# TAMPONS AS MENSTRUAL GUARDS

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Month by month the "curse" hangs over one seventh of a woman's active life. If strung along in sequent days, the flow would carry on for five full years. Yet of the thirty-five years of menstrual periods, the first six or seven and the last eight or ten are times in which pregnancy is little or not all to be desired and chiefly to be apprehended. Therefore, one third of the span of the function is needless fertility, footing up to fifteen years of all but futile vexation. Even with four pregnancies and full nursings, there are still some four hundred periods in which to use ten guards each, or some four thousand nuisances.

Any venture looking to mitigation of menstruation merits unbiased analysis.

For protection against the four or five days of trickle or gush or stain the requirement has been a roll or pad between the thighs, in a cleft so narrow there is no room for it. With this device every step in walking produces some degree of triple-surface rubbing, and every jounce when sitting produces upward pressing. These may be gratuitous discomforts, since, in the absence of the napkin, there is no contact or pressure of the chair seat against the vulva except in unusual conformations, as shown in an unpublished study of mine.

To the external menstrual guard there are some six objections.

To and fro motion may carry contamination from the anal opening to the urinary and vulvovaginal canals, and from the urinary outlet to the vaginal entrance (figures 1 and 6), a process favored by dampness and warmth, to say nothing of surface irritation. In one questionnaire, notice of chafing runs to 14 per cent.[1]

This region, like the armpit, is especially endowed with glands which give forth odor with hampered ventilation, from perspiration and sebaceous secretion, while stale blood, urine and leukorrheal discharge may be factors. Commercial reports show deodorants bought with napkins by one fourth of the purchasers in one series, by nearly half in another [2] and in a third by 59.8 per cent.[3] Recently, napkins carrying a deodorant have appeared in the market. One fourth of certain tampon users praised the freedom from odor.[1]

The support for this surgical dressing calls for some sort of harness or attachment—strap, girdle and buckles—ill adapted to close fitting or diaphanous modern clothing.

Carriage of unnecessary bulk is a bother; disposal after soiling is a trouble, what with the prohibition on blocking drains. The contrast is strikingly shown in figures 5, and between 6 and 7. (Box sizes are as seven to one figured in lots of twelve.)

Lastly, any external menstrual guard, in addition to applying some degre of heat within a confined space, is responsible for rhythmic play of pressure against surfaces uniquely alert to erotic feeling. This may affect a point projecting nearly to the outside and lying in a crevice into which the band may sink—a point which carries more nerve ends closely packed than any like area—namely, the clitoris (fig. 6). The timing of this combination of warmth, friction and pressure fits the peak of congestion of the external genitals for the monthly cycle. Thus an unavoidable focus of attention on the region is emphasized for four days.

The engineering efficiency—or deficiency of the external guard calls for study. This bulk is worn in order to take care of an amount of fluid smaller than is generally appreciated. The total flow averages 2 to 4 ounces (60 to 120 cc.), which is only up to a half cupful.[4] The first day may yield half the total, or a gush may expel retained fluid, or there may be a pause and resumption. Among 30 women only one fourth ran over 3 ounces and one eighth exceeded 4 ounces.[4] Twenty gynecologic textbooks give a much higher average, the range being from 2 to 7 ounces, as compared with those of the researches here summarized—researches which are not yet sufficient or altogether convincing.

The capacity for absorption for the usual commercial article would allow two to four tampons to take up the total output, so that the common employment of ten to twelve, as with napkins—at a cost from 22 to 36 cents—should provide the desirable changes. For the first day, with its possibility of half the total flow, unless the tampon is replaced often or two are worn at the same time, a tenth to a fourth of the women in various reports use a supplementary or substitute external guard. Home made tampons were reported in use by 37 per cent of users in 1942.[3] (This may account for part of the discontinuance.) The common commercial form is a cotton roll compressed to the size of the last two joints of the little finger (figs. 5 and 8), some being slightly tapered. The variety that has far the largest sales runs in three sizes and is provided with a light inserter for placement at any depth by means of a cardboard tube of glazed surface with a cardboard plunger for expulsion of the tampon into the vagina (fig. 8). Four of the six varieties are absorbent cotton, one of cotton linters, one of crape paper held with a net of threads [4a] (fig. 5). All are provided with a waterproofed string for withdrawal. All but one are compressed. They are packaged with individual wrapping of cellophane or paper or in twos or threes. The length, when compressed, is below 2 inches (fig. 5); the diameters run from ½ to 9/16 inch (12-15 mm.). It is to be noted that the posterior vaginal wall averages 3½ inches (9 cm.) in length, while the breadth of the vagina at its upper end, undilated, averages 2½ inches (6 cm.), which is a fact not generally understood. Under ordinary intravaginal pressures the material does not swell as much as in a glass of water. During the process of removal the passage is to be noted as funnel shaped downward. The outlines in figure 5 show tampons compressed and also pulled wide apart to demonstrate differences in construction, but this size is quite beyond their dimensions when saturated within the vagina. As between external and internal guards, the proportional bulk is as fifteen to one.

