Blood Absorption Capacity of Various Sanitary Pads Available in Thailand

Chatchai Treetampinich, M.D.*, Komsun Suwannarurk, M.D., Athita Chanthasenanont, M.D.**, Somsak Fongsupa, M.Sc.***, Terasak Tamrongterakul, M.D.****, Manee Rattanachaiyanont, M.D.*******

**Department of Obstetrics and Gynaecology, Faculty of Medicine, Ramathibodi Hospital, Mahidol University, Bangkok 10400, **Department of Obstetrics and Gynaecology, Faculty of Medicine, ***Department of Medical Technology, Faculty of Allied Health Science, Thammasat University, Pathumthani 12000, ****Department of Obstetrics and Gynaecology, Phramongkutklao Hospital, Bangkok 10400, *****Department of Obstetrics and Gynaecology, Faculty of Medicine, Siriraj Hospital, Mahidol University, Bangkok 10700, Thailand.*

ABSTRACT

Objective: To assess the blood absorption capacity of various sanitary pads available in Thailand.
Methods: Forty-eight models of sanitary pads, 10 pads per each model, were tested. Whole blood was poured into the center of each pad. Three volumes were recorded: volume-A, the volume recorded when the seeping blood reached at least one lateral rim of the pad, volume-B, when it reached at least one longitudinal end, and volume-C, when it showed the maximal absorption capacity of the pad.
Results: The blood volume absorbed in each model ranged from 2.4±0.5 to 23.5±2.9 mL for volume-A, 4.9±0.9 to 40.7±2.1 mL for volume-B, and 7.9±1.2 to 90.0±16.9 mL for volume-C, respectively. Some models did not allow blood to reach either a lateral rim or a longitudinal end of the pad.
Conclusion: The blood absorption capacity of sanitary pads largely varied on model and brand. Therefore, in order to use pad counting for estimating the volume of excess menstrual blood loss, it is necessary to know the exact model of sanitary pad used by the patient.

Keywords: Blood absorption capacity; sanitary pad

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Menstruation is a physiological phenomenon characterized by predictable cyclic vaginal bleeding with an interval of 28 ± 7 days, a duration of 2-7 days, and an amount of less than 80 mL.[1] Vaginal bleeding with a deviation of one or more parameters is considered abnormal. When excess vaginal bleeding occurs, the initial evaluation for determining the causes of bleeding includes the complete information of bleeding profiles. The amount of blood is one piece of the information that is sometimes difficult to obtain. Clinical assessment and laboratory methods have been developed to estimate the amount of menstrual blood loss (MBL). A pictorial blood loss assessment chart (PBAC), weighing of used pads, and alkaline hematin assay of extraction from used pads are examples of methods for MBL estimation.[2-6] However, these methods are either inconvenient or too complex to be used in a clinical setting.[7] In clinical practice, counting the number of "soaked pads" is generally used to estimate the volume of MBL.

Nowadays, a number of models of sanitary pads are commercially available. The different blood absorption capacity of each model makes it difficult to estimate the volume of blood absorbed. The purpose of this study is to determine the blood absorption capacity of each model of sanitary pads.

MATERIALS AND METHODS

The study was approved by the Ethics Committee of the Faculty of Medicine, Thammasat University. The blood absorption capacity of various sanitary pad models was determined by recording the volume of blood poured onto the surface of each pad. The study procedure was as follows: 1) drew whole blood into 10-mL syringe, 2) held the syringe in a vertical axis using a holding stand, 3) positioned the syringe until its outlet touch the surface of a sanitary pad which was attached on a flat bench top, 4) gently poured one mL of blood onto the center of the pad, 5) waited until the blood droplet was totally absorbed before pouring another one mL of blood, and 6) repeated the blood pouring steps until the pad could not absorb more blood poured at the center of the pad, 7) then the syringe was moved to non-blood-stained area and 8) more

Correspondence to: Chatchai Treetampinich
E-mail: ractf@mahidol.ac.th

TABLE 1. Blood absorption capacity of various sanitary pads available in Thailand.

