

Sudan University of Science and Technology

College of Graduate Studies

Evaluation of Abnormal Vaginal Bleeding
Causes Among for Non Pregnant Female
Using Ultrasonography

تقويم اسباب النزف المهبلي الغير طبيعي للنساء غير
الحوامل باستخدام التصوير بالموجات فوق الصوتيه

A thesis submitted for partial fulfillment for the requirements of
M.Sc Degree in Medical Diagnostic Ultrasound

By

Mawahib Noor Alhuda Alamin Ahmed

Supervisor

Dr. Caroline Edward Ayad

Associated Professor.

2014

الآيات

قال تعالى :-

1. (اقرأ بلسم ربك الذي خلق (1) خلق الانسان من علق (2) اقرأ وربك الاكرم (3) الذي علم بالقلم (4) علم الانسان ما لم يعلم (5) سورة القلم

2. لله ملك السموات والارض يخلق من يشاء يهب لمن يشاء اناثا ويهب لمن يشاء الذكور (49) او يزوجهم زكرانا واناثا ويجعل من يشاء عقيما انه عليهم قدير (50) سورة الشورى

3. (ان لله عنده علم الساعه وينزل الغيث ويعلم ما في الارحام وما تدري نفس ماذا تكسب غدا وما تدري نفس بي ارض تموت لن لله عليهم خبير (34) سورة لقمن

صدق الله العظيم

Dedication

I dedicate this work to my father, my mother, my husband my family , my sisters, my brothers, my teachers, and my friends.

Always you are sitting in mind and en courage me to do the best in my life.

Best regards for all.

Acknowledgment

I thank God for enabling me to complete this thesis. I sincerely thank Dr Caroline Edward Ayad, the supervisor of my thesis for her continuous help, supervision and guidance.

I greatly thank all those who supported and helped me to complete this thesis. I am very grateful to all my teachers in all educational levels, especially thanks for my teachers Dr.Alsafi Ahmed

Very much thanks to the staff of Bahri Hospital, especially the Dr Arafat and Ultrasound Department for their help and co-operation to achieve my work.

Abstract

The objectives of this study were to determine the causes of abnormal vaginal bleeding in non pregnant females find out any sonographical markers. It was carried out on 50 patients complaining of abnormal vaginal bleeding in Bahri city

included Hospitals and Clinics. The study was conducted from August up to December 2014. The machines used in the study were Toshiba with 3-5 MHz and probes was convex with frequencies ranging from 3-4MHz. All patients were prepared and examend with full bladder -all patients were scanned in supine position technique.

After the detailed literary work the study comes to conclusion that fibroid is the commonest cause of abnormal vaginal bleeding which is constitute 44%, the others factors of abnormal vaginal bleeding include bulky uterus 20%, ovarian cyst 14% ovarian masses 12% iucd 4% cervical mass 4% and chorion carcinoma 2%

The study reveal that the incidence of abnormal vaginal bleeding is more common in patients of age 25-34

ملخص البحث

إن الهدف من هذه الدراسة هو الكشف عن أسباب النزف المهبلي الغير طبيعي للنساء غير الحوامل بواسطة الموجات فوق الصوتية. عدد المرضى الذين أجريت عليهم الدراسة خمسين مريض يعانون من النزف المهبلي الغير طبيعي في مستشفى بحري وبعض العيادات الخاصة. هذه الدراسة أجريت في الفترة من أغسطس إلى ديسمبر 2014م. الجهاز الذي أستعمل في هذه الدراسة توشيبا

وأما المسبار كان محدّب بتردد يتراوح من 3-4 ميغاهيرتز. جميع المرضى تم تحضيرهم بملء المثانة وباستخدام المسبار البطني . كُـلُّ المرضى مَسحوا علي وضع الاستلقاء، كما تم أيضاً تطبيق الوضع الطولي والعرضي.

خلصت الدراسة إلى أن السبب الرئيسي فى النزف المهبلى غير الطبيعى هو وجود اللحمية التى شكلت 44%، من الاسباب. أما العوامل الاخرى فتمثلت فى كبر طول وسمك الرحم 20% تكيس المبيض 14%، اورام المبيض 12%، اورام عنق الرحم 4% استعمال مانع اللولب 4% واورام بطانة الرحم 2%.

وتوصلت الدراسة إلى أن معظم المرضى الذين يعانون من النزف المهبلى الغير طبيعى تتراوح اعمارهم من 25 الى 34 سنة ويمثلون 48% من المرضى.

List of abbreviations:

CL	Corpus Luteum
DUB	Dysfunction Uterine Bleeding
EH	Endometrial Hyperplasia
HCG	Human Chorionic Gonadotropin
IUCD	Intra Uterine Contraceptive Device
KHz	Kilo Hertz
PCOD	Polycystic Ovarian syndrome Disease
SPSS	Statistic Package for Social Studies
TAS	Trans Abdominal Sonogram
AUB	Abnormal Uterine Bleeding
Ca	Cancer
A.V.B	Abnormal Vaginal Bleeding
M.C	Menstrual Cycle

List of figures

Page	Title	Figures
7	Female Reproductive System	Figure 2.1
9	Sagital Section of [elvis	Figure 2.2
15	Fallopian Tube	Figure 2.3
16	Cross Section Anatomy of Ovary	Figure 2.4
26	Uterine Anomalies	Figure 2.5
29	Fibroid Location in the Uterus	Figure 2.6
30	Fibroid	Figure 2.7
30	Fibroid	Figure 2.8
31	Adenomyosis	Figure 2.9
33	Pedunculated polyp of the Cervix	Figure 2.10
33	Endometrial polyp outline by Fibroid	Figure 2.11
34	Endometrial Hyperplasia	Figure 2.12
35	Simple Ovarian Cyst	Figure 2.13
36	Dremoid Cyst	Figure 2.14
36	Ovarian Ca	Figure 2.15
37	Ovarian Ca	Figure 2.16
37	Complex Cystic solid Mass	Figure 2.17
39	Polycystic Ovarian Syndrome	Figure 2.18
39	Intra Uterine Trauma	Figure 2.19
41	Endometrial Ca	Figure 2.20
41	Endometrial Ca	Figure 2.21
46	Shows the distribution of patients ages frequency and percentages	Figure 4.1

47	Shows the ultrasound finding diagnosis and its frequencies	Figure 4.2
48	shows the lesions sites and its frequencies	Figure 4.5
50	Shows the uterus length and the ultrasound findings	Figure 4.6
63	Figer one: intermural fibriod	Figure 5.1
63	Figer tow: overian cyst	Figure 5.2
64	Figer three: Bulky utrus	Figure 5.3
64	Figer four: cervical mass	Figure 5.4
65	Figer five: submucous Fibroid	Figure 5.5
65	Figure six:43 old Ultrasound show complicated ovarian cyst	Figure 5.6
66	Figure Seven: 43 old Ultrasound show poly cystic ovary	Figure 5.7
66	Figure eight: 35 old Ultrasound show ovarien mass	Figure 5.8
67	Figure nine: 32 old Ultrasound show ovarien mass	Figure 5.9
67	Figure ten: 30 old Ultrasound show chorio carcinoma	Figure 5.10

List of tables

Pages	Title	Tables
46	. Shows the distribution of patients ages	4.1
47	Shows ultrasound findings in patient with bleedings	4.2
48	Shows the site of the lesion in patients with bleedings	4.3
49	Shows cross tabulations between the age and ultrasound findings	4.4
50	Shows cross tabulations between the uterus length and ultrasound findings	4.5
51	Shows corss tabulation between the number of deliveries and ultrasound findings	4.6
52	Shows correlations between the variables	4.7
61	Shows the master table	4.8

Table of Contents

Topics	page number
Quran	I
Dedication	II
Acknowledgement	III
Abstract	IV
Arabic Abstract	VI
List of Abbreviations	VIII
List of figures	IX
List of tables	XI
Table of Contents	XII
Chapter One : Introduction	
Introduction	1
Objective	2
Over view of the study	3
Capter Two : Literature review	
Literature review	4
Role of Ultrasound	5
Anatomy	6
Physiology	17
pathology	25
Chapter Three: Methodology	
Methodology	43

Chapter Four: Results	
Results and Analysis	46
Chapter Five: Discussion, Conclusion and Recommendations	
Discussion	53
Conclusion.	55
Recommendation.	56
References.	57
Appendices	61

Chapter one

1.1 Introduction:

The uterus is a muscular organ with central cavity, it has three Layers; the thin inner layer is called the endometrium (mucosa) which lay in the uterine cavity. And the myometrium is middle and thickest tissue layer. And outer layer is the peritoneum (serous). Which is thin layer in women who menstruate, the endometrium thickens every month in preparation for pregnancy. If the woman does not become pregnant, the endometrial lining is shed during the menstrual period. After menopause, the lining normally stops growing and shedding. (Richard S- 2007)

Under normal circumstances, a woman's uterus sheds a limited amount of blood during each menstrual period; bleeding that occurs between menstrual periods or excessive menstrual bleeding is considered to be abnormal vaginal bleeding. Once a woman enters menopause and the menstrual cycles have ended, any bleeding, other than the small amount that may occur in women on hormone therapy, is considered abnormal. (Richard S- 2007)

In general any vaginal bleeding that is not normal menstrual bleeding may be abnormal and must be investigated. This includes the following list:

Excessive heavy menstrual bleeding (menorrhagia), Fibroids and polyps, Cancer of the cervix, Cancer of the uterus, Ovaries Masses and cyst, I.U.C.D,

Others like perforation of the uterus due to surgery

The use of ultrasound machine in the investigation is important because it is non invasive, easy to conduct, with no hazard to patient and accurate to identified the causes of abnormal vaginal bleeding.

Abnormal vaginal bleeding is one of the major health problems in the world especially in the developing countries, like Sudan. This is because it is one of the major causes that increase the maternal mortality rate which jumped to 1000 deaths per 100000 women in the last years, prior was 500 deaths in every 100000 women (Sudan Medical Journal, 2008).

Bahri is middle city in Khartoum State as we know, no previous study was conduct in this hospital; therefore, evaluation and investigation of abnormal vaginal bleeding causes are important.

1.2 Problem of the study:

An Incidence of abnormal vaginal bleeding is high among non-pregnant women in Bahri city which locate in Khartoum State, This may consider as one of the main causes of death, u/s is non invasive method to investigate females with bleeding, No study was done for Sudan female in Bahri city regarding that issue,

1.3 General objective of the study:-

The general objective of this study was to investigate the causes of abnormal vaginal bleeding in order to find out any sonographical markers.

1.4 Specific objectives

- 1-To assess the presence of tumor, cyst or other u/s finding
- 2- To correlate the findings with female age , uterus length and number of delivers
- 3-To characterize the lesion site if present.

1.5 Overview of the study

This study consisted of five chapters with Chapter one is an introduction which includes (problem and objective of the study), Chapter two is a literature review which includes (Anatomy, physiology, Pathology and previous study), Chapter three about research methodology, Chapter four deals with result and Chapter five include discussion, conclusion and recommendation .

Chapter 2

Literature review

2.1 Literature review

There are many studies carried on abnormal vaginal around the world, the Goldstein was refer to {Abnormal uterine bleeding (AUB) is highly prevalent and an important factor in female health; up to one in 20 women aged 30–49 visits her general practitioner because of menorrhagia and AUB accounts for 20% of visits to the gynecological outpatient department (Goldstein, 2004 and Royal College of Obstetricians and Gynecologists, 2006).}

Emanuel and Cornelis said that {Apart from hormonal disbalance, is40% of the referred women with AUB are reported to have intrauterine abnormalities (Emanuel et al., 1995 and Cornelis et al., 2006).

Women of child bearing age who are at low risk for endometrial cancer (Jane ec-2004)

In Sudan also there are many studies carried on the issue, Abu baker Adam find that {most causes of abnormal vaginal bleeding were related to pregnancy problems which constitute 59% and related to non pregnant constitute 41% (Abu baker Adam, Ultrasound finding of abnormal vaginal bleeding in Abu Gebiha Area, (Abubaker Adam 2007)}.

Hassan Ali found that others causes of abnormal vaginal bleeding include uterine fibroids 6%, ovarian masses 5% and endometrium Ca 1 %.(Hassan Ali Ultrasound finding of abnormal vaginal bleeding in Alfaw city (Hassan 2011).

2.2 Role of Ultrasound

Ultrasound is the preferred imaging [modality](#) for the diagnosis and monitoring of pelvic organs. Pelvic ultrasound can help to identify and evaluate a variety of urinary and reproductive system disorders in both sexes without even the minimal risks associated with [x-ray](#) exposure. Ultrasound imaging, formed by exposing part of the body to high-frequency sound waves to produce pictures of the inside of the body. Because ultrasound images are captured in real-time, they can show the structure and movement of the body's internal organs, as well as blood flowing through blood vessels. (Stewart C, Benjamin R – 1991)

Ultrasound scanners consist of a console containing a computer and electronics, a video display screen and a [transducer](#) that is used to scan the body and blood vessels. The transducer is a small hand-held device that resembles a microphone, attached to the scanner by a cord. The transducer sends out high frequency sound waves into the body and then listens for the returning echoes from the tissues in the body. The principles are similar to sonar used by boats and submarines. (Stewart C, Benjamin R – 1991)

In an ultrasound examination, a [transducer](#) both sends the sound waves and records the echoing waves. When the transducer is pressed against the skin, it directs small pulses of inaudible, high-frequency sound waves into the body. As the sound waves bounce off of internal organs, fluids and tissues, the sensitive microphone in the transducer records tiny changes in the sound's pitch and direction. These signature waves are instantly measured and displayed by a computer, which in turn creates a real-time picture on the monitor. One or more frames of the moving pictures are typically captured as still images. (Stewart C, Benjamin R – 1991)

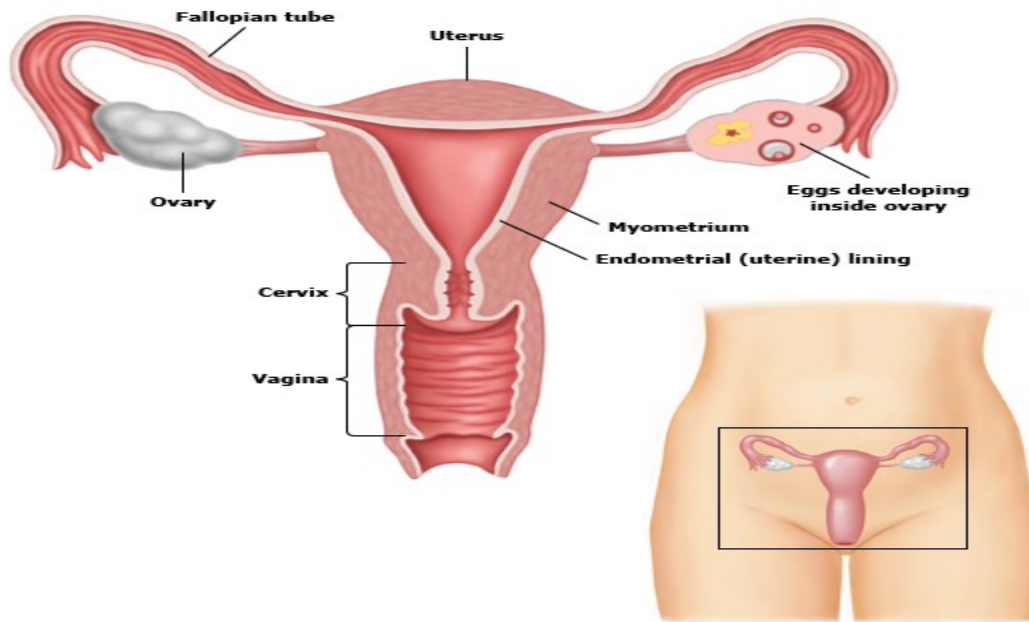
Doppler ultrasound, a special application of ultrasound, measures the direction and speed of blood cells as they move through vessels. The movement of blood cells causes a change in pitch of the reflected sound waves (called the Doppler Effect). A computer collects and processes the sounds and creates graphs or color pictures that represent the flow of blood through the blood vessels.

