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## MRI as an imaging tool in abnormal uterine bleeding among non gravid women

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### Abstract

**Background:** The causes of Abnormal Uterine Bleeding and its differential diagnosis are heterogeneous and complex. TAS, TVS and histopathological investigations were found to be controversial. MRI is an advanced, noninvasive and can be an accurate diagnostic imaging modality in AUB diagnosis.

**Objectives:** This study was conducted to evaluate the role MRI in abnormal uterine bleeding (AUB) patients.

**Methods:** It was a prospective, analytical study where 101 patients with complaints suggestive of abnormal uterine bleeding, with varying the age of 31-84 years as well as those who underwent surgery were evaluated. Proper history clinical and systemic examination was done. After which each patient was planned for MRI. On the basis of age, parity, desire to have further pregnancy, medical conditions, MRI diagnosis, treatment strategy was planned.

**Result:** The maximum number of patients fall in the age group of 31-50 years with mean age 47.4 years. Parity 2 was highest followed by nulliparity, 22.77% patients have acute while 77.23% have chronic onset menstrual complaints.

Menorrhagia in 68 patients, Heavy Menstrual bleeding (HMB) in 36 (35.69%) and Heavy and Prolonged Menstrual Bleeding (HPMB) in 32 (31.68%), 21(20.79%) patients were found. Most common systemic disease was Hypothyroidism. Myoma was most common followed by Adenomyosis alone and with combination of Adenomyosis and myoma.

**Conclusion:** When clinical diagnosis is not confirmed and sonography is deceptive inspite of normal findings the patient remains symptomatic, MRI stands to be promising and accurate imaging modality.

**Keywords:** Abnormal uterine bleeding (AUB), abnormal menstrual bleeding (AMB), adenomyosis, magnetic resonance imaging (MRI)

### Introduction

Any uterine bleeding outside the normal volume, duration, regularity or frequency is considered abnormal uterine bleeding (AUB). Abnormal menstrual bleeding pattern expressed by terms like menorrhagia, Metorrhagia, Polymenorrhea and oligomenorrhea. The causes of Abnormal Uterine Bleeding and its differential diagnosis are heterogeneous and complex. Various causes of AUB include pregnancy, miscarriage, ectopic pregnancy, Adenomyosis, fibroids, uterine and /or cervical infection, polyps, IUCD, OC pills, PCOS, coagulation defects, uterine synechia etc. AUB is one of the common presentations of endometrial hyperplasia (precancerous), adenocarcinoma, other uterine tumors, cervical malignancy, vaginal cancer etc. Thus, identifying the etiology is important [1, 2, 3].

Abnormal uterine bleeding can be evaluated by careful history, clinical examination, blood investigations, hormonal profile, ultrasonography, sonohysterography, hysteroscopy, MRI and endometrial sampling to reach a diagnosis.

Investigation and management of abnormal uterine bleeding (AUB) among nongravid women of reproductive age has been hampered both by confusing and inconsistently applied nomenclature and by the lack of standardized methods for investigation and categorization of the various potential etiologies [4, 5].

Therefore in 2011, the FIGO classification system, there are 9 main categories, which are arranged according to the acronym PALM-COEIN (pronounced "pahm-koin"): polyp, Adenomyosis, leiomyomas, malignancy and hyperplasia, coagulopathy, ovulatory dysfunction, endometrial, iatrogenic and not yet classified. In general, the components of the PALM group are discrete (structural) entities that can be measured visually with imaging techniques and/or histopathology, whereas the COEIN group is related to entities that are not defined by imaging or histopathology (non-structural) [6].

Transvaginal ultrasound is an appropriate screening tool and, in most instances, should be performed first or early in the course of the investigation. Even in ideal circumstances, TVUS is not 100% sensitive because polyps and other small lesions may elude detection, even in the context of a normal study [7, 8]. However, if office hysteroscopy is available, there may be additional value should polyps be identified because they could be removed in the same setting. When vaginal access is difficult, as may be the case with adolescents and virginal women, TVUS, SIS, and office hysteroscopy may not be feasible. In such cases, there may be a role for MRI [6].

Estimates of the prevalence of adenomyosis vary widely, ranging from 5% to 70%<sup>9</sup>—an observation that, at least in part, is probably related to inconsistencies in the histopathologic criteria for diagnosis. Consequently, and because there exist both sonographic [10] and magnetic resonance imaging (MRI)-based [11, 12] diagnostic criteria, adenomyosis has been included in the classification system. Adenomyosis is a disorder that should have its own sub-classification system [13] and it is clear that there should be an initiative to standardize methods of both imaging and histopathological diagnosis.