Code	Brands	Types[a]	Surfaces[a]	Sizes[a]	Volume of blood (mean ± standard deviation, mL)		
					Volume-A	Volume-B	Volume-C
1111	Laurier	Maxi	Air layer	22 cm wing	13.5±2.1	19.4±4.2	72.0±3.5
1112	Laurier	Maxi	Air layer	22 cm	12.5±1.2	18.3±2.9	65.4±12.8
1121	Laurier	Maxi	Wonder gel	22 cm	10.7±1.3	20.3±2.5	55.2±7.2
1211	Laurier	Slim	Air layer	22 cm wing	13.0±2.4	18.1±2.2	52.9±6.0
1212	Laurier	Slim	Air layer	22 cm	12.1±1.1	26.5±1.9	60.9±6.9
1213	Laurier	Slim	Air layer	27 cm wing	9.2±0.9	16.1±0.9	55.4±12.5
1214	Laurier	Slim	Air layer	30 cm wing	15.9±1.7	21.4±3.6	77.6±5.9
1221	Laurier	Slim	Wonder gel	22 cm wing	N.A.	N.A.	26.7±2.4
1222	Laurier	Slim	Wonder gel	27 cm wing	11.1±2.7	21.9±8.1	55.3±20.4
1311	Laurier	Ultra slim	Air layer	27 cm wing	8.1±1.6	12.8±3.3	42.8±4.8
1321	Laurier	Ultra slim	Wonder gel	27 cm wing	N.A.	N.A.	32.4±2.0
2112	Sofy	Maxi	Soft close-fitting	22 cm	16.9±6.5	25.7±9.4	60.1±14.7
2121	Sofy	Maxi	Soft side-stopper	22 cm	22.0±3.7	26.5±5.4	66.4±7.0
2122	Sofy	Maxi	Soft side-stopper	22 cm wing	23.5±2.9	28.7±3.3	71.5±11.6
2211	Sofy	Slim	Soft close-fitting	23 cm wing	14.7±1.6	21.3±2.9	51.3±8.5
2212	Sofy	Slim	Soft close-fitting	23 cm	14.3±0.9	20.5±4.4	54.4±5.9
2213	Sofy	Slim	Soft close-fitting	29 cm wing	14.9±2.8	19.4±2.7	71.0±7.9
2221	Sofy	Slim	Soft side-stopper	23 cm wing	9.8±1.5	12.6±2.5	40.7±8.6
2231	Sofy	Slim	Dry side-stopper	23 cm wing	11.6±1.1	14.2±2.8	42.6±5.9
2232	Sofy	Slim	Dry side-stopper	29 cm wing	10.7±0.7	15.5±2.2	60.4±7.1
2233	Sofy	Slim	Dry side-stopper	33 cm wing	18.9±2.3	33.6±5.8	90.0±16.9
2241	Sofy	Slim	Side-stopper	23 cm wing	6.5±0.5	11.0±1.0	42.4±4.5
3111	Modess	Maxi	Soft	23 cm wing	N.A.	N.A.	54.2±7.9
3112	Modess	Maxi	Soft	23 cm	N.A.	N.A.	49.3±7.7
3211	Modess	Slim	Soft	23 cm. wing	12.1±1.7	15.0±3.9	66.5±5.1
3213	Modess	Slim	Soft	27 cm wing	N.A.	N.A.	68.9±3.5
3221	Modess	Ultra thin	Dry	23 cm wing	N.A.	N.A.	61.2±8.8
3312	Modess	Ultra thin	Soft	23 cm wing	7.8±0.8	12.5±1.3	40.8±4.9
3314	Modess	Ultra thin	Soft	27 cm wing	10.7±1.2	32.5±4.9	62.7±5.0
3315	Modess	Ultra thin	Dry	31 cm wing	9.9±1.3	27.5±4.3	65.6±4.5
3411	Modess	Spirit	Soft	23 cm wing	N.A.	N.A.	59.9±5.1
3412	Modess	Spirit	Soft	23 cm	N.A.	N.A.	55.3±3.8
3421	Modess	Spirit	Soft (4 wall)	23 cm	N.A.	N.A.	59.7±9.2
4101	Whisper	Regular	-	22 cm	15.7±2.0	40.7±2.1	73.8±4.6
4102	Whisper	Regular	-	24 cm wing	10.4±1.9	26.8±4.2	66.5±4.5
4103	Whisper	Regular	-	28 cm wing	16.1±2.5	29.7±3.5	58.7±9.2
4201	Whisper	Ultra tips	-	22 cm	6.0±0.8	21.0±2.5	26.1±3.1
4202	Whisper	Ultra tips	-	24 cm wing	7.0±0.9	23.0±2.8	31.3±3.5
4203	Whisper	Ultra tips	-	28 cm wing	7.3±1.3	28.4±2.8	36.5±2.7
5111	My best friend	Slim	Cotton soft	23 cm wing	18.3±2.4	34.3±6.5	74.9±6.9
5121	My best friend	Slim	Super dry	23 cm wing	20.8±2.9	35.9±5.7	75.9±7.7
6111	Wonder soft	Maxi	Blue wonder sheet	Normal	5.5±1.1	19.7±2.4	39.1±4.8
6112	Wonder soft	Maxi	Blue wonder sheet	Normal wing	8.4±1.4	12.1±3.2	53.4±4.5
6211	Wonder soft	Slim	Blue wonder sheet	Normal	12.3±2.4	23.3±1.3	64.3±7.4
6212	Wonder soft	Slim	Blue wonder sheet	Normal wing	9.2±0.6	12.0±0.8	48.5±1.6
7111	Kotex	Maxi	-	-	6.4±1.9	10.5±2.4	81.0±4.7
8111	Carefree[b]	Standard	-	-	2.6±0.5	5.2±0.9	12.6±0.9

