The Female Prostate Revisited: Perineal Ultrasound and Biochemical Studies of Female Ejaculate

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ABSTRACT

Introduction. Many speculations have been made on the possible existence of a “female prostate gland” and “female ejaculation.” Despite several reports on the subject, controversy still exists around the “female prostate” and whether such a gland might be the source of fluid emitted during orgasm (ejaculation).

Aim. To investigate the ultrasonographic, biochemical, and endoscopic features in two women who reported actual ejaculations during orgasm.

Main Outcome Measures. Perineal ultrasound studies, as well as biochemical characteristics of ejaculate and urethroscopy, have been performed in two women.

Methods. Two premenopausal women—44 and 45 years of age—who actually reported fluid expulsion (ejaculation) during orgasm have been investigated. Ultrasound imaging, biochemical studies of the ejaculated fluid, and endoscopy of the urethra have been used to identify a prostate in the female. Ejaculated fluid parameters have been compared to voided urine samples.

Results. On high-definition perineal ultrasound images, a structure was identified consistent with the gland tissue surrounding the entire length of the female urethra. On urethroscopy, one midline opening (duct) was seen just inside the external meatus in the six-o’clock position. Biochemically, the fluid emitted during orgasm showed all the parameters found in prostate plasma in contrast to the values measured in voided urine.


Key Words. Female Prostate; Ultrasound; Female Orgasm; Female Ejaculation

Introduction

The debate around female ejaculation and the existence of a female prostate dates back to 300 BC when the Greek anatomist Herophilos first wrote about the “female prostate” [1]. The term “female prostate” itself was first introduced by the Dutch physiologist Reijnier De Graaf in 1672 [1].

Even though most physiological and organic functions of the female arousal cycle—and orgasm in particular—have been clarified, the existence of the female prostate and female ejaculation still remains a matter of debate [2–4]. With a year-long experience on the topic [5], we wanted to look more deeply into the subject when two women who reported fluid expulsion during orgasm agreed to undergo further investigation.

Aims

To investigate the ultrasonographic, biochemical, and endoscopic features in two women who reported ejaculation during orgasm.

Methods

In the two women who experienced ejaculation during orgasm, pelvic anatomy has been studied using high-definition perineal ultrasound (5 MHz)
and endoscopically with a 4F cystoscope. The ejaculated fluid collected during orgasm with masturbation at the sexual medicine office has been evaluated biochemically at the hospital laboratory. The results were compared to the parameters of urine voided prior to sexual activity, as well as to the parameters usually found in normal male ejaculate.

Main Outcome Measures

The focus of the present study was to further clarify the anatomic features of paraurethral anatomy in women reporting “ejaculation” during orgasm, with new imaging techniques, especially high-definition perineal ultrasound. To define the emitted fluid as “ejaculate,” biochemical parameters have been evaluated, mainly to rule out stress incontinence as the source of fluid emission.

Results

Two premenopausal, karyotypically normal women—44 and 45 years of age—who reported to the Sexual Medicine Clinic because of frequent, significant fluid expulsions during orgasm have been subjected to further studies following informed consent. Both women are in stable, heterosexual relationships; one of them (44 years) gave birth to a daughter at 20 years of age.

Biochemically, parameters of the examination of the fluid emitted were clearly different than urine voided prior to sexual activity. Biochemical parameters—with special reference to prostate specific antigen (PSA)—are shown in Table 1. The values show that the source of fluid expulsion during orgasm is not urine, but is rather similar to male ejaculate.

Perineal ultrasound imaging showed a hyperintense structure surrounding the entire length of the urethra with the anterior wall of the vagina adjacent dorsally (Figure 1). This picture closely resembles that of the male prostate.

On urethroscopy with a 4F endoscope, an opening was identified in the distal part of the urethra in the six-o’clock position. Passage into this opening

Table 1  Comparison of different biochemical parameters in female ejaculate and voided urine compared to male ejaculate

