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Quantification of menstrual
blood loss

The Menorrhagia Research Group

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Menorrhagia is one of the most significant causes of ill health in women. It accounts for a significant number of gynaecological outpatient referrals and once referred to a gynaecologist, more than half of these women will have had a hysterectomy within five years. Objective menorrhagia is taken to be a total measured menstrual blood loss in excess of 80 millilitres per cycle. The objective diagnosis of menorrhagia can pose a clinical challenge. This article reviews the different methods currently used for the objective estimation of menstrual blood loss.

Introduction

Menorrhagia is considered to be one of the most significant causes of ill health in women. One in 20 women aged between 30 and 49 years consults her general practitioner each year with heavy menstrual loss. Menorrhagia accounts for 12% of gynaecological outpatient referrals and once referred to a gynaecologist 60% of these women will have had a hysterectomy within five years.^{1,2} It poses a burden on healthcare resources, with an estimated annual cost of medical and surgical management for this condition in the UK of over £7million and £98.4million per annum, respectively.^{3,4}

Menorrhagia can be defined both objectively and subjectively. Objective menorrhagia is taken to be a total of measured menstrual blood loss in excess of 80 ml per cycle. The average menstrual blood loss is 35–50 ml, without significant clots. This definition is taken from population studies,

which have shown that approximately 10% of women experience losses of over 80 ml/cycle.⁵ Subjectively, menorrhagia is defined as a complaint of excessive regular menstrual bleeding occurring over several consecutive cycles in women of reproductive years.

The objective diagnosis of menorrhagia can pose a clinical challenge. Our aim was to review the different methods proposed for the estimation of menstrual blood loss.

Methods of estimation of
menstrual blood lossA woman's self-estimate of her
menstrual loss

A woman's own perception that she has a heavy menstrual loss is the usual indication for medical and even surgical intervention. However, several

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studies have demonstrated that women's self-reports of the quantity of blood loss are often inaccurate. When this subjective estimate was compared with more objective methods, 38–76% of women complaining of heavy menstrual bleeding actually suffered from objective menorrhagia.^{6–8} This would suggest that a significant number of women have invasive investigations and treatment for a condition that they do not have. Although a women's subjective estimation of her blood loss may be an appropriate screening method for further investigation, it does not seem to be an accurate way of diagnosing the condition.

Counting the number of days of menstruation

The number of days of menstrual bleeding has been used to assess menstrual loss. Based on this method, the diagnosis of menorrhagia is made if the menstrual period lasts for more than seven days/cycle.⁶ This duration of menstruation is one of the most distressing symptoms from the woman's point of view. However, it does not seem to be an accurate method of quantifying the menstrual blood loss. Rybo *et al.* (1966) demonstrated that 78% of the total menstrual loss occurred by the second and 91% by the third day of menses.⁸ Haynes *et al.* (1977) reported that women with menorrhagia tended to have an increased loss in the first three days of menstruation.⁹ When measurement of length of menstruation was compared with the actual measurement of the menstrual blood loss, only 45% of the women who bled for more than seven days had a measured loss of more than 80 ml.⁸ With such a low sensitivity, this test is not diagnostic for menorrhagia.

Counting the number of sanitary products

There is little doubt that a woman tends to use more menstrual products during a heavy period compared with a lighter one. Therefore, it seems obvious that counting the number of sanitary products can be a fairly easy method for quantifying menstrual blood loss and consequently diagnosing menorrhagia. However, studies have clearly shown that the most important determinants for the number of sanitary products used were the woman's personal hygiene practices, frequency of attention to menstrual flow and financial resources.^{10,11} An extreme example from one study indicated that one woman used 18 sanitary pads to collect 32 ml of menstrual blood, whereas another woman used the same number and brand of pads to collect 399 ml.¹⁰

Another limitation of using the number of sanitary products as an assessment of menstrual blood loss is that brands of sanitary products vary widely in their absorbency. In a study assessing the absorbency of 15 different types of commercially available sanitary pads and tampons, the amount of blood absorbed by the products varied from 0.55 ml to 111.99 ml.¹¹ This demonstrates that the number of sanitary products used does not correlate well with actual blood loss. The number of sanitary products used by a woman might be a good indicator of a change in the pattern of menstrual loss, as long as she continues to use the same brand. However, it is not a good tool for quantifying this loss or making a definitive diagnosis.