The myometrium should also be evaluated for the presence of adenomyosis or to distinguish between leiomyoma's and adenomyomas [12]. If available, MRI may be used to evaluate the myometrium to distinguish between leiomyomas and adenomyosis [11]. It may also be superior to TVUS, SIS, and hysteroscopy for measuring the myometrial extent of sub mucosal leiomyoma's [7].

When uterine conservation is desired in women with fibroids and TVUS or SIS is indeterminate in localizing depth of myometrial involvement of a fibroid, MR imaging should be considered as a part of the clinical algorithm. The precision of MR imaging localization of submucosal fibroids can obviate the need for hysterectomy and permit a skilled surgeon to hysteroscopically resect the fibroids. If the clinical examination is suspicious for adenomyosis and the US is no diagnostic, the clinician should consider MR imaging strongly.

When the results of the imaging study would influence surgical route and planning, MR imaging should be considered in the preoperative evaluation [14].

Atypical hyperplasia and malignancy are important potential causes of, AUB and must be considered in nearly all women of reproductive age. The present classification system is not designed to replace those of WHO and FIGO for categorizing endometrial hyperplasia and neoplasia [15, 16]. Consequently, when a premalignant hyperplastic or malignant process is identified during investigation of women of reproductive age with AUB, it would be classified as AUB-M and then sub classified using the appropriate WHO or FIGO system.

The appearances of endometrial cancer, hyperplasia, and benign polyps may overlap on magnetic resonance imaging and MRI has role is in the staging of biopsy confirmed endometrial cancer.

Magnetic resonance imaging is more sensitive than transvaginal ultrasound or computed tomography in the detection of deep myometrial invasion and tumor spread beyond the uterus. The natural contrast between the endometrial tumor and surrounding myometrium is poor on transvaginal ultrasound. Consequently, magnetic resonance imaging is more sensitive than ultrasound (84-87% (specificity 91-94%) v 77%) [17, 18, 19].

Magnetic resonance imaging (MRI) is an imaging modality that has been developed and used since the mid 1970s. MRI has several advantages over computed tomography (CT) and ultrasonography. One important feature is its noninvasiveness.

The imaging components include a large static magnetic field and an electromagnetic field produced by radio frequency (RF) waves. Although once termed *nuclear magnetic resonance imaging*, MRI uses no ionizing radiation. A second feature that makes MRI particularly attractive is its capability for multiplanar imaging. Without repositioning the patient, transverse, sagittal, coronal, and non-orthogonal views may be obtained in a short time. Such capabilities allow excellent study of normal and abnormal anatomy.

A third advantage of MRI is its excellent tissue differentiating capabilities, made possible because the biochemical characteristics of the nuclei within their microscopic environment alter the information (called signals) received during an MRI acquisition. MRI acquisitions may further alter and different contrast. These signals are not influenced by the amount of bladder filling, the size of a patient, or the amount of gas in the surrounding bowel, but these factors have an important role in the quality of an ultra sonographic image. With MRI, excellent tissue differentiation is possible without the use of contrast agents [6].

A fourth advantage of MRI is its intrinsic sensitivity to flowing blood. As with Doppler ultrasonography, flow direction and speed may be determined. Both arterial and venous abnormalities can be assessed by MRI. Additionally, biochemical states of blood can be characterized by MRI.

However, it is clear that MRI can serve as an alternative or an adjunctive tool in many instances. This study was conducted to evaluate the role MRI in AUB patients.

## Material and Methods

A prospective, analytical study was conducted at the Department of Obstetrics and Gynecology, Sri Shankaracharya Medical College, Bhilai, Chhattisgarh, from September 2018- September 2019. It was a prospective, analytical study where 101 patients with complaints suggestive of abnormal uterine bleeding, after the age range of 30 years and above and those who underwent surgery were evaluated.

A total of 101 women with consent and various age group having complaints suggestive of abnormal uterine bleeding were included in the study. AUB with adnexal pathology were excluded from the study.

Patients fulfilling the inclusion criteria were selected through detailed clinical history, examination: general physical, systemic, gynecological (per speculum, per vaginal) and all general and specific investigations were carried out. Each patient irrespective of the baseline investigations and transabdominal sonography findings were directly subjected to the investigation MRI pelvis.

