The Role of Color Duplex Ultrasonography as a Diagnostic Aid in Assessment of Abnormal Uterine Bleeding

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List of Abbreviations

AUB	= Abnormal uterine bleeding
AIS	= Adenocarcinoma in situ
CAH	= Complex atypical hyperplasia
CW	= Continuous wave.
CT	= Computerized tomography
D&C	= Dilatation and Curettage
DUB	= Dysfunctional uterine bleeding
EIN	= Endometrial intraepithelial neoplasia
HRT	= Hormone replacement therapy.
IUD	= Intrauterine device.
IUP	= Intrauterine pregnancy
LH	= Lutinizing hormone.
N	= Number
PI	= Pulsatiliry index.
PW	= Pulsed wave.
PCO	= Polycystic ovary syndrome
TAS	= Transabdominal sonography.
TVS	= Transvaginal sonography.
TVCD	= Transvaginal color Doppler.
RI	= Resistive index.
ROC	= Receiver operating characteristics
SIS	= Saline infusion sonography
SD	= Standard deviations
US	= Ultrasonography

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Introduction

Introduction

Abnormal uterine bleeding is a common reason for women of all ages to consult their family physicians, although common but also complicated clinical presentation so an understanding of normal menstruation is essential to investigate the compliant of abnormal vaginal bleeding. **[American family physician ٢٠٠٤]**

Dysfunctional uterine bleeding is the most common cause of abnormal uterine bleeding which is a diagnosis of exclusion and could be defined as abnormal uterine bleeding not caused by pelvic pathology, medication, systemic disease or pregnancy**. [Simon et al., ٢٠٠٢]**

The specific diagnostic approach depends on whether the patient is premenopausal , perimenopausal , postmenopausal. so age is the most important factor as organic causes including gynecologic neoplasms become more common with advancing age.

Traditionally, evaluation of abnormal uterine bleeding is based on histological diagnosis established though examination of endometrial tissues obtained by dilatation and curettage as history and physical examination cannot alone determine if endometrial hyperplasia is present .The sensitivity of endometrial biopsy for detection of endometrial abnormality has been reported to be as high as ٩٦ % **[Stovall et al., ١٩٩١]** once considered as therapeutic method.

However, this procedure may miss up to ١٨% of focal lesions**,[Goldstein et al., ١٩٩٦]** including polyps and fibroids , because only a small part of the endometrium may be sampled at any time ,furthermore it is limited in its ability to access the tubal cornua of the uterus

[Bettocchi et al., ٢٠٠١]. Also consider as invasive procedure with some discomfort during its performance and require anesthesia.

Hysteroscopy has been considered as a gold standard method for detection of uterine cavity pathologies **[Revel et al., ٢٠٠٢],** hysteroscopy may be performed in the outpatient clinical setting, Biopsy could be taken during hysteroscopy providing more information than dilatation and curettage alone **[Gimplelson et al., ١٩٨٨]** .Still invasive procedure need general anesthesia and skilled gynecologist.

Hydrosonography (saline infusion sonography) is a diagnostic technique in which sterile saline solution infused under ultrasonographic guidance is used to distend and to produce a contrast media into the uterine cavity thereby enabling visualization of the endometrial surface and cavity so diagnose of submucous fibroids , polpys and other sources of abnormal uterine bleeding **.[Krampl et al., ٢٠٠١]**

Transvaginal ultrasound provides an excellent images and therefore more information especially in obese patient, transvaginal ultrasound may reveal lieomyoma , endometrial thickening , focal masses .Although this imaging modality may miss endometrial polyps and submucous fibroids **[Tabor et al., ٢٠٠٢]**

However color Doppler study started to play a role in detection and prognosis of suspecting endometrial lesions ,by analyzing hemodynamic parameters at the large uterine blood vessels level and by examining the characteristics of vascularisation on the myometrium and at the endometrial level , however long-term follow up is required **.[Badawy et al., ٢٠٠٣]**

Malignant lesions are often associated with angiogenic alterations, bizarre atypical vascularisation , increased intratumoral blood flow and increased flow in blood vessels of pelvic organs **[E moto et al., ٢٠٠٢].** The newly formed and densely arranged myometrial and endometrial blood vessels with low blood flow resistance have a positive predictive value in detection of endometrial pathological change**[Kurjak et al., ١٩٩٤].** Resistance index and pulsatility index have been proved to be sensitive hemodynamic parameters in examination of uterine circulation, for being sensitive to minimal changes of peripheral resistance of blood flow **[Lehotska et al., ١٩٩٩].**

Based on the above observe color Doppler sonography could help in differentiating benign from malignant endometrial changes, and in deciding on the most efficient therapeutic regime **[Syetlanaetal.,٢٠٠٤].**

It is apparent ,therefore that there is a true need for less invasive diagnostic methods that would point out with almost perfect sensitivity those patients who would rightfully benefit from a tissue diagnosis .Such a method must be also safe, accurate, rapid and cheep **[Osman et al., ٢٠٠٣].** Thus this study will be held to determine role of color Doppler ultrasonography as a diagnostic tool in management of abnormal uterine bleeding.

Aim of this work

The aim of this work is to determine the role of color Doppler ultrasonography as a non invasive technique as regard its sensitivity & specificity as a diagnostic aid in cases of abnormal uterine bleeding .

