Nature and Origin of "Squirting" in Female Sexuality

Samuel Salama, MD,*† Florence Boitrelle, MD,‡§ Amélie Gauquelin, CM,‡ Lydia Malagrida, MD,¶ Nicolas Thiounn, PhD, MD,†** and Pierre Desvaux, MD†††

*Department of Gynaecology and Obstetrics, Hopital Privé de Parly 2, Le Chesnay, France; †AIUS (Association Inter disciplinaire post Universitaire de Sexologie), Pérols, France; ‡Department of Reproductive Biology, Cytogenetics and Gynaecology, Poissy General Hospital, Poissy, France; §Versailles University of Medicine and Science, Versailles, France; ¶Department of Medical Biology, Poissy General Hospital, Poissy, France; **Department of Urology, Hopital Europeen Georges Pompidou, Paris, France; ††Department of Urology, Hopital Cochin, Paris, France

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ABSTRACT

Introduction. During sexual stimulation, some women report the discharge of a noticeable amount of fluid from the urethra, a phenomenon also called "squirting." To date, both the nature and the origin of squirting remain controversial. In this investigation, we not only analyzed the biochemical nature of the emitted fluid, but also explored the presence of any pelvic liquid collection that could result from sexual arousal and explain a massive fluid emission.

Methods. Seven women, without gynecologic abnormalities and who reported recurrent and massive fluid emission during sexual stimulation, underwent provoked sexual arousal. Pelvic ultrasound scans were performed after voluntary urination (US1), and during sexual stimulation just before (US2) and after (US3) squirting. Urea, creatinine, uric acid, and prostatic-specific antigen (PSA) concentrations were assessed in urinary samples before sexual stimulation (BSU) and after squirting (ASU), and squirting sample itself (S).

Results. In all participants, US1 confirmed thorough bladder emptiness. After a variable time of sexual excitation, US2 (just before squirting) showed noticeable bladder filling, and US3 (just after squirting) demonstrated that the bladder had been emptied again. Biochemical analysis of BSU, S, and ASU showed comparable urea, creatinine, and uric acid concentrations in all participants. Yet, whereas PSA was not detected in BSU in six out of seven participants, this antigen was present in S and ASU in five out of seven participants.

Conclusions. The present data based on ultrasonographic bladder monitoring and biochemical analyses indicate that squirting is essentially the involuntary emission of urine during sexual activity, although a marginal contribution of prostatic secretions to the emitted fluid often exists. **Salama S, Boitrelle F, Gauquelin A, Malagrida L, Thiounn N, and Desvaux P. Nature and origin of "squirting" in female sexuality. J Sex Med **;**:**–**.**

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Introduction

During sexual arousal or orgasm, some women report the involuntary emission of variable amounts of fluid [1] varying from 0.3 mL to more than 150 mL [2]. Although the prevalence of this phenomenon is difficult to evaluate, authors estimate that 10–40% of women may experience regularly or sporadically an emission of fluid during orgasm [2–4].

The exact nature of this fluid emission has been controversial for decades [5]. Indeed, whereas this fluid represents, for some authors, a mere vaginal hyper-lubrification [6]; for others, it is produced by the Bartholin's glands [7] or by the Skene's glands [8,9], also referred to as female prostate [10,11]. For some other authors, this fluid is rather a urinary emission [12,13]. More recently, insights were obtained into this issue, in particular, with the demonstration that

the fluid is actually emitted through the urethra instead of the vagina or the Bartholin's glands [14]. One plausible reason for this debate is the discrepant characterization, among authors, of the amount of fluid emitted by these women, which is, for some, limited to few milliliters, also referred to as the expulsion of scanty fluid like "watered-down" or "fat-free milk," whereas for others, the amount of liquid is much larger, often exceeding 150 mL [15]. Both these phenomena result from different physiological mechanisms. Therefore, we elected, in the present study, to not consider individuals reporting slight fluid emission but to focus only on those that related a regular and massive liquid discharge during arousal or orgasm, also known as "squirting."

Aims

In this investigation, we aimed at analyzing the biochemical nature of squirting but also at exploring the presence of any pelvic liquid collection that could result from sexual arousal and explain a massive fluid emission.

Material and Methods

Population

Seven female volunteers were included in this prospective study. All of them were referred by other physicians who were aware of the purpose of our investigation. Inclusion criteria were: (i) report of regular liquid expulsion during arousal or orgasm that was comparable with, at least, that of a glass of water, which abundantly wetted bed sheets; (ii) age >18 years; and (iii) body mass index (BMI) ranging from 18 and 25 kg/m^2. Exclusion criteria were: (i) chronic systemic or neurological disease; (ii) history of stress urinary incontinence (urine leakage during physical effort) or urinary incontinence during vaginal penetration; (iii) uterine or adnexal pathologies, in particular, ovarian cysts or hydrosalpinx; (iv) urinary or vaginal infections; and (v) pregnancy. All participants signed an informed consent, and this investigation received the approval of our Institutional Review Board.