Proper history clinical and systemic examination was done. After which each patient was planned for MRI, following which dilatation and curettage was planned. In 20 patients all findings were normal and hence they were excluded from study and proper counseling was done and simultaneously new patients were taken. On the basis of age, parity, desire to have further pregnancy, medical conditions, MRI, treatment strategy was planned.

MRI of 1.5 Tesla with a three plane localizer must be taken in the beginning to localize and plan the sequences, localisers are normally less than 25sec. T1 and T2 weighted low resolution scans were used for the scans.

All subjects were followed up for 4 weeks. 1<sup>st</sup> follow up for 1<sup>st</sup> week and 2<sup>nd</sup> follow up at the end of 4<sup>th</sup> week for histopathological complications and treatment planning.

After primary data collection, a master chart was prepared with

the help of Microsoft excel sheet and data entered into it was analyzed according to the set objectives. Non-parametric (discrete) data was analyzed using chi-square test. Mean standard deviation and percentage was used for analysis of parametric (continuous) data. P- Value of < 0.05 was considered to be statistically significant.

## Results

The age group in the present study was between 31-85 years. Among them 62.38% of cases belonged to the age group of 41-50 years. Maximum cases found were of age group 31-50 years. Minimum age was 31 years. Maximum age was 84 years. Mean age was 47.4 years. Patient having Abnormal uterine bleeding, maximum number were of para 2 that is 49 patients (48.5%) the next were nullipara 26(25.74%). We found 2 unmarried patients with AUB in the perimenopausal group. Lastly there were 4 cases (3.96%) of grand multipara.

**Table 1:** Age and parity wise distribution of patients

Variable	Subgroup	N	%
Age	31-40	17	16.83
	41-50	63	62.38
	51-60	11	10.89
	61-70	8	7.92
	>70	2	1.98
Parity	P0	26	25.74
	P1	11	10.891
	P-2	49	48.515
	P-3	11	10.891
	Grand multipara	4	3.96

Out of total 101 cases 23 cases (22.78%) presented with Acute Onset of Abnormal uterine bleeding i.e within 6 months of onset of symptoms whereas (77.23%) that is 78 cases have chronic Onset of Abnormal uterine bleeding i.e more than 6 months of onset of symptoms. When studied Cases of AUB for thyroid disorders the Hypothyroidism was noted in total of 62 patients; of which 34(33.67%) have Sub-clinical hypothyroidism and 28(27.72%) have overt hypothyroidism and 6 have hyperthyroidism and 33(32.67%) have euthyroid status. Maximum number of patients has menorrhagia as their primary Complaints in about 68 patients. Heavy Menstrual bleeding (HMB) in 36 (35.69%) and Heavy and Prolonged Menstrual Bleeding (HPMB) in 32 (31.68%), 21(20.79%) patients have irregular Menstrual bleeding patterns, while 12 (11.88%) patients had post-Menopausal bleeding.

**Table 2:** Complains among patients with AUB

Clinical condition	Subgroups	N	%
Duration of complaints	Acute AUB(<6months)	23	22.77
	Chronic AUB(>6months)	78	77.23
Thyroid disorder	Euthyroid	33	32.67
	Sub-clinical Hypothyroid	34	33.66
	Hypothyroid	28	27.72
	Hyperthyroidism	6	5.94
Bleeding Pattern	HMB	36	35.64
	HPMB	32	31.68
	IMB	21	20.79
	PMB	12	11.88

Heavy menstrual bleeding at the age group of 31-40 years was seen in about 9 patients and in age group of 41-50 years was seen in 25 patients while in age group of 51-60 and 61-70 years only 1 patient had complaints of heavy menstrual bleeding.

**Table 3:** Distribution of menstrual pattern in various age groups

Age group (years)	31-40	41-50	51-60	61-70	>70	Total
Menstrual pattern						
HMB	9	25	1	1	0	36
HPMB	7	22	3	0	0	32
IMB	1	15	3	2	0	21
PMB	0	1	4	5	2	12
Total	17	63	11	8	2	101

In 17 cases (5.54%) there was no complaint except menorrhagia. In 62 cases (20.20%), besides menorrhagia there was pain in abdomen. In other cases heaviness in lower abdomen was seen in about 39 cases (12.39%), 46 (14.98%) have discharge per vagina, 35(11.40%) have dyspareunia, 48(15.64) have associated dysmenorrhoea, 31(10.10%) have pressure symptoms, 29(9.45%) have nonspecific symptoms. 34 (33.66%) cases were having mild anaemia. 21(20.79%) cases were having moderate anaemia 9 cases were having severe anaemia and were given blood transfusions.