The living vagina is something of a *terra incognita* as far as slant, shape and dilatability are concerned, and these are all factors bearing on tampon usage. In the dorsal posture the cavity readily holds 10 cc. and, relaxed, 20 to 45 cc., or from ⅓ to 1½ ounces.[5] In the knee chest posture it holds 2 to 3 ounces (60-90

1. Research Bulletin, Womans Home Companion, January 1940.
2. Private study by manufacturers of Meds.
3. Fawcett Publications Market Research Forum, December 1942.
4. Hoppe-Seyler: Ztschr. f. physiol. Chem. **42**: 545, 1904. Driessen: Zentralbl. f. Gynäk. **17**: 618, 1914. Lahile: Ann. d. gynéc. et obst. **72**: 535, 1916-1917. Hermstein: Arch. f. Gynäk., 1927, p. 130. Barer, A. P.; Fowler, W. M., and Balbridge, C. M.: Proc. Soc. Exper. Biol. & Med. **32**: 1458, 1935. Barer, A. P., and Fowler, W. M.: Am. J. Obst. & Gynec. **110**: 790, 1938. Fluhman, C. F.: Menstrual Disorders, Philadelphia, W. B. Saunders, 1939, p. 60. Lewing, A. W.: Personal communication to the author.
4a. Consumers Reports, June 1942, p. 157; October 1943.
5. Rakoff, A. E., and Caspar, S. L.: Technic of Vaginal Medication, Pennsylvania M. J. **46**: 582 (March) 1943.

cc.) but 5 to 10 ounces (145-300 cc.) with its outlet held closed and under pressure (fig. 2). Kolbow [6] found 20 cc. a convenient fill for his 500 x-ray shadows, median and lateral (figs. 2 and 3). The passage, in the

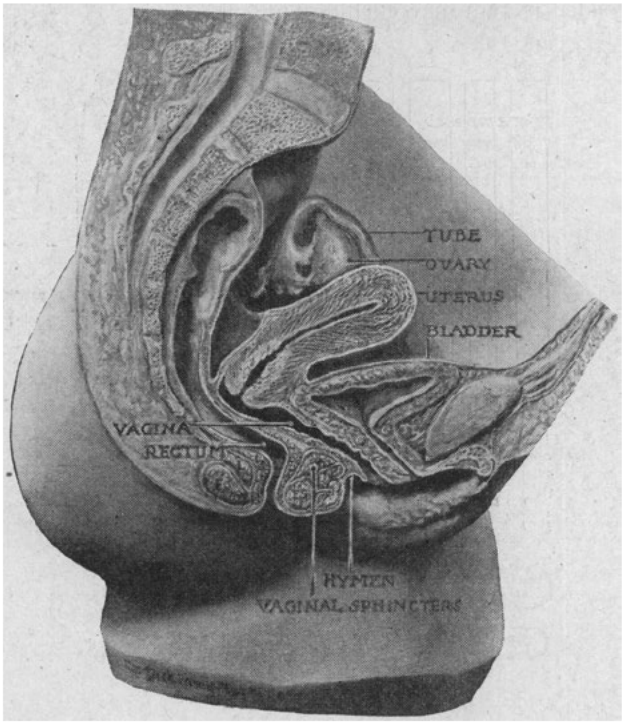


Fig. 1.—Midsection of pelvic contents of women, standing or sitting, with vaginal walls drawn somewhat apart and uterus slightly lifted.

