# The G-spot: A modern gynecologic myth

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The G-spot is an allegedly highly erogenous area on the anterior wall of the human vagina. Since the concept first appeared in a popular book on human sexuality in 1982, the existence of the spot has become widely accepted, especially by the general public. This article reviews the behavioral, biochemical, and anatomic evidence for the reality of the G-spot, which includes claims about the nature of female ejaculation. The evidence is far too weak to support the reality of the G-spot. Specifically, anecdotal observations and case studies made on the basis of a tiny number of subjects are not supported by subsequent anatomic and biochemical studies. (Am J Obstet Gynecol 2001;185:359-62.)

**Key words:** G-spot, female ejaculation, vaginal anatomy

The term *G-spot* or *Grafenberg spot* refers to a small but allegedly highly sensitive area on the anterior wall of the human vagina, about a third of the way up from the vaginal opening. Stimulation of this spot is said to result in high levels of sexual arousal and powerful orgasms.[1] The term *G-spot* was coined by Addiego et al[2] in 1981 to recognize Dr Ernest Grafenberg who, they said, was the first to propose the existence of such an area in a 1950 paper.[3] The G-spot broke into public consciousness in 1982 with the publication of the popular book on human sexuality "The G Spot and Other Recent Discoveries About Human Sexuality."[1] One survey study[4, 11] suggests that the reality of the G-spot is widely accepted at least by professional women. A 192-item questionnaire on sexuality was mailed to "a random sample of 2350 professional women in health-related fields in the United States and Canada."[11] The response rate was 55% with a total of 1289 questionnaires being returned. Of this sample, 84% responded that they "believed that a highly sensitive area exists in the vagina."[4] Most popular books on sexuality take it for granted that the G-spot is real. Even a leading college-level sexuality text[5] uncritically reports that the spot is "located within the anterior (or front) wall of the vagina, about one centimeter from the surface and one-third to one-half the way in from the vaginal opening."

Given the widespread acceptance of the reality of the G-spot, one would expect to find a considerable body of research confirming the existence of such a structure. In fact, such supporting evidence is minimal at best. Two types of evidence have been used to argue for the existence of the G-spot and will be reviewed in turn. The first is behavioral, the second is based on claims of female ejaculation. This issue of female ejaculation is relevant to the G-spot for 2 reasons. First, the two are often considered together in the popular literature with the strong implication that the reality of ejaculation supports the reality of the G-spot. Second, some authors[4] mistake the presence of glands that may produce a female ejaculate with the G-spot, a topic discussed in detail later.

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## Behavioral evidence

Ladas, Whipple, and Perry[1] reported anecdotes about women who had powerful orgasms when their G-spot was stimulated. Anecdotes aside, there are only 2 published studies of the effects of specific stimulation of this area. The first study[2] reported a single case of a woman who experienced "deeper" orgasms when her G-spot was stimulated. During one session with the subject during which digital stimulation of the anterior vaginal wall was administered, it was reported that the area "grew approximately 50%."

Two years later, Goldberg et al[6] examined 11 women, both to determine whether they had a G-spot and to examine the nature of any fluid they ejaculated during orgasm. The latter aspect of this article will be discussed later. To determine whether the subjects possessed G-spots, 2 gynecologists examined each subject. Both had been given a 3-hour training session on how to examine for the presence of a G-spot. This training consisted of "a special type of bimanual exam as well as a sexological exam where they palpated the entire vagina in a clockwise fashion." Using this technique, they judged that 4 of the 11 women had G-spots.

Even if a G-spot had been found by using techniques such as those described in a much larger sample, this would still have provided little real evidence for the existence of the spot. Almost any gentle, manual stimulation of any part of the vagina can, under the right circumstances, be sexually arousing, even to the level of orgasm.[7, 8] The fact that manual stimulation of the putative

G-spot resulted in real sexual arousal in no way demonstrates that the stimulated area is anatomically different from other areas in the vagina. The subjects in these studies knew that researchers were searching for an allegedly sexually sensitive area, as did the individuals who performed the stimulation. Under these conditions, it is highly likely that the demand characteristics of the situation played a major role in the responsiveness of the female subjects.

One might think that Grafenberg's original 1950 paper,[3] which is credited with introducing the concept, would contain significant evidence for the spot. It does not. In that paper, Grafenberg discusses no evidence for a G-spot. Rather, he reports anecdotes about some of his female patients. Some he terms *frigid*. Others, he says, derived sexual pleasure from inserting objects, such as hat pins, into their urethras. Just how later writers (ie, 2) transformed these reports into evidence for a G-spot is unclear.