Medical imaging uses frequencies that are much higher than 20 kHz; the range normally used is from 3 to 15 MHz. These frequencies do not occur in nature and it is only within the last 50 years that the technology has existed to both generate and detect this type of ultrasound wave in a practical way. (Barness E, Spicer D – 2004)

2.3 Anatomy Internal Genital Organs

2.3 .1 Vagina:

The vagina is an elastic fibro muscular canal extending upwards and backwards forms the vulva at an angle of 60-70 degrees to the horizontal, although it is not straight as it is generally supposed but angled backwards. The vagina pierces the triangular ligament and the pelvic diaphragm. The level of these structures being approximately 1 and 2.5cm, respectively from its lower end. The vagina has blind upper and except in so far that the cervix with its external os projects through its upper anterior wall. (Roger W, Peter L – 1996)



The vault of the vagina is divided into four areas according to their relations to cervix, the posterior fornix, which is capacious, the anterior fornix that is shallow and the two lateral fornices. Because the cervix is inserted below the vault, the posterior vaginal wall is approximately 10cm, where as the anterior wall is approximately 8cm, in length. (Roger W, Peter L – 1996)

The introitus is functionally closed by the labia, which are in contact with each other. Moreover, the lumen of the vaginal is ordinarily obliterated by the anterior and posterior walls lying in opposition. In its lower parts it appears H-shaped on cross-section with lateral recesses anteriorly and posteriorly. When, however, a woman is in the knee-chest, sim's or kneeling position and the labia are separated, the vaginal balloons out. This is a result of a negative intra-abdominal pressure, transmitted to the vagina causing entry of the air. Exceptionally, such air can enter the uterus, tubes and peritoneal cavity. (Roger W, Peter L – 1996)

If the walls are separated, the vagina of the nulliparous married women has a diameter of approximately 4-5cm at its lower end and is twice as wide at its upper end. Although the width and length of the vagina show considerable individual variations, anatomical shortness or narrowness is rarely a cause of difficulty or pain on coitus because the vagina is distensible and accommodates itself. The functional width is determined to a large extent by the tone and contractions of surrounding muscles.

A raised double column formed by underlying fascia can often be seen running sagittally down the anterior wall and there is a less definite median ridge on the posterior wall. Running circumferentially from these columns are folds of epithelium (rugae) which account in part for the ability of the vagina to distend during labour. (Roger W, Peter L – 1996)

2.3.1.1 The supports of the Vagina:

The vagina is supported in its upper part by the lower components of the transverse cervical ligaments, which fuse with its fascial sheath. Below this it is held by the fibers of the levator ani which are inserted into its side walls, by the urogenital diaphragm, and by the peroneal muscles. The anterior vaginal wall, urethra and bladder base are supported by the pubo-cervical fascia and also, it is said, by posterior vaginal wall and perineal body on which they rest when the woman is standing, the posterior vaginal wall rests on recto-vaginal fascia and perineal body. The support, which the perineal body gives to the vaginal wall, is minimal and the pelvic diaphragm does not sustain and cradle the pelvic viscera as is so often supposed. The latter offers no more than an elastic foundation to which the important inelastic ligaments are attached. (Roger W, Peter L – 1996)

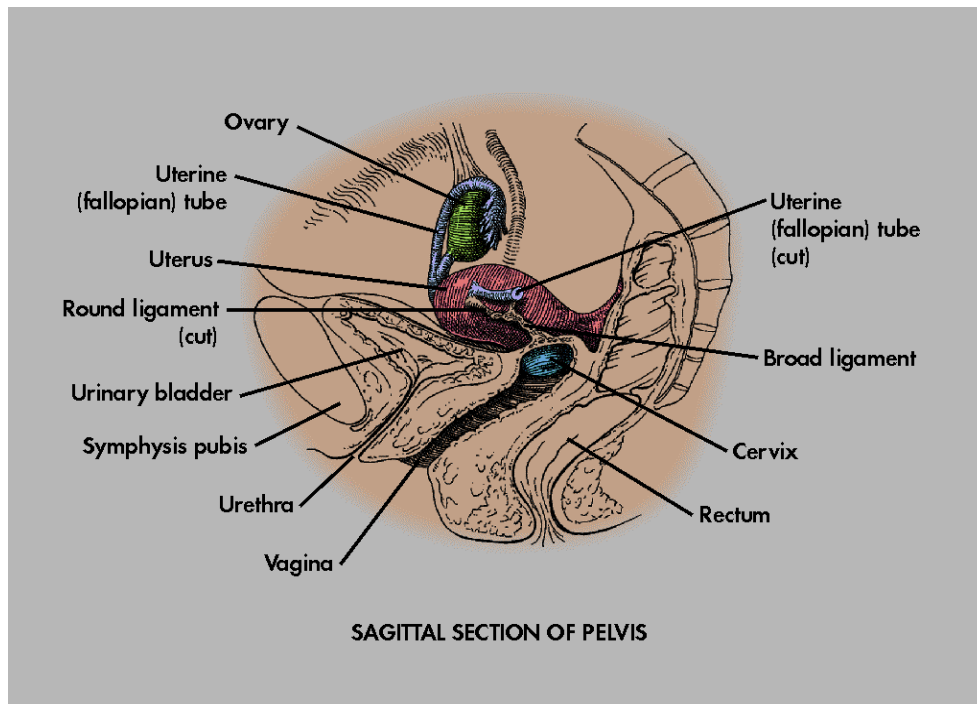


Figure (2) Sagittal section of pelvis – (www.imagingconsult.com)

2.3.1.2 Vascular Connections:

1-Arterial:

These are: the vaginal artery mainly, branches of the uterine artery, branches of the internal pudendal artery, and twigs from the middle and inferior rectal arteries.

2-Venous:

A plexus of veins around the vagina connects with those around the bladder and rectum, and ultimately drains into the internal iliac veins by branches, which mainly accompany corresponding arteries.

2.3.1.3 Lymphatic drainage:

The lymphatics of the lower vagina accompany those of the vulva to the inguinal nodes. The drainage of the upper is the same as that of the cervix, to the internal iliac (hypo gastric), external iliac, obturator and sacral nodes.

2.3.2 Uterus:

The uterus is a thick walled, muscular, hollow organ shaped like a pear, its tapering end being the cervix, which projects into the upper vagina. The measurements were formerly given as 3x 2x1 inches. But this understates its size. Their dimension varies but the nulliparous organ measure approximately 8-9cm (3.5inch) in overall length, 6cm (2.5in) across its widest part and 4cm (1.5inches) from before backwards in its thickest part. It weight 45-55g. The wall is 1-2cm thick, so the length of normal uterine cavity, including the cervical canal, is not less than 7.5-8cm. The uterus is made up of a body or corpus, isthmus and cervix. The part of the body situated above the level of insertion of the fallopian tubes is described separately as the fundus, especially during pregnancy. The area if insertion of each fallopian tube is termed the cornu. The opening of the cervix into the vagina is the external os. The cavity of the uterus is triangular in shape when seen from the front, but is no more than a slit when seen from the side. It communicates with the vagina through the cervical canal, and with the lumen of each fallopian tube at the cornua. (Richard S- 2007)

2.3.2.1 Special features of each part of the uterus:

I- Corpus (including fundus):

The corpus makes up two thirds or three quarters of the uterus of the mature woman. The main muscle coat (myometrium) is lined by endometrium a specialized form of mucous membrane. The later varies in thickness from 1-5 mm according to the phase of the menstrual cycle. It is covered by a single layer of

cuboidal or columnar epithelium which dips in to form simple un branched tubular or spiral glands, some of which are so long that they extend from the surface to the myometrium. The glands lie on a stroma, which is made up of loosely vessels, lymphatics and leukocytes. Stromal cells are spindle- or star- shaped with little cytoplasm so, in microscopic sections, it is the dark staining, small round or oval nuclei, rather than the cell outlines, which are seen. The endometrium and, to a lesser extent, the myometrium show cyclical histological and functional changes related to menstruation. (Richard S- 2007)

II- Isthmus:

The isthmus is an annular zone, measuring no more than 0.1-0.5cm from top to bottom in the non-pregnant uterus, which lies between the cervix and the corpus. The obvious constriction between the uterine cavity and the cervical canal is the anatomical internal os and the isthmus is below this. The junction between the isthmus and the cervical canal proper, which is only recognized microscopically, is the histological internal os. The mucous membrane of the isthmus is intermediate in structure and function between that of the corpus and that of the cervix. The importance of the isthmus is that it is the area, which during late pregnancy and labour becomes the lower uterine segment. (Richard S- 2007)

III- Cervix:

The cervix is barrel-shaped, measuring 2.5-3.5cm from above downwards. Half of it projects into the vagina (vaginal cervix or portivaginalis) while half is above the vaginal attachment (supervaginal cervix). The vaginal part is covered with squamous epithelium continuous with that of the vagina. The supervaginal part is surrounded by pelvic fascia except on its posterior aspect where it is covered with the peritoneum of the pouch of Douglas. A spindle-shaped canal, disposed centrally connects the uterine cavity with the vagina. The part of the cervix is composed

mainly of involuntary muscle, many of the fibers being continuous with those in the corpus. The lower half has a thin peripheral layer of muscle (the external cervical muscle) but is otherwise entirely composed of fibrous and collagenous tissues. (Richard S- 2007)

The mucous membrane lining the canal (endocervix) is thrown into fold, which consists of anterior and posterior columns from which radiate circumferential folds to give the appearance of tree trunk and branches, hence the name arbor vitae. Historically the endocervix differs considerably from the endometrium. It is covered by a single layer of more cuboidal 'basal' or 'reserve' cells from which new surface cells are believed to develop and which can undergo squamous metaplasia. (Richard S- 2007)

The surface epithelium dips down to form complicated glands and crypts, which are said to number approximately 100. They penetrate the fibromuscular tissue and lie in a stroma more fibrous and dense than that of the endometrium. The epithelium of these glands is taller than that of the endometrial glands and the nuclei are always basal in position. (Richard S- 2007)

2.3.2.2 The support of the uterus:

The uterus is held in a position of anteflexion and anteversion by its weight, by the round ligaments, which hold the fundus forwards, and by the uterosacral ligaments, which keep the supravaginal cervix far back in the pelvis. The broad ligaments and their cellular tissues also have a steadying effect on the uterus.

The round and broad ligament do not, however, have any significant action in preventing descent of the uterus. This function is performed almost entirely by the transverse cervical ligaments and their posterior extensions – the uterosacral

ligaments. These ligaments also contribute to support the vaginal vault, which is also important in preventing uterine prolaps. (Richard S- 2007)

2.3.2.3 Vascular Connection:

I- Arterial:

Uterine and ovarian arteries.

II- Venous:

Pampiniform plexuses in broad ligament.

Uterine and ovarian veins.

Vaginal plexus and vertebral plexuses.

2.3.2.4 Lymphatic drainage:

I- Cervix:

Paraervical plexus.

External iliac and internal iliac (hypogastric) nodes.

Obturator nodes.

Sacral nodes.

II-Corpus:

The same as the cervix also the aortic nodes (via lymphatics accompanying the ovarian vessels) and the superficial inguinal nodes (via lymphatics in the round ligament). (Richard S- 2007)

2.3.3 Fallopian Tubes:

2.3.3.1 General description:

The two fallopian tubes are oviducts, which extend from the ovaries to the cornua of the uterus, one on either side. They are somewhat tortuous and their outer parts curve backwards. Each lies in the free upper border of the broad

ligament and, when straightened is 10cm in length. Its lumen communicates with the uterine cavity at its inner end and with the peritoneum cavity at its outer, and thus provides the final section of an open, or potentially open, canal, which lead from the exterior to the abdominal cavity. The fallopian tube is divided into four parts. (Richard S- 2007)

2.3.3.2 Interstitial or intramural parts:

This only 1-2cm in length and is the part which transverse the uterine wall. It was a very narrow lumen (1mm in diameter) and is different from the remainder of the tube in that it is without a peritoneal coat, and in that, the outer longitudinal muscle has disappeared to cover the uterus. (Richard S- 2007)

I-Isthmus:

This is the straight and narrow portion adjacent to the uterus and measures 2-3cm. It has thick walls but the lumen is so narrow that it only admits the finest probe (1-2cm in diameter). (Richard S- 2007)

II-Ampulla:

This is the wider, thin-walled and tortuous outer portion approximately 5cm in length, which lead to the infundibulum.

