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VASECTOMY FOLLOW-UP: CLINICAL SIGNIFICANCE OF RARE NONMOTILE SPERM IN POSTOPERATIVE SEMEN ANALYSIS

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ABSTRACT

Objectives. To examine patient compliance, complications, and significance of rare nonmotile sperm (RNMS) after no-scalpel vasectomy.

Methods. We reviewed the records of 690 consecutive men who had undergone vasectomy at our institution between 1996 and 2002. All men were instructed to submit two initial semen samples for analysis (3 and 4 months after vasectomy) and additional samples (at 2-month intervals) if sperm were identified on the initial and subsequent analyses. All patient complaints (telephone and clinic visit) were recorded.

Results. A total of 315 men (45.6%) did not submit any semen samples. Of the 295 men who submitted two samples, 176 (60%) were azoospermic, 110 (37%) had RNMS, and 9 men (3%) had rare motile sperm (the vasectomy of 1 of these 9 men subsequently failed). Of the 110 men with RNMS, 83 submitted one or more additional semen samples. Of these 83 men, 62 (75%) had become azoospermic, 20 (24%) had persistent RNMS, and 1 (1%) subsequently had a failed vasectomy (with motile sperm). The 2 patients with failure underwent a repeat vasectomy (failure rate 0.67% [2 of 295]). A total of 69 patients (10%) reported a complaint, but only 9 (1.5%) of these men returned for clinical examination. No surgical complications and no pregnancies occurred.

Conclusions. Our data show that despite aggressive counseling, compliance with follow-up testing is very poor. Patient-reported complaints are common but minor. We found that most men with RNMS become azoospermic and propose that the presence of RNMS is consistent with a successful vasectomy. However, long-term, prospective studies are needed to assess the risk of late failure in men with RNMS.

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Vasectomy is a popular, safe, and effective method of birth control throughout North America and the rest of the world. The modification of this technique using the "no-scalpel" approach has decreased the risk of postoperative complications.[1–4]

Classically, the absence of sperm in the postvasectomy semen analysis is required to establish the contraceptive efficacy of this procedure. Some investigators have recommended the use of an alternative form of contraception until the patient achieves two consecutive negative semen analyses (with azoospermia) and, furthermore, that men submit a yearly analysis to ensure continued success.[5] However, other investigators have proposed that achieving azoospermia after vasectomy is not an absolute requirement. The rationale behind this is that men with rare sperm in the semen have little or no fertility potential. It has been proposed that a man can be considered infertile as long as the spermatozoa present in the postvasectomy sample are nonmotile.[6,7] Other investigators have considered that the presence of fewer than 10,000 nonmotile sperm per milliliter in two consecutive semen samples collected longer than 7 months after vasectomy is in keeping with successful vasectomy.[8]

Clarifying the significance of rare nonmotile sperm (RNMS) is also important given that up to 33% of patients have RNMS in the postvasectomy semen analyses[7] and without a clear consensus on the subject, men are committed to use an alternative form of contraception until azoospermia is achieved. This is problematic because of the poor compliance historically seen in men after vasecto-

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my.[5,9] With a better understanding of the clinical significance of nonmotile sperm, we could better guide our patients regarding the necessity of repeated semen analysis to confirm azoospermia. Perhaps then a more feasible vasectomy follow-up protocol could be implemented, further improving compliance rates.

With this in mind, we sought to examine the clinical significance of RNMS in a cohort of vasectomized men. In addition, we examined patient compliance with postvasectomy testing and reported complaints and complications after this common procedure.

MATERIAL AND METHODS

We reviewed the charts of 690 consecutive men who had undergone no-scalpel vasectomy (all performed by one surgeon [A.Z.]) at our institution between 1996 and 2002. In general, the socioeconomic background of our patient population was middle to upper middle class. All men were carefully instructed (in the preoperative assessment and at vasectomy) to submit two semen samples for analysis (at 3 and 4 months after vasectomy) and to review the results with their urologist.

Bilateral vasectomy was performed by the no-scalpel technique using local infiltration with 1% lidocaine. In brief, the vas deferens was delivered through the scrotal skin and the lumen cauterized. The vas deferens was then doubly ligated with titanium Weck clips, and an intervening segment of vas deferens (~1 cm long) between the metal clips was excised and the specimen submitted for pathologic examination.

At the first follow-up visit (~4 to 6 months after vasectomy), the 3-month and 4-month postvasectomy semen analyses were reviewed. Men were instructed to submit an additional sample 2 months later if sperm were identified on one or both of the initial analyses. A fourth sample was obtained (2 months later) if sperm were identified on the third sample. In rare circumstances, a fifth sample was obtained (2 months later) if sperm were identified on the fourth sample.