Weighing sanitary products

Weighing used sanitary products and subtracting the weight of the unused product has been proposed as a method of quantifying menstrual blood loss.¹² This method would be a useful tool for quantifying menstrual blood loss if all menstrual fluid constituted blood. However, according to Fraser *et al.* (1985), the proportion of blood in menstrual fluid varied widely among women, from 1.6% to 81.0%. Blood only constitutes on average 36.1% of the total menstrual loss.¹³ A large amount of menstrual fluid comes from other sources including endometrial tissue exudates, endometrial glands and cervical and vaginal secretions.

The wide variation in the composition of the menstrual loss is a limitation to the validity of this method as a diagnostic tool in this context. In addition to the inaccuracy inherent in this method, it requires that women collect and store all of their used sanitary products to be submitted for weighing, which may not be acceptable or feasible for many women.

Full blood count

Menorrhagia is one of the most common causes of anaemia in premenopausal women.¹⁴ RCOG guidelines suggest that one of the first investigations to be carried out on women presenting with this condition should be a full blood count.² However, looking solely at haemoglobin (Hb) levels is not a conclusive way of diagnosing or excluding menorrhagia. Janssen *et al.* (1995) compared women's Hb levels with their menstrual blood loss (measured using the alkaline haematin method) and reported that anaemia was 74% predictive for having menorrhagia.¹⁵ Haematocrit, serum iron and protoporphyrin levels are inversely related to

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menstrual blood loss.^{14,15} However, they should not be relied upon solely for a conclusive diagnosis of menorrhagia.

Menses cup

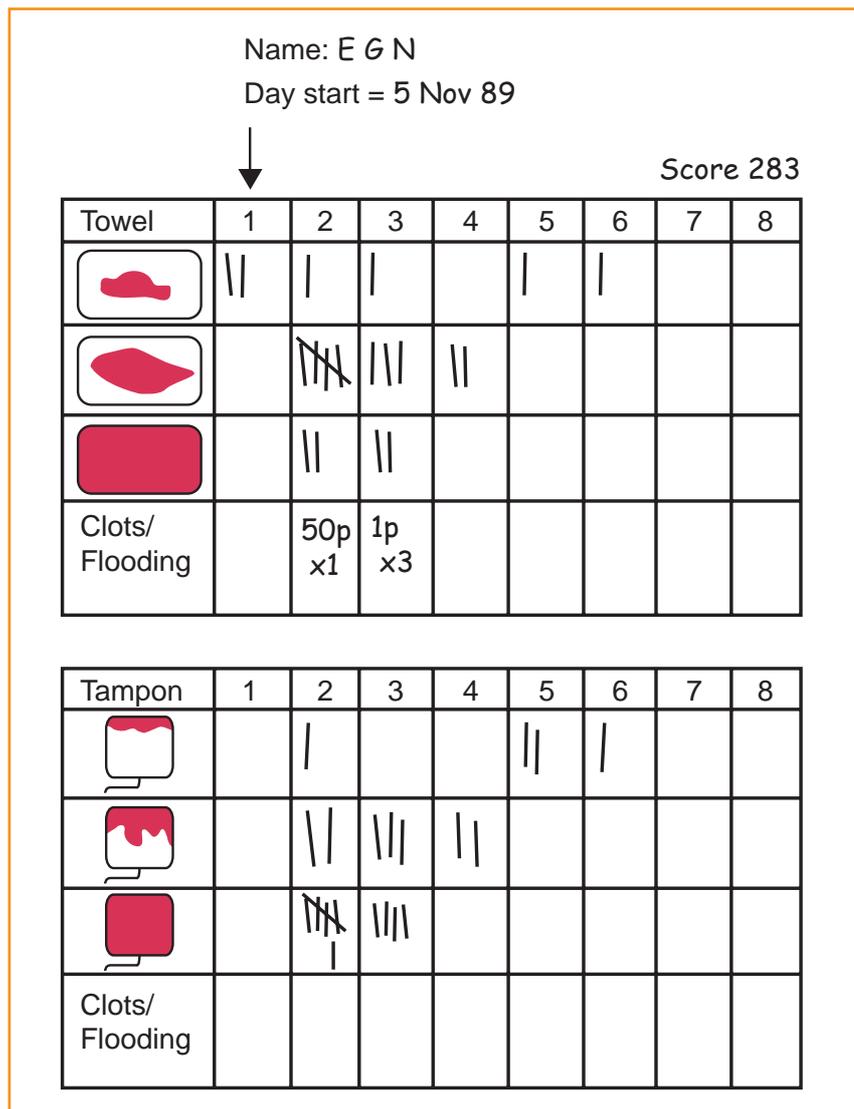
This method involves covering the vagina with a latex seal that retains all the menstrual blood discharge and alleviates the need for sanitary wear. There are two published methods, the Gynaeseal¹⁶ and the menses cup.¹⁷ The Gynaeseal consists of an inner cup that seals by gentle suction surrounding and covering the cervix and an outer collection pouch which contains the menses. The menses cup is a soft silicone rubber cone which is inserted into the vagina with the wider opening placed below the cervix. The narrower end is plugged, allowing drainage of the collected menses at appropriate intervals. It was reported that women found the seals easy to insert but difficult to remove while successfully containing the blood loss. This criticism was particularly applicable to women with heavy menstrual loss.¹⁷ Consequently, the