III-Infundibulum:

This is the trumpet-shaped outer end with an opening into the peritoneal cavity (abdominal ostium). The latter is surrounded by fronds or fimbriae, one of which is longer than the others and is directed towards the ovary. (Richard S- 2007)

2.3.3.3 Structure:

Except for a narrow a strip opposite to its attachment to the broad ligament, the extra uterine part of the fallopian tube is covered with peritoneum. Beneath this

are an outer longitudinal layer and an inner circular layer of involuntary muscle. Zone is thick at the isthmus and thin at the ampulla. It is separated from the mucosa lining the lumen (endosalpinx) by a delicate connective tissue submucosa. The tube is lined by columnar epithelium supported by a thin stroma, about half of the epithelial cells especially the outer parts of the tube are ciliated and create a current. This combined with peristaltic action of the muscle propels the ovum towards the uterus. (Richard S- 2007)

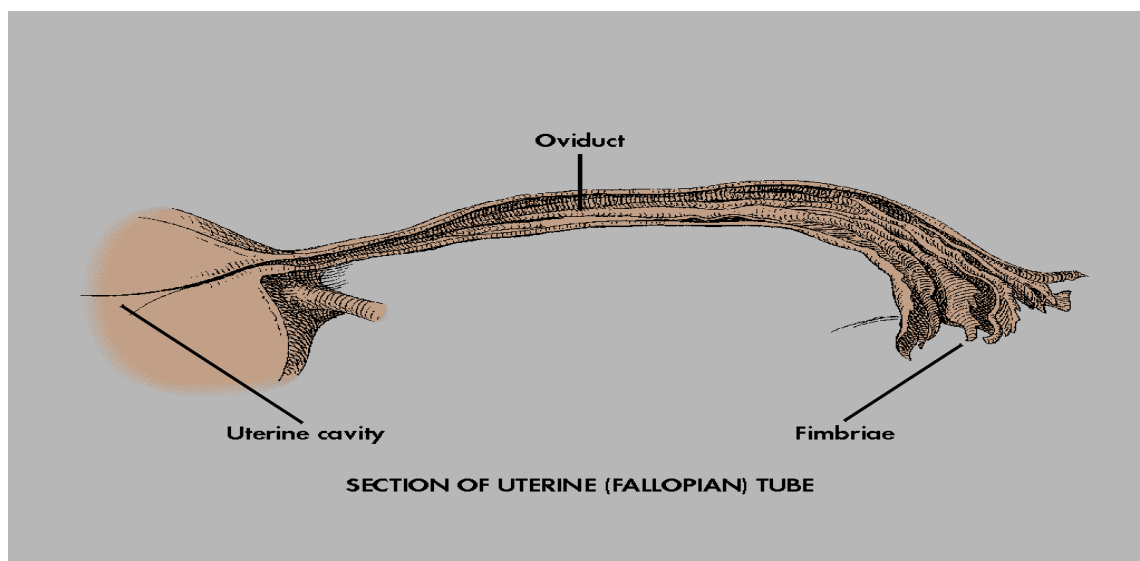


Figure (3) Fallopian Tube – (www.diagnosticimaging.com)

2.3.4 Ovaries:

2.3.4.1 General Descriptions:

The two ovaries are mainly solid ovoid structures, approximately 3.5cm in length and 1.5-2.5cm in thickness. Each weights 4-8g, the right tending to be larger than the left. They are attached to the back of the broad ligament by the mesovarium, one on either side of the uterus. Each is suspended form the cornu of the uterus by an ovarian ligament. The surface of an adult active ovary is corrugated, and is pale

except where there happens to be some structure such as a corpus luteum. The ovary is the only organ in the abdomen, which is not covered by peritoneum. The part of the ovary attached to the mesovarium is the hilum and all nerves and vessels enter and leave at this point. In the hilum and adjacent mesovarium are small collections of hilus cells, which may be homologous to the interstitial cells of the testis. (R J Last – 2005)

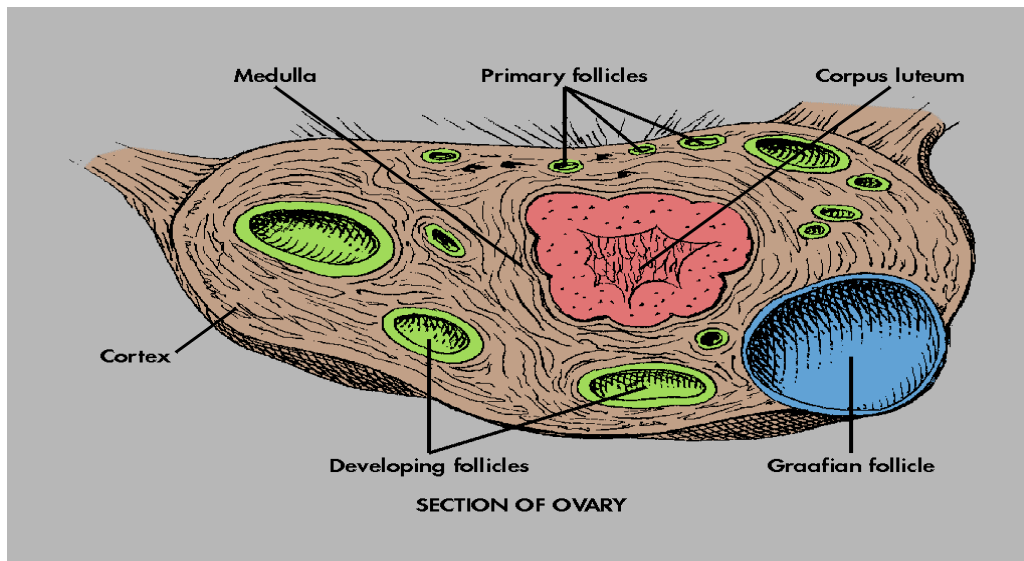


Figure (4) Cross section ovary – (www.diagnosticimaging.com)

2.3.4.2 Structure:

The ovary has a cortex (outer zone) and medulla (inner zone) but they are not clearly defined. Both areas have a connective tissue stroma in, which can be found blood vessels, nerves and graafian follicles in varying stages of development together with their derivatives – corpora lutea and corpora albicantia. Primordial follicles are mostly found in the cortex is covered with germinal epithelium, which consists of a single layer of low cuboidal cells but is only seen in early life. Later, the ovary is coated only by the connective tissue tunica albuginea. It is now

recognized that the germinal epithelium does not give rise to germ cells, so many prefer to call it surface epithelium, The tunica albuginea is not well developed and as resistant as the comparable structure in the testis, so distention of the ovary by ripening follicles or by pathological states does not cause pain. Even when the tunica is unusually thick, as in the skin- leuental syndrome, it does not prevent ovulation. (R J Last – 2005)

2.3.4.3 Vascular connection:

I-Arterial:

Uterine and ovarian arteries.

II-Venous:

Pampiniform plexus, ovarian vein and uterine vein.

2.3.4.4 Lymphatic drainage:

Aortic nodes (via lymphatics accompanying the ovarian vessels) and external iliac nodes. (R J Last – 2005)

2.4 Reproductive Physiology:

In the normal female between the age of 9 and 16, cyclic changes occur in the ovaries and uterus in response to endocrinologic activities. These cyclic changes are known as the menstrual cycle and represent the reproductive phase of a female's life cycle. The changes associated with the endometrium are known as the endometrial cycle. The purpose of the ovarian cycle is to provide a suitable ovum for fertilization, whereas that of the endometrial cycle is to provide a suitable site in which the blastocyst can implant and develop properly. Since the endometrial changes are regulated by the ovarian hormones, the two cycles are intimately related. (Guyton, Hall – 2000)

The typical menstrual cycle is 28 days however variations are very common and normal. For the purpose of description, the 28 day “idealized” cycle is used. The cycle is divided into four or five phase. It is customary to assign the first day of menstruation as the first day of the cycle. (Guyton, Hall – 2000)

2.4.1 Ovarian Cycle:

Throughout the reproductive years, at the onset of each menstrual cycle, a number of small, immature follicles known as primary or primordial follicles undergo growth and development. The hormonal stimulus that activates the follicular process is mediated by follicle-stimulating hormone or FSH which is secreted by the anterior pituitary gland. With each menstrual cycle, there is usually only one mature follicle, known as the dominant or Graffian follicle, which makes its way to the surface of the ovary where it appears as a transparent cyst. The mature preovulatory follicle contains the ovum at one end and a cystic cavity or antrum at the other. There are several layers of specialized cells known as theca and granulosa cells which secrete estrogen, progesterone and luteinizing substances. (Guyton, Hall – 2000)

The ovum is released from the mature follicle during ovulation. Ovulation normally occurs on day 14 which is the mid-point of the idealized cycle. Following ovulation, the ruptured dominant follicle becomes the corpus hemorrhagicum which is then followed by the corpus luteum. The corpus luteum (CL) secretes progesterone (as well as estrogen) which is absolutely necessary to maintain the endometrium for successful implantation. If fertilization does not occur, the CL undergoes regressive, progesterone output is diminished, and by the end of the cycle complete regression occurs. The failing CL triggers endometrial sloughing and menstrual bleeding ensues. The end point of the regressing CL is the corpus

albicans, which is a small fibrous area in the cortex of the ovary. (Guyton, Hall – 2000)

2.4.2 Endometrial Cycle:

With each menstrual cycle and in step with ovarian, the functional layer of the endometrium undergoes changes characterized by regeneration, proliferation, secretory activity, necrosis, and sloughing. During menstruation, the functional layer of the endometrium is sloughed off and along with blood, passes into the vagina. Following menstruation, a new functional layer begins to form from the basal layer. Primed by estrogen secreted by the ovary, the endometrium progressively thickens throughout the proliferative and secretory phases. (Guyton, Hall – 2000)

Following ovulation and the formation of the CL, the endometrial glands exhibit secretory activity. If fertilization does not occur, the corpus luteum undergoes regressive changes, and the endometrium, supported by the hormonal output of the ovary, begins to “shrink”. The shrinking is due to the loss of tissue fluids and secretions which occurs secondary to the drop in estrogen. Estrogen has a “water-retaining” effect on tissues whereas progesterone is a factor in the secretory activity of the gland. As the endometrium shrinks, the spiral arteries kink resulting in vascular stasis followed by ischemia, necrosis, sloughing and bleeding. . (Guyton, Hall – 2000)

The menstrual cycle is a continuous ongoing cycle but for descriptive purpose it is divided into specific phases based on hormonal levels, and events occurring in the ovary and endometrium. The hormonal relationships and the effects of these hormones on the receptor tissues and organs are considered with these phases in

mind. The “ideal” 28 day cycle will be considered although in relating the length of the normal menstrual cycle may vary considerable. (Guyton, Hall – 2000)

2.4.3 Phase of the Menstrual Cycle:

I-Menstrual Phase (Day 1 to 5):

Synonyms: menstruation, menses, period. Characterized by uterine bleeding and endometrial sloughing. The serum level of estrogen is low at the beginning menstrual cycle. A low estrogen level signals the hypothalamus to release gonadotropin-releasing hormone (GnRH). The hypothalamus is considered the biologic clock which primes the cycle. When the neurohormonal axis is functioning properly, there are pulsatile which induce regular monthly cyclical secretions from the pituitary in the form of FSH and LH. The pituitary output of FSH and LH act directly on the ovary to produce a mature follicle in one ovary and to cause ovulation. GnRH induces the anterior pituitary to secrete FSH and luteinizing hormone (LH). Under the influence of FSH, numerous primordial follicles begin to develop and grow, and secrete estrogen. (Guyton, Hall – 2000)

II- Follicular/ Proliferative Phase (Day 6 to 13):

Characterized by development and growth of primordial follicles (process of folliculogenesis) and by recognition of proliferation of the functional of the functional layer of the endometrium. The developing follicles secrete increasing amounts estrogen. For reasons largely unknown, a single dominant follicle emerges and the other developing follicles regress and become atretic. The dominant follicle continues to grow towards the surface of the ovary. There is negative feedback loop in the hormonal axis such that increasing serum levels of ovarian hormones cause decreasing secretions from the hypothalamus and pituitary.

Just prior to ovulation, the rising serum levels of estrogen induce a surge in the pituitary output of LH. This “extra squirt” of LH is very important for ovulation. LH also includes the dominant follicle and corpus luteum to secrete progesterone. (Guyton, Hall – 2000)

III-Ovulation (Day 14):

Characterized by the release of the mature oocyte of ovum.

Ruptured, dominant follicle becomes the corpus hemorrhagicum, and then the corpus luteum. Suppression of ovulation is the primary mechanism of action of oral contraceptives. A dominant follicle fails to emerge, ovulation is suppressed and there is no corpus luteum formation. A practical method of detecting ovulation is the shift in basal body temperature from a relatively constant lower during the preovulatory phase to a slightly higher level early in the postovulatory phase. The typical upward shift is 0.3 degrees Celsius and is measured by a special thermometer with 0.1 degree gradations. The increase in the basal body temperature is caused by the thermogenic action of progesterone. The rise in basal body temperature may provide evidence for the development of a corpus luteum and the secretion of progesterone and is therefore considered a clinical sign of ovulation. (William F- 2003)

IV-Luteal/secretory phase (Day 15 to 25)

Characterized by formation of the corpus hemorrhagicum and corpus luteum, and secretory activity of the endometrial glands. The CL secretes progesterone and estrogen. The functional layer of the endometrium thickens and secretes large amounts of lubricating mucus. If fertilization does not occur, the CL begins to regress after day 20-21 and the levels of estrogen and progesterone gradually decrease. If fertilization occurs, the conceptus moves into the uterus and implantation occurs between day 21 and 25. The trophoblastic cells of the

blastocyst secrete human chorionic gonadotropin (HCG) which signals the CL to maintain its hormonal output of progesterone. HCG is necessary to maintain the hormonal output of the CL which in turn is necessary at this stage to maintain the decidual reaction of the endometrium. Later in pregnancy (at about 3 months), the placenta secretes sufficient amounts of estrogen and progesterone to maintain the decidua and the CL atrophies to become the corpus albicans (small area of scar tissue in the cortex of the ovary). (William F- 2003)

V-Ischemic Phase (Day 26 to 28):

Synonym: premenstrual phase.

