CASE REPORTS

New Insights from One Case of Female Ejaculation

Alberto Rubio-Casillas, Biologist* and Emmanuele A. Jannini, MD†

*Escuela Preparatoria Regional de Autlán, Biology Laboratory, Universidad de Guadalajara, Guadalajara, México;
†Course of Endocrinology and Sexology, Department of Experimental Medicine, University of L'Aquila, Rome, Italy

DOI: 10.1111/j.1743-6109.2011.02472.x

ABSTRACT

Introduction. Although there are historical records showing its existence for over 2,000 years, the so-called female ejaculation is still a controversial phenomenon. A shared paradigm has been created that includes any fluid expulsion during sexual activities with the name of "female ejaculation."
Aim. To demonstrate that the "real" female ejaculation and the "squirting or gushing" are two different phenomena.
Methods. Biochemical studies on female fluids expelled during orgasm.
Results. In this case report, we provided new biochemical evidences demonstrating that the clear and abundant fluid that is ejected in gushes (squirting) is different from the real female ejaculation. While the first has the features of diluted urines (density: 1,001.67 ± 2.89; urea: 417.0 ± 42.88 mg/dL; creatinine: 21.37 ± 4.16 mg/dL; uric acid: 10.37 ± 1.48 mg/dL), the second is biochemically comparable to some components of male semen (prostate-specific antigen: 3.99 ± 0.60 × 103 ng/mL).
Conclusions. Female ejaculation and squirting/gushing are two different phenomena. The organs and the mechanisms that produce them are bona fide different. The real female ejaculation is the release of a very scanty, thick, and whitish fluid from the female prostate, while the squirting is the expulsion of a diluted fluid from the urinary bladder.
Rubio-Casillas A and Jannini EA. New insights from one case of female ejaculation. J Sex Med 2011;8: 3500–3504.

Key Words. Female Ejaculation; Orgasm; Vagina; Urethra

Introduction

The phenomenon of female ejaculation has been the object of a great controversy in the last decades, although there are historical data that show its existence since more than 2,000 years ago. Female ejaculation refers to the expulsion of a scanty fluid, like "watered-down, fat-free milk." Other authors described it as the expulsion of noticeable amounts of clear fluid by human females from the paraurethral ducts through and around the urethra, during or before an orgasm (see reference [1] and references therein).

It has been generally accepted that the fluid is produced in the female prostate. However, some researchers have openly expressed their doubts when large amounts of fluids are expelled, and have mentioned that that might arise from the urinary bladder. It is matter of evidence that the amount of expelled fluid varies, according to different authors, from 3–5 mL to 126 mL [1].

Why are there such great differences in these data? Is the female ejaculate a scanty or an abundant fluid? Is it a clear or a milky fluid? Are these different forms of the same fluid? Because there is still much controversy surrounding the origin of urethral expulsions, we decided to conduct further analysis to try to determine if the squirting fluid is a diluted form of urine. We supposed the existence of two different phenomena: squirting and female ejaculation. We hypothesized that the squirting fluid is a diluted form of urine, so it must contain high concentrations of uric acid, urea, and creatinine, while female ejaculate is produced by the female prostate and should contain the prostate-specific antigen (PSA) at high levels. We verified

our hypotheses in a female volunteer able to produce both fluids during vaginally activated orgasm, by measuring markers of possible anatomical sources. Furthermore, for the first time, uric acid concentration is measured in the fluid of urethral orgasmic expulsions.

Materials and Methods

Subject

A nulliparous, 43-year-old healthy, neurologically intact, volunteer was recruited. After institutional review board approval and subject's informed consent, the woman underwent physical and neurological examination (including perineal/genital inspection, vaginal, pelvic floor muscle strength, and assessment of reflexes such as anal wink, bulbocavernosus, and perineal–perianal sensation) as previously described [2]. The subject underwent a nonstructured clinical interview. Administration of the abridged Female Sexual Function Index showed absence of female sexual dysfunction [3]. The subject was exclusively heterosexual, with stable relationship, and reported at least two acts of sexual intercourse per week and a regular menstrual cycle. She has been sexually active within the past 6 months.

The examined woman was regularly able to obtain both clitoral and vaginal orgasm, as previously described [2]. All examinations have been performed during the late follicular phase of her menstrual cycle.

Before the study, a blood sample was obtained to determine glucose, uric acid, urea, and creatinine concentrations, which resulted within the normal range. Furthermore, endocrine screening showed normal levels of 17-β-estradiol, testosterone, luteinizing hormone (LH), follicle-stimulating hormone (FSH), prolactin, and thyroid-stimulating hormone (TSH) as measured in the late follicular phase (not shown).