Study Design

All participants were first invited to fill out a questionnaire detailing their medical history and sexuality, in particular, focusing on their experience of regular fluid emission during arousal or orgasm. Then, they were asked to urinate to empty completely their bladder, and a sample of urine was collected for further analysis (urinary sample before sexual stimulation [BSU]). Immediately after, each participant underwent a baseline ultrasonographic examination (US1) using a Voluson I equipped with a vaginal probe 3.7–9.3 MHz (RIC 5–9 H, General Electric Medical System, General Electric Healthcare, Vélizy, France) to confirm normal pelvis morphology and complete bladder emptiness. Each participant was then left alone in the same examination room and started sexual stimulation by herself (with or without a sex toy) or with the help of her partner. In case of sexual intercourse, a condom was systematically used to prevent all genital contamination with ejaculate. As soon as the participant felt sufficiently aroused, a second ultrasonographic examination (US2) was performed to identify any noticeable modification in the pelvic anatomy and to assess the size of the bladder (measurement of the three orthogonal diameters). Left by herself again, each individual continued sexual stimulation until squirting occurred. The expelled fluid was collected into proper plastic bags. A sample of it was then aspirated for further analysis (squirting sample [S]). Immediately after this, a third ultrasonographic examination (US3) was performed as at US2. Finally, they were asked to urinate again, and another sample of urine was collected for further analysis (urinary sample after squirting [ASU]). All liquid samples (BSU, S, and ASU) were immediately frozen and stored at –20°C for centralized analysis. All ultasonographic examinations were performed by the same operator (SS).

Biochemical Measurements

In all samples (BSU, S, and ASU), concentrations of urea, creatinine, and uric acid were determined using a Cobas 6000 system (Roche Diagnostics, Meylan, France) to explore the potential renal origin of S. In addition, concentrations of the prostatic-specific antigen (PSA) were also measured using a Immunoanalysor-Kryptor system (B.R.A.H.M.S, Asnières sur Seine, France) to explore the potential prostatic origin of S.

Statistics

Because normality of data distribution could not be ascertained, we preferred to use the median as the measure of central tendency and minimum–maximum values as the measure of variability. Possible differences among groups BSU, S, and ASU with regard to biochemical data were assessed

Table 1 Characteristics of the seven participants (P), concerning the age, height, weight, body mass index (BMI), age of the first sexual intercourse, number of sexual intercourse per month, and time after first squirting experience

Participant	P1	P2	P3	P4	P5	P6	P7
Age (years)	28	19	44	52	30	24	25
Height (m)	1.72	1.60	1.78	1.70	1.65	1.63	1.64
Weight (kg)	62	53	68	64	50	65	53
BMI (kg/m^2)	20.9	20.7	21.5	22.1	18.4	24.4	19.7
Age of first sexual intercourse (years)	18	15	17	15	16	14	15
Number of sexual intercourse per month	6	20	8	5	4	18	10
Time after first squirting experience (years)	0.5	0.5	3	5	1	2	4

using the Kruskall–Wallis test. A P value < 0.05 indicated a statistically significant difference.

Results

Population Characteristics

Population characteristics are detailed in Table 1. Median age and BMI values of participants were 28 (19–52) years and 20.9 (18.4–24.4) kg/m^2. Four of them were nulliparous, and three of them had children. They began their sexual activity at the age of 15 (14–18) years and had since then a median of 20 (4–200) sexual partners. Within the past 6 months, all of them were sexually active and had a median of eight (4–20) sexual intercourses per month. They had their first experience of squirting during sexual stimulation within the past 5 years. They reported that this event was partner dependent, and in six of seven women, this fluid emission was only possible during or after digital stimulation of the anterior vaginal wall.

Fluid Emission

Sexual stimulation by self digital masturbation (n = 2) or with her partner (n = 5) lasted from 25 to 60 minutes. The volume of squirting that could be recovered ranged from 15 to 110 mL (median: 60 mL). It is noteworthy to mention that participants confessed that they all have an orgasm that occurred just before or during fluid emission. They also reported that the squirting volume tended to be smaller at the experimental conditions than in private sexual practices.