dorsal posture, slopes toward the midsacrum with the tip of the cervix on the level of the ischial spines. In the standing or sitting posture it runs at only a slight

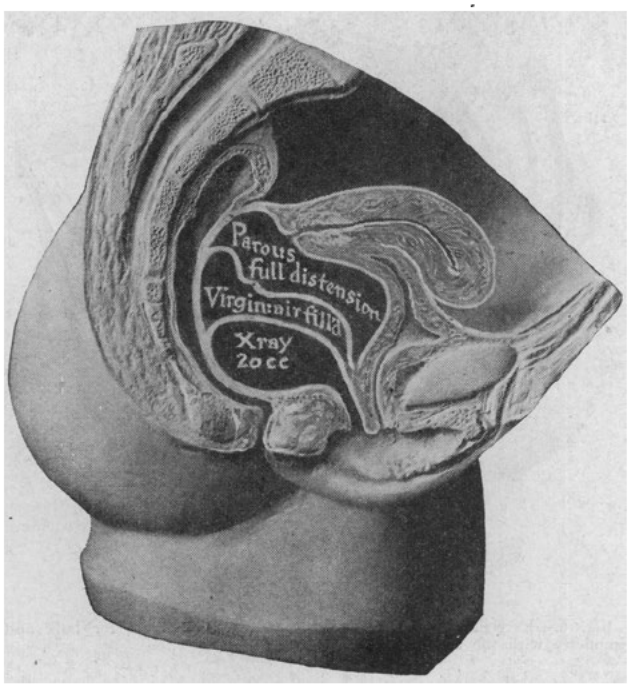


Fig. 2.—Capacity of moderately distended vagina, from the Kolbow x-rays in dorsal posture and the Dickinson averages of 116 cases taken on knee chest posture under atmospheric pressure.

incline, so that the external os lies close to the tip of the coccyx, a situation almost unknown to the pictures in textbooks on anatomy and gynecology, but fully illustrated in my Human Sex Anatomy.[7]

The total channel is most aptly designated by the term vulvovaginal passage. Undistended, the major diameters of the two crevices are set in curious fashion at right angles to each other. The inner aspects of the vulva lie together in the midline of the body; the walls of the empty vagina lie flat crosswise of the body (fig. 3). Only when distended rather fully are the combined passages a continuous tunnel. And this tube exhibits a curve with a moderate hour glass narrowing just within the hymen. Most important is the lateral spread of the passage at its upper end (fig. 3), where it reaches the breadth of 2½ inches (60 mm.) and where such span sometimes permits the retroversion pessary to slip crosswise. The right lateral fornix is usually the deeper and the cervix not in the midline,[6] and the tip of a long tampon slips into the pocket on one side or other of the portio vaginalis, if not behind it.

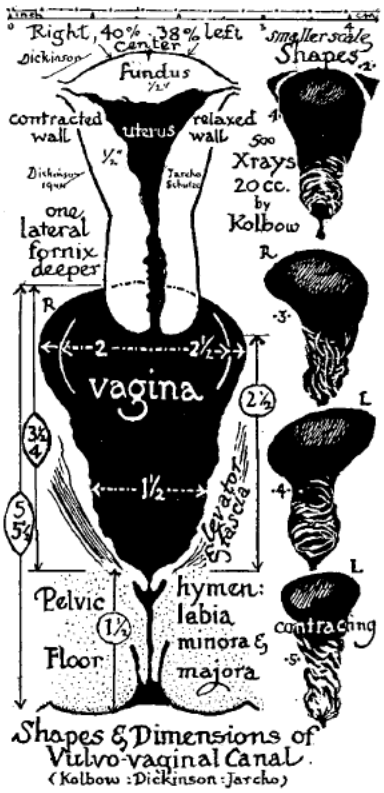


Fig. 3.—Vagina from front to show width at upper end, asymmetry and pelvic floor support for tampon.