<table>
<thead>
<tr>
<th>Parameter</th>
<th>W1: female ejaculate</th>
<th>W1: voided urine</th>
<th>W2: female ejaculate</th>
<th>W2: voided urine</th>
<th>Male ejaculate</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSA (ng/mL)</td>
<td>213.49</td>
<td>0.80</td>
<td>105.00</td>
<td>0.16</td>
<td>110–2,211 [27]</td>
</tr>
<tr>
<td>PAP (U/L)</td>
<td>329</td>
<td>42</td>
<td>—</td>
<td>&lt;1</td>
<td>—</td>
</tr>
<tr>
<td>PSAP (U/L)</td>
<td>271</td>
<td>37</td>
<td>860.0</td>
<td>178</td>
<td>—</td>
</tr>
<tr>
<td>Glucose (mg/dL)</td>
<td>127</td>
<td>30</td>
<td>100</td>
<td>31</td>
<td>0.4–29.5 [28]</td>
</tr>
<tr>
<td>Creatinine (mg/dL)</td>
<td>33.0</td>
<td>178.0</td>
<td>30.0</td>
<td>225.0</td>
<td>—</td>
</tr>
<tr>
<td>BUN (mg/dL)</td>
<td>1,474</td>
<td>—</td>
<td>363</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>K (mMol/L)</td>
<td>8.6</td>
<td>37.3</td>
<td>—</td>
<td>31</td>
<td>5.0–24.8 [28]</td>
</tr>
<tr>
<td>Na (mMol/L)</td>
<td>46</td>
<td>203</td>
<td>—</td>
<td>129</td>
<td>23.6–51.2 [28]</td>
</tr>
<tr>
<td>Cl (mMol/L)</td>
<td>37</td>
<td>148</td>
<td>—</td>
<td>144</td>
<td>43</td>
</tr>
</tbody>
</table>

W1 = woman 1; W2 = woman 2; PSA = prostate specific antigen; PAP = prostatic acidic phosphatase; PSAP = prostate specific acid phosphatase; BUN = blood urea nitrogen; K = potassium; Na = sodium; Cl = chloride; — = no parameters available.

Figure 1  Perineal ultrasound of the female prostate. (a) median aspect (b) sagittal aspect. B = bladder; U = urethra; P = prostate; V = vagina.
was possible; however, the duct ended blindly after 2 cm. Endoscopically, no diverticulum or other pathologies of the urethra have been found.

Discussion

**Orgasm Intensity**

It seems that female orgasm with fluid emission is more intense than an orgasm without ejaculation—in women who do experience such phenomena [6]. This finding has been confirmed by both women reported in this study. Is female ejaculation the cause or the effect of more intense orgasms—a similar question just raised in a study on lubrication difficulties [7]? With female orgasm and arousal difficulties being highly prevalent [8], a possible link to ejaculations would be an interesting field of future studies.

**Anatomy**

Perineal ultrasound has been used to study paraurethral anatomy without artefacts that occur in any form of endoluminal ultrasound investigation (distortion and compression). From an anatomic point of view, we found glandlike structures surrounding the female urethra of the two female subjects who had frequent ejaculations during orgasm. Comparing these findings with previous data from the literature, we agree with De Graaf’s description of a gland similar to the male prostate rather than with Skene’s concept of pure female paraurethral glands [9]. In this respect, some authors even believe that Skene’s work hindered further studies of a female prostate for many years [10].

Historically, Reinjer de Graaf was the first to study the female prostate as early as 1672 [1]. Alexander Skene reported on “paraurethral glands” in 1880, leading to the terminology “Skene’s glands” of a female organ that seems to be the same as the male prostate (and that had been described by De Graaf in the first place). Later on, J.W. Huffman was the first to disagree with several conclusions drawn by Skene. Ultrastructural and immunohistochemical work in the 1980s—with special reference two PSA staining—further strengthened the concept of the existence of the female prostate.

Taking anatomical data of Huffman’s revolutionary wax models [11] into account (Figures 2 and 3), M. Zaviacic found different types of female prostates according to his pathoanatomic cross-sectional studies: anterior (meatal) type, posterior type, the prostate distributed over the hole length of the female urethra, the rudimentary female prostate, and rare middle and dumbbell configurations [10,12].

J.W. Huffman’s description of a female prostate with ductal tissue predominating has been strengthened by later observations [13,14].
lobulated appearance of the gland is similar to the prostate of the male before puberty [13]. Termination of hormonal stimuli in the female embryo, together with a different anatomic development of the urethra (and adjacent anterior vaginal wall), stops the full development of the gland.

According to ultrasonography, the subject studied exhibits a paraurethral gland that is “distributed over the hole length of the female urethra” (Figure 1). This type of distribution has been found in about 6% of Zaviacic’s autopsy material [11].

The ultrasonographic appearance of the structure surrounding the female urethra just like the male prostate is supported by numerous histologic and ultrastructural studies that found PSA-positive glands and stroma resembling an actual female prostate [15,16].

Critics of the concept of female ejaculation often postulate that urethral diverticula might be the source of fluid emitted during female orgasms. In this respect, both ultrasound and endoscopic features in the two cases presented show that no diverticulum was present. It must be postulated, however, that the majority of the female prostate gland’s excretory ducts are not seen on conventional urethroscopy. Previous studies reported of more than 20 ducts [11,15].

Immunohistochemically, PSA is the major tissue-specific marker for male prostate tissue. Wernert et al. [13] performed PSA and prostate specific acid phosphatase immunohistochemical staining of female paraurethral glandular tissue with positivity found in 22 of 33 cases (66.7%). Other authors found female prostatic tissue in up to 80% of cases [14,17].