Sample Collection

Morning urine samples to compare PSA, uric acid, urea, and creatinine concentrations have been collected (Table 1). The experiments have been replicated three times in three different, nonconsecutive cycle phases.

The subject was requested to abstain from sexual intercourse and masturbation in the 5 days prior to each experiment. During the experiments, the volunteer was in the Trendelenburg position. Sterile gloves were used to avoid bacterial contamination. A digital stimulation of the anterior vaginal wall was performed. Then, when she was properly excited, the vaginal lubricant was collected using a vaginal swab. To avoid contact with the labia minora, a sterile vaginal speculum was used. Once the sample was taken, stimulation continued until the subject reached the orgasm and urethral expulsions were separately collected. A large plastic receptacle to collect the first urethral fluid (squirting) was used. Although the ideal device to collect this fluid is a Foley catheter, the tube could compress the urethral orifice and prevent the release of the female ejaculate. The other urethral fluid (female ejaculate) was collected with a sterile tong depressor. The total volume of each fluid was measured. Furthermore, uric acid, urea, creatinine, and PSA concentrations have been determined. Specimens have been microscopically examined with an optical microscope (Carl Zeiss Optical, Inc., Chester, VA, USA).

Biochemistry

Biochemical determinations were performed using the dry chemistry technique. The device used was a Vitros 250 Chemistry System (Ortho Clinical Johnson & Johnson, Hong Kong). For PSA determination, a chemiluminescent immunometric assay was performed using the Immulite 1,000 System (Siemens Healthcare Diagnostics, Deerfield, IL, USA).

Table 1 Comparison of different biochemical parameters in the voided urine, squirting fluid, and female ejaculate

	Voided urine	Squirting	Ejaculate
PSA (ng/mL)	0.90 ± 0.03	0.23 ± 0.25*	$3.99 \pm 0.60 \times 10^{3}$*,**
Uric acid (mg/dL)	41.66 ± 3.52	10.37 ± 1.48*	—
Urea (mg/dL)	923.67 ± 82.10	417.0 ± 42.88*	—
Creatinine (mg/dL)	72.67 ± 4.04	21.37 ± 4.16*	—
Color	Yellow	Clear	White
Density	1,028.33 ± 2.89	1,001.67 ± 2.89*	—
Volume (mL)	84.00 ± 8.54	120.67 ± 56.36	0.89 ± 0.52*,**

*$P < 0.05$ vs. voided urine; **$P < 0.05$ vs. squirting.
PSA = prostate-specific antigen.
N = 3 for each determination.

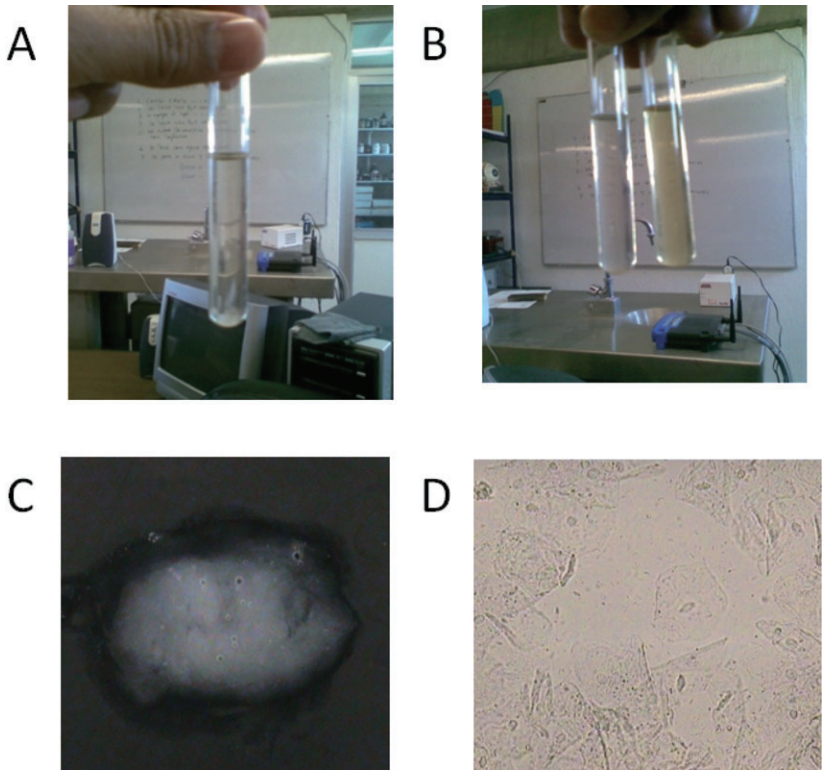

Figure 1 (A) Squirting fluid, 2 hours after collection. (B) The same squirting fluid (left) and morning urine (right). Note differences in color. (C) Macroscopic aspect of the female ejaculate, 2 hours after collection. (D) Microscopic aspect of the female ejaculate (Magnification 400×).