Ultrasound Scans

After the first urination, as expected, US1 showed complete emptiness of bladder in all of the seven women, with no residual volume. No pelvic abnormality could be detected except for a characteristic aspect of polycystic ovaries in one patient during this examination. After sexual stimulation, US2 results remained comparable with US1 except that it evidenced a significant bladder filling. Bladder volume was then assessed by measuring the three inner orthogonal diameters, which are reported in Table 2. Finally, after squirting, US3 showed that bladder had been totally emptied, as it is illustrated in Figure 1.

Biochemical Analyses

Detailed data of urea, creatinine, uric acid, and PSA concentrations in BSU, S, and ASU are plotted in Figure 2. Median urea concentrations were 137 (37–407), 307 (62–376), and 225 (111–427) mmol/L, median creatinine concentrations were 10 (0.9–16.6), 9.3 (1.9–17.9), and 6.5 (3.0–14.6) mmol/L, median uric acid concentrations were 2.1 (0.6–5.1), 2.6 (0.1–3.5), and 2.2 (0.1–2.9) mmol/L, and median PSA concentrations were 0 (0–0.33), 0.72 (0–3.74), and 0.26 (0–0.69) ng/mL, for the samples BSU, S and ASU, respectively. In BSU, PSA was undetectable for all participants except one. For most of women (n = 5), PSA became detectable in S and remained detectable in

Table 2 Bladder size assessed by 3 orthogonal diameters

Participant	P1	P2	P3	P4	P5	P6	P7
US 1 (cm)	0	0	0	0	0	0	0
US 2 (cm)	$7.2 \times 3.3 \times 2.0$	$8.9 \times 5.0 \times 2.0$	$5.1 \times 3.9 \times 3.1$	$7.5 \times 5.6 \times 4.1$	$10.2 \times 6.2 \times 1.6$	$7.1 \times 5.2 \times 3.0$	$5.6 \times 4.0 \times 1.6$
US 3 (cm)	0	0	0	0	0	0	0

US1 = complete emptiness of bladder after spontaneous urination; US2 = different size of the bladder after sexual stimulation; and US3 = empty bladder after squirting.

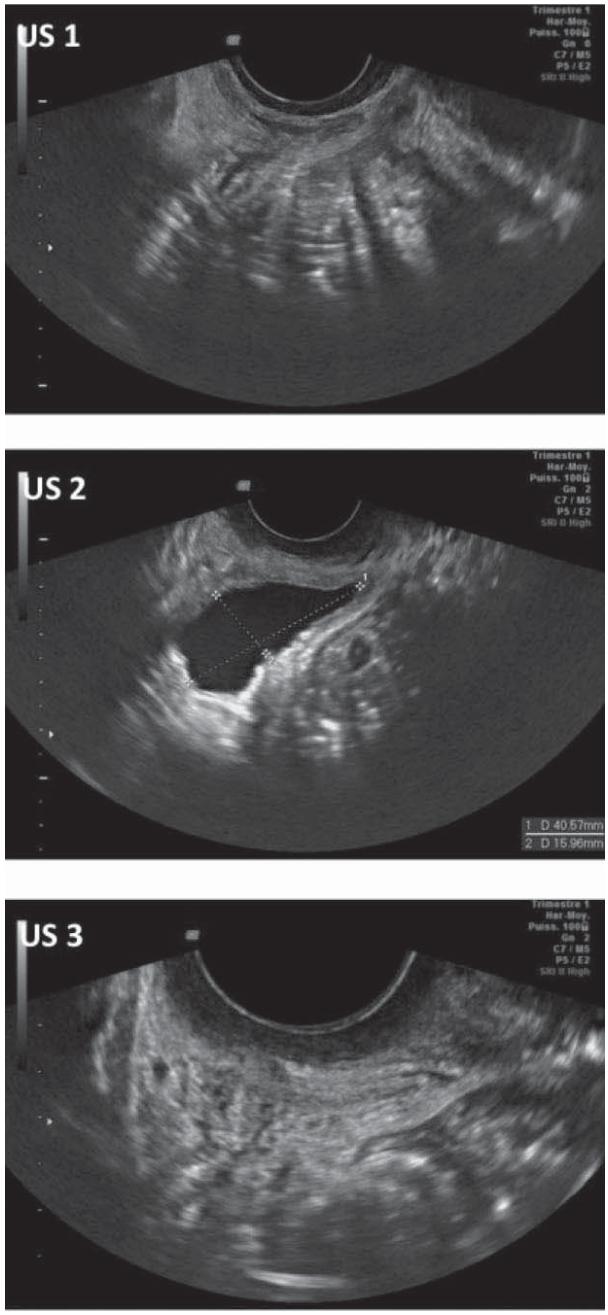

Figure 1 Ultrasound scan of the pelvis showing the different bladder filling status during the study demonstrate urinary origin of squirting
US1 = complete emptiness of bladder after spontaneous urination; US2 = refilled bladder after sexual stimulation; US3 = empty bladder after squirting.