An important factor is the sling of muscular and fascial layers that sweep downward and backward along the sides and rear of the passage (figs. 1 and 3), forming a sphincter group which retains the tampon within its upper two thirds. The levator ani is pictured for the most part as made up of fan shaped sloping bands with the inner border skirting the sides of the vaginal and anorectal canals. But attention is being drawn more and more to the large numbers of fibers running into the perineal body and into the lateral and posterior walls of the vagina.[8] Hence a new designation is suggested for the group of four muscles that loop around the vagina, maintaining closure of its outlet. The "vaginal sphincter group" would thus be made up of the outer ovals, the deep and superficial bulbocavernosus muscles, plus the pubococcygeal pair, with clearly palpable, thickened inner edges, plus the ischiococcygeals that furnish the inner flattened plane. Indeed, the female pelvic floor is built as if designed to hold a tampon in place in the erect posture, because the vagina lies nearly level on this floor. With any fluid content it becomes the "bowl" of Kolbow,[6] as shown in figure 2, this lesser bowl being supported on the larger bowl, the pelvic floor.

Here then is a hollow organ with thin walls endowed with very faint, slow rhythms of contraction; [6] with

6. Kolbow, H.: Ztschr. f. Gynäk. **16**: 748, 1941.

7. Dickinson, R. L.: Human Sex Anatomy, Baltimore, Williams & Wilkins Company, 1933.

8. Curtis, A. H.: Surg., Gynec. & Obst. **74**: 708-727, 1942.

sensory fibers of the mucous membrane "meager" in the upper two thirds;[9] so little sensitive "in its deeper portion and farther part of the anterior wall" that one can operate here without anesthesia, the sensory capacity developing "the nearer one approaches to the vestibular orifice.[10] Goodall [11] calls this cervicovaginal district the "great silent area of the pelvis." The vaginal response in coitus belongs to the orifice and to the muscular girdle, as my swab tests show. The erotic stimulus of the stationary interior guard should be, therefore, momentary and negligible as compared with that of the moving pressures of the external pad, on areas provided with remarkably different ratios of sensory nerve endings.

The hymen may, at first touch, be tender like the lining of the eyelid, but it is unlike the conjunctiva in that it can become as tolerant as the mucous lining of the mouth and its lips, what with douching, gentle stretching or good lubrication of the tampon tip, and this without any nick or damage. Only in the hypersensitive or in the rare, thick, rigid form, or the somewhat infrequent substandard opening is stretching needed, begun in the hot bath. The looping muscles just within the hymen (fig. 1) may resist entrance because of a reflex due to apprehension of hurt. There is wide variation here as in all other muscles, for these muscle slings are especially thick and tense in tennis addicts and horsewomen, but any spasm disappears with patient avoidance of urgency.

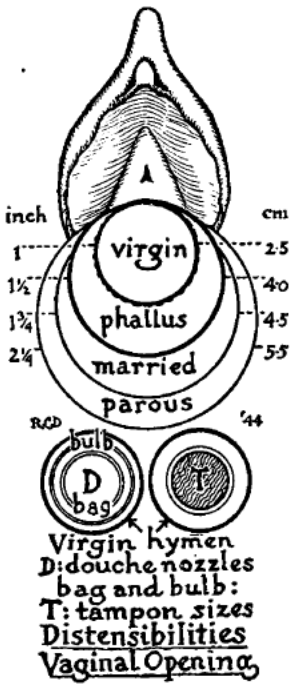


Fig. 4.—Caliber of distended hymen in virginal, married and parous woman, in relation to tampon and douche tube diameters.

A good educator is the douche.

Within the bony walls of the pelvic cavity the organs are provided with capacity for very free displacement, to care for complete filling of the bladder and the rectum and to welcome the to and fro movement of a 6½ inch phallus of a diameter of 1½ inches. Thus room for one or two tampons falls well inside the shifts to which uterus and vaginal walls are keyed.

Concerning the diameters and dilatability of the hymen there has been little published. My long series when pioneer calibrator [7] shows that most unentered hymens admit the average lubricated examining male forefinger for two joints, or the female index entire, the circle having a median diameter of an inch (2.5 cm.) (fig. 4). With the childless married woman two male forefingers pass fully (1½ inches, 4 cm.), which is the peak of the graph of the diameters of the erect penis in the Grien series of 486 white adults [12] and fits the 1,000 of the Kinsey series.[13] Thus the tampon has a caliber that does not impair standard anatomic virginity (figs. 4 and 5).