Characterized by further regression of the CL and shrinking of the endometrium accompanied by vascular stasis and ischemia in the last few days. (William F- 2003)

Estrogen and progesterone levels rapidly diminish resulting in the loss of tissue fluids and of secretory activity. The endometrium consequently shrinks resulting in kinking of the spiral arteries. This leads to vascular stasis, ischemia and necrosis. (William F- 2003)

With tissue necrosis and associated hemorrhaging, the process of menstrual bleeding begins and a new menstrual cycle is under way. (William F- 2003)

2.4.4 Gynecological Endocrinology:

The structure directly involved in the regulation of the menstrual cycle and in reproductive physiology are the hypothalamus, pituitary gland, ovary, and trophoblast of the early blastocyst if the patient is pregnant. (William F- 2003)

I-Gonadotropic- Releasing Hormone:

The hypothalamus secretes gonadotropic releasing (GnRH) that control gonadotropin release (FSH and LH). GnRH is secreted in a pulsatile manner; the

amplitude and frequency of the secretions vary throughout the cycle. One pulse every hour is typical of the follicular phase; one pulse every 2-3 hours is typical of the luteal phase. The amplitude and frequency are regulated by feedback of estrogen and progesterone and neurotransmitters within the brain. (William F- 2003)

GnRH stimulates the synthesis and release of both FSH and LH from the same cell in the anterior pituitary. With GnRH stimulation, there is a rapid (30 minute) increase in serum FSH and LH with a later (90 minute) release of LH. Improper amplitude or frequency of GnRH may be a factor in infertility. (William F- 2003)

II-Follicle Stimulating Hormone and Luteinizing Hormone:

The anterior pituitary secretes follicle stimulating hormone (FSH) and luteinizing hormone (LH). There are FSH receptors primarily in the cell membrane of the granulosa cells which line the walls (single layer) of the ovarian follicles. FSH acts primarily on the granulosa cells to stimulate follicular growth and also stimulates formation of LH receptors. FSH stimulates follicular growth and also stimulates formation of LH receptors. FSH stimulates follicular growth by increasing both FSH and LH receptor content in granulosa cells. This action is enhanced by the estrogen being produced by the granulosa cells. (William F- 2003)

LH receptors exist in theca cells at all stages of the cycle and on granulosa cells after the follicle matures under the influence of FSH and estrogen. With sufficient number of LH receptors on the granulosa cells, LH acts directly on the granulosa cells to cause luteinization (i.e. formation of the corpus luteum) and the formation of progesterone. LH increases steadily until mid cycle when there is a surge, which is accompanied by a lesser surge of FSH. LH initiates luteinization

and progesterone production in the granulosa cells. The preovulatory rise in induce the mid cycle FSH peak. (William F- 2003)

III-Estrogen:

All least six different estrogens level has been isolated from the plasma of human females. However, only three are present in significant quantities. These are beta-estrodinol, estrone, and estriol. Of these, beta-estrodinol (or simply, estradiol) exerts the major effect. As reference is made to estrogens in subsequent discussions, keep in mind that estradiol s the principle estrogen.

Estrogen is secreted by the granulosa cells of the ovarian follicles and the corpus luteum. Estrogen stimulates follicle growth and increases FSH action on the granulosa cells. The follicle destined to become dominant secretes the greatest amount of estrogen, which, in turn, increases the density of the FSH receptors on the granulosa cell membrane. Rising estrogen levels result in negative feedback on FSH secretion levels; this halts the development of other follicles, which then become atretic. The follicular rise of estrogen exerts a positive feedback on LH secretion. LH levels rise steadily during the late follicular phase. FSH induces the appearance of LH receptors on granulosa cells. Estrogens rise rapidly, reaching a peak approximately 24-26 hours before ovulation. Major physiological effects of estrogen.

include:

Development and maintenance of female reproductive structures.

Development of female secondary sex characteristics.

Development of breast.

Control of fluid and electrolyte balance.

Increase protein anabolism. (William F- 2003)

IV-Progesterone:

Progesterone is secreted by the maturing follicle just prior to ovulation and by the corpus luteum following ovulation. Peak levels of progesterone are attained 8-9 days after ovulation, which approximates the time of implantation of the blastocyst. Progesterone is also synthesized by the placenta around the end of the first trimester to term. Major physiological effects of progesterone include:

Prepares the endometrium for implantation.

Maintains the decidua during pregnancy.

Prepares breasts to secrete milk for lactation. (William F- 2003)

V-Human Chorionic Gonadotropin (hCG):

HCG is biochemically similar to LH. It is secreted in early pregnancy by the trophoblast of the blastocyst (the trophoblast forms the chorion which differentiates into the villous chorion frondosum (which becomes the placenta) and the smooth chorion or chorion laeve (which joins with the amnion to form the amniochorionic membrane). HCG maintains corpus luteal function until the placenta is established and begins to manufacture estrogen and progesterone. (William F- 2003)

2.5 PATHOLOGY

2.5 Abnormal vaginal bleeding includes:

2.5.1 Abnormal uterine bleeding:

Abnormal uterine bleeding is a descriptive term applied to any alteration in the normal pattern of menstrual flow. However, from a practical point of view abnormalities in menstrual flow may take form of excessive flow, prolonged flow or inter menstrual bleeding. Menorrhagia is one of the commonest gynecological complaints seen in practice as accounts for approximately 15 per cent of all referrals to a general gynecologic clinic. Among women aged 16 to 45 years it has an incidence of around 30 per cent and remains the commonest indication for

hysterectomy. The average menses lasts for 3-7 days with a mean blood loss of 35 ml. Menorrhagia is generally define as blood loss of greater than 80 ml is women who loose this amount or more will consistently have a lower hemoglobin and heamatocrit value . Abnormal uterine bleeding can be classified as organic and non organic. At least 50 per all women with menorrhagia have no identifiable pathology (non-organic). This pattern is called dysfunction uterine bleeding (DUB). Most cases of DUB (at least 85%) are due to a failure of ovulation as a result of an alteration in neuro-endocrinological function. Therefore DUB can be further classified as anovulatory or ovulatory. (Robbins C – 1999)

2.5.2 Organic causes:

The major organic causes of abnormal uterine bleeding include the following condition. Local disorder (uterine malformation , myoma or fibroids , adenomyosis ,endocervical polyps , endometrial polyps ,hyperplasia , IUCD , PID , malignant of the cervix or uterus hormone producing tumor and trauma). (Robbins C – 1999)

2.5.3 Uterine malformation

A congenital uterine malformation is a deviation in the shape or structure of the uterus that occurred during a woman's own prenatal development. Exposure to certain chemicals may cause congenital malformations, such as if the woman's mother took a drug called DES while pregnant.

Some type's congenital uterine malformations can increase the risk of miscarriages or preterm delive rus, bicornuate uterus, unicornuat 'shaped uterus. (Robbins C – 1999)

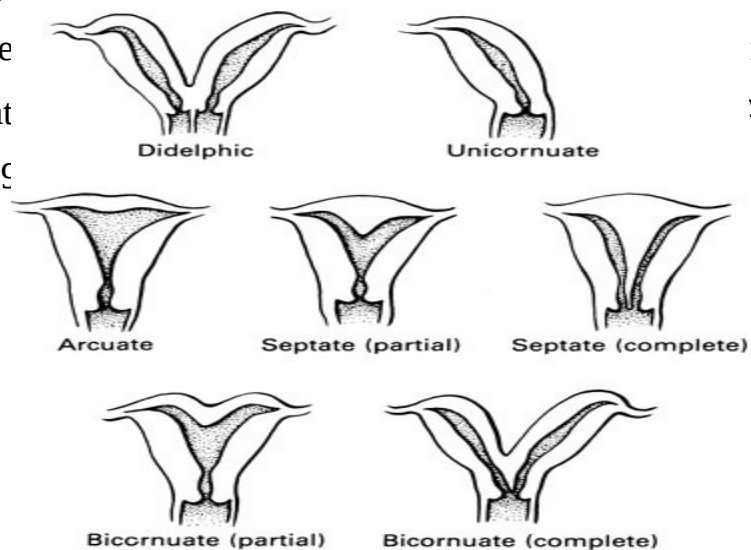


Figure (5) Uterine Anomalies – (www.imagingconsult.com)

2.5.4 A Fibroid:

Myomas or myoma are benign tumors arising from smooth muscle. A myoma is composed mainly of smooth muscle with varying amounts of fibrous tissue. Myomas may also be referred to as leiomyomas and fibromyomas. “Fibroid” is a popular slang referring to a myoma of the uterus (fibroid is the word generally used in the clinical setting by sonographers and gynecologists). Myomas can occur in any structure with smooth muscle including the fallopian tubes, bladder and gastrointestinal tract. The most common location for myomas is the body of the uterus. (Robbins C – 1999)

Myomas are the most common masses of uterine origin and are one of the most frequent abnormalities palpated in the pelvis. The exact incidence of myomatous disease of the uterus is uncertain but it is diagnosed in about 20% to 25% of women 35 years of age or older; the incidence is up to seven times higher in black women compared to Caucasians. Evidence strongly suggests that uterine myomas are dependent on estrogen for growth as they are rarely found before puberty and

stop growing and atrophy after menopause (in well documented cases, new myomas rarely appear after menopause). (Robbins C – 1999)

During pregnancy, when blood estrogen levels are sustained and relatively high, there is often rapid growth of myomas. They are frequently diagnosed in conditions of hyperestrogenism including an ovulation, endometrial polyps, and endometrial hyperplasia. Myomas respond to GnRH agonists which have an antiestrogenic effect. Estrogen receptors have been shown to be higher in myomas compared to normal myometrium. Although myomas are associated with conditions involving high levels of estrogen, they are also found in women with normal cycles who exhibit no hormonal imbalance. Myomas may occur singly but are usually multiple (as many as 100 or more have been found in a single uterus). They vary in size from less than 1 cm to huge masses measuring over 20 cm. (Robbins C – 1999)

Fibroids locations:

- Subserosal - on the outside surface of the uterus
- Intramural - within the muscular wall of the uterus
- Submucous - bulging in to the uterine cavity
- [Pedunculated fibroid](#) – within out wall of the uterus.
- The only type that is supposed to have a large impact on reproductive function (unless they are large or numerous) is the submucous type that pushes in to the uterine cavity. These are much less common than the other 2 types of fibroids.
- Because of their location inside the uterine cavity, submucous fibroids can cause fertility problems and miscarriages.

- Submucosal fibroids can often be surgically resected to improve fertility. (www.diagnosticimaging.com)

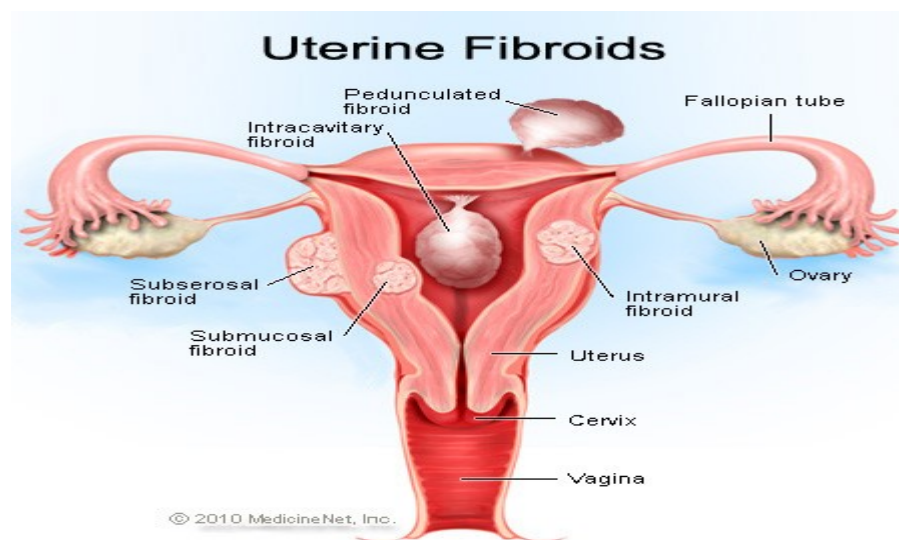
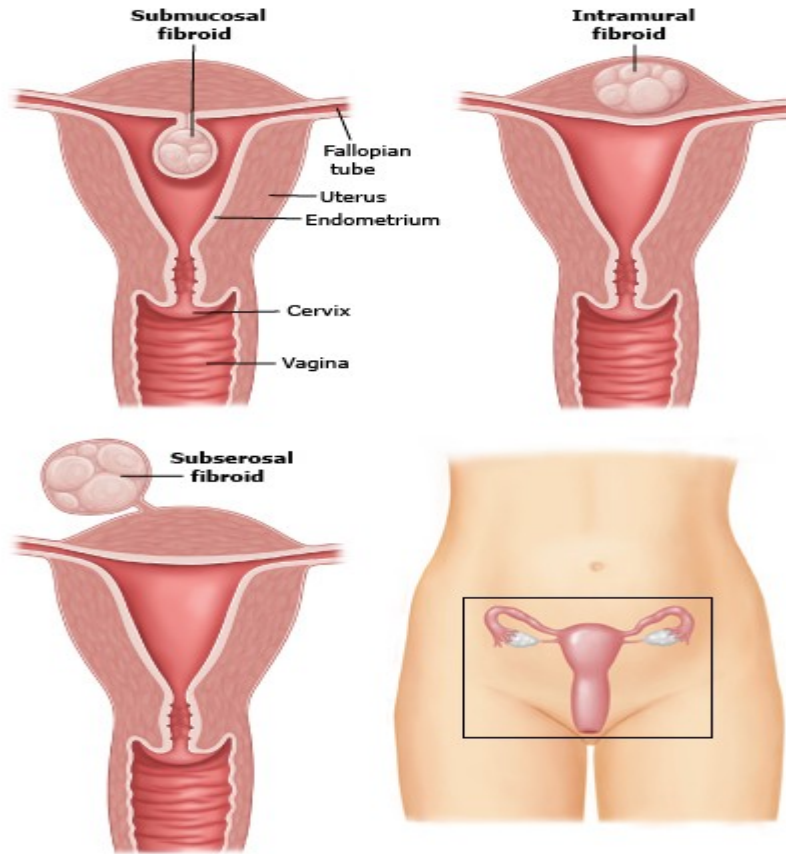


Figure (6) **Fibroid locations in the uterus -**

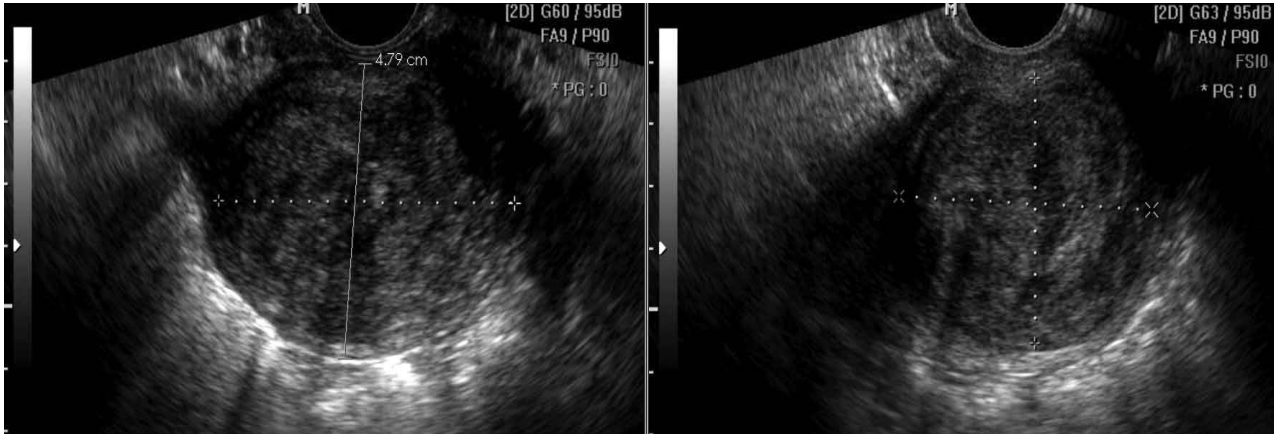


Figure (7) Fibroid - (www.ultrasound-image.com)