ASU. For two women, PSA was undetectable in all samples (participants P2 and P7). Differences of urea, creatinine, and uric acid concentrations among BSU, S, and ASU did not reach statistical signification. However, PSA concentrations at S were significantly higher than at BSU ($P < 0.05$) but not at ASU ($P < 0.07$).

Discussion

The present investigation aimed at assessing the origin and the nature of the massive fluid emission

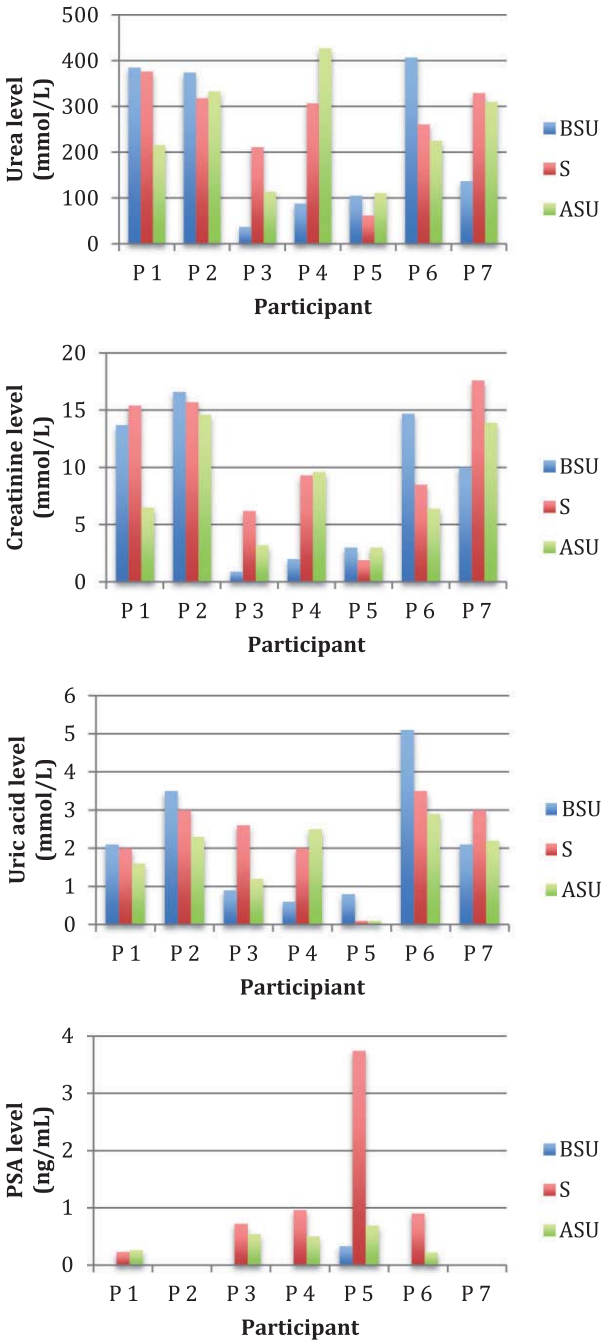

Figure 2 Per-participant (P1–P7) concentrations of urea, creatinine, uric acid, and PSA in the three samples
BSU = before sexual stimulation urine; S = squirting fluid; ASU = after squirting urine.

that some women experience during sexual arousal or orgasm and that are also called squirting. This event has been hitherto confounded with other fluid emissions by paraurethral glands during sexual activity under the term of "female ejaculation" [4,7]. Indeed, paraurethral glands cannot account themselves for the whole massive fluid emission. In support of this, the study by Wimpissinger et al. on the cartography of paraurethral glands by magnetic resonance imaging showed that their volume is limited to 2–4 mL [16], and Zaviacic et al. estimated the average weight 2.6–5.2 g [17], whereas squirting volume often exceeds 150 mL. The purpose of our study was to associate biochemical analyses of the emitted fluid with careful research, using pelvic ultrasound scans, of any liquid collection that could be formed and released during sexual stimulation or orgasm. Our results lead us to conclude that squirting essentially is an involuntary emission of urine with a relative and unnecessary contribution of female prostatic secretions and support the hypothesis that squirting and the so-called "female ejaculation" essentially are two distinct events [15,18].