9. Piersol: Anatomy, 1918, p. 2018.
10. Poirier and Charpy: Anatomie, 1907, p. 572 (Rieffel).
11. Goodall, J. R.: Puerperal Infection, Montreal, 1932, p. 75.
12. Grien, S. K.: Research about to be published.
13. Kinsey, Alfred C.: Personal communication to the author.

Unrepaired injuries of labor and sagging vaginal walls may fail to provide support for the tampon. Cervicitis,[14] frequent in the genuine virgin, [14a] or tender uterosacral ligaments, or a sensitive bladder base, or the habitually loaded rectum may exclude tampon usage.

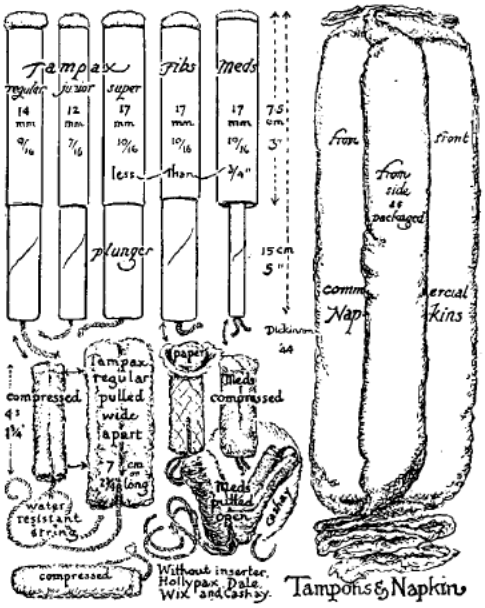


Fig. 5.—Tampons of various makes.

Sales of tampons run to about 10 per cent of sales of commercial napkins. The commercial reports on increase in demand is clinical evidence of value. A continuous survey of 749 drug stores finds the increase all over the country,[15] with 1943 sales five times those of 1937. A

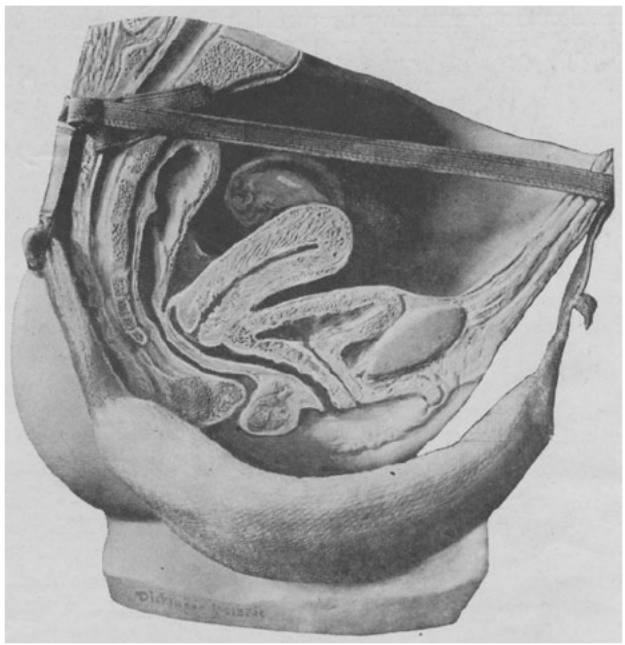

Fig. 6.—External menstrual guard in place to contrast for bulk and simplicity with the tampon in figure 8.

14. Macfarlane, Catharine; Sturgic, Margaret C., and Fetterman, Faith S.: The Value of Periodic Pelvic Examination in the Control of Cancer of the Uterus, J. A. M. A. **126**: 877 (Dec. 2) 1944.
14a. Brunet, W. M.: M. Rec. **151**: 384, 1940 (913 premaritals, 177 cervicitis with intact hymen).
15. A. C. Nielson & Co., Chicago.

study of 1,674 women made in 1940 found one fourth using tampons, though but few depended on them exclusively, while of the total questioned a fifth had made no trial and a seventh discontinued them.[1] A 1944 survey in twenty-six cities covered interviews with 2,500 women purchasing the two kinds of menstrual protectives.[2] Of these, 24 per cent used tampons, including the third with exclusive dependence, and the two thirds with supplement of a napkin part of the time. Such use was equally distributed between married and single women, the higher the income bracket the greater being the employment of the tampon. The peak of exclusive use was between 20 and 24. Availability of the tampon as guard was known to 94 per cent of those seen, but nearly one third were too apprehensive to make a trial, and inertia and satisfaction with the napkin accounted for 43 per cent of nonusers. Among the 300 who stopped, discontinuance had been due to discomfort in one fifth, to defective protection in another fifth and

