

Original Article
Clinical Investigation**Enhanced visualization of female squirting**Miyabi Inoue,¹  Yuki Sekiguchi,² Noriko Ninomiya,³ Tomoko Kobayashi^{4,5} and Motoo Araki⁵ ¹Miyabi Urogyne Clinic, Okayama, Japan, ²Women's Clinic LUNA, Kanagawa, Japan, ³Ninomiya Ladies Clinic, Osaka, Japan, ⁴Okayama Central Hospital, Okayama, Japan, and ⁵Department of Urology, Okayama University Graduate School of Medicine, Dentistry and Pharmaceutical Sciences, Okayama, Japan**Abbreviation & Acronym**

PSA = prostate specific antigen

CorrespondenceMiyabi Inoue, M.D., Ph.D.,
Miyabi Urogyne Clinic, 1-4-1
Omotechou Okayama city,
Okayama 700-0822, Japan.
Email: uromiya@msn.comReceived 27 April 2022;
accepted 13 July 2022.**Introduction:** Squirting is the involuntary expulsion of fluid from the female urethra following stimulation of the anterior vaginal wall before or during orgasm. The mechanism underlying squirting has not been established.**Purpose:** To elucidate the mechanism of squirting.**Methods:** The subjects in the current study were women who were able to squirt. They were not sex workers. A urethral catheter was inserted before sexual stimulation and the bladder was emptied. Then, a mixture of indigo carmine (10 ml) and saline (40 ml) was injected into the bladder. Sexual stimulation was provided to facilitate squirting, which was videotaped and verified. The secretions were collected in sterile cups, and prostate specific antigen (PSA) and glucose levels were measured.**Results:** Five women (2 in the 30s, 2 in the 40s, and 1 in the 50s) participated in this study. All women were able to squirt; three squirted only with manual sexual stimulation and two with penetrative sexual stimulation. The discharged fluid was blue in all cases, confirming the bladder as the source. The fluid was PSA-positive in four patients.**Conclusions:** The main component of squirt fluid is urine, but may also contain fluid from Skene's glands (female prostate). This is the first report in which visualization of squirting was enhanced.**Key words:** female ejaculation, female prostate, female sexual function, female squirting, Skene's glands.**INTRODUCTION**

There is a phenomenon in which a woman expels liquid during sexual intercourse. This phenomenon is referred to as ejaculation or squirting. In ancient Asia, female ejaculation was well-known and mentioned in several Chinese Taoist texts in the 4th century.¹ Specifically, 10%–54% of women were reported to squirt with a volume ranging from 1–900 ml.^{2–4} Little is known about the composition of this fluid and the mechanism by which the fluid is discharged.

Salama et al.⁵ reported that squirted fluid is urine by determining the composition of the fluid and observing urine in the bladder before and after sexual intercourse by ultrasonography.⁵ The components of the fluid proved to approximate the composition of urine.

Other reports have indicated that a small amount of fluid comes from the Skene's glands and a large amount of fluid is urine.^{3–6} It has also been reported that the squirted fluid is prostate specific antigen (PSA)- and glucose-positive.⁶

Female ejaculation and squirting are distinguished from urinary incontinence based on achieving an orgasm during sexual intercourse.² Urinary incontinence during sexual intercourse elaborates PSA-negative urine and the woman is aware of urinary incontinence.³

Female ejaculation and squirting are two distinctly different phenomena.⁷ Pastor and Chmel⁶ defined female ejaculation as a small amount of PSA-positive, milky fluid from the female prostate (Skene's glands).⁶ Pastor and Chmel⁶ also defined female squirting as a large amount of urine, or urine and PSA-positive Skene's glands secretions.

AIMS

The aim of this study was to elucidate the mechanism underlying female squirting. Although this squirting phenomenon has been proven indirectly, there have been no reports that have directly and visually proved this phenomenon.

METHODS

The subjects were women who were able to squirt and voluntarily consented to participate in the study. They were not sex workers. We chose women who were not sex workers because we wanted to eliminate the possibility of squirting in an act.

To empty the bladder, a urethral catheter was inserted into the bladder and urine was collected prior to sexual stimulation. Then, a mixture consisting of indigo carmine (10 ml) and saline (40 ml) was injected into the bladder. Sexual stimulation was provided to make the woman squirt. The sexual stimulation was done by hand or by the insertion of a penis, and the stimulation was provided in a way to facilitate squirting. We instructed him to put on a condom, when he inserted his penis. We waited in an adjacent room and entered the room just before squirting commenced. A video was obtained to verify the results. Secretions were collected in sterile cups and were tested for PSA and glucose.

This study was approved by the Ethics Committee of Okayama Central Hospital. In addition, disclosure of personal information was minimized to protect the identity of the participants.

RESULTS

Five women participated in the study (2 in the 30s, 2 in the 40s, and 1 in the 50s). Three squirted only with manual sexual stimulation, and two squirted with penetrative sexual stimulation (Figure 1; Video S1). Unfortunately, although we instructed him to use condoms, in Cases 2 and 3, he did not stimulate well and they were removed during intercourse. But he did not ejaculate. All squirted fluids were blue, indicating indigo carmine mixed with urine. The PSA of the squirted fluid was positive in four women and negative in one woman. One woman had a very high PSA. Indeed, only the indigo carmine solution was negative for PSA (Table 1).