cups were deemed unsuitable as diagnostic tools for menorrhagia or for quantification of menstrual loss and are rarely used for clinical or research purposes.

Chemical analysis of the blood content of used sanitary products

The use of the alkaline haematin technique as a method to quantify menstrual blood loss was devised by Hallberg *et al.* in 1964.¹⁸ This method involves the extraction of haem from used sanitary towels using 5% sodium hydroxide. It is considered to be the standard technique for estimating blood loss during menses. However, this method is expensive, labour intensive and time consuming. It also requires that women collect, store and submit all of their used sanitary products for analysis, which may be burdensome and unacceptable for some women. Thus, this method has limited application in routine clinical practice and its use is usually limited to research. The technique was modified by other researchers to make it more user friendly.^{19,20} However, many of the original problems associated with the method still exist, in particular the finding that the new ‘ultra-slim’ sanitary products interfere with the absorbance of haem and so underestimate the haemoglobin concentration. A further criticism of the method is that it only measures blood loss on sanitary wear and misses the extraneous blood loss experienced by many women. It has been suggested that up to 12% of menstrual blood could be lost extraneously.²¹

Figure 1. Pictorial blood loss assessment charts (adapted from Higham *et al.*, 1990)



Pictorial blood loss assessment charts

Pictorial blood loss assessment charts (PBACs) were first introduced by Higham *et al.* in 1990 as a visual representation of blood loss from which a numerical score is derived.¹⁰ The chart consists of a series of diagrams representing lightly, moderately and heavily soiled tampons or towels. In addition, passage of clots (size equated with that of UK coinage) and episodes of flooding were also recorded (Figure 1). A numerical scoring system was devised to coincide with the amount of blood lost. The scores assigned were 1 for each lightly stained tampon, 5 if moderately soiled and 10 if it was completely saturated with blood. The towels were given ascending scores of 1, 5 and 20, with increased level of soiling. Small and large clots scored 1 and 5, respectively.

Higham *et al.* reported that when the PBAC was used as a diagnostic clinical tool, a score of 100 or more diagnosed menorrhagia with a sensitivity and specificity of more than 80%.¹⁰ However,

there were some inadequacies and inaccuracies in assessment of large volume loss and extraneous blood loss. Moreover, the specific sanitary products that were used for the Higham technique are not now widely available, which may make it less accurate. The discriminatory power of PBAC as a diagnostic test has been questioned.²²

Janssen *et al.* assessed the sensitivity, specificity and positive and negative predictive values of PBACs at several cut-off points.¹⁵ Using a score of 185 as their cut-off point, they reported predictive values of positive and negative tests of 85.9% and 84.8%, respectively. Although Janssen *et al.* implied in their paper that they had validated and refined a new simple technique for quantifying menstrual loss they had essentially used the pictorial charts designed and validated by Higham *et al.* in 1990.¹⁰

The menstrual pictogram

The menstrual pictogram that is currently in use is a modification of the previous PBAC technique. Two additional icons representing blood lost on towels and one additional icon to represent blood lost on tampons were added and distinctions were made between the different levels of absorbency to overcome the problem of inaccuracy at high blood loss ranges. Three icons were introduced to demonstrate variation in the size of blood clots and another three icons were included to represent the volume of blood lost in

the toilet when changing sanitary wear. An additional value for the modified charts is that the score is calculated in millilitres and is equivalent to the actual volume of blood lost. The menstrual pictogram is shown in Figure 2.