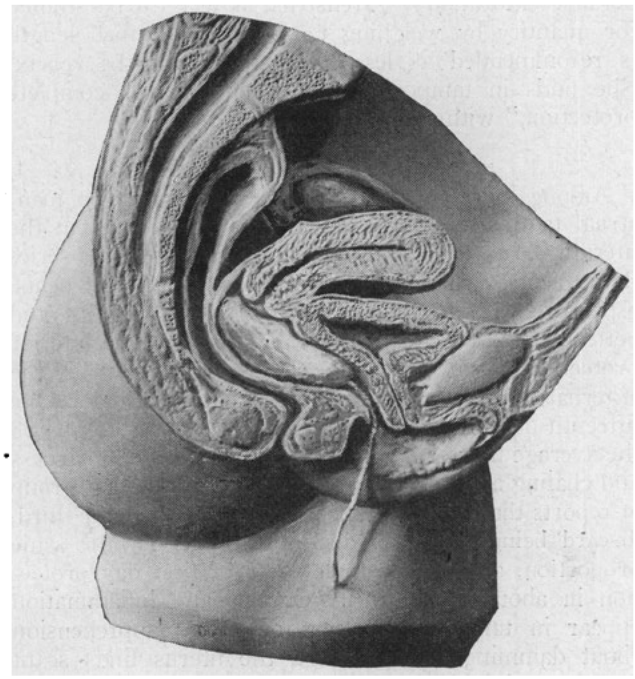

Fig. 7.—Tampon in place filled with absorbed flow.

to dislike in one sixth. Recommendation by friends started a third; advice by a doctor was the reason for beginning on the part of 34 out of 900 women, while 11 were stopped in such use by their physicians.

The 1941 research of Karnaky[16] on 2,000 women, covering use for a year or more, included 40 who tested its tolerance by wear day and night. They replaced the tampon twice a day and were examined every two to four weeks for vaginal $p_H$ and for glycogen and had cultures for bacterial growth, with biopsies and also a recording of the visual finding. Karnaky made the sweeping claim that the normals stayed normal, the abnormals became normal, and changes in biopsy and vaginal smear were not found. Also that in 6 patients with profuse bleeding he had packed the vagina snugly during one to six days before opening the abdomen, yet he discovered no evidence of backing up into the peritoneal cavity. Among 110 nurses testing tampon use, he reported 95 per cent satisfied with control all through the period. Sackren[17] reports 90 per cent of users completely protected. Magid and Geiger[18] in 25 women found no alteration in $p_H$, glycogen or flow and with complete absorption wherever the size of the tampon was correlated with the length and caliber of the

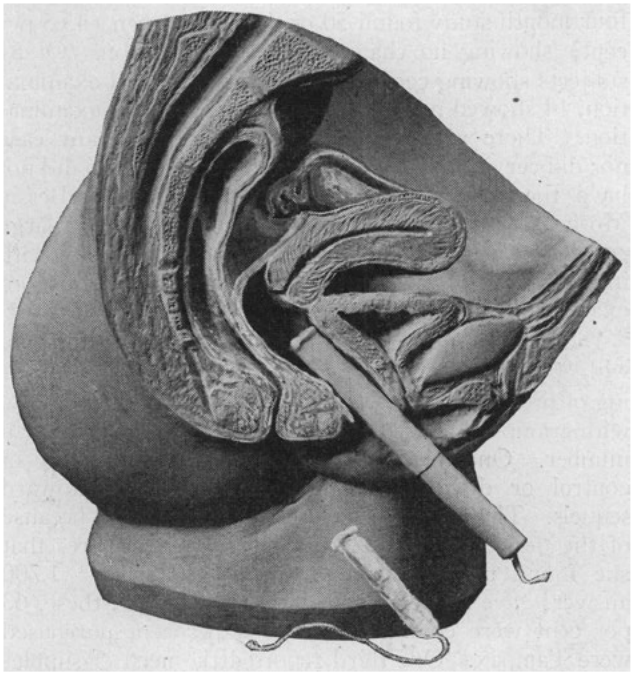

Fig. 8.—Inserter passed into vagina before plunger extrudes tampon; below, average dimensions compressed for introduction.