Statistics

Data are expressed as mean ± standard deviation assessing significant differences, as measured by Student's *t*-test for paired data, at $P < 0.05$.

Results

During orgasm obtained by 5 to 10 minutes of digital stimulation of the anterior vaginal wall, two different fluids leaving the urethra have been collected. First, a clear and abundant fluid was expelled in gushes. This fluid (squirting) is a thin, watery liquid, with little or no color, or smell, and without apparent aspect of urine (Figure 1A, B).

Immediately after the first abundant fluid, another fluid was expulsed and collected. The latter fluid (ejaculate) was very scanty, thick, and milky in aspect, similar to the male semen (Figure 1C). Microscopic examination of the fresh fluid revealed numerous epithelial cells and little bacteria (Figure 1D). Cultures of the ejaculate revealed the saprophytic nature of the bacteria. Interestingly, no Döderlein's bacteria have been found, suggesting that the vaginal environment is not involved in the phenomenon.

The squirting fluid showed markedly lower amount of PSA, uric acid, urea, and creatinine when compared with baseline samples of urine (Table 1). The ejaculate expressed high concentration of PSA.

The presence of urinary markers (uric acid, urea, and creatinine) confirms that the squirting fluid comes from the urinary bladder. Although in all samples the collected liquid was clear and not yellow, the uric acid, urea, and creatinine concentrations were high. PSA is found in female ejaculate at high concentrations compared with the other orgasmic fluids, but at lower concentration than that of male semen [4]. On the other hand, we found significant differences in PSA concentration in voided urine and in the squirting fluid. PSA concentration was higher in morning urine samples than in the squirting fluid. The presence of PSA in urine at low concentration when compared with the ejaculate, but at significantly higher concentration when compared with squirting, suggests a mixing of the ejaculate with squirting.

Finally, PSA was evaluated in three samples of vaginal secretions before orgasm. We found, as previously demonstrated by Zaviacic [5], PSA at very low, although detectable, concentration (0.080 ± 0.001 ng/mL).

Discussion

We here demonstrated for the first time biochemical differences in the urethral fluids expelled

during orgasm after sexual stimulation of the clitoro-urethro-vaginal (CUV) complex [6,7]. In particular, the first fluid (squirting) is characterized by features resembling those of much diluted urines. On the other hand, the second fluid (ejaculate) expresses organoleptic and biochemical characteristics of male semen without gametes. Hence, we may infer that these two fluids, although both related to the direct stimulation of the CUV complex and subsequent orgasm, are different in origin: the first from the bladder, the second from the female prostate [8]. All previously published studies lack to differentiate these two fluids, thus generating confusion and controversial findings.

It could be hypothesized, from our data, that during the sexual stimulation of CUV or orgasm, the female prostate sometimes pours its secretions and they mix with diluted fluid coming from the urinary bladder. In the squirting fluid, we found, in fact, very low PSA levels, suggesting that this was due to the dilution of the ejaculate from the female prostate with the large squirted volume. On the contrary, when the female ejaculate mixes with small amounts of fluid from the bladder (if any: we did not measure urinary markers in the ejaculate), PSA levels are very high [4]. Interestingly, a gradient of PSA concentration, demonstrating the role of the female prostate in the different female fluids, has been found, as in the following formula:

$$[\text{PSA}]: \text{vaginal secretion} < \text{squirting} < \text{urine} <<< \text{female ejaculate}$$

Because, theoretically, the bladder sphincter should be closed during arousal and orgasm, the abundant, clear fluid (squirting) expulsed at orgasm has not been considered by the majority of authors to be urine [1]. However, this mechanism applies to men; in women, it could be different. It has been proven that during female orgasm, an involuntary bladder contraction with simultaneous urethral relaxation may occur, resulting in leakage [9].

