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Vasectomy and vasectomy reversal : development of newly designed nonabsorbable polymeric stent for reconstructing the vas deferens

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Chapter 2

Persistence or reappearance of nonmotile sperm after vasectomy: does it have clinical consequences?

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Introduction

In our clinic, we perform two consecutive semen examinations at 6 and 12 weeks after a vasectomy. If the final examination shows azoospermia, the patient is given clearance to have intercourse without contraception.

Recently, we observed that a large portion of the patients had persisting nonmotile sperm even 12 weeks after vasectomy. This resulted in repeated semen examinations and some patients underwent revasectomy. This uncomfortable situation caused us to search for the probable cause and significance of nonmotile sperm and the best way to deal with this clinical problem.

Materials and Methods

Vasectomies were performed by six different urologists. All the procedures were done on an outpatient basis under local anaesthesia with lidocaine 1 %. After luxation of the vas deferens, a 1 to 2 cm long segment of vas deferens was resected and submitted for histological confirmation. During the vasectomy procedure, both vas ends were ligated with vicryl 1.0 and spermatic fascia was interposed. If the semen examination at 12 weeks postvasectomy showed azoospermia, the patient was given clearance to have intercourse without contraception. If residual sperm was found at 12 weeks postvasectomy, semen examinations were repeated until azoospermia was seen. Semen examinations were done by our infertility laboratory. Twenty fields of noncentrifuged semen samples were investigated under the microscope with an x200 magnification.

The vasectomy procedure and the semen analysis have not changed over the last 10 years.

Review of the semen analyses (≥ 12 weeks after vasectomy) was done in 413 patients who underwent vasectomy in the period between April 1st, 1993 and July 31st, 1995. A letter was written to all 413 patients. In the letter, a new semen sample was requested. In an added

questionnaire, we asked for the occurrence of possible pregnancies. Because 62 letters were returned by the postal service, we concluded that 351 patients received our inquiring letter. Despite repeated attempts, we were not able to trace the correct addresses of the remaining 62 patients.

Results

From the 413 patients who underwent a vasectomy, 395 patients delivered a semen sample 12 weeks after vasectomy. Azoospermia was found in 262 of 395 (66%) patients. Nonmotile sperm after vasectomy was found in 130 of 395 (33%) patients who delivered semen 12 weeks after vasectomy. The sperm count varied from 2.30 to $1.65 \times 10^6/\text{mL}$ (nonmotile sperm). Of 130 patients with persisting nonmotile sperm, 91 (70%) men continued to deliver semen samples after 12 weeks postvasectomy. In this group of 91 patients, azoospermia was found in 87 (96%) patients after a mean follow-up of 6.36 months (3 to 21 months). Even a patient with a sperm count of 1.65×10^6 nonmotile sperm 12 weeks after vasectomy achieved azoospermia 10 months postvasectomy. There was no significant difference between the group of patients with azoospermia and the group with nonmotile sperm 12 weeks postvasectomy with regard to mean age and length of resected vas deferens. Table 1 shows data of the group with nonmotile sperm 12 weeks after vasectomy.

Table 1. Patients with nonmotile sperm 12 weeks postvasectomy

	<i>Mean</i>	<i>Minimum</i>	<i>Maximum</i>
Resected vas (cm) (n=127)	1.2	0.4	2.8
Age(years) (n=130)	38.4	28	58
Sperm concentration ($\times 10^3/\text{mL}$) (n=130)	79	2.3	1.650
Months to azoospermia (n=87)	6.36	3	21

From the 91 patients with persisting nonmotile sperm, 4 patients underwent revasectomy because of unacceptable duration of persistent nonmotile sperm concentrations. After revasectomy, two patients still had unchanged concentrations of nonmotile sperm 12 weeks after the revasectomy (Table 2). Pathological investigations of the resected specimens at revasectomy showed in only one case a sperm granuloma that could suggest a possible recanalization.

Table 2. Semen analysis of four revasectomy patients (nonmotile sperm)

<i>Patient</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
	$\times 10^3$ /mL			
Before vasectomy *	7.5(10)	20 (9)	7.5 (9)	15(5)
12 weeks after vasectomy	0	20	7.5	0

*values in parentheses are months between first vasectomy and last semen analysis before revasectomy

Only 65 of 351 (18.5%) men replied to the letter and provided a renewed specimen together with their questionnaire. From the 65 men who delivered a further semen sample, 53 (82%) had azoospermia. Nonmotile sperm was found in 12 of 65 men (18.5%). Reappearance of nonmotile sperm after initial azoospermia (at 12 weeks) was found in 5 of 65 men (8%) (Table 3).

Table 3. Five patients with reappearance of nonmotile sperm after azoospermia

<i>Patient</i>	<i>months to azoospermia*</i>	<i>months to reoccurrence of non motile sperm**</i>	<i>No. of sperm/mL</i>
1	7	12	7.500
2	5	12	20.000
3	7	18	150.000
4	3	20	7.500
5	7	22	7.500

* after vasectomy

** after previous azoospermia

The five patients with reappearance of nonmotile sperm (longest follow-up 22 months) did not report any pregnancies. Only one patient in this group had repeated semen examinations (five times) because of persistent nonmotile sperm.