With increasing awareness of the existence of a female prostate, pathology of the female paraurethral apparatus has been linked to adenocarcinoma similar to male prostate cancer [18–20].

In this context, more common problems like lower urinary tract symptoms or recurrent urinary tract infection could possibly be attributed to diseases of the female prostate [21,22]. This could in turn pave the way for new treatment strategies and research on new immunohistochemical markers [23].

Female Ejaculation

The description of female ejaculation dates back to the ancient Indian erotic text Ananga-Rang published in the 16th century AD [5]. In 20th century literature, Gräfenberg was among the first to describe the release of a milky opalescent fluid via the urethra during orgasm [11,12].

The fact that the female ejaculate is not a form of orgasm-induced stress urinary incontinence or the result of increased vaginal lubrication is established among all authors involved in studying female sexual response [11,12,24–27].

Because PSA is physiologically excreted by the prostate and appears in high levels in the male ejaculate to liquefy the ejaculated coagulum after its positioning at the female cervix, it seems obvious that measuring PSA levels in female ejaculate could differentiate between actual prostatic excretion and possible other sources of the fluid [28].

Biochemical parameters of the ejaculate in the women studied (high levels of PSA, prostatic acid phosphatase [PAP], and PSAP) further strengthen the fact that the emitted fluid comes from prostatic tissue and resembles that of male prostatic excretions with PSA levels in male seminal plasma ranging from 110 to 2,211 ng/mL (Table 1) [29,30]. Considering all studies published, rates of women who experience ejaculation during orgasm range from 10% to 69% [10,12,31–33].

It has been shown previously that PSA is detectable in female voided urine, and that the levels are higher following intercourse and orgasm [34]. Some specialists postulate that every woman ejaculates during orgasm, but most women experience retrograde ejaculation (into the bladder) [32,35]. To differentiate between urine and emitted fluid during orgasm (ejaculate), voided urine was collected prior to sexual activity in this study, and could thus be clearly differentiated (Table 1). Furthermore, urinary incontinence has been commonly associated with urinary incontinence [36]—just the opposite of what ejaculating women do experience.

Conclusions

Female ejaculation—first described as “love juice” in ancient Indian textbooks—seems to be more common than generally recognized. In the two women who ejaculated during orgasm, perineal ultrason and urethroscopy revealed structures consistent with a (paraurethral) female prostate. The fluid emitted during orgasm was biochemically comparable to male prostatic plasma.

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Conflict of Interest: None declared.
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Commentary on Wimpissinger F, Stifter K, Grin W, Stackl W. The Female Prostate Revisited: Perineal Ultrasound and Biochemical Studies of Female Ejaculate

In this paper, the authors demonstrate the biochemical differences between the fluid emitted during female ejaculation and samples of urine taken prior to sexual activity. The paraurethral glands have been previously suggested as a female homolog of the male prostate, and histological evidence suggests that they might be the source of such ejaculatory fluid. In support of this hypothesis, the authors draw a comparison between the PSA levels found in the female ejaculate samples, and that expected in male ejaculate.

While the biochemical data provide convincing evidence that the ejaculatory fluid collected was not urine, we are concerned that the authors have over-interpreted the ultrasound data to fit with their hypothesis of a female prostate. The image reproduced in the paper is of poor quality. The area labeled “U” for urethra probably represents a stripe of artifact caused by scanning the urethra along its course. Furthermore, while paraurethral glandular tissue may extend along the length of the urethra, it is not noted to surround the proximal urethra. Thus the area labeled “P” for prostate most likely represents the striated urethral sphincter, a structure which does surround the proximal urethra in this way. We would suggest that three-dimensional ultrasound or magnetic resonance imaging may be more appropriate modalities for imaging the periurethral structures.

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Author Response

We appreciate the thoughtful comments regarding the interpretation of perineal ultrasound images in our examination of women reporting ejaculation during orgasm. Perineal ultrasound is a well-established tool in the workup of women with suspected prolapse as well as nullipara girls. In the hands of the experienced clinician, the female introitus, including urethra, bladder neck, and vagina, can easily be identified. The image printed in the manuscript is a static view of a very dynamic examination—a fact that applies to all ultrasound techniques. Therefore, definition of the urethra and surrounding tissue must be seen in the context with this dynamic process and the resulting three-dimensional image in the observer’s mind. However, we agree that the actual definition of paraurethral tissue as prostate “P” is rather hypothetic. Only biopsies could prove that this gross anatomic feature really relates to the female prostate. Hopefully, high resolution magnetic resonance images will help us solve this problem in future studies.