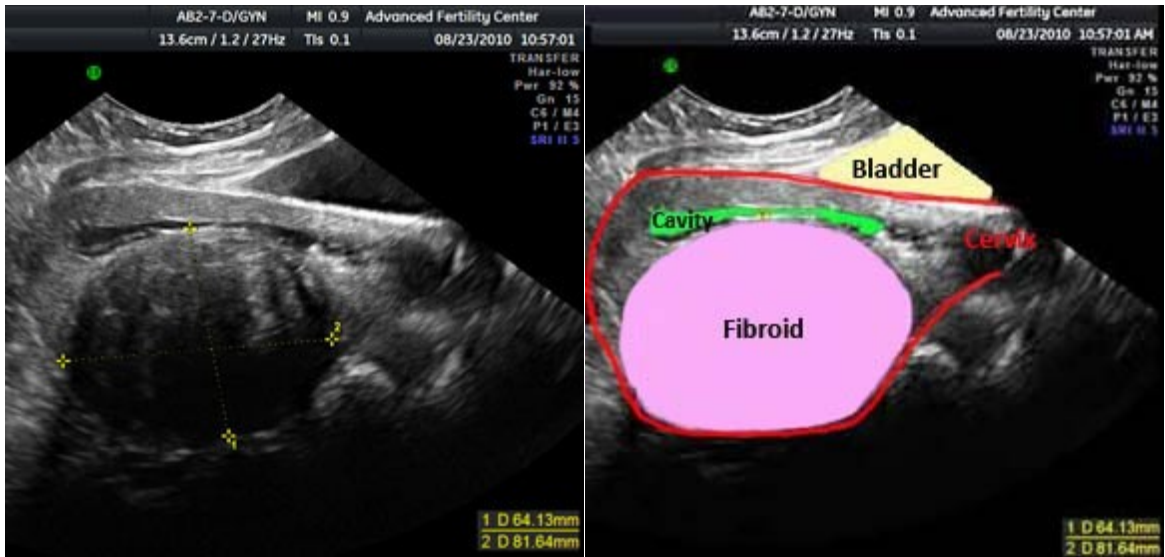


Figure (8) **Fibroid** - (www.ultrasound-image.com)

2.5.5 Adenomyosis:

Adenomyosis is defined as ectopic endometrial tissue within the myometrium. Adenomyosis can coexist with endometriosis however it is usually a separate disease. The term “internal endometriosis” is sometimes used to refer to adenomyosis. Adenomyosis may be either diffuse (infiltrative) or focal (known as adenomyoma). Diffuse adenomyosis manifests as an enlarged and globular uterus; focal adenomyosis manifests as a focal mass in the uterine wall, usually associated with uterine pain and tenderness. Adenomyosis is a benign disease that usually affects women in their reproductive years, and is most common in women 40 to 50 years of age (perimenopausal). Incidence is higher in multiparous women. The most common symptoms associated with adenomyosis are abnormal uterine bleeding (hypermenorrhea), dysmenorrhea, and pelvic pain referable to the uterus. Before the advent of EVS and MRI, adenomyosis was called the neglected diagnosis because preoperative diagnosis was only rarely made. Distinguishing focal adenomyosis and myoma may not be possible in some cases. Definitive diagnosis is by histological analysis of the uterus following hysterectomy. (Robbins C – 1999)



Figure (9) Adenomyosis - (www.ultrasound-image.com)

2.5.6 A Polyp:

Endometrial polyps are localized overgrowths of endometrial glands and stroma. These lesions may be either sessile (broad-based) or pedunculated. They are multiple in 20% of cases, and range in size from a few millimeters to several centimeters. In premenopausal women, polyps have very little premalignant potential however there is a 10 to 15 percent association with malignant disease in postmenopausal women. Endometrial polyps are often asymptomatic and detected incidentally during pelvic ultrasound. The most frequent symptom is irregular uterine bleeding, which may manifest as metrorrhagia, increased perimenopausal bleeding, or postmenopausal bleeding. Less commonly, polyps may be associated with mucous discharge. The diagnosis of endometrial polyps can be made with endovaginal sonography, dilation and curettage (D&C), and hysteroscopy Polyps may be removed by D&C or hysteroscopic excision. (Robbins C – 1999)

2.5.6 B Ultrasound/Doppler

With TAS, endometrial polyps are generally too small to be defined and typically produce non specific endometrial thickening. With EVS, polyps are generally discretely visualized and appear as focal echogenic masses with a uniform echo texture (slightly more echogenic than normal adjacent endometrium). On CD/PD evaluation, polyps typically demonstrate a single feeding vessel in the center of the lesion. Sonohysterography with the aid of CD provides more accurate EVS distinction between polyps, submucous myoma, clots, and synechia. The most frequent lesions to be distinguished are polyps and submucous myoma. Typical polyps have a single feeding vessel whereas submucous myomas typically have

multiple feeding vessels that arise from the inner myometrium. (Maulik D, Zalud I – 2005)

Figure (10) pedunculated polyp of the cervix - (www.ultrasound-image.com)

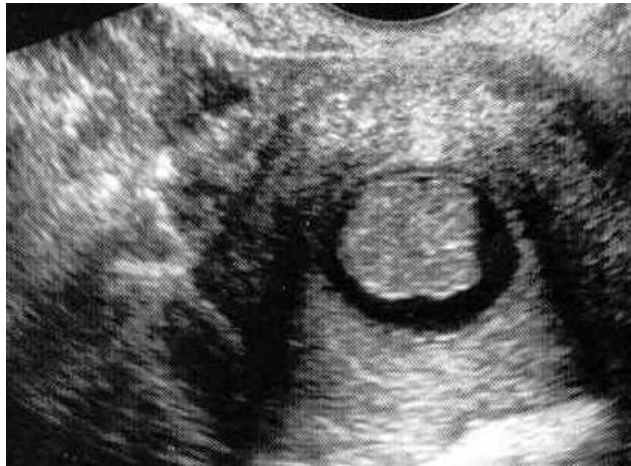


Figure (11) endometrial polyp outlined by fluid - (www.ultrasound-image.com)

2.5.7. Endometrial hyperplasia

Endometrial hyperplasia is defined as generalized overgrowth of the endometrium. There are several histological patterns with a spectrum of glandular proliferation with varying degrees of architectural disarray including simple hyperplasia, and complex adenomatous hyperplasia, with and without atypia risks include polycystic ovarian disease, tamoxifen therapy, and estrogen replacement therapy. Estrogen stimulation of the endometrium, without the controlling effects of a progestin or progesterone, is the underlying causes of endometrial hyperplasia, and eventually, endometrial cancer. The risk of progression to endometrial cancer is reported to be 1% to 14% in untreated cases. This risk is greatest in postmenopausal women and in women with severe atypia. Endometrial hyperplasia is the most common cause of vaginal bleeding in both premenopausal and postmenopausal women. In women on estrogen replacement therapy, the addition of a progestational agent has dramatically reduced the risk of endometrial hyperplasia and carcinoma. Treatment of endometrial hyperplasia is usually medical, and depends on the patient's age, the underlying cause, and reproductive needs. On ultrasound, endometrial hyperplasia appears as generalized thickening of the endometrium with a smooth myometrial boundary and no evidence of myometrial invasion. It may be indistinguishable from endometrial polyps or carcinoma, even on EVS. Sonohysterography can provide more accurate distinction. Diagnosis is usually confirmed by endometrial sampling. (Mohan H – 1999)

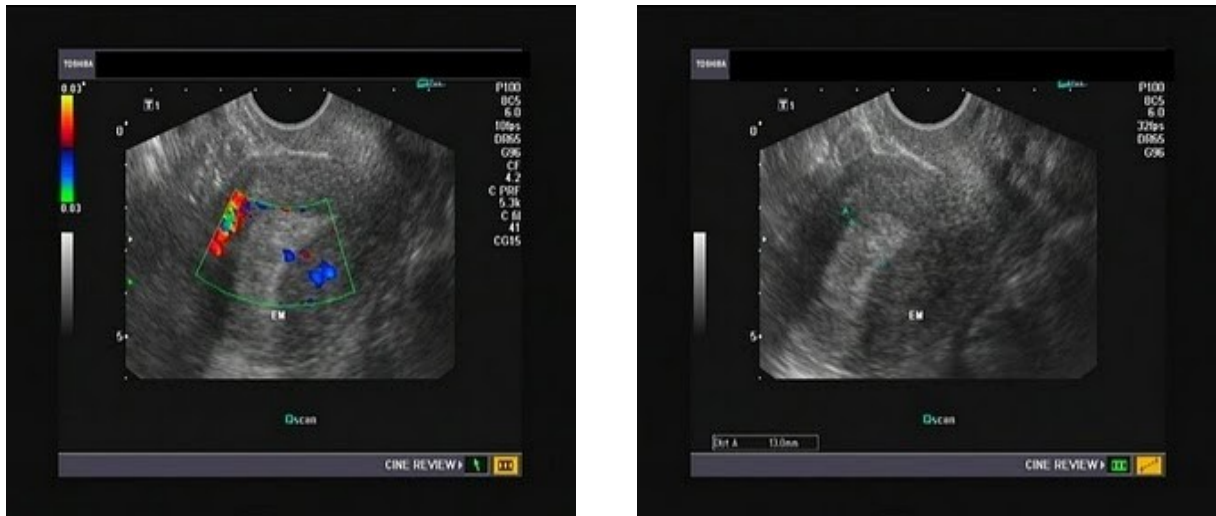


Figure (12) endometrial hyperplasia - (www.ultrasound-image.com)

2.5.8 Ovarian Mass

Ovarian masses represent a wide variety of pathologies including functional cysts, endometriosis, benign or malignant neoplasms, and those originating from adjacent pelvic organs. The term "tumor" does not mean benign or malignant. It simply means the mass in the ovary is not a functional, ovulatory cyst. "Tumor" implies that the mass or cyst is not in a normal finding.

The ovarian cysts are characterized by anechoic (black) fluid filling the cyst cavity and thin walls. Simple cysts are less than 40-50 mm in diameter. If an ovarian cyst has recently ruptured, one will see fluid in the pelvis. If there are echoes within the cyst, it may be from hemorrhage.

A complex cyst with hyperechoic regions may indicate a dermoid, and cysts with uniform hypoechoic texture can suggest endometriomas. Features suggestive of malignancy include that of a complex cyst (Figure 3) with thickened walls, septations, papillary solid components and flow detected on Doppler, It's also can

associated with ancillary features of malignancy such as hydronephrosis, ascites, and pleural effusions. (www.Radiographics.com)

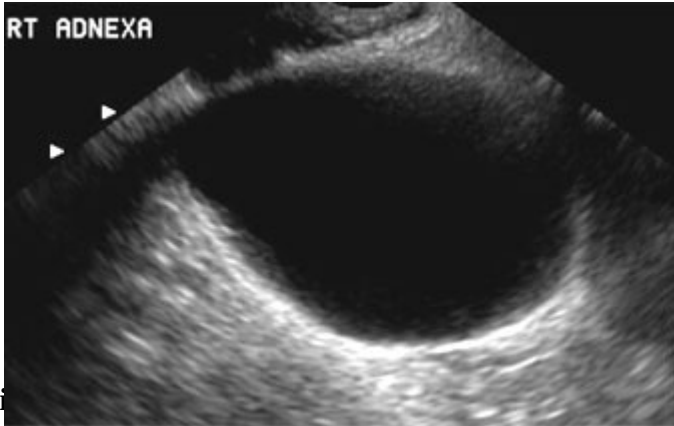
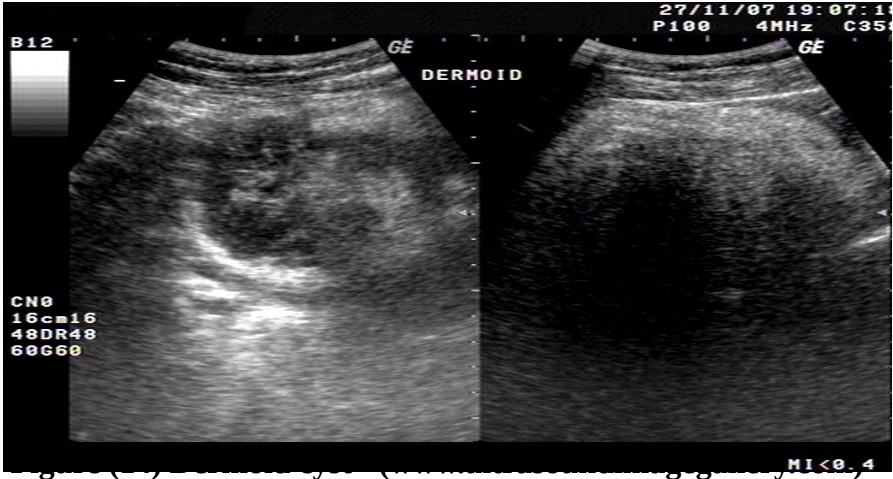


Figure (13) S... y.com)



