%)
<3	97	76
3–8	88	53
9–14	79	44
≥15	71	30

Source: Belker et al., 1991 (1).

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TABLE 2

Return of sperm to the semen and pregnancy rates after vasovasostomy in relation to the quality of sperm observed in the vasal fluid.

Quality of sperm	Return of sperm to the semen (%)	Pregnancy rate (%)
Grade 1	94	63
Grade 2	91	54
Grade 3	96	50
Grade 4	75	44
Grade 5	60	31

Source: Belker et al., 1991 (1).

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sperm returned to the semen in 36 of 48 men (84%) evaluated for 6 months or more after microsurgical end-to-side vasoepididymostomy, and 17 of 41 (42%) men evaluated for 12 months or longer achieved pregnancy. Similar success rates have been reported by others using the tubular intussusception technique (41).

MANAGEMENT OF OPERATIVE FAILURES

Although a repeat operation may be offered to men who remain azoospermic after vasectomy reversal, most decline to undergo further surgery. Repeat procedures may be more difficult technically because the remaining viable segments of the vas will be shorter. After a failed vasoepididymostomy, a repeat procedure may or may not be possible, depending on the amount of scar that forms around the epididymis after the first operation.

When performing a repeat operation after a failed vasovasostomy, the surgeon first should perform a microsurgical vasotomy below the level of the original anastomosis and examine the fluid obtained for the presence of sperm. Patency of the old anastomosis is tested, as previously described. When no sperm are observed in the vasal fluid obtained from the vasotomy site, vasoepididymostomy will be required. When the previous anastomosis is obstructed, that segment usually is resected before a new anastomosis is performed. When performing a repeat vasovasostomy, the surgeon should bypass all of the vas that is scarred and mobilize a sufficient length of the abdominal end of the vas to avoid anastomotic tension.

Among the 222 repeat vasectomy reversal procedures reported by the Vasovasostomy Study Group (1), sperm returned to the semen after surgery in 75% of men, and 43% of their partners subsequently conceived. Several groups have since reported comparable patency and pregnancy rates after repeat vasectomy reversal (42–45). A second vasoepididymostomy procedure also is technically feasible for experienced surgeons (46). Although the success rates of repeat vasectomy reversal procedures are lower than those of first operations, many patients regard the likelihood for success sufficient to justify the attempt.

INTRAOPERATIVE SPERM HARVESTING AND CRYOPRESERVATION

Before the advent of ICSI, it was not practical to harvest and cryopreserve sperm obtained during the operation because their numbers and motility were too low to be useful for either intrauterine insemination or conventional IVF. However, the wide availability of ICSI technology now encourages experienced surgeons to consider and offer the option. Cryopreservation of sperm obtained during vasoepididymostomy is particularly important because approximately 35% of men remain azoospermic after surgery (34). In one study, motile sperm were found in the vasal and epididymal fluid in 35% of 603 men undergoing vasectomy reversal (47). Although harvesting and cryopreservation of sperm during vasectomy reversal is recommended by some (48), others believe it is neither useful nor cost effective (49, 50).

In all cases, the technical aspects of vasovasostomy or vasoepididymostomy should have priority over attempts to harvest sperm for cryopreservation. The anastomosis should be performed at the location farthest from the testicle where intact sperm are found, regardless of their motility, and not closer to the testicle merely to improve the likelihood of harvesting motile sperm. Before harvesting sperm for cryopreservation, the patient and his partner should have the opportunity to consider the costs involved and their interest in pursuing ICSI should the surgery fail. Finally, plans to harvest sperm for cryopreservation must be coordinated carefully with laboratory personnel to ensure that the harvested sperm are prepared in small aliquots suitable for later use in one or more attempts with ICSI (51).

SUMMARY AND RECOMMENDATIONS

- Vasectomy reversal is a technically feasible means to restore fertility in men who previously have had a vasectomy.
- The highest technical success rates are achieved by experienced surgeons using microsurgical techniques.
- The choice between vasovasostomy and vasoepididymostomy must be made at the time of surgery, after determining the level and extent of the obstruction.
- Postoperative patency rates (return of sperm to the semen) and pregnancy rates after vasectomy reversal procedures decrease as the interval between vasectomy and its reversal increases.
- Although harvesting sperm for cryopreservation at the time of vasectomy reversal is possible, it also may not be useful or cost effective.

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