There was no difference in glucose concentrations between urine and the collected fluid (Table 2).

None of the women had a sensation of urinary incontinence during squirting.

DISCUSSION

We were able to capture a video of a woman who was actively squirting. We also showed that there was a mixture of PSA-positive fluid as well as urine.

One squirt sample had a very high PSA level, and one sample was negative for PSA. PSA-positive fluid has been reported to be secreted by the Skene's glands. The female prostate glands (Skene's glands) are located around the urethra and vary in size and location from woman to woman.^{8,9} PSA levels may vary due to differences in prostate



FIGURE 1 Case 3: A woman in her 40s squirted by sexual stimulation with insertion a penis

TABLE 1 PSA level in squirted fluid

Case	Urine (ng/ml)	Squirted fluids (ng/ml)
① 40s	0.01↓	7596.59
② 50s	0.01↓	1.94
③ 40s	0.01↓	0.07
④ 30s	0.01↓	0.01↓
⑤ 30s	0.01↓	0.39

Note: Squirted fluid was PSA-positive in four women and PSA-negative in one woman. One woman had a very high PSA level.

TABLE 2 Glucose level in squirted fluid

Case	Urine (ng/ml)	Squirted fluids (ng/ml)
① 40s	Unmeasured	Unmeasured
② 50s	4	2
③ 40s	3506	1735
④ 30s	3	2
⑤ 30s	8	5

Note: The glucose concentration was not different between urine and the collected fluid in this study.

development. In Case 1, he said that he feels something bulging in her G-spot with his hand before she squirts. She may have developed Skene's glands. Further, the PSA level changes depending on the amount of urine produced during squirting.

One reason for this observation might be the method of collection. It is not known if the ejaculatory fluid is emitted during the squirting phenomenon or if the ejaculatory fluid is

released first, followed by urine. The squirting phenomenon in males involves the release of urine after ejaculation.¹⁰ If the same is true for females, the first fluid to be released during squirting will have a high concentration of PSA.

If the fluid is collected before the squirting phenomenon occurs, it is possible to obtain the first portion of liquid, which may contain prostatic fluid. In Case 1, the entire genitals were covered by hand: it was also possible that the PSA level was high because the first amount of ejaculatory fluid was caught well by the hand. Other women may have low PSA levels because the fluid was obtained after the squirting commenced. Women who are PSA-negative may have collected the last portion of squirted fluid. If female ejaculation occurs after ejaculation as in males, whether or not the fluid is PSA-positive depends on the phase in which the fluid is collected.

It was difficult to collect squirted fluid from the onset of squirting. If the researcher is nearby, the study subject will not be able to have sexual intercourse. Therefore, the researcher entered the room quietly just before squirting, obtained a video, and collected a fluid specimen. In addition, it is difficult to collect squirted fluid because the direction of squirting is variable.

In Cases 2 and 3, they were sexual intercourse without condoms and may have been contaminated with PSA on the male's side. Sexual stimulation with hand is the preferred method of measuring PSA, but some women are unable to squirt. This study is a difficult one to find subjects for.

It has been reported that glucose is strongly positive in female ejaculates and negative in squirting.⁶ In our study, the level of glucose was the same in urine and squirted liquid. It may be difficult to collect a representative sample because the concentration of glucose is lower than that of PSA or because the glucose fraction is released first. The components in the squirted liquid have not been established; further research is thus warranted.

It is clear that squirting is a mixture of urine, but the subjects were unaware of urinary incontinence. Pastor and Chmel⁶ concluded that female ejaculation is the secretion of a scant, milky fluid by Skene's glands. Squirting is the involuntary expulsion of a substantial amount of urine during sexual activity. The fluid is as clear as water. Fluid may be contaminated with Skene's gland secretions and may contain small amounts of PSA or may consist of urine only. Nevertheless, squirted fluid is distinct from urinary incontinence during sexual intercourse. Coital incontinence is the involuntary leakage of urine. Women with coital incontinence are embarrassed and aware of urine leakage. The subjects in our study had no complaints of urinary incontinence during sexual stimulation; thus, the observed phenomenon was squirting.

This study found that the main body of squirt fluid is urine, which may also contain Skene's gland fluid. This is the first report in which visualization of squirting was enhanced.

AUTHOR CONTRIBUTIONS

Miyabi Inoue: Investigation; project administration; writing – original draft. **Yuki Sekiguchi:** Investigation. **Noriko**

Ninomiya: Investigation. **Tomoko Kobayashi:** Investigation. **Motoo Araki:** Supervision.

CONFLICT OF INTEREST

None declared.

APPROVAL OF THE RESEARCH PROTOCOL BY AN INSTITUTIONAL REVIEWER BOARD

This study was approved by the Ethics Committee of Okayama Central Hospital. Ethical Institutional Review Boards number is 20190719.

The study was conducted in accordance with the Declaration of Helsinki.

INFORMED CONSENT

All women provided written informed consent.

REGISTRY AND THE REGISTRATION NO. OF THE STUDY/TRIAL

N/A.

ANIMAL STUDIES

N/A.

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Supporting information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

Video S1