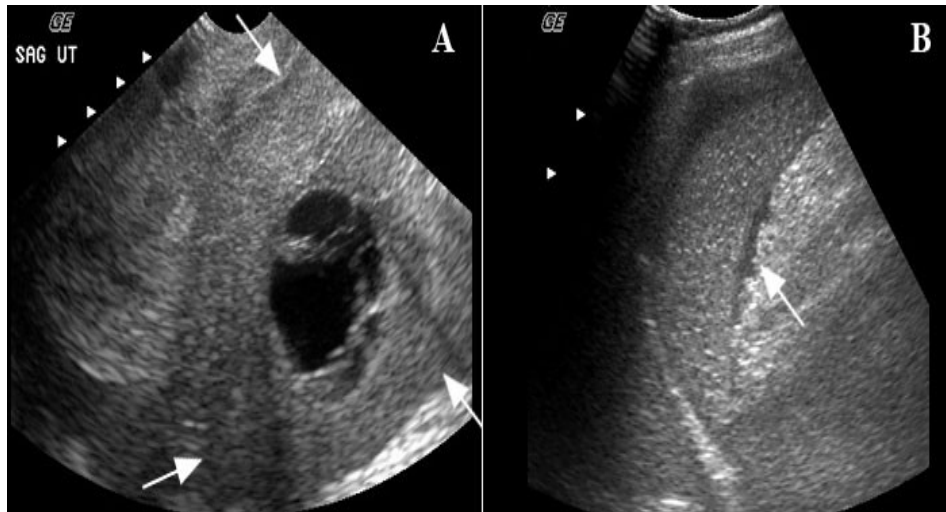


Figure (15) Ovarian Cancer - (www.ultrasoundimagegallery.com)

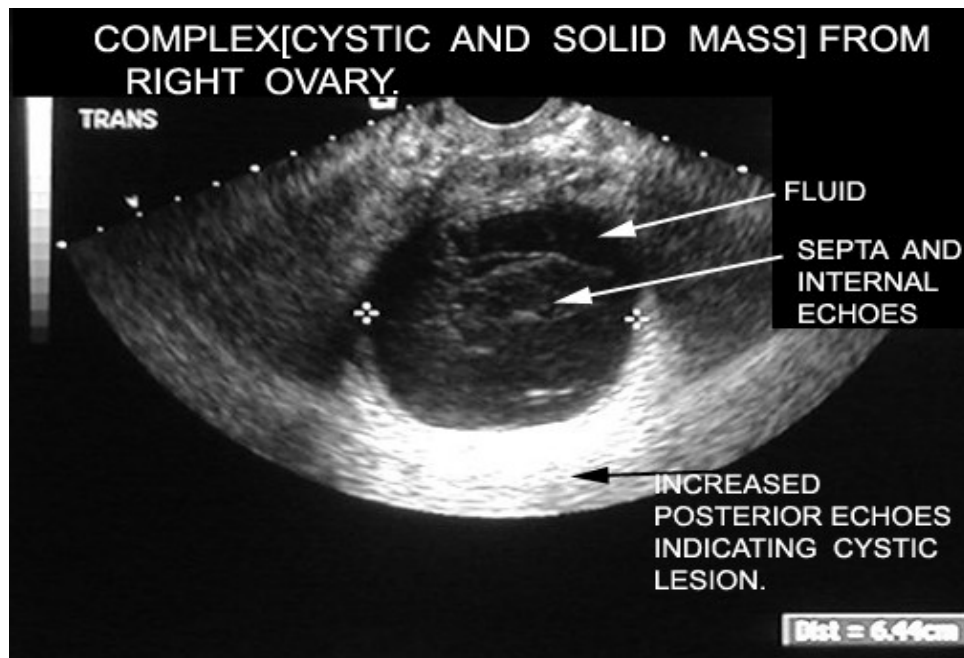


Figure (16) Ovarian Cancer - (www.ultrasoundimagegallery.com)

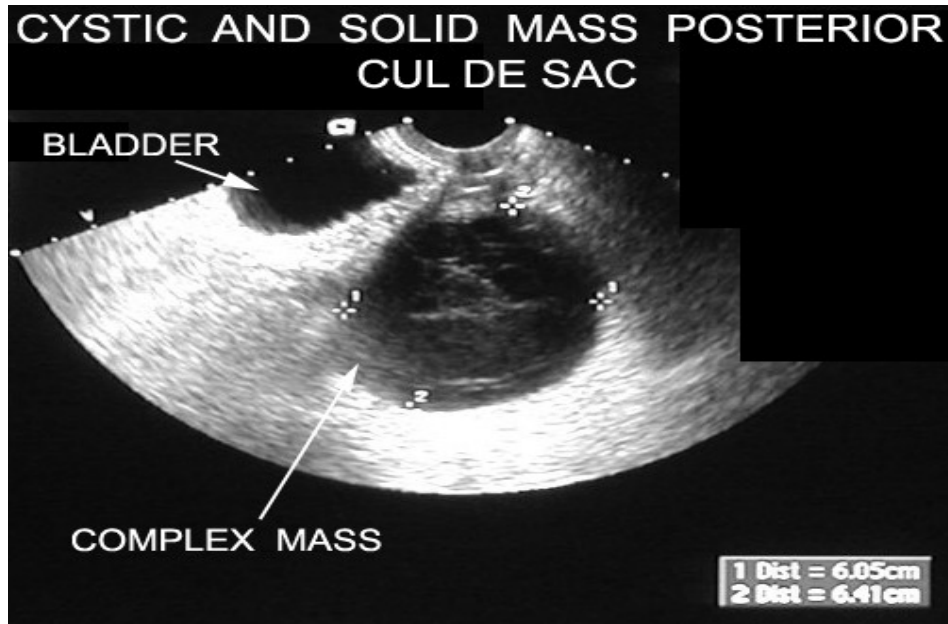


Figure (17) Complex cystic and solid mass - (www.ultrasoundimagegallery.com)

2.5.9 Polycystic ovarian syndrome:

PCOD is a complex endocrine disorder characterized by chronic an ovulation associated with elevated serum androgen levels (hyperandrogenemia) and unbalanced elevations of serum LH levels (PCOD is the most common cause of chronic anovulation). The clinical and sonographic manifestations of PCOD are variable depending on the degree of hormonal imbalance. Patients may present with amenorrhea, oligomenorrhea, or other menstrual irregularity; other symptoms include hirsutism, infertility, and obesity. Stein-Leventhal syndrome is the clinical manifestation of PCOD associated with obesity, hirsutism, and amenorrhea. Stein-Leventhal syndrome spans a wide array of clinical manifestations including anovulation and infertility in addition to the classic triad of obesity, hirsutism, and amenorrhea. Women with Stein-Leventhal syndrome represent only a small subset of all women with PCOD although the names are often used interchangeably. The

subsequent androgen elevations may cause hirsutism and, because of the local effects of androgen on the ovarian follicle, premature regression of developing follicles. This results in the characteristic multifollicular (polycystic) ovary typically seen in women with PCOD. Women with PCOD are at risk for endometrial hyperplasia and endometrial carcinoma due to chronic unopposed estrogen stimulation. Hormonal findings of PCOD include a generalized increase in serum androgens (androstenedione, testosterone) as well as an elevation of serum LH in the presence of normal to low serum FSH levels, resulting in an increased LH/FSH ratio which in many cases approaches or exceeds 2.5:1.

Ultrasound/Doppler - Patients with PCOD typically have bilateral ovarian enlargement, numerous immature follicles without evidence of dominance (cysts <15 mm), and stromal hypertrophy with increased echogenicity. “An increase in the amount and echogenicity of the ovarian stroma distinguishes PC ovaries from the multifollicular ovary characteristic of normal puberty and hypothalamic anovulation. Ovarian volume in the diagnosis of PCOD has lessened in importance because various groups have reported demonstrating normal ovarian volumes in approximately one-third of patients. There are two morphological patterns of polycystic ovaries including peripheral and generalized distribution of cysts. The peripheral pattern is referred to as the “necklace” or “string of pearls” pattern. The Doppler characteristics of the ovaries and uterine arteries have been studied by several investigators with mixed and inconclusive results. (Robbins C – 1999)

Figure (18) polycystic ovarian syndrome - (www.ultrasoundimagegallery.com)

2.5.10 Trauma

Trauma to the lower genital tract should also be considered as a cause for an acute presentation of abnormal bleeding. Postcoital laceration to the vagina can occur and in many situations a history may not be readily forthcoming. It may be use of a ring pessary. Vaginal trauma may be associated with significant hemorrhage, and occasionally will leave vesical or fistula. Rare it is such as arteriovenous malformation in the uterus have also been reported. . (Robbins C – 1999)

2.5.11 *Neoplasm of genital tract:*

Vulval carcinoma account for approximately 5 per cent of genital tract cancer in the UK. It most commonly seen in older women with a media age of over sixty years. Little is known about the etiology of vulval cancers, most invasive cancers [85%] are squamous, some 5 per cent are melanoma and adenocarcinoma in underlying porcine glands melanoma and paged disease any carry as especially poor prognosis. . (Robbins C – 1999)

The most common malignant disease affecting the uterine body is adenocarcinoma. Squamous carcinoma is rare, but when it occurs it develop in a glandular epithelium which has undergone squamous metaplasia .Sarcomas occurs much less frequently than adenocarcinoma and include leiomyosarcoma which can

develop within the myometrium or within a leiomyo fibroma , and the rare sarcomas developing from endometrial stroma. The common presentation symptom in patient suffering from endometrial carcinoma is abnormal vaginal bleeding. It is the most common postmenopausal and the bleeding can be scanty with irregular and sometimes quit long interval between episodes of bleeding. Other symptoms such as pain are uncommon until very late stage. In all patients with abnormal vaginal bleeding the possibility of either a cervical or uterine carcinoma should only be discount after they have been formally excluded.

Ultrasound appearance is variable, depending on the stage at presentation. Generally no uterine enlargement at the time of diagnosis but changes in the endometrium and inner myometrium may be apparent. Endometrium thickening is always pathological but no morphological features to malignancy have been identified. Initially there is endometrium thickness and there is irregular of cavity interface. Small cystic area may be identified within the endometrium .early tamer cannot be detected by ultrasound imaging; cervical enlargement may be the first visible feature, the differential diagnosis being fibroid, lymphoma or sarcoma. Irregularity of the cervical outline is a common feature that suggestive tumor spread in to the parametrium or invasion of the bladder. (Robbins C – 1999)

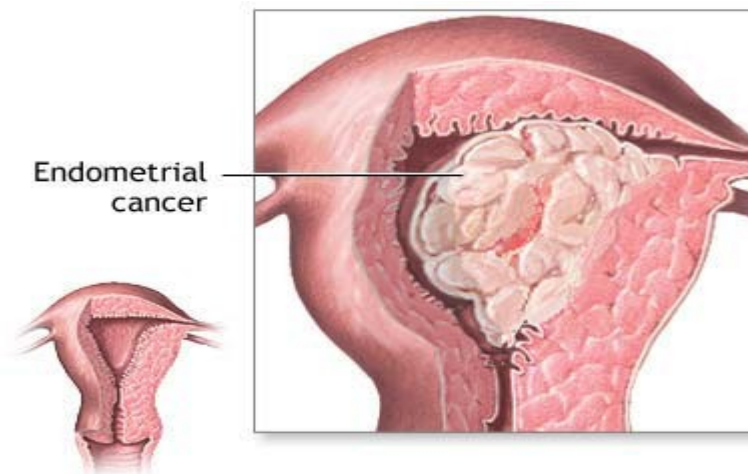


Figure (19) Endometrial Cancer

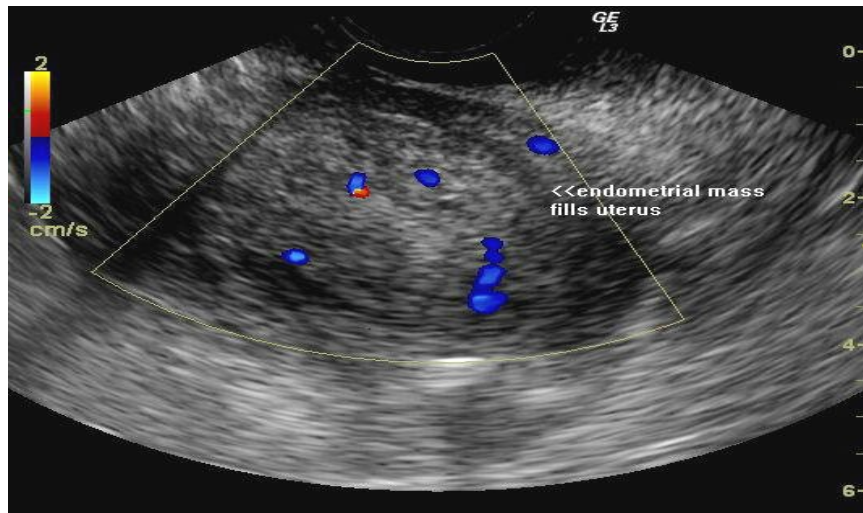


Figure (20) Endometrial Cancer (www.ultrasoundimagegallery.com)

2.5.12 Systemic disorder:

Endocrine disorder may manifest themselves as abnormality of menstruation. The following conditions may be associated with menstrual dysfunction. Hyper-or hypothyroidism, diabetes mellitus, adrenal disease, prolactin disorders. These disorders most likely interfere with the normal feedback mechanism that regulates the secretion of gonadotrophin-releasing hormone (GnRH) from the hypothalamus, gonadotropin from the pituitary and sex steroids from the ovary. In addition to iron deficiency anemia, bleeding disorders, liver disease, renal disease or medication. (Robbins C – 1999)

Chapter Three

Material and Methods

3.1 Type of the study:-

This is a prospective study deals with the females complaining of abnormal vaginal bleeding in non pregnant that come for ultrasound department.

3.2 Population of the study:

Women with abnormal vaginal bleeding ,non pregnant present to ultrasound department in Bahri hospital in the period from August to December 2014.

3.3 Study sample:

The samples size consisted of 50 cases (age in range 25 up to 70) of Sudanese women were selected randomly.

3.3.1 Inclusion criteria:

Non pregnant female with vaginal bleeding presented to the ultrasound department.

Patient prepared by full bladder using Trans abdominal Probe. All patients scanned with supine position technique.

3.3.2 Exclusions criteria:

- Normal menstruation,
- pregnant females were excluded .

3.4 Material:

Real time Ultrasound machine Toshiba with 3-5 MHz

3.5 Method

The method used is direct interviewing the patients when they call in ultrasound department, asking them their history, recent complains. The patients undergoing ultrasound investigation were well prepared i.e. they must come with almost reasonably full bladder, then the patient lay in supine position on the couch. All patients were examined Trans abdominally only, then gel was applied in pelvis area and both longitudinal (in the midline between the umbilicus and the pubicsymphysis) and transverse (start just above the pubic syphsis and move upward to the umbilicus) views of the patients uterus, its contents and adnexa were applied.