**Table 4:** Other associated complaints among AUB

Clinical condition	Subgroups	n	%	
Other associated complaints	No Complaints	17	5.54	
	Pain in lower Abdomen	62	20.20	
	Heaviness in lower Abdomen	39	12.70	
	Discharge per Vaginum	46	14.98	
	Dyspareunia	35	11.40	
	Dysmenorrhoea	48	15.64	
	Pressure Symptoms	31	10.10	
	Non-Specific Symptoms	29	9.45	
	Anaemia	No Anaemia ( $\geq 11$ gm/dL)	37	36.63
		Mild Anaemia (9.5 - 11 gm/dL)	34	33.66
Moderate Anaemia (8 - 9.5 gm/dL)		21	20.79	
	Severe Anaemia (< 8 gm/dL)	9	8.91	

## Discussion

In our present study, highest number of cases having abnormal uterine bleeding were in the age group of 41-50 years which is 63 corresponding to 62.38% of cases. 17 patients were of age group in 31-40 years. 11 patients are in age group of 51-60 years. 10 patients are in age group more than 60 years.

In a study conducted by Ghazala Rizvi *et al.* (2015) same age group of 40-50 years were the highest numbers of patients complaining of abnormal uterine bleeding i.e. 44.56% of the patients.<sup>20</sup> Similarly, in a study conducted by MS Bhansali *et al.* (2017) Majority of the patients complaining of abnormal uterine bleeding were in the age group of 41-50 years i.e. about 35.92% of the total cases<sup>[21]</sup>

Thus the demographic findings of our study were consistent with other studies. There was higher number of patients in the 41-50 age groups than in post-menopausal age group. In our present study maximum number of patients complaining of Abnormal uterine bleeding were of parity – 2 i.e. 48.5% of the total cases 49 patients followed by parity – 0 in which we had 26 patients corresponding to 25.74%.

In a study conducted by N. Bhavani *et al.* (2015), Abnormal uterine bleeding was found to be most commonly associated with parity – 2 about 43 patents i.e. 21.5% followed by parity -3 i.e. 20.5% and followed by Nulliparous i.e. 19.5%.<sup>22</sup> Whereas in the study conducted by Meghna Suresh Bhansali *et al.* (2017) 37.32% of the patients were of parity -3 where as 31.69% of the patents were Multiparous<sup>[21]</sup>

In our study Abnormal uterine bleeding was associated in parity 2 because the number of patients with parity 2 was high. The

parity 2 was followed by nulliparity in our study which may be attributable to the increased age of marriage these days and early consultation for infertility.

In our study, out of 101 AUB patients, 23 patients i.e. 22.78% had acute onset of symptoms while the rest of 78 patients 77.23% have a chronic onset of symptoms. No study was found regarding duration of complains in patients complaining of abnormal uterine bleeding.

But we compared the duration of complaints in our study, because the patients with acute onset of complaints required immediate intervention in form of hormonal therapy and in form of emergency polypectomy or hysterectomy.

In our present study, hypothyroidism was found to be maximally associated with Abnormal uterine bleeding i.e. 27.22% and total of 28 patients have overt hypothyroidism while 34 patients have subclinical hypothyroidism and 6 patients i.e. 5.94% have hyperthyroidism.

In a study conducted by N. Bhavani *et al.* (2015) 76.3% of thyroid dysfunction was seen in nonstructural causes of Abnormal uterine bleeding and 23.6% of thyroid dysfunction was seen in structural causes of AUB and about 1.29% of hyperthyroidism was seen in structural causes of Abnormal uterine bleeding [22].

In our present study association of thyroidism was found more which may be due to the higher incidence of thyroid disorders in our areas moreover we compared the structural causes of abnormal uterine bleeding and hence the association was found more.

Most of the patients of Abnormal uterine bleeding complains of menorrhagia this is as per study conducted of Rehana *et al.* (2016) in which 55.8% of the patients had menorrhagia [23]. In Meghna S Bhansali *et al.* (2017) study also the most common presenting symptom was found to be menorrhagia in about 60.56% of the patients [22].

In our present study, the Menorrhagia was again the most common presenting complaint seen in about 68 patients corresponding to 67.33% followed by irregular Menstrual bleeding in 21 patients of 20.79% While 12 patient i.e. 11.8% have post menopausal bleeding. Thus the findings of our study were consistent with other studies.