Grafenberg[3] does make some mention of the innervation of the vagina. He cites Hardenbergh[9] whom, he says, "mentions that nerves have been demonstrated only inside the vagina in the anterior wall, proximate to the head of the clitoris." Hardenbergh does indeed make this statement, but provides no citation. Hardenbergh then goes on to rather dismiss claims of vaginal sensitivity in the course of his discussion of his questionnaire study of female sexual experience, the actual topic of his paper.

### Female ejaculation

The second source of evidence for the existence of a G-spot is the claim that women sometimes ejaculate a non-urine fluid during orgasm. Initially, the relationship between female ejaculation and the G-spot was tenuous and nonanatomic. Grafenberg[3] noted the possible existence of such ejaculation. Ladas, Whipple, and Perry[1] devoted an entire chapter to the topic in their book. The chapter consists largely of anecdotes about ejaculation.

Belzer[10] concluded that "female ejaculation...is theoretically plausible" based on a brief literature review and interview-generated anecdotes. The interviews were conducted by students taking a graduate level course on sexuality. Six students interviewed "about 5" people each, male or female. Included in the interview was a question about female ejaculation. Of the 6 students, each "found at least 1 person who reported that she herself, or, in the case of a male informant, his female partner, had expelled fluid at orgasm." Three of these women were then interviewed at length about their ejaculation, and their comments are included in the paper in some detail. In the questionnaire study[4, 11] discussed above, 40% of the respondents reported experiencing ejaculation.

Anecdotal and interview-generated reports such as those noted above are far from adequate to show that the ejaculated fluid is anything other than urine. Such evidence would be provided by chemical analysis of the ejaculated fluid. Addiego et al[2] were the first to perform such a chemical analysis. They obtained samples of urine and ejaculate from 1 female subject. They reported a higher level of prostatic acid phosphatase in the ejaculate than in the urine. Prostatic acid phosphatase is found in high levels in male ejaculate and originates in the prostate which, of course, produces components of the male ejaculate. This evidence could be taken, indirectly, as support for a "female prostate" and, more indirectly, for the G-spot. However, Belzer[12] later noted that the test used was "not entirely specific for acid phosphatase," citing a review to this effect by Stolorow, Hauncher, and Stuver.[13] In another study[6] of the chemical nature of female ejaculate, 11 subjects were studied. All produced preorgasmic urine samples. All then engaged in "some form of noncoital activity resulting in orgasm" and 6 collected some resulting ejaculate. The urine and ejaculate samples did not differ in levels.

### Anatomic considerations

Other researchers have taken a more anatomic approach to the issue of prostate-like components in female ejaculate. If women ejaculate a fluid that is not urine, or has non-urine constituents, it must be coming from someplace other than the bladder. Following Severly and Bennett,[15] Tepper et al[16] suggested that any non-urine female ejaculate would likely come from the female paraurethral glands, also known as Skene's glands or ducts. On anatomic grounds, these glands were considered analogous with the male prostate by Huffman[17] who also provided a detailed anatomic description and notes on the history of anatomic thought on the nature of these glands. If these glands are analogous to the male prostate, it might be expected that their secretions would be similar to those of the prostate. It was this hypothesis that Tepper et al[16] tested.

Eighteen autopsy specimens and 1 surgical specimen were obtained. These were sectioned and examined for immunologic reactions to prostate-specific acid phosphatase and prostate-specific antigen by using a peroxidase-antiperoxidase method. The results showed that "eighty-three percent (15/18) of the specimens had glands that stained with antibody to prostate-specific antigen and 67% (12/18) with PSAcPh (prostate-specific acid phosphatase)."[16] The authors concluded that "we have clearly demonstrated...that cells of the female paraurethral glands and adjacent urethral mucosa contain antigenic substances identical to those found in the prostate." Heath,[18] commenting separately on this finding, stated that the "homology between male and female prostate was shown."

More recent studies[14] have come to similar conclusions and have confirmed the presence of prostate-specific antigen reactivity in the paraurethral tissues. These stud-

ies, using immunohistochemical techniques to look for prostate-specific antigen expression, found the marker in the "superficial layer of the female secretory (luminal) cells of the female prostatic glands and membranes of secretory and basal cells and membranes of cells of pseudostratified columnar epithelium of ducts."[14] On the basis of these findings, Zaviacic and Ablin[14] argued for dropping the term *Skene's glands* and replacing it with *female prostate*. Whatever term one favors, these results are in line with a view of female ejaculate in which "evacuation of the female prostate induced by orgasmic contractions of the muscles surrounding the female urethra may account for the increased PSA (prostate-specific antigen) values in urine after orgasm."[14]

It was the results of the study by Tepper et al[16] that led Crooks and Baur,[4] in their aforementioned college sexuality text, to confuse the concept of glands that release something with a sensitive area that would have to have a large number of nerve endings to support the reported heightened sensitivity. Specifically, Crooks and Baur stated that the G-spot consists of a "system of glands (Skene's glands) and ducts that surround the urethra."