3.6 Duration of the study:

This study started from August up to December 2014

3.7Data collection:

The data were collected by master data sheets using the following variables age, marriage, child number, length of the uterus, if the lesion were characterized the site were also been evaluate

3.8 Data analysis:

Data were analyzed by using SPSS program version 16 and the results were presented in form of graphs and tables.

3.9Ethical consideration

No identification or individual details were published.

No information or patient details will be disclosed or used for other reasons than the study.

3.10 Data storage:

The data was stored on:-

- Personal computer.
- Patients data collection sheet.

Chapter Four

Results

The following tables and figures presented the data obtained from 50 female patients presented with bleeding ;all were scanned using ultrasonography .The uterus size ,patients ages, number of deliveries, presence of lesions ,mass ,cysts, bulky uterus presentation all had been evaluated as well as the lesion site. SPSS program version 16 was and Excel sheet was also used to analyze the data statistically.

Table 4.1 shows the distribution of patient's ages

Age classes	frequency	Percentages%
25-34	24	48
35-44	18	36
45-54	5	10
55-64	1	2
65-74	2	4
Total	50	100

Figure 4.1 shows the distribution of patient's ages, frequency and percentages

Table 4.2 shows the Ultrasound Findings in patients with bleedings

Ultrasound Findings	frequency
	Percentages%
	10
Bulky Uterus	20%
	1
Chorion Carcinoma	2%
	2
Cervical Mass	4%
	2
IUCD	4%
	22
Fibroid	44%
	7
ovarian cyst	14%
	6
Ovarian Mass	12%

Figure 4.2 shows the ultrasound findings/diagnosis and its frequencies

Table 4.3 shows the site of the lesion in patients with bleedings

Ultrasound Findings	Frequency	Per
Cavity of The uterus	1	21%
Cervix of the uterus	2	4%
Intramural	10	20%
Subserosa	12	24%
Ovaries	13	26%
No mass detected	12	24%
Total	50	100%

Figure 4.5 shows the lesions sites and its frequencies

Table 4.4 Cross tabulations between the age and ultrasound findings

Cross tabulation								
Age*ultrasound findings								
		Ultrasound findings					Total	
		Bulky Uterus	Chorion Carcinom	cervical mass	IUCD	Fibroid	Ovarian Lesion	
a								
Age	25-34	4	1	0	2	9	8	24
	35-44	4	0	0	0	11	3	18
	45-54	2	0	0	0	2	1	5

55-64	0	0	1	0	0	0	1
>64	0	0	1	0	0	1	2
Total	10	1	2	2	22	13	50

Table 4.5 Cross tabulations between the Uterus Length and ultrasound findings

Cross tabulation								
Ultrasound findings* Uterus length								Total
		Bulky Uterus	Chorion Carcinom	cervical mass	IUCD	Fibroiod	Ovarian Lesion	
a								
Uterus Length	9-9.2	0	1	2	2	22	13	40
	9.3-9.5	6	0	0	0	0	0	6
	9.6-9.8	3	0	0	0	0	0	3
	9.9	1	0	0	0	0	0	1
	Total	10	1	2	2	22	13	50

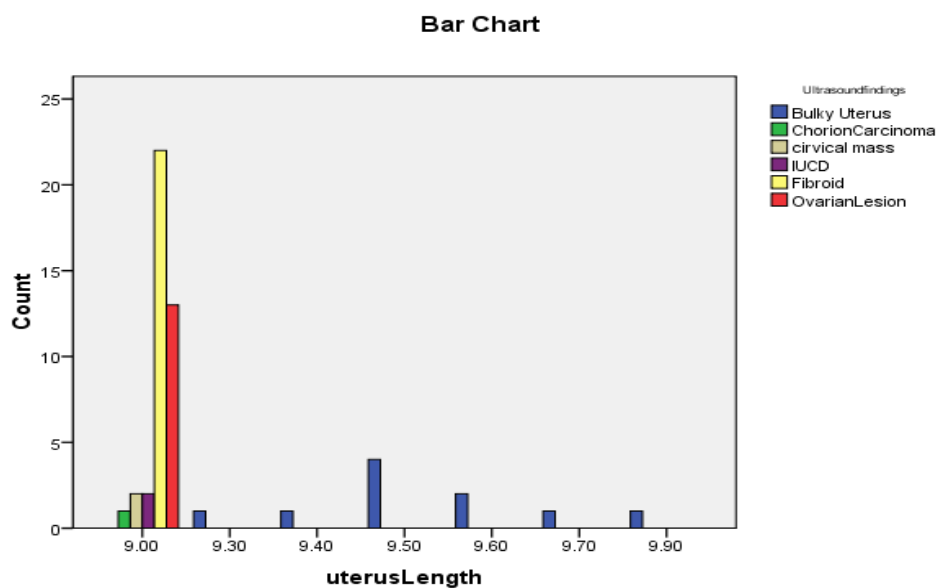


Figure 4.6 shows the Uterus length and the ultrasound findings

Table 4.6 Cross tabulations between the Number of deliveries and ultrasound findings

		Ultrasound findings						Total
		Bulky Uterus	Chorion Carcinoma	cervical mass	IUCD	Fibroiod	Ovarian Lesion	
Number of deliveries	1	2	0	0	0	1	1	4
	2	0	0	0	1	3	2	6
	3	1	1	0	1	7	4	14
	4	2	0	0	0	6	4	12
	5	2	0	0	0	4	0	6
	6	2	0	1	0	1	2	6
	6	1	0	1	0	0	0	2
Total		10	1	2	2	22	13	50

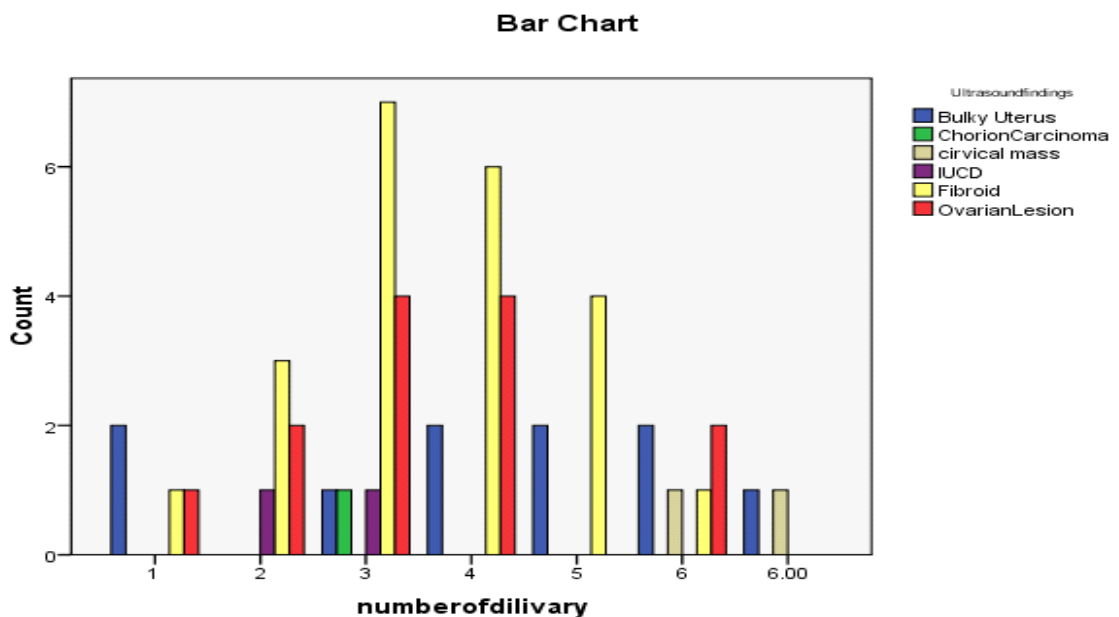


Figure 4.7 shows the Uterus length and the ultrasound findings

Table 4.10 10 correlations between the variables

Correlations between the variables					
		age	Ultrasoun d findings	Uterus Length	Number of delivery
Age	Pearson	1	-.157-	.044	.460**
	Correlation				
	Sig. (2-tailed)		.277	.761	.001
	N	50	50	50	50
Ultrasound findings	Pearson	-.157-	1	-.857**	-.208-
	Correlation				
	Sig. (2-tailed)	.277		.000	.148
	N	50	50	50	50
Uterus Length	Pearson	.044	-.857**	1	.205
	Correlation				
	Sig. (2-tailed)	.761	.000		.153
	N	50	50	50	50
Number of delivery	Pearson	.460**	-.208-	.205	1
	Correlation				
	Sig. (2-tailed)	.001	.148	.153	
	N	50	50	50	50

**.

Correlation is significant at the 0.01 level (2-tailed).

Chapter 5

5.1 Discussion

Abnormal vaginal bleeding is one of the commonest ailments among the gynecological problems, in the mean times it can be parometetors and an indication of something else. This study is looking for ultrasound findings of abnormal vaginal bleeding in Bahri city. Fifty patients were investigated by ultrasound to figure out the possible causes of the abnormal bleeding. this study showed and classified the causes of vaginal bleeding for non pregnant.

In this study the table (4.1) shows the frequency distribution of vaginal bleeding and age group. The table showed patient in the age ranging from 25-34 years were the most constitute 48% and this within the reproductive age which support that the most of vaginal bleeding is associated with, the age group range from (20-40) (Goldstein 2006)

The table (2) shows the frequency of ultrasound finding in the patient with, vaginal bleeding we find the uterine fibroids constitute 44% of the most presented and followed by bulky uterus 20% , ovarian cyst 14% ovarian mass 12% and iucd 4%, cervical mass 4% and chorion carcinoma2%this is common causes of abnormal vaginal bleeding result supported by previous studies (Hassan Ali -2011)

The table (3) shows the site of the lesion in patients with bleeding; we find the site is the ovaries constitute of 26% followed by sub mucosa 24% and intramural 20% , no mass detected 24% , cervix of the uterus 4% and cavity of the uterus 2% no mass detected explained the hormonal disturbance (we find that the sub mucosa the highest in the site of the lesion because the finding of the artery and vein in this site.

The Table (4) shows the cross tabulations between the age and ultrasound findings we find that high incidence in age group in (25-34) this result confirm the previous study evaluation of abnormal vaginal bleeding depends on the age (Jane ec -2004)

Table (5) shows the cross tabulation between uterus length and ultra sound finding we find that 40 of total finding in length 9-9.2–and 10 of the total finding length 9.3- 9.9 out put of the effected of hormones and concluded that the effect of the hormone companion to increase length. (green top guide line 2009 page 265)

Table (6) shows the cross tabulations between the number of deliveries and ultrasound findings we find that the highest number of children linked with fewer finding we conclude that the large number of children reduces the incidence of these findings.

The table (7) shows the correlations between the variables we find that strong relation between the age and number of delivery and strong relation between the ultrasound findings and uterus length.

Figure 4.3 scatter plot diagramme shows the relation ship between the patient.s ages and uterus length $r^2=0.001$.

Figure 4.4 scatter plot diagramme shows the relation ship between the uterus length and number of deliveries $r^2= 0.042$

The present study agree with many studies had been done in different areas in Sudan, which were come out to most causes of abnormal vaginal bleeding is related to pregnancy problems. And other causes of vaginal bleeding for non pregnant.

Conclusion

Abnormal vaginal bleeding is a common gynecologic problem or complaint can be caused by a wide variety of local and systemic disease and this problem in many areas in Sudan the study comes to conclusion that the common causes of abnormal vaginal bleeding is fibroid constitute 44% and other causes are bulky uterus 20% ovarian cyst 14% ovarian mass 12% I U C D 4% cervical mass 4% and chorioncarcinoma 2%

In this study the incidence of abnormal vaginal bleeding is more common in patient of age (25-34) which constitute 48%

Recommendation 5.3

Ultrasound examination is very important to identify the causes of abnormal vaginal bleeding in order to prevent the complications

- The initial approach to evaluation of non pregnant reproductive-age Women with AUB is to confirm that the source of bleeding is the uterus, exclude pregnancy,
- Ultrasound can be used as routine to control the risk of vaginal bleeding.
 - Ultrasound scan should be followed by hormone profile or endometrium biopsy.
 - Hormonal contraception or an intrauterine device (IUD) may cause AVB.
- Doppler ultra sound is an important for more accurate result.

References

Abubaker Adam, Ultrasound finding of abnormal vaginal bleeding in Abu Gebiha Area, M.Sc Research in diagnostic ultrasound, College of medical Radiologic science, Sudan University, 2007.

Bate Jane, Practical gynaecological ultrasound, second edition, Cambridge university press, Cambridge, UK, 2006.

Bisset R, Khan A, Differential diagnosis in abdominal ultrasound, second edition, Saunders, Philadelphia, USA, 20002.

Carol A, Ronald L, Ultrasound atlas of disease processes, First edition, Saunders, New York, USA, 1980.

Chudleigh T, Thilaganathan B, Obstetric ultrasound How, Why and When, Third edition, Elsevier Churchill Livingstone, LONDON, UK, 2004.

Gilani S, Guidelines and protocols for medical diagnostic ultrasound, First edition, Burwin Institute of ultrasound, Toronto, Canada, 20003.

Guyton, Hall, Text book of medical physiology, 10th edition, Saunders company, New York, USA, 2000.

Hassan ali, Ultra sound finding of abnormal vaginal bleeding in Alfaw city, M.Sc Research in diagnostic ultrasound, College of medical Radiologic science, Sudan University, 2011.

Maulik D, Zalud I, Doppler ultrasound in obstetrics and gynaecology, second edition, Springer, New York, USA, 2005.

Mohan H, Text book of pathology, 4the edition, Jabee Brothers, New Delhi, India, 1999.

Richard S, Snell – clinical anatomy, 7th edition, Lippincott Williams and Wilkins, New York, USA, 2000.

Robbins C, Pathologic basis of disease, 7th edition, Saunders, Philadelphia, USA, 1999.

Roger W, Peter L, Grays anatomy, 35th edition, Elsevier Saunders, New York, USA, 2006.

Simpson L Lynn, Ultrasound in obstetrics, second edition, Elsevier Saunders, New York, USA, 2004.

Stewart C, Benjamin R, Diagnostic ultrasound, physics, biology and instrumentation, 2nd edition, David Culerwell, Washington, USA, 1991.