Review

Abnormal Uterine Bleeding Etiology

Introduction :

Abnormal uterine bleeding accounts for up to ٣٠% of outpatient visits to gynecologists and is described as bleeding that is excessive or outside of normal cyclic menstruation. A typical cycle interval is ٢١ to ٣٥ days with an average flow duration of ٢ to ٨ days and estimated blood loss between ٣٠ and ٨٠ mL. Predictors of heavy bleeding include passage of clots, iron deficiency anemia, and volume depletion. While estrogen increases thickness and vascularity of the endometrium, progesterone increases the glandular secretions and vessel tortuosity, and withdrawal of sex steroids results in endometrial sloughing and bleeding **[Laurie et al., ٢٠٠٧].**

While rarely life-threatening, AUB exacts a large emotional and physical toll on women. For instance, women with heavy periods work an estimated ٣.٦ fewer weeks per year and lose an estimated $١,٦٩٢ annually in wages compared with women in the general workforce. **[Cote et al., ٢٠٠٢].**

Abnormal uterine bleeding (AUB) is a common presentation in primary care, but is often complex and difficult to diagnose. One study found that menstrual disorders were the reason for ١٩.١% of ٢٠.١ million visits to clinicians for gynecologic conditions over a ٢-year period. **[Nicholson et al., ٢٠٠١]** Furthermore, a reported ٢٥% of gynecologic surgeries involve AUB. **[Alber et al., ٢٠٠٤].** Between ٣٠% to ٥٠% of all hysterectomies are due to abnormal uterine bleeding and fibroids, yet ٢٠% of hysterectomies are associated with normal uterine pathology. Many conditions may be associated with AUB, including anovulatory cycles, chronic medical conditions, and systemic illness. Conditions may also be associated with intrauterine pathology. Dysfunctional uterine bleeding (DUB) is defined as abnormal bleeding in the absence of intracavitary or uterine pathology. **[Alber et al., ٢٠٠٤]**

Menstrual physiology

A brief review of normal menstrual physiology may be helpful in understanding abnormal uterine bleeding. The typical menstrual cycle has

two phases: proliferative and secretory. The proliferative phase is characterized by a predominance of estrogen over progesterone and a buildup of endometrium. The secretory phase begins after ovulation triggers progesterone production. This phase is marked by a reaction to the combination of estrogen and progesterone and stabilization in the thickness of the endometrium. **[Brenner ١٩٩٦ - Cynthia et al., ٢٠٠١].**

Menstrual bleeding occurs after secretion of estrogen and progesterone tapers off. Early during menses, thrombin plugs restrain blood loss, but later, vasoconstriction of the spiral arterioles is responsible for hemostasis. When ovulation does not take place, progesterone levels do not rise. Therefore, typical cyclic withdrawal of estrogen and progesterone cannot occur. **[Brenner ١٩٩٦ - Cynthia et al., ٢٠٠١].**

Pathophysiology:

The hallmark of normal menstrual bleeding is the final result of fluctuations in the hypothalamic-pituitary-adrenal-ovarian axis leading to predictable denudation and sloughing of the endometrium. Hemorrhage followed by prompt hemostasis and repair causes stabilization and regrowth of the endometrium. Physiologically, constant low levels of estrogen prime the endometrium. Normal secretion of progesterone from the corpus luteum stabilizes the endometrium, decreases vascular fragility, and supports the endometrial stroma. Patients with menorrhagia typically have an imbalance of prostaglandin levels and increased fibrinolytic activity. Specifically, women with heavy bleeding often have elevated levels of plasminogen activators compared to those with normal menstruation. [**Gleenson et al.,١٩٩٣].**

An intact coagulation pathway is important in regulating menstruation. Menstruation disrupts blood vessels and in the face of normal hemostasis, the injured blood vessels are rapidly repaired. Restoration of the blood vessel requires successful interaction of platelets and clotting factors. Deficiency of platelets, abnormal platelet function, and an intact coagulation pathway may be associated with profound changes in the menstrual cycle. **[Bradley et al., ٢٠٠٥].**

Abnormal uterine bleeding can usually be classified as either anovulatory bleeding or ovulatory. Anovulatory bleeding can be episodic or continuous.

Patients with anovulatory cycles typically do not experience constitutional premenstrual symptoms. Cycles that vary in length by more than ١٠ days from one cycle to another are likely anovulatory dysfunctional bleeding. Anovulatory DUB is usually due to failure of the corpus luteum to sustain the developing endometrium. **[Bradley et al., ٢٠٠٥].**

Puberty and the perimenopausal years are typically associated with anovulatory menstrual cycles. The immature hypothalamic-pituitary axis does not develop the necessary hormonal feedback to sustain the endometrium. Likewise, the decline of inhibin levels and rise in follicle-stimulating hormone (FSH) levels reflect the loss of follicular activity and competence as the perimenopausal transition occurs. **[Bradley et al., ٢٠٠٥].**

Ovulatory dysfunctional bleeding occurs when ovulatory cycles coexist with intracavitary lesions including polyps, hyperplasia, endometrial cancer, or fibroids, which cause erratic bleeding. Patients who ovulate typically have the following symptoms: breast discomfort, increased mucoid vaginal discharge midcycle, premenstrual cramping and bloating, mood, and appetite changes. **[Bradley et al., ٢٠٠٥].**

Abnormal uterine bleeding patterns :

Abnormal uterine bleeding may involve any disturbance of regularity, frequency, duration or volume of menstrual flow **[Fraser & Sungertekin , ٢٠٠٠ – Livingston & Fraser, ٢٠٠٢].**

Table ١: Terms Used to Describe Abnormal Uterine Bleeding

Term	*Abnormal uterine bleeding pattern*
Oligomenorrhea	Bleeding occurs at intervals of > ٣٥ days and usually is caused by a prolonged follicular phase.
Polymenorrhea	Bleeding occurs at intervals of < ٢١ days and may be caused by a luteal-phase defect.
Menorrhagia	Bleeding occurs at normal intervals (٢١ to ٣٥ days) but with heavy flow (>=٨٠ mL) or