If the G-spot does exist, it will certainly be more than a "system of glands and ducts." If an area of tissue is highly sensitive, that sensitivity must be mediated by nerve endings, not ducts. One can ask whether, on embryologic grounds, one would expect to find tissue with nerve endings inside the vagina. Heath[18] seems to have been the first to discuss this issue in light of the topics considered in this article. He criticized Kinsey, Pomeroy, and Martin[19] for stating that the entire vagina originates from the mesoderm, which is "poorly supplied with end organs of touch." Rather, Heath[18] cites Koff's[20] work, which is said to show that the upper 80% of the vagina is of mesodermal origin, but the lower 20% is of ectodermal origin, the ectoderm also giving rise to the skin.

A more modern view of the embryology of the vagina is that the vestibulum, bladder, and urethra are of endodermal origin, whereas the rest of the vagina, and the vulva, are of ectodermal origin.[21] This view leaves open at least the possibility that tissue with nerve endings sufficient for the function of a G-spot could be present in the lower portion of the anterior vaginal wall, where the G-spot is said to be.

There have, of course, been histologic studies of the vagina and surrounding tissue. In 1958, Krantz[22] reviewed the early literature, starting with Tiedman's 1822[23] treatise, and then reported the results of his own microscopic analysis. The various studies Krantz reviewed are difficult to evaluate in terms of the issue at hand because they used various methods and many different species. Krantz himself examined only human tissue. In the vagina itself, what he termed "ganglion cells" were found "along the lateral walls of the vagina adjacent to the vascular supply" that were thought to be "parasympathetic terminal neurons." Regarding the types of nerve cell endings that mediate sensations of touch, pressure, and pain in cutaneous tissue, "no corpuscles were observed in the muscularis tunica propria and epithelial areas" although "a very small number/of fibers/were found to penetrate the tunica propria and occasionally terminate in the epithelium as free nerve endings." As would be expected from their well-known high levels of sensitivity, tissues of the external genitals were rich in the various disks, corpuscles, and nerve endings found in other highly sensitive cutaneous tissue.

No further work on the innervation of the vagina seems to have been done after Krantz[22] until 1995 when Hilliges et al[24] published their results. Anatomic techniques had obviously advanced between 1958 and 1995 and these latter authors used immunohistochemical techniques to search for nerve cells in the vagina. Twenty-four vaginal biopsy specimens, 4 from each of 6 women undergoing operation for "benign gynecological disorders not including the vagina," were obtained. The 4 locations from which biopsy specimens were obtained were the "anterior and posterior fornices, the anterior vaginal wall at the bladder neck level, and the introitus vaginae region."

Results generally showed a greater degree of innervation than previously reported by Krantz.[22] There was innervation of the introitus vaginae, with this area showing free nerve endings and a few structures that resembled Merkel's disk. The anterior vaginal wall showed more innervation than the posterior wall, but this was subepithelial, and there was "no evidence for intra-epithelial innervation of this part of the vagina." Such innervation would be expected if a sensitive G-spot existed in the area.

The failure of Hilliges et al[24] to find a richly innervated area on the anterior vaginal wall does not prove that the G-spot does not exist there. The authors did not specifically set out to search for the G-spot and did not sample the entire anterior vaginal wall. Thus, they might have simply missed it. Nonetheless, the existence of such a spot would presume a plexus of nerve fibers, and no trace of such appeared in the results.

Finally, it should be pointed out that the issue of the existence of the G-spot is not just a point of minor anatomic interest. As noted, the G-spot seems to be widely accepted as being real, at least within a sample of American and Canadian women.[4, 11] If the G-spot does not exist, then many women have been seriously misinformed about their bodies and their sexuality. Women who fail to "find" their G-spot, because they fail to respond to stimulation as the G-spot myth suggests that they should, may end up feeling inadequate or abnormal.

Two conclusions emerge from this review. First, the widespread acceptance of the reality of the G-spot goes well beyond the available evidence. It is astonishing that examinations of only 12 women, of whom only 5 "had" G-spots, form the basis for the claim that this anatomic struc-

ture exists. Second, on the basis of the existing anatomic studies reviewed above, it seems unlikely that a richly innervated patch of tissue would have gone unnoticed for all these years. Until a thorough and careful histologic investigation of the relevant tissue is undertaken, the G-spot will remain a sort of gynecologic UFO: much searched for, much discussed, but unverified by objective means.

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