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## Persistence of Vaginal Spermatozoa as Assessed by Routine Cervicovaginal (Pap) Smears

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**REFERENCE:** Randall, B., "Persistence of Vaginal Spermatozoa as Assessed by Routine Cervicovaginal (Pap) Smears," *Journal of Forensic Sciences*, JFSCA, Vol. 32, No. 3, May 1987, pp. 678-683.

**ABSTRACT:** Retrospective review of cervicovaginal (Pap) smears of women with known sexual histories affords an opportunity to assess the potential for postcoital sperm recovery for large numbers of individuals. This study reviewed 542 individuals' Pap smears with accompanying sexual histories. Three hundred forty-nine respondents reported at least one act of sexual intercourse during the five days preceding the Pap smear. Unlike a previous report, the current study showed very poor sperm recovery (maximum of 25% during the first postcoital day). The observed results roughly correlate with the incidence of sperm noted on screening of large numbers of routine clinical Pap smears in a private reference laboratory. Routine Pap smears can detect sperm but do not appear to be an ideal method to substantiate recent sexual intercourse.

**KEYWORDS:** pathology and biology, criminal sex offenses, spermatozoa, coitus, Pap smears

Rape usually is an unwitnessed crime. The prosecution of rape therefore hinges on the testimony of the victim versus that of the accused. To substantiate further the victim's testimony, and thus make her (or him) more credible than the accused, the prosecution will present other corroborating evidence. One of the most important aspects of the victim's testimony to substantiate is the allegation of sexual intercourse.

Although a variety of enzyme markers (for example, acid phosphatase) and protein markers (for example, p30) are used to establish that intercourse has occurred, short of pregnancy, the most unequivocal marker of intercourse remains the recovery of spermatozoa from the victim. Yet sexual intercourse can occur without the subsequent recovery of sperm. How often the postcoital failure to recover sperm can occur, and under what circumstances, is important for the prosecutor to know as he proceeds with a rape case without being able to substantiate the key allegation of sexual intercourse.

The incidence of failure to recover sperm from the postcoital vagina has been explored using three different avenues. The methods described below however cannot be directly compared since variable degradation of sperm recovery over time and studies restricted to different postcoital intervals confound comparison of much of the reported incidence of sperm recovery. The retrospective review of actual rape evidentiary material represents the first approach. The largest study of this type [1] reviewed 1332 cases and revealed an overall sperm recovery rate of 58% during the first 24 postcoital h. Another large study [2] of 574 rape victims showed a sperm recovery rate of 54% during the first 24 postcoital h. The use of

Received for publication 30 June 1986; accepted for publication 28 July 1986.

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case material however probably underestimates the expected sperm recovery under normal circumstances. Sexual dysfunction amongst rapists [3], marked variation in victim activity after the rape, delay in seeking medical attention, unreliable victim history, and fabrication of the assault all could be expected to reduce the incidence of sperm recovery.

Study of volunteer couples engaging in sexual intercourse should produce the best indication of expected sperm recovery after "normal" sexual activity. The acquisition of large numbers of volunteer couples however is difficult. The largest volunteer couple study I found [4] used only 37 couples. One study reported a detailed analysis of postcoital findings utilizing only 4 couples [5]. In the former study, sperm recovery was 86% during the first 12 h. Some volunteer studies have shown 100% sperm recovery during the first 24 postcoital h [6]. The volunteer couple studies overall appear to use too few couples to allow meaningful interpretation of the data, but do suggest very high sperm recovery rates compared to case material recovery rates.

The third investigative avenue is to gather retrospective sexual histories and specimens from patients or volunteers after they have engaged in sexual intercourse during the course of their normal activities. The largest of such studies involved 675 women interviewed as to sexual history and from which cervicovaginal smears were obtained for routine cervical neoplasia screening [7]. Silverman and Silverman's [7] report showed 64% sperm recovery during the first 24 postcoital h.

Certain birth control practices (for example, condoms, contraceptive foams, and vasectomy) and hygienic practices (for example, bathing, showering, and douching) would be expected to reduce the incidence of postcoital sperm recovery. Indeed Silverman and Silverman's [7] study showed that these birth control practices plus the use of oral contraceptives did reduce the expected vaginal sperm recovery rate. The present study will also explore the assumption that multiple episodes of sexual intercourse in a given period before collection of the cervicovaginal smears should increase the recovery of spermatozoa.