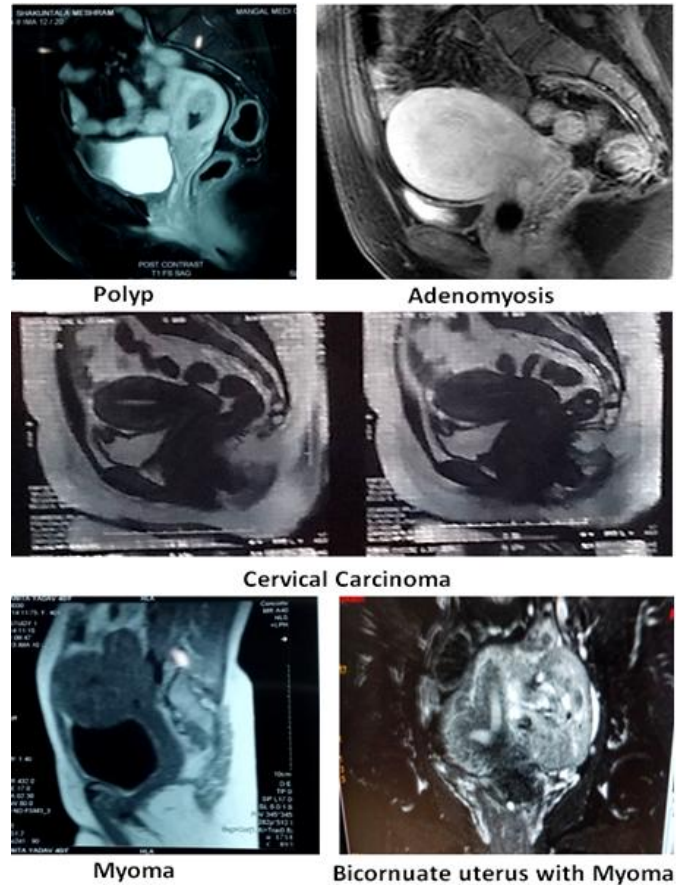
Heavy menstrual bleeding at the age group of 31-40 years was seen in about 9 patients and in age group of 41-50 years was seen in 25 patients while in age group of 51-60 and 61-70 years only 1 patient had complaints of heavy menstrual bleeding. Similarly heavy and prolonged menstrual bleeding was found in 7 patients at the age group of 31-40 years, and in age group of 41-50 years it was found in 22 patients while 3 patients had heavy and prolonged menstrual bleeding in age group of 51-60 years. Intermenstrual bleeding was complained by 15 patients in age group of 41-50 years, while only 1 patient had Intermenstrual bleeding in age group of 31-40 years, 3 patients in age group of 51-60 and 2 patients in age group of 61-70 years. Post-menopausal bleeding was seen in about 5 patients in the age group of 61-70 years while 2 patients in age group of >70 years has Post-menopausal bleeding 1 patient in age group of 41-50 years and 4 patient in age group of 51-60 years were found to have post-menopausal bleeding.

Thus we conclude that menorrhagia is the main complaint among reproductive age group and post-menopausal bleeding in post-menopausal age group. In our present study the most recurring complaint followed by Menorrhagia is pain in lower Abdomen which was repeatedly observed 62 times i.e. in 20.20% circumstances along with other associated complaints which is followed by Dysmenorrhoea in 15.64% circumstances.

Discharge per Vaginum was observed 46 times i.e 14.98%. Only 5.54% of the patients had no other complaints 9.45% have Non-Specific symptoms.

Similarly in the study conducted by Radha Nair *et al.* (2015), titled "Clinical profile of patients with abnormal uterine bleeding" had the most common presenting symptom of pain in Abdomen 28% followed by dysmenorrhoea 16% and backache in 2% [24]. Thus the findings of our study were consistent with other studies.

In our study among 101 patients 64 had been diagnosed with anaemia in which 9 were diagnosed as severe anaemia and required blood transfusion. There was no study for the Comparison of the data.



## Conclusion

We can conclude from our discussion that AUB Abnormal uterine bleeding was common during the peri-menopausal age group of 40-51 years while the causes ranged from medical disorders to simple pathologies like Myoma to malignancy.

Though MRI is an costly investigation but for the patients who can afford this investigation, and also when clinical diagnosis is not confirmed or inspite of normal findings the patient remains symptomatic, the choice as well as indication is to be precisely explained and whenever needed patient must be asked to get through this imaging modality. MRI also has a major role in diagnosing and staging carcinomas which also present as major cause of abnormal uterine bleeding.

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