The samples were produced by masturbation and allowed to liquefy at room temperature. All semen samples were examined within 1 hour of collection. After liquefaction of semen, standard semen parameters (volume, sperm concentration, sperm motility, and sperm morphology) were obtained according to World Health Organization guidelines.[10] Raw semen samples in which no sperm were identified after examination of 5 to 10 high power fields were centrifuged at 500*g* for 10 minutes. The pellet was then prepared as a smear and stained using a modified Papanicolaou stain. The entire slide (stained smear of the pellet) was examined under low-power magnification for the presence of spermatozoa (confirmed under high-power magnification). Generally, patients with RNMS had one to two spermatozoa per high power field.

Complications (documented by telephone, letters, and visits) were carefully recorded and documented. They were categorized on the basis of the nature of the patient complaint. If a physician had examined the patient, a diagnosis was recorded.

This study was undertaken under ongoing internal review board approval. Patient information for this study remained confidential and within the institution.

The mean values are reported. Clinical parameters (eg, age, failure rate) were compared using parametric and nonparametric tests as appropriate. All hypothesis testing was two-sided, with a probability value of 0.05 deemed statistically significant. The statistical analyses were conducted with the SAS software system (SAS Institute, Cary, NC).

RESULTS

A total of 690 patients were studied. The mean age of the men was 39.5 years (range 23 to 63). The average number of children per couple was 2.3. Of the 690 patients, 295 (42.8%) submitted at least two semen samples, 80 (11.6%) submitted only one semen sample, and 315 (45.6%) did not submit any samples. No statistically significant difference in age was found between those who did and those who did not submit a semen sample for analysis (39.6 and 39.4 years, respectively). Although no formal inquiry (by telephone or mail) was conducted, no contraceptive failures (pregnancies) were reported in this study.

Of the 295 men who submitted two initial semen samples as counseled, 176 (60%) were azoospermic, 110 (37%) had RNMS on one (n = 48) or both (n = 62) samples, and 9 men (3%) had rare motile sperm (on one or both samples). Of the 9 men with rare motile sperm, 6 eventually became azoospermic, 2 developed RNMS, and 1 proved to have vasectomy failure, with persistence of motile sperm 9 months after vasectomy (sperm concentration 7×10^6/mL with 21% motility). Of the 110 men with RNMS, 83 submitted one or more additional semen samples (one to three samples) and, eventually, 62 (75%) became azoospermic, 20 (24%) had persistent RNMS, and 1 (1%) subsequently had vasectomy failure, with motile sperm on two consecutive semen analyses (sperm concentration 43.6×10^6/mL with 10% motility). The 2 patients with motile sperm (failure rate 0.67% [2 of 295]) underwent repeat vasectomy and both subsequently became azoospermic. In both cases, the pathology report confirmed that bilateral vasal segments had been excised, excluding the possibility of a technical error.

Of the 690 patients, 80 (11.6%) only submitted one postvasectomy semen sample. Of these 80 patients, 69 were azoospermic, 8 had RNMS, and 3 had rare motile sperm. The true failure rate in these men was hard to assess because no additional samples were submitted and no follow-up visit was attended despite careful counseling.

Patient complaints, in the form of telephone calls, letters, and visits, were carefully recorded. Overall, 10% of the patients reported a complaint or concern: 84.1% by telephone, 14.5% by clinical visit, and 1.4% by letter. Common patient concerns included testicular pain (4.9%), scrotal swelling (2.2%), wound complications (0.9%), painful sperm granuloma (0.7%), decreased libido or erectile dysfunction (0.6%), discussion of vasectomy failure (0.3%), painful ejaculation (0.3%), and epididymitis (0.1%).

COMMENT

Compliance with postvasectomy testing was very poor in our patient population. Only 43% (295 of 690) of the patients submitted two semen samples for analysis and 45.6% failed to submit any semen samples despite careful preoperative and postoperative instructions (verbal and written). Historically, published data have demonstrated consistently poor patient compliance with postvasectomy testing. It has been reported that up to 40% of patients never return for a follow-up semen analysis.[5,9] The reasons for the poor postoperative compliance are unknown, but Weiske[11] suggested that psychological factors, including an aversion to masturbation, as well as the patient being quoted a low failure rate (less than 1%), may be possible etiologies. An overwhelming confidence in the surgeon performing the procedure has also been described as a possible cause.[11]