The collection of vaginal material used to evaluate the presence or absence of spermatozoa has traditionally been done by vaginal swab or vaginal fluid aspirate. Silverman and Silverman's [7] paper suggested that traditional cervicovaginal (Pap) smears as used in routine cervical neoplastic screening represents an equally acceptable method to collect vaginal material for sperm analysis. My associates and I have not noted the expected number of spermatozoa in the over 148 000 gynecological Pap smears annually screened by our laboratory. The current study will reassess the data generated by Silverman and Silverman [7] using routinely collected gynecological Pap smears and retrospective patient histories. The Pap smears in the current study were performed by a large number of physicians undoubtedly using slightly different techniques, a situation more closely simulating recovery of true case material than would be the case if only a few physicians were involved in the specimen collection process.

## Method

Physicians routinely submitting cervicovaginal smears for neoplasia screening (Pap smears) to our private reference laboratory were asked to participate in the study. A total of 38 physicians agreed to participate. The physicians were primarily family practitioners (with some gynecologists and internists) practicing in both rural and metropolitan (primarily rural) settings in Iowa, Minnesota, and South Dakota.

The physicians were asked to select female patients to participate in the study whom the physicians felt would be willing to participate, were probably sexually active, and who were having a Pap smear done that day by the physician at the time they were asked to participate. Pap smears included sampling of vaginal, cervical, and endocervical cells with each physician using his individual routine collection procedure. Each patient asked to participate was given a numbered questionnaire of recent sexual history including dates and times of pre-

vious sexual intercourse (see Fig. 1). A numbered sticker from the questionnaire was affixed to the Pap smear requisition, and the patient was then free to decide if she wished to participate, and if so, complete the questionnaire response card and mail it in at a later date. Pap smears received with stickered requisitions were routinely processed with Papanicolaou staining and screened. In addition, the screening cytotechnologist screened the slide for the presence or absence of sperm. Identification of at least one complete spermatozoa was considered positive.

**Results**

A total of 542 Pap smears with matching questionnaire response cards were received. Of that total, 349 respondents (64%) reported at least 1 act of sexual intercourse during the 5 days before collecting the Pap smear. Sperm were identified on only 47 individual smears, 45 from the group of 349 reporting intercourse within 5 days, and 1 with a 7 day and 1 with a 68-day (probable reporting error) postcoital interval. The respondents varied in age from 18 to 56 years (mean 30 years).

The frequency of sperm recovery by one-half day intervals during the first five postcoital days is shown in Fig. 2. Table 1 illustrates the effect of different birth control practices on sperm recovery. Table 2 records the effects of different hygienic practices (bathing, showering, and douching) on sperm recovery.

The recovery of sperm as related to multiple acts of sexual intercourse is illustrated in Table 3.

Sixty-four of the respondents indicated that they were pregnant (11% were sperm positive).

**QUESTIONNAIRE**

Please answer each question as completely and truthfully as possible on the correspondingly numbered space on the enclosed prepaid, self-addressed response card.

1. Age.
2. Date of last menstrual period (month/day/year).
3. Are you currently pregnant ("Y" = Yes, "N" = No)?
4. Date and approximate time of most recent pap smear examination. (Circle "A" or "P" for A.M. or P.M.)
5. Date and approximate time of most recent sexual intercourse prior to your pap smear listed in question 4.
6. How many times have you had sexual intercourse during the five days prior to your pap smear?
7. How many different sexual partners have you had during the five days prior to your pap smear?
8. During the most recent sexual intercourse referred to in question 5, what form of birth control did you use? (Answer with the appropriate letter response below.)
  - A. None
  - B. Birth Control Pill
  - C. Intrauterine Device (IUD)
  - D. Diaphragm
  - E. Foam or Jelly
  - F. Condom
  - G. Vasectomy
  - H. Tubal Ligation
  - I. Other
9. Since the most recent intercourse referred to in question 5, have you douched (D), bathed (B), showered (S), or none of the above (N)? Answer with appropriate letter(s).

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RESPONSE CARD	
1	
2	
3	
4	_____ : _____ A P
5	_____ : _____ A P
6	
7	
8	
9	

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FIG. 1—Numbered questionnaire of recent sexual history.