TABLE 1. (continve)

Code	Brands	Types[a]	Surfaces[a]	Sizes[a]	Volume of blood (mean ± standard deviation, mL)		
					Volume-A	Volume-B	Volume-C
9111	Sofy[b]	Slim	-	-	2.4±0.5	4.9±0.9	7.9±1.2

Note Volume-A = volume of blood recorded when the seeping blood reached at least one lateral rim of a pad; volume-B = volume of blood recorded when the seeping blood reached at least one longitudinal end of a pad; volume-C = volume of maximal blood absorption capacity of a pad; N.A. = the pad did not allow seeping blood to reach either lateral rim or longitudinal end; [a] = type, surface and size described on the package of each model; [b] = panty liner.

blood was poured until the maximal absorption capacity of the pad was reached. The maximum absorption capacity of the pad was defined as the total volume of blood poured onto the pad before the pad could not absorb any more blood, i.e. the last blood droplet persisted on the surface of pads for longer than 10 minutes. Three volumes of blood were recorded: volume-A, the volume recorded when the absorbed blood dispersed to reach at least one lateral rim of the pad, volume-B, when it dispersed to reach at least one longitudinal end, and volume-C, when it reached the maximal absorption capacity of the pad.

Forty-eight models of sanitary pads, 10 pads per each model were tested. A unique coding number was allocated to each model of sanitary pad. The pads of the same model were encoded with the same coding number. All of the 480 pads were pooled in one box and totally mixed. One pad was randomly picked up each time for the test. The unfolded pad was attached on a flat bench top and marked at its center to standardize the site for blood pouring.

Blood used in the present study was the leftover unclotted whole blood obtained from the biochemistry laboratory.

Statistical analysis

The volume of blood absorbed at each point of each model was averaged and presented as mean ± standard deviation (SD).

RESULTS

The blood absorption capacity of each sanitary pad model is shown in Table 1. It was found that the majority of the models had the same pattern of blood absorption, i.e. blood was absorbed and gradually dispersed to lateral rims then to longitudinal ends before the maximal absorption capacity was reached. The exception was found in nine models that showed persistent blood droplet beyond 10 minutes at the center of pads and did not allow the absorbed blood to reach either lateral rim or longitudinal end of the pad. Therefore the volume-A and volume-B could not be recorded.

DISCUSSION

In the present study it was found that the blood absorption capacity of sanitary pad varied largely on model and brand. The blood absorption capacity of each pad in the same model was rather constant as demonstrated by a small standard deviation. The result was in contrast to that of previous study which demonstrated a large variation in absorption capacity of pads from the same model and the authors recommended not to use the pad-counting to estimate MBL.[8] The conformance procedures in all of the 480 experiments in our study accounted for less variation. It was not unexpected that the blood absorption capacity of the larger pad was more than that of the smaller pad. Interestingly, pads of similar size but from different brands had different blood absorption capacities. Such differences could be due to the difference in absorption material of the pad. Nowadays, the absorption materials used in most models of pads are publicized as the so-call "gel" which actually is polymers. However, the chemical formula of the polymers used in a particular brand is an industrial secret. It is possible that different polymers have different absorption capacity.

The result of the present study should be interpreted with some caution. Firstly, menstrual discharge is composed of not only blood but also degraded endometrial tissue and genital secretion. In fact, nearly half of the menstrual volume is the genital secretion.[9] Therefore the amount of menstrual blood is only half of the menstrual volume absorbed in the pad. In contrary, the volume of fluid measured in the present study was purely whole blood. As a matter of fact, the use of blood absorption capacity as a surrogate to estimate the volume of MBL is not applicable in the case with normal menstrual bleeding but the information may be useful in the case with excessive bleeding. Secondly, the in vivo bleeding pattern is not the same as the blood pouring pattern in the present experimental study. For example, in one situation, a small amount of digested blood might slowly drip from the vagina whereas, in another situation, a large amount of fresh blood with clot might gush out of the vagina. Such different bleeding patterns including the pressure of body weight on a pad and concentration of blood may have an effect on the absorption and dispersion of blood on the pad. Finally, newer models of pads produced after the initiation of the present study were not included.

CONCLUSION

The blood absorption capacity of the sanitary pad largely varied depending on the model and brand of the pad. Therefore, in order to use pad counting for estimating the volume of MBL, it is necessary to know the exact model of sanitary pad used by the patient during that event.

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