vagina. Meigs[19] reports tolerance in trichomonas treatments. Barton[20] had 30 patients using tampons four to five years without irritation or inflammation, but with

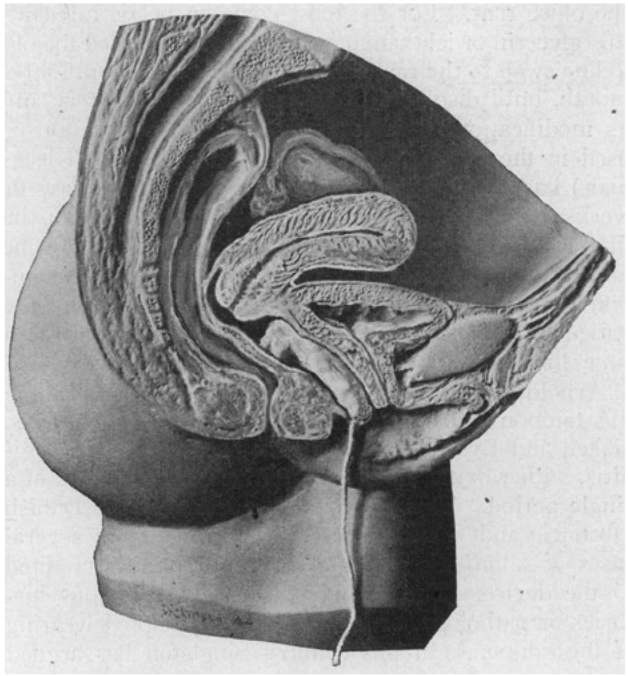

Fig. 9.—Tampon placed too near surface absorbs urine.

virgins showing partial or total "rupture" of the hymen, and found that blood acquired odor only after leaving

16. Karnaky, K. J.: M. Rec. & Ann., May 1941.
17. Sackren, H. S.: Clin. Med. & Surg. **46**: 327, 1939.
18. Magid, M. O., and Geiger, J.: M. Rec. **155**: 316, 1942.
19. Meigs, J. W.: New England J. Med. **226**: 562, 1942.
20. Barton, M.: Brit. M. J. **1**: 524 (April 25) 1942.

the vagina. In 6 women in another series, exact tests devised for odor determined a mean increase with napkin over tampon of 3½ times, the range being 1½ to 7 times.[21]

Thornton [22] found 103 of 110 women preferring tampons through all or part of the period and after a twenty-four month study found 50 of the 110 women (45.5 per cent) showing no change in pelvic condition. Of 51 subjects showing cervical erosion at the initial examination, 14 showed no cervical erosion at the final examination. There was no increase in severity in any case nor did cervical erosion develop in a subject who did not have the lesions at the initial examination. Bessie Moses,[23] lecturer in three women's colleges, finds a large percentage using tampons and without ill effects or (with intact hymens) without irritation or cervicitis on examination.

Diddle and Boulware [24] studied 569 college students, with 80 per cent reporting comfort, 17 per cent complaining of pressure on the bladder or difficulty in defecation, with cramps increased and leukorrhea caused in a small number. One third discontinued because of failure of control or discomfort, but there were no untoward sequels. Thwing,[25] in free use in a large school because of the desire not to interrupt swimming, declares that she found no complaints. In a 1940 series [1] 1,700 answers gave 26 per cent using tampons. Of these, 63 per cent were commercial and 65 per cent purchased were Tampax. One third reported the need of supplement by napkin. The reasons given by those discontinuing were 40 per cent for discomfort and 25 per cent insufficient protection, while among the 650 women only 1 developed cramps.