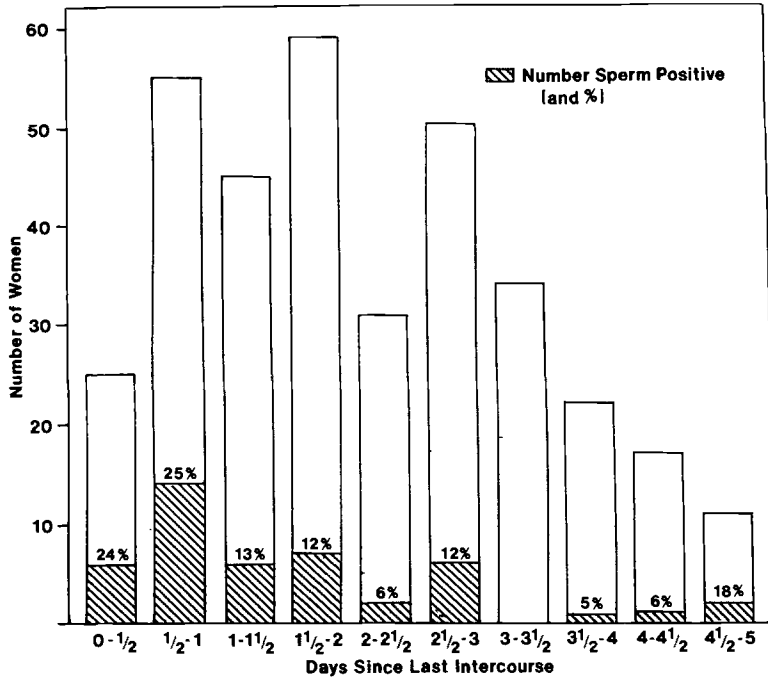


FIG. 2—Distribution of respondents' postcoital intervals (data for postcoital intervals greater than five days not included). Crosshatched areas represent number (and percent) positive for sperm in each interval.

TABLE 1—Birth control method.

	None	BC Pill	IUD	Diaphragm	Foam	Condom	Vasectomy	Tubal
Totals	126	110	13	9	13	27	38	51
(%)	(33)	(28)	(3)	(2)	(3)	(7)	(10)	(13)
No. of Sperm	20	10	2	1	0	0	0	11
(%)	(16)	(9)	(15)	(11)	(0)	(0)	(0)	(22)

TABLE 2—Postcoital hygiene.<sup>a</sup>

	B	D	S	BD	BS	BSD	DS	N
Totals	137	20	132	20	65	5	12	6
(%)	(35)	(5)	(33)	(5)	(16)	(1)	(3)	(2)
No. of Sperm	19	1	13	4	7	0	0	1
(%)	(14)	(5)	(10)	(20)	(11)	(0)	(0)	(17)

<sup>a</sup>B = bathe, D = douche, S = shower, and N = none.

TABLE 3—Number of acts of sexual intercourse during five days preceding Pap smear.

	0	1	2	3	4	5	6	7
Totals (% grand total)	119 (23)	163 (32)	139 (27)	64 (13)	16 (3)	8 (2)	2	1
No. of Sperm (% sperm of column total)	1 (1)	9 (6)	22 (16)	9 (14)	4 (25)	1 (13)	0 (0)	0 (0)

Only two of the respondents indicated that they had sexual intercourse with more than one partner (both reported two partners).

### Discussion

Only a 25% sperm recovery during the first postcoital day (Fig. 2) certainly does not support the use of routine cervicovaginal smears for the recovery of spermatozoa. The results however do appear to correlate roughly with the observed presence of sperm on large numbers of routine clinical gynecologic Pap smears seen in our laboratory. I cannot explain the large discrepancy noted in sperm recovery between this report and that of Silverman and Silverman [7], although a more controlled collection environment in their study may be a significant factor. I would suggest that additional studies be done before cervicovaginal smears are routinely used to evaluate the presence of sperm in cases of suspected rape. On the other hand, routine cervicovaginal smears can detect the presence of sperm and should be reviewed for that purpose if the traditional vaginal swabs or fluid aspirates have not been done.

As expected, birth control methods utilizing condoms and vasectomies resulted in the absence of detectable sperm. Oral contraceptives also reduced the recovery of sperm, perhaps reflecting a hostile vaginal environment for sperm survival induced by the oral contraceptive pseudopregnancy state. The remaining birth control practices included in Table 1 were too small in number to allow meaningful evaluation.

Postcoital douching, as shown in Table 2, by itself does appear to reduce the recovery of sperm. Yet bathing and douching combined is not significantly different than bathing or showering alone as an adverse effect on sperm recovery. In this study, douching appears to be a relatively uncommon activity. I do not believe sufficient numbers of subjects with postcoital douching are included to allow a meaningful evaluation of douching effects on sperm recovery. Similarly, nearly all of the subjects either bathed or showered after intercourse precluding an evaluation of their effect on sperm recovery.

Table 3 illustrates that multiple episodes of intercourse have a higher incidence of sperm recovery than a single episode. No significant difference however is seen between two and three acts of intercourse on sperm recovery. I do not believe that the four through seven episodes of prior intercourse material contains enough data to allow for evaluation of sperm recovery effect.

### Acknowledgments

The author gratefully acknowledges the financial support of the Laboratory of Clinical Medicine and the South Dakota Department of Health for this project. The author also thanks Mr. Cecil VanderWoude and Mr. Gerald Burke for their assistance in data reduction, Mrs. Jean Wilson for her assistance in the manuscript preparation, the cytotechnologists who screened the slides, and the 38 area physicians for their participation in the study.

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