In the present study, we observed an early vasectomy failure rate of 0.67% (2 of 295). In both cases, the failure was determined by the finding of motile sperm in semen (no pregnancies were reported in our series). These failures were deemed to be early, because the patients did not achieve azoospermia on the initial two semen samples. The observed early failure rate (0.67%) in this study is in keeping with that reported by other investigators. Early failure rates after vasectomy, regardless of the method used, have been reported to be in the range of 0.3% to 0.8%.[7,12,13] Early vasectomy failures may be due to technical error (incomplete ligation of the vas deferens or erroneous ligation of a structure other than the vas deferens) or to early recanalization and are associated with the detection of motile sperm in semen, typically at 3 to 6 months after vasectomy. In contrast, with late failures (estimated to occur in ~1 in 2000 cases[13,14] and as a result of late recanalization), the initial postvasectomy samples show complete azoospermia, but on later testing (often as a result of a pregnancy) spermatozoa can often be detected in the semen.[15,16]

We found that close to 40% of the assessable men (110 of 295) had RNMS in the semen (in one or both of the postvasectomy samples). At 6 to 12 months after vasectomy (after submitting an additional one to three samples), 75% of these men had no sperm in the semen, 24% had persistent RNMS, and 1% had failed vasectomy (motile sperm in semen). In keeping with these results, De Knijff *et al.*[7] reported that 33% of the men (130 of 395) in their series had detectable RNMS in the noncentrifuged semen at 12 weeks after vasectomy. De Knijff *et al.* also found that 96% of the men with RNMS ultimately became azoospermic (with a mean follow-up of 6 months, range 3–21) and concluded that it was safe to give clearance to patients with RNMS, although, admittedly, they performed a second vasectomy in the remaining 4% (with persistent RNMS).[7] They postulated that nonviable sperm in the seminal vesicles and abdominal portion of the vas deferens was the likely etiology for the persistence of RNMS.[7]

The true failure rate and the recommended follow-up for men with RNMS have not been established. This is largely because a significant subset of these men is lost to follow-up and often continues to show RNMS 6 to 12 months after vasectomy. Also, the identification of RNMS may differ from center to center because of differences in the postvasectomy semen analysis protocols (the use of centrifugation is not routine). The persistence of RNMS has been anatomically traced to very small channels and slits in the connective and scar tissue between the ends of the vas deferens, suggesting the potential for late failure.[11] However, the observed failure rate associated with RNMS is reportedly low, and investigators have suggested that the finding of RNMS is not an indication for additional testing.[17] Philp *et al.* did not observe any pregnancies in 310 men (2% of their series) with RNMS.[8] However, only 2% of the men in their series[8] had RNMS (substantially lower than that observed in this and other series[7]). Similarly, Davies *et al.*[18] and Edwards and Farlow[19] observed no pregnancies when clearance was given to their patients (151 and 200 men, respectively) with RNMS in the postvasectomy semen. Benger *et al.*[20] estimated that the risk of pregnancy with RNMS is less than that of spontaneous late recanalization (estimated to occur in ~1 in 2000 cases[13,14]) on the basis of their experience and a survey of urologists in England and Wales. In contrast, Thompson *et al.*[21] described a case in which a patient with persistent RNMS caused a pregnancy 2 years after vasectomy. We observed a 1% failure rate associated with RNMS (not significantly greater than the reported 1 in 2000 late failure rate[13,14]).

Postoperative complications are not uncommon after vasectomy. The most frequent postvasectomy complications include hematoma (0.04% to 18%), scrotal pain (3% to 8%), epididymitis (0.4% to 6.1%), sperm granuloma (0% to 6%), wound infection (0% to 3%), vasocutaneous fistula (0% to 2%), and recanalization (0% to 6.0%).[1–4,22] In general, the no-scalpel vasectomy is associated with a lower risk of early complications (hematoma, postoperative pain, wound infection) than is conventional vasectomy.[1–4,22] In contrast, the risk of late complications (chronic pain, congestive epididymitis, recanalization) is similar for both no scalpel and conventional vasectomy.[1–4,22] In the present study, we monitored all patient-reported complaints after vasectomy, including those reported by telephone and at clinic visits. Overall, 10% of patients re-

ported a complaint, but only 14.5% of these complaints (or 1.5% of the total population) were significant enough that patients returned to the clinic for evaluation. All complaints were treated conservatively (with analgesics and/or antibiotics), and none of the patients required acute surgical intervention.

CONCLUSIONS

Our data have indicated that a significant proportion of men are not compliant with respect to the postvasectomy semen testing protocol. Although a significant proportion of men will have RNMS in their semen after vasectomy, only a small percentage of these men (1% in our series) will ultimately fail. As such, our data support the published data and suggest that men with RNMS may be considered sterile. Long-term, prospective studies are needed to assess the true risk of late failure in men with RNMS.

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