Antagonism to tampons presents a curious reversal on the part of gynecologists. The tampon used to pay the office rent. For the most common pelvic ailment,[9] this glycerin or ichthammol carrier supplemented the old iodine swab to the raw cervix twice a week, month after month, until displaced by my electric wire cautery and its modifications, with only one or two applications,[24] used in the office. An authority on vaginitis (Kleegman) has seen 5 instances with the tampon lost days or weeks, because, in placing a second, the presence of the first was forgotten. The odor was strong, the douche ineffective, the raw surfaces healed promptly. (A tampon packed in the far fornix may be reached by the patient in squatting and bearing down. Using two at a time their strings should be tied together).

Arnold and Hagele [26] found 87 of 95 women calling the tampon inadequate for the earliest day or days. Genell and Lysander [27] saw 3 instances of severe vaginitis, with vulvitis, follow tampon use, 2 of them as of a single period. This report at a meeting of the Danish Obstetric and Gynecologic Society brought out several cases of salpingitis and 1 of pelvic peritonitis credited to the device. The report fails to give previous histories or pathology, or length of uninterrupted wearing of the tampon. In this country Singleton has argued most strongly against the principle of intravaginal protection and has been at pains to draw on several sources. His questionnaire to 3,400 diplomates in our specialty and to 500 general practitioners brought singularly few replies, only 211 being usable. These showed 74 per cent opposed, 13 per cent favorable to limited use and 13 per cent giving endorsement. In attempting to summarize his returns from six sources one seems to find 641 women who had made trial of the tampon, with acceptance by about one third and with the main part of the approval from college women and nurses. Karnaky reports returns from 42 physicians concerning 2,780 tampon users with these results: vaginitis 1 in 33, cervicitis 1 to 100, dysmenorrhea made worse 1 to 112, salpingitis 1 to 123 and possible endometriosis 1 to 932.

Widenius [28] describes the six varieties of tampons. Frontal x-rays show size and location at placement and after a short stay in the vagina (but not with fullest possible saturation). Menstrual flow is to be studied for quantity by weighing tampons. A 2 inch length is recommended as less likely to deflect the cervix. She finds in tampons "safety, comfort and complete protection," with no unfavorable effect.

## COMMENT

Among more than 6,500 women reporting on menstrual tampons as recorded in nineteen sources in the literature, medical and commercial, there are series that voice satisfaction ranging around the 90 per cents, especially with younger women, educated groups and better incomes. This includes much reliance on interior protection alone, but with some supplement by the external guard at the beginning of the period. One fifteenth of the bulk of material thus suffices to absorb the average flow of 2 to 4 ounces and avoids the harness and chafing and also minimizes odor. In another group of reports there is acceptance by one fourth to one third, discard being based on discomfort in about the same proportion, and on incompleteness of first day protection in about one fourth. Cramps and inflammation appear in under 1 per cent of users; apprehension about damming back through the uterus finds scant support; salpingitis and serious complications are rare, appearing in two American and one foreign report. A questionnaire to 4,000 physicians brought notably few answers, with a fourth of those endorsing use or limited use.

The physician asked by the patient about tampons can answer that healthy women with average flow are using them increasingly with comfort, but may need the outer guard the first day also; second, that doctors lack reports on a series of local examinations on those who reject them after trial, to discover the reasons, and, third, that in her own case her local examination will show, or has shown, absence of any undue tenderness, inflammation, cramp or lack of room which would defer or prevent use of the tampon.

Relations between the anatomy in the living and tampon size and placement are fully presented, with the need shown for new figures on average flow and of much more analysis of pelvic findings before and after wearing tampons throughout the menstrual flow.

2 East 103d Street.

21. Applied Research Laboratories, Dayton, N. J., June 1939.
22. Thornton, M. G.: Am. J. Obst. & Gynec. **46**: 259-265, 1943.
23. Moses, Bessie L.: Personal communication to the author.
24. Diddle, A. W., and Boulware, L.: J. Iowa M. Soc. **32**: 256 (June) 1942.
25. Thwing, G.: J. Health & Phys. Ed., March 1943.
26. Arnold, Lloyd, and Hagele, Marie: Vaginal Tamponage for Catamenial Sanitary Protection, J. A. M. A. **110**: 790 (March 12) 1938.
27. Genell, S., and Lysander, A.: Svenska läk.-tidning. **36**: 2236-2240 (Dec. 8) 1939.
28. Widenius, Elizabeth F.: Am. J. Obst. & Gynec. **48**: 510-522, 1944 (under supervision of B. D. Watson).