Early recanalization was found in 3 of 395 of the patients (0.75%) who delivered semen samples within 12 weeks after their initial vasectomy (Table 4). One pregnancy occurred among these patients because of the fact that the concerned patient (patient 3) had unallowed unprotected intercourse before his final semen control at 12 weeks postvasectomy.

Table 4. Sperm analysis of three patients with motile sperm*

<i>Patient</i>	<i>at 6 weeks</i>	<i>at 12 weeks</i>
	x10 ⁶ /mL	x 10 ⁶ /mL
1	7(0)	12(60)
2	13(30)	5(25)
3	0	21(50)

* values in parentheses are percent motile sperm

Discussion

Renewed patency or pregnancy after vasectomy can have several causes. Technical error, early recanalization, and residual motile sperm in the seminal vesicle after vasectomy are causes that can be detected easily by the presence of motile sperm, in various concentrations, in the postvasectomy specimen.

In the literature, a distinction is made between early and late recanalization. Early recanalization can be detected by an increasingly large amount of motile sperm in the postvasectomy specimen. Late recanalization is the presence of motile sperm after the postvasectomy specimen(s) showed azoospermia. Late recanalization can occur several years after vasectomy and usually is detected only after a pregnancy has occurred ¹. All the above mentioned causes of patency and pregnancy refer to motile sperm.

But what about nonmotile sperm? Can nonmotile sperm cause pregnancy? Is the presence of nonmotile sperm a signal that patency of the vas is present, meaning that the patient with nonmotile sperm has a higher risk of causing pregnancy compared with a patient with azoospermia? Persisting nonmotile sperm after vasectomy is a known phenomenon. Philp et al. ² reported no pregnancies after special clearance of 310 (2%) men with nonmotile sperm (<10,000/mL) after vasectomy. Davies et al. ³ also reported no pregnancies after special clearance of 151 (2.5%) men with nonmotile sperm (< 10,000/ mL), with a minimum follow-up of 3 years after vasectomy. Edwards and Farlow ⁴ gave clearance to 200 men with nonmotile sperm (30 patients with 500,000/mL and 2 patients with 24×10^6 /mL).

Of these 200 men, 190 were followed up 12 to 15 months after vasectomy and no pregnancies were reported, even though 5 of 48 men who submitted a semen specimen still had nonmotile sperm. In a study published by Edwards ⁵, patients tested 4 weeks after vasectomy, regardless of the amount of postvasectomy ejaculations, were given clearance if no motile sperm was

found. An important detail in this article is that five cases are mentioned in which the initial tests showed a count of 16×10^6 to 33×10^6 nonmotile sperm. These patients had repeated tests after a few weeks and a marked reduction in numbers of nonmotile sperm was observed. In the same paper, Edwards reported two pregnancies on a total of 3,178 vasectomized men; both patients had a recanalization of the vas deferens proven by motile sperm in the semen analysis. From the above mentioned data, one can conclude that patients with persisting nonmotile sperm postvasectomy have a very low risk of causing pregnancy.

If we search for proof to the contrary, one case report ⁶ can be found in which a patient with a small number of nonmotile sperm after vasectomy caused a pregnancy. Paternity was ascertained by DNA profiling in this case. Even more confusing is the article by Smith et al.⁷ in which they present six cases of DNA-proven fatherhood caused by azoospermic men. They explain this phenomenon by the intermittent production of viable sperm. Still, these few data do not prove that men with nonmotile sperm after vasectomy have a higher risk of causing a pregnancy than azoospermic patients.

In our study, 96% of the patients returned and delivered a semen sample at 6 and 12 weeks postvasectomy. This is a high patient compliance rate compared with the 64% mentioned by Belker et al.⁸ and the 71% mentioned by Edwards ⁵.

In our study, we found that 33% of our patients had nonmotile sperm 12 weeks postvasectomy. Edwards ⁵ found that 42% of his patients had nonmotile sperm between 7 and 14 weeks postvasectomy. From the group of patients with persisting nonmotile sperm that continued to deliver semen samples, 96% became azoospermic in our study.

The persistence of nonmotile sperm in two cases after revasectomy in our study only can be explained by residual sperm in the seminal vesicles or the abdominal part of the vas, because large pieces of the vas were resected at the revasectomy and no recanalization was found after

microscopic investigation of the resected pieces.

Reappearance of nonmotile sperm after azoospermia was found in 8% of the volunteer group. The highest count was 150,000/mL. No pregnancies were found among these patients with a maximum follow-up of 22 months.

In a recent article by O'Brien et al.⁹, temporary reappearance of sperm 12 months after vasectomy is described in six cases (0.6%). The sperm count was <10,000/mL. Unfortunately, the percent motility of the sperm is not mentioned in this article, which is essential information if one is to say anything on the chance of causing pregnancy.

Based on the literature and on our own experience, we assume that men with small amounts (<1 x 10⁶) of nonmotile sperm after vasectomy have a very low risk of causing pregnancies. Probably this risk is comparable with the risk that azoospermic men generate pregnancies.

For this reason, we give clearance to patients who have small amounts of nonmotile sperm 12 weeks after vasectomy. Our hypothesis is that persistence and reappearance of nonmotile sperm after vasectomy is caused by release of nonviable residual sperm in the seminal vesicles and the abdominal part of the vas deferens. This is supported by the observation that nonmotile sperm in some cases do not disappear after revasectomy

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