William F, Ganong, Review of medical physiology, 2nd edition, Lippincott Williams and Wilkins, New York, USA, 2003.

www.emedicine.medscape.com.10/6/2011 (pathology).

www.diagnosticimaging.com 23/6/2011

www.GEhealthcare.com 23/6/2011

www.ImagingConsult.com 20/6/2010

www.medcastle.com 24/6/2011.

www.nvsc.com 15/6/2011.(uterus image)

www.RadioGraphics.com 5/7/2011.

www.Ultrasoundimagegallery.com 27/6/2011

www.ultrasound-image.com 24/6/2001

www.women.webmd.com 15/06/2011

NO	EAG	UTERUS LENGTH	MAREG E	CHILD NO	FINDING	SITE
1	44	9,5	YES	4	BULK UTERUS	0
2	27	9,7	YES	3	BULK UTERUS	0
3	30	9,3	YES	2	BULK UTERUS	0
4	49	9,6	YES	6	BULK UTERUS	0
5	30	9,5	YES	5	BULK UTERUS	0
6	35	9,9	YES	4	BULK UTERUS	0
7	44	9,4	YES	3	BULK UTERUS	0
8	30	9,5	YES	0	BULK UTERUS	0
9	40	9,6	YES	5	BULK UTERUS	0
10	48	9,5	YES	0	BULK UTERUS	0
11	30	9	YES	2	CHORIO CARCINOM	cavity of uterus
12	60	9	YES	6	CERVICAL MASS	cervix of uterus
13	70	9	YES	5	CERVICAL MASS	cervix of uterus
14	34	9	YES	2	IUCD	0
15	31	9	YES	1	IUCD	0
16	32	9	YES	2	FIBROID	intermural
17	30	9	YES	0	FIBROID	intermural
18	28	9	YES	2	FIBROID	intermural
19	26	9	YES	3	FIBROID	intermural
20	27	9	YES	1	FIBROID	intermural
21	28	9	YES	3	FIBROID	intermural
22	35	9	YES	4	FIBROID	intermural
23	27	9	YES	3	FIBROID	intermural
24	35	9	YES	2	FIBROID	intermural
25	39	9	YES	1	FIBROID	intermural
26	40	9	YES	2	FIBROID	submucosa
27	33	9	YES	3	FIBROID	submucosa
28	32	9	YES	2	FIBROID	submucosa
29	45	9	YES	3	FIBROID	submucosa
30	38	9	YES	3	FIBROID	submucosa
31	36	9	YES	1	FIBROID	submucosa
32	39	9	YES	2	FIBROID	submucosa
33	38	9	YES	2	FIBROID	submucosa
34	36	9	YES	4	FIBROID	submucosa
35	37	9	YES	4	FIBROID	submucosa

36	40	9	YES	5	FIBROID	submucosa
37	45	9	YES	4	FIBROID	submucosa
38	43	9	YES	3	OVRIAN CYST	overy
39	50	9	YES	2	OVRIAN CYST	overy
40	38	9	YES	1	OVRIAN CYST	overy
41	28	9	YES	0	OVRIAN CYST	overy
42	25	9	YES	2	OVRIAN CYST	overy
43	27	9	YES	3	OVRIAN CYST	overy
44	70	9	YES	5	OVRIAN CYST	overy
45	32	9	YES	5	OVRIAN MASS	overy
46	29	9	YES	3	OVRIAN MASS	overy
47	27	9	YES	2	OVRIAN MASS	overy
48	28	9	YES	1	OVRIAN MASS	overy
49	35	9	YES	2	OVRIAN MASS	overy
50	30	9	YES	3	OVRIAN MASS	overy

Appendix I - Master Table

Appendix II – Data Sheet

Sudan University for science & technology

College of graduate studies

Ultrasound finding of abnormal vaginal bleeding

For non pregnant woman in Bahri City

Data collection sheet

Patient data

Date:

Patient Number: Residence:

Occupation: Age:.....

Referral of patient from:

1. Surgeon () 2. Medical officer () 3. Unknown ()

Gynecological and obstetrical history:

-Gravidity:..... Parity:.....

Clinical findings including vaginal bleeding:

Pelvic pain:

1. Symptomatic () 2.asymptomatic ()

Amenorrhea:

1. Yes () 2. No ()

Pelvic masses:

1. Yes () 2. No ()

Past history of Patient:

- () Trauma Yes () No **.1**
 () Fibroids Yes () No **.2**
 () Cancer Yes () No **.3**

Causes of Bleeding

1. Trauma Yes () No ()
 2. Fibroids Yes () No ()
 3. Cancer Yes () No ()

Ultrasound Findings:

.....

Final diagnosis:

.....

Comments:

.....



Figure one:32 old Ultrasound show intermural fibriod

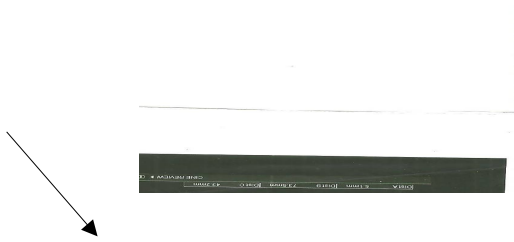


Figure tow: 28 old Ultrasound show overian cyst

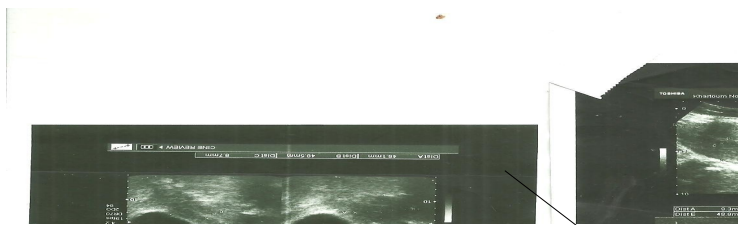


Figure three:30 old
Ultrasound show
Bulky utrus

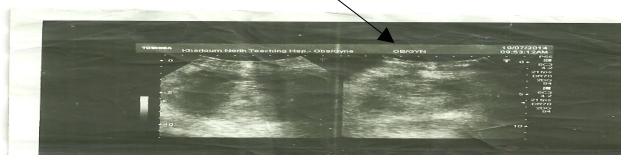


Figure four: 70 old Ultrasound show cervical mass

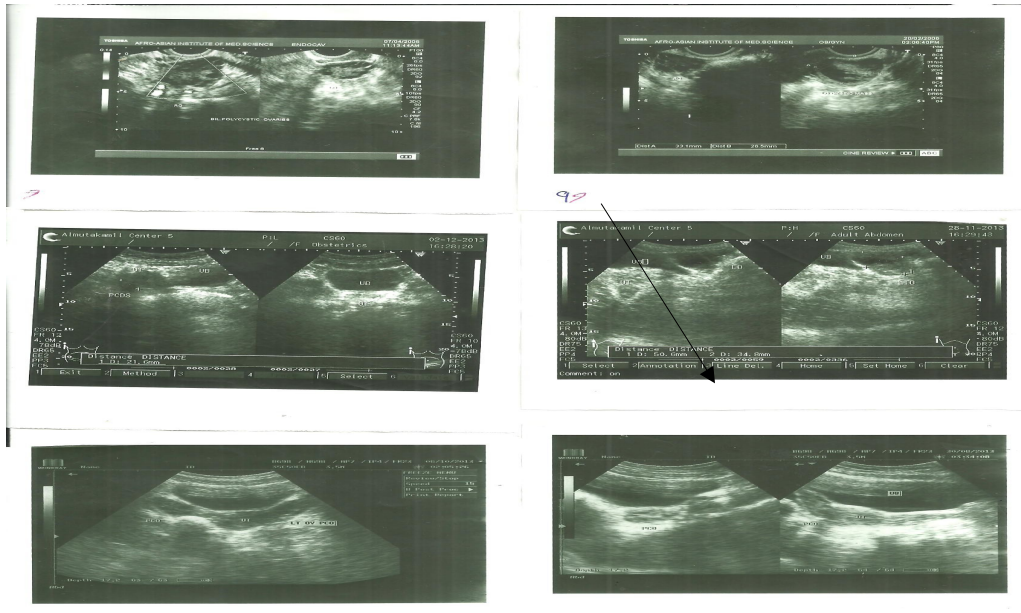
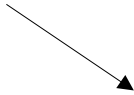
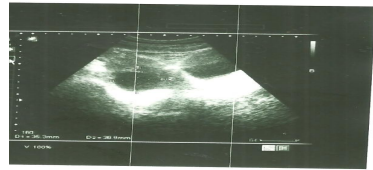


Figure six:43 old Ultrasound show complicated ovarian cyst

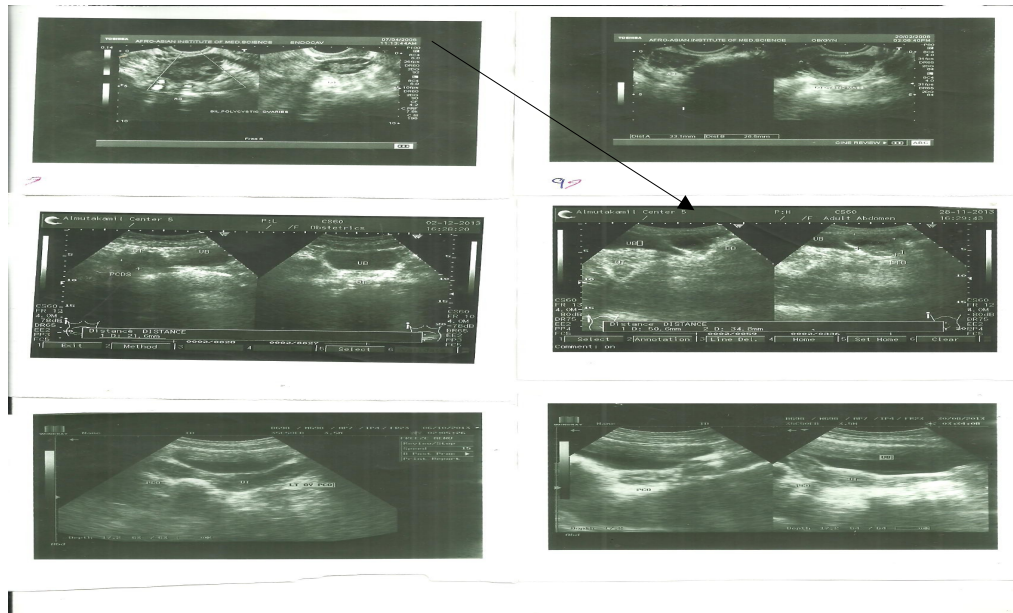


Figure Seven: 43 old Ultrasound show polycystic ovary

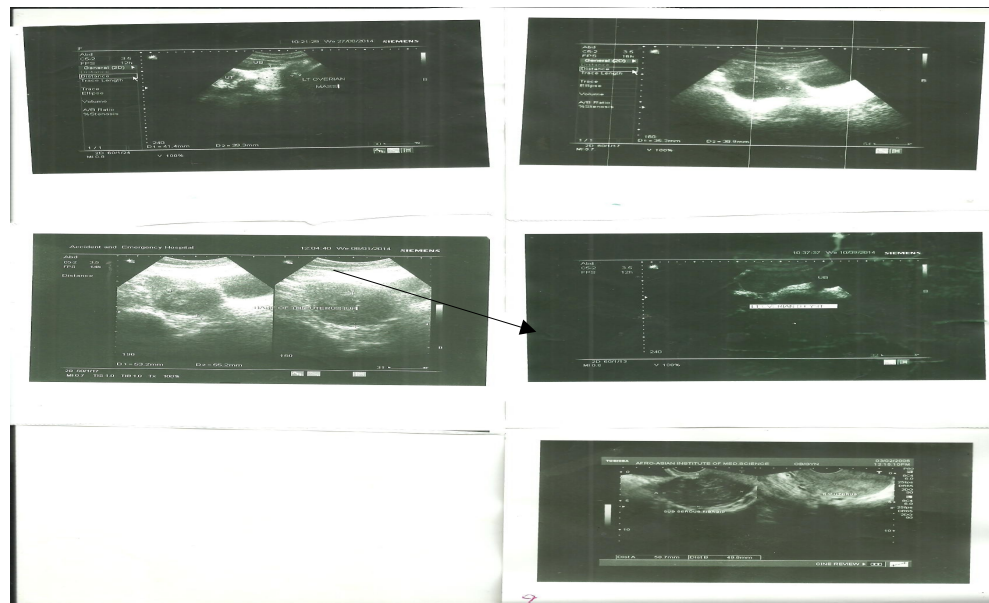


Figure eight: 35 old Ultrasound show ovarien mass

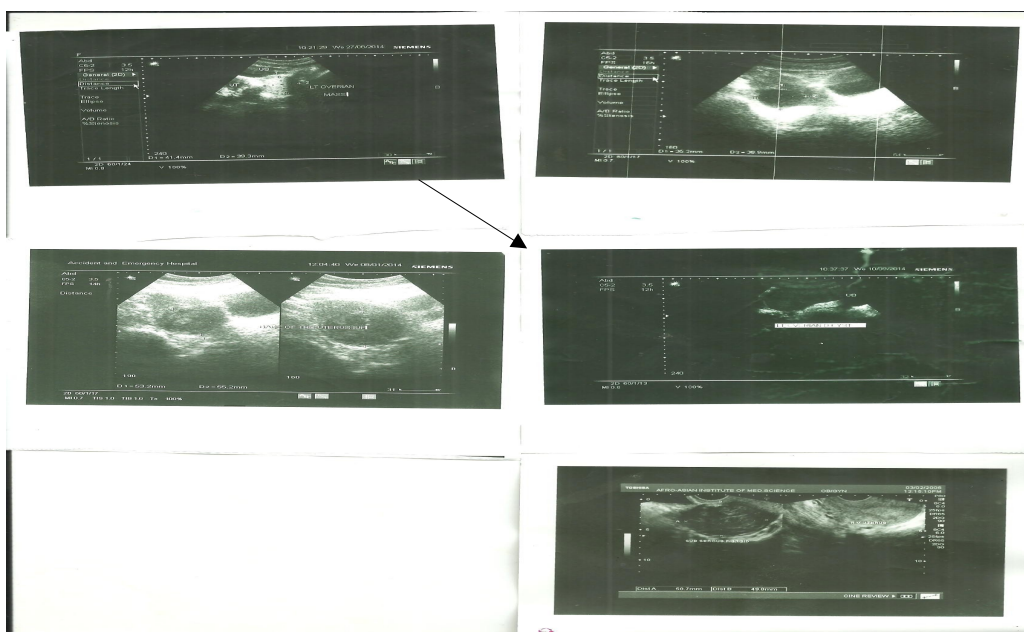


Figure nine: 32 old Ultrasound show ovarien mass



Figure ten: 30 old Ultrasound show chorio carcinoma