Can the squirting phenomenon be considered as urinary incontinence? Not necessarily and not in all women. It has been proved that pelvic muscles in female ejaculators are strong, not weak as in women with urinary incontinence [10]. More recently, it was demonstrated that women who experience female ejaculation may have normal voiding patterns, no bothersome incontinence symptoms, and no demonstrable detrusor overactivity [11].

The subject here described, although squirting much diluted urines, did not suffer for any patent urological or gynecological disorder. Furthermore and interesting, she did not drink abnormal amount of liquid in the hours before the experiments, suggesting that proactive, still unknown mechanisms are working during excitation and stimulation of CUV to produce the phenomenon of squirting overdiluted urines. One valuable way to get more information about this issue would be to perform video urodynamic studies testing in women who frequently expulse great amounts of fluid. With this technique, it could be possible to observe the bladder sphincter relaxation and the output of the squirting fluid during sexual activities or orgasm. These studies are currently underway in our facilities. Furthermore, we are increasing our experiences in more subjects in order to determine the relative frequency of ejaculation with respect to squirting.

Conclusions

Although there are many historical and modern references describing the female ejaculation, findings from the subject here examined suggest that female ejaculation and the squirting or gushing, which have been always considered as if they were the same, are different in biochemical composition and, thus, in origin. The squirting is the expulsion of a diluted fluid from the urinary bladder, while the real female ejaculation is the release of a very scanty, thick, and whitish fluid from the female prostate.

Acknowledgment

The authors are indebted to Dr. Roberto Rangel Cobián, Director of the Regional Hospital of Autlán, Mexico, for his disinterested support in our research. This article is partially supported by Italian Ministry of University and Research grants (PRIN).

Corresponding Author: Emmanuele A. Jannini, MD, Course of Endocrinology and Sexology, Department of Experimental Medicine, University of L'Aquila, L'Aquila 67100, Italy. Tel: +39 (0)862 433530; Fax: +39 (0)862 433523; E-mail: emmanuele.jannini@univaq.it

Conflict of Interest: None.

Statement of Authorship

Category 1

(a) Conception and Design
Alberto Rubio-Casillas; Emmanuele A. Jannini

(b) Acquisition of Data
Alberto Rubio-Casillas

(c) Analysis and Interpretation of Data
Alberto Rubio-Casillas; Emmanuele A. Jannini

Category 2

(a) Drafting the Article
Alberto Rubio-Casillas; Emmanuele A. Jannini

(b) Revising It for Intellectual Content
Emmanuele A. Jannini

Category 3

(a) Final Approval of the Completed Article
Alberto Rubio-Casillas; Emmanuele A. Jannini

References

1 Korda JB, Goldstein SW, Sommer F. History of female ejaculation. J Sex Med 2010;7:1965–75.
2 Gravina GL, Brandetti F, Martini P, Carosa E, Di Stasi SM, Morano S, Lenzi A, Jannini EA. Measurement of the thickness of the urethrovaginal space in women with or without vaginal orgasm. J Sex Med 2008;5:610–8.
3 Isidori AM, Pozza C, Esposito K, Giugliano D, Morano S, Vignozzi L, Corona G, Lenzi A, Jannini EA. Development and validation of a 6-item version of the Female Sexual Function Index (FSFI) as a diagnostic tool for female sexual dysfunction. J Sex Med 2010;7:1139–46.
4 Wimpissinger F, Stifter K, Grin W, Stackl W. The female prostate revisited: Perineal ultrasound and biochemical studies of female ejaculate. J Sex Med 2007;4:1388–93.
5 Zaviacic M, Ablin RJ. The use of prostate-specific antigen as a criterion for condom effectiveness. Am J Epidemiol 2005;162:704–5.
6 Jannini EA, Whipple B, Kingsberg SA, Buisson O, Foldès P, Vardi Y. Who's afraid of the G-spot? J Sex Med 2010;7:25–34.
7 Buisson O, Foldes P, Jannini E, Mimoun S. Coitus as revealed by ultrasound in one volunteer couple. J Sex Med 2010;7:2750–4.
8 Wimpissinger F, Tscherney R, Stackl W. Magnetic resonance imaging of female prostate pathology. J Sex Med 2009;6:1704–11.
9 Khan Z, Bhola A, Starer P. Urinary incontinence during orgasm. Urology 1988;31:279–82.
10 Perry J, Whipple B. Pelvic muscle strength of female ejaculators: Evidence in support of a new theory of orgasm. J Sex Res 1981;17:22–39.
11 Cartwright R, Elvy S, Cardozo L. Do women with female ejaculation have detrusor overactivity? J Sex Med 2007;4:1655–8.