A validation study by Wyatt *et al.* suggests a significant positive correlation between a woman's ability to estimate her blood loss on sanitary wear using the menstrual pictogram and her actual blood loss assessed using the alkaline haematin technique.²³ An additional advantage of the menstrual pictogram is the estimation of the extraneous blood loss. Wyatt *et al.*²³ reported that menorrhagia was confirmed objectively in 36% of their study group presenting with menorrhagia when only the sanitary products were assessed. However, when extraneous blood loss was taken into consideration this figure increased to 74%. Consequently, extraneous blood loss can no longer be ignored. For these reasons, the menstrual pictogram appears to be an accurate and acceptable way of measuring menstrual blood loss for both research and clinical purposes. Research data from the authors' unit suggest that an accurate, retrospective estimation of menstrual loss may also be possible using the pictogram. Studies that validated the use of the menstrual pictogram used standardised brands of sanitary wear. The use of these charts with different brands of sanitary wear is currently being assessed to decide whether conversion charts are required or not.

Figure 2. A representation of the menstrual pictogram with blood loss equivalents indicated

TOILETS		Score	CLOTS		Score	TOWELS			TAMPONS			
		1ml			1ml		Day time	1ml		DATE	BRAND	Score in ml
		3ml			3ml		Night time	1ml				
		5ml			5ml		Day time	2ml				
							Night time	3ml		Regular		0.5
							Day time	3ml		Super		1.0
							Night time	6ml		Super Plus		1.0
							Day time	4ml		Regular		1.0
							Night time	10ml		Super		1.5
							Day time	5ml		Super Plus		2.0
							Night time	15ml		Regular		1.5
										Super		3.0
										Super Plus		4.0
										Regular		4.0
										Super		8.0
										Super Plus		12.0

Menorrhagia is only one of many disorders associated with the menstrual cycle. Management of menstrual disorders in isolation can lead to inappropriate treatments and unsatisfactory outcomes for the woman. Unfortunately, diagnosing conditions and interpreting symptoms that occur perhaps for only a few days out of every month is difficult. Therefore, the authors working at North Staffordshire Hospital/Keele University, in collaboration with Nottingham University, developed and validated the Menstrual Symptometrics Device.²⁴ The device is a specially programmed palmtop computer designed to allow the user to record all their daily symptoms. The icons of the menstrual pictogram are used for the objective assessment of the menstrual blood loss. The computer program also quantifies daily physical and or psychological premenstrual symptoms using a series of visual analogue scales, together with a measure for quality of life and any underlying psychiatric morbidity. This system provides a unique means for assessing the complete menstrual cycle symptomatology rapidly and easily, so that treatment can be tailored according to individual woman's requirements.

Conclusion

A significant number of women referred to the gynaecology clinic with menorrhagia will end up having a hysterectomy. Subjective estimation of menstrual blood loss is not an accurate way of

diagnosing the condition. However, the routine use of an objective method could lead to health benefits and cost savings, if it were to reduce the number of unnecessary medical and surgical interventions.

Objective quantification of the menstrual loss also provides an opportunity to feed back the measurement to the women, which might help them in the process of decision making and contextualising their blood loss in relation to the general population. Provision of more structured information to women themselves may also affect treatment choices. In a clinical trial that randomised women suffering with menorrhagia to either a control group, a group with a structured information pack or a group with the information pack together with a structured interview reported that women in the latter group were considerably less likely to undergo hysterectomy in comparison with the other groups.²⁵

Quantification of menstrual blood loss also provides an invaluable tool for the assessment of treatment response and disease progression. The menstrual pictogram is an easy and accurate method for objectively estimating menstrual blood loss. It is suitable for use in the gynaecological outpatient clinic, as well as in the initial assessment of women in primary care or in nurse-led clinics. Women have also been able to complete the charts successfully when sent to them as part of a menstrual survey. ■

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