Indeed, the ultrasonographic observation of a remarkable bladder filling during sexual arousal followed by the complete bladder emptiness after squirting in all participants strongly supports the hypothesis that squirting is an involuntary urine emission. In addition, the present data evidenced that the origin of the expulsed fluid is renal because urea, creatinine, and uric acid were detected at concentrations that were very close to that observed in urine (BSU and ASU). Incidentally, in contrast to previous publications [13,15], our data showed no urinary dilution in squirting.

The observation that most of the participants had detectable PSA concentrations in the squirting fluid (S) may be explained by the fact that their prostate had been mechanically stimulated during sexual activity. This suggests a marginal contribution of the female prostate secretions to the nature of the abundant fluid expulsion. Whether the type or intensity of local stimulation is related or not to PSA levels deserves to be clarified in additional studies. Moreover, the observation that one of the participants showed sizable PSA concentrations in BSU remains unclear. The present study is not contributive to elucidate whether it was the result of a spontaneous prostatic contamination of the urine by an unexplained PSA hypersecretion or any mechanical prostatic stimulation occurred before the experiment.

Coital urinary incontinence has been described under two distinct forms: first, the incontinence occurring during penetration and, second, the incontinence that occurs during orgasm [19,20]. Given that the participants in our study did not report fluid emission during penetration, the cases of squirting observed may be assimilated to a form of orgasmic urinary incontinence. Indeed, Khan et al. have shown that, in women suffering from detrusor overactivity, orgasm triggers bladder contractions and sometimes sphincter relaxation [21]. Incidentally, detrusor overactivity has been observed in up to 69% of women reporting orgasmic urinary incontinence [20] Moreover, other investigators failed to demonstrate that women reporting female ejaculation/squirting had functional bladder abnormalities such as detrusor overactivity [22]. Yet, cases of urinary emission during orgasm in women suffering from stress urinary incontinence have been also reported, but they probably implicate a different mechanism [18]. Unfortunately, in the present study, participants did not undergo prior urodynamics examination. Yet, to compensate for this limitation, during the questionnaire detailing their medical history, they were asked for urinary abnormalities (either stress or coital incontinency) to confirm the absence of this exclusion criterion.

It is also noteworthy that squirting often results from the combination of direct mechanical stimulation of the anterior vaginal wall (around the so-called G-spot) and a facilitating emotional status, with extreme confidence and relaxation. This indicates that some sexual practices may foster the occurrence of massive urinary emission in absence of any pathological condition.

Finally, the impact of squirting on female sexual life could not be carefully evaluated in the present experiment. In a recent study, Wimpissinger et al. [2] reported that around four of five women with female ejaculation (or squirting) considered that this event represented an "enrichment" of their sexual life. Unfortunately, these authors have included all cases of very limited fluid expulsion (0.3 mL) and those of abundant liquid emission (15 to over 150 mL). As the volume of the emitted fluid presumably exerts an influence on the women's perception of this event, we cannot rule out the hypothesis that abundant squirting during sexual activity may represent a real problem to some of them. Therefore, based on our present results, the effectiveness of frequent urinations during sexual activity as a preventive measure in women to whom the occurrence of squirting alters

the quality of their sexual life deserves to be demonstrated in further investigations.

Conclusions

The present data based on ultrasonographic bladder monitoring and biochemical analyses indicated that squirting essentially is the involuntary emission of urine during sexual activity. Moreover, a marginal contribution of prostatic secretions to the emitted fluid often exists.

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Corresponding Author: Samuel Salama, MD, Department of Obstetric and Gynaecology, Hopital Privé de Parly 2, 21 rue MOXOURIS, Le Chesnay 78150, France. Tel: +33 1 39 63 70 62; Fax: +33 1 39 63 70 62; E-mail: docsalama@gmail.com

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Statement of Authorship

Category 1

(a) Conception and Design
Samuel Salama; Florence Boitrelle; Amélie Gauquelin; Lydia Malagrida; Nicolas Thiounn; Pierre Desvaux

(b) Acquisition of Data
Samuel Salama

(c) Analysis and Interpretation of Data
Samuel Salama; Florence Boitrelle; Amélie Gauquelin; Pierre Desvaux

Category 2

(a) Drafting the Article
Samuel Salama; Florence Boitrelle; Amélie Gauquelin; Pierre Desvaux

(b) Revising It for Intellectual Content
Samuel Salama; Florence Boitrelle; Amélie Gauquelin; Pierre Desvaux

Category 3

(a) Final Approval of the Completed Article
Samuel Salama; Florence Boitrelle; Amélie Gauquelin; Pierre Desvaux

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