Sudan University of Science and Technology
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Study of Placenta Previa using Ultrasonography

تقييم المشيمة المتقدمة باستخدام الموجات فوق الصوتية

A thesis Submitted for Partial Fulfillment of Msc Degree in
Medical Imaging Diagnostic Ultrasound

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الآيـــة

بِسْمِ اللهِ الرَّحْمَنِ الرَّحِيمِ

(ضَرَبَ اللهُ مَثَلاً عَبْداً مَّمْلُوْكاً لا يَقْدِرُ عَلَى شَيءٍ وَمَنْ رَّزَقْنَاهُ مِنَّا رِزْقاً حَسَناً فَهُوَ يُنْفِقُ مِنْهُ سِراً وَجَهْراً هَلْ يَسْتَوُون الحَمْدُ لِلَّهِ بَل أَكْثَرُهُمْ لَا يَعْلَمُونْ * وَضَرَبَ اللهُ مَثَلاً رَجُلَيْنِ أَحَدُهُمَا أَبْكَمُ لَا يِقْدِرُ عَلَى شَيءٍ وَهُوَ كَلٌّ عَلَى مَوْلَاهُ أَيْنَمَا يُوَجِّهَهُ لَا يَأتِي بِخَيْر هَلْ يَسْتَوِي هُوَ وَمَنْ يَأمُرُ بِالْعَدْلِ وَهُوَ عَلَى صِرَاطٍ مُسْتَقِيم*)

الآيه{75*76}سُوْرَةُ النَّحَلْ

Dedication

To my loving mother

(Amna Hamad Mohammed)

To my husband who supported me all the time

(Mohammed Abd El-wahab)

To my daughters:

(Wieam, Nesreen, and maeen)

To my sons

(Mustafa & Ahmed)

To my sisters and brothers

To my teacher and collogues

To all people I love and they love me

Acknowledgement

Elhamd to ALLH firstly how gave me health and strength to conduct this study.

I would like to thanks my supervisor DR Mona

There is no suitable word that I can express my feeling to my big family and small family for their continuous support

Thanks for everyone assisted me to perform this research.

Abstract

An important causes of bleeding in the second half of pregnancy and in labor include placenta previa. These conditions are associated with significant maternal and prenatal mortality and morbidity. This is descriptive study conducted in Omdurman obstetrics and gynecology hospital. Duration of the study is 4 months. Our purpose was to study the placenta previa and its associatin risk factor sonographically to help in better outcome by reducing fetomaternal complication.

Method of collecting data is Observational of direct ultrasound examination of placenta. The study found that incidence of placenta previa were 42 pregnant ladies, The mean age is 30.47 years, median is 30 years, pregnant women complain of painless vaginal pleading is less than asymptomatic one. This study demonstrates that a high proportion of patients with placenta previa were multiparous. The risk increases with number of prior cesarean deliveries and advancement of maternal age. According to placenta location, anterior location of placenta high percentage while posterior and lateral location of placenta was low incidence.

Finding of this study showed that types of placenta, the minor degree of placenta previa is higher than major degree of placenta previa. Advances in ultrasonography have made it possible to diagnose this condition with reasonable accuracy, which allows appropriate management planning.

المستخلص

أهم الحالات المسببة للنزيف المهبلي خلال الثالوث الثاني والثالث من الحمل والولادة , المشيمة المتقدمة وهي تعتبر من الأسباب المهددة لحياة الأم والجنين, هذه دراسة وصفيه أجريت في ولاية الخرطوم مستشفى امدرمان للنساء والتوليد ابتداء من مطلع يناير وحتى نهاية ابريل من العام 2017. الهدف الأساسي للبحث هو تقييم المشيمة المتقدمة بالموجات فوق الصوتية مع علاقتها بعمر الأم ,عدد الولادات السابقة والقيصرية منها. تم خلالها جمع البيانات المفصلة عن عمر المريضة وعدد الولادات الطبيعية والقيصرية منها وتم التحليل بواسطة برنامج التحليلات الاحصائيه للعلوم الانسانيه.

وقد توصلت الدراسة إلى أن :حالات المشيمة المتقدمة 42 حاله,أكثر الأعمار تكرارا 30 سنه, نسبه الذين يعانون من أعراض النزف المهبلي مع المشيمة المتقدمة اقل من الأتي لا بعانين, في العلاقة مع عدد الولادات السابقة تم التوصل إلى أن أعلى نسبه كانت مع الحوامل متعددات الولادة 36 حاله بنسبه (85.8%) بالمقارنة مع 6 حالات لأول حمل أما بالنسبة لنوع المشيمة المتقدمة ,المتقدمة الصغرى أعلى نسبه من المتقدمة الكبرى. وبالنسبة لوضعيه المشيمة المتقدمة فقد حازت المشيمة الاماميه على أعلى نسبه.

التطور الهائل في علم الموجات الصوتية وأجهزتها الحديثة جعلها من الوسائل المعتمدة في تشخيص واثبات حاله المشيمة المتقدمة, مما يسمح بالتخطيط السليم للحفاظ على صحة الأم والطفل.

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List of Abbreviation

Abbreviation	Meaning
CS	Cesarean Section
CD	. Color Doppler
GTN	Gestational Trophoblastic Neoplasia
HCG	human chorionic gonadotropin (hCG)
HPL	human placental lactogen (hPL)
IUGR	Intra-Uterine Growth Restriction
PP	Placenta previa
PSTT	Placental-site trophoblastic tumor
PSV	Peak systolic vealocety
PSTT	Placental-site trophoblastic tumor
PTN	Persistent Trophoblastic Neoplasia
PS	Previous scare
U\S	Ultrasound

Chapter One
Introduction

Chapter One

Introduction

1.1 Introduction

Placenta previa is a condition that occurs during pregnancy when the placenta is abnormally placed, and partially or totally covers the cervix. The uterus is the muscular organ that contains the developing baby during pregnancy. The lowest segment of the uterus is a narrowed portion called the cervix. This cervix has an opening (the os) that leads into the vagina, or birth canal. The placenta is the organ that attaches to the wall of the uterus during pregnancy. The placenta allows nutrients and oxygen from the mother's blood circulation to pass into the developing baby (the fetus) via the umbilical cord. (Wasington, DC 2009).

In placenta previa, the placenta develops in an abnormal location. Normally, the placenta should develop relatively high up in the uterus, on the front or back wall. In about one in 200 births, the placenta will be located low in the uterus, partially or totally covering the os. This causes particular problems in late pregnancy, when the lower part of the uterus begins to take on a new formation in preparation for delivery. As the cervix begins to efface and dilate, the attachments of the placenta to the uterus are damaged, resulting in bleeding. (Wasington, DC 2009).

While the actual cause of placenta previa is unknown, certain factors increase the risk of a woman developing the condition. These factors include: having abnormalities of the uterus, being older in age, having a prior delivery by cesarean section and smoking cigarettes. When a pregnancy involves more than one baby (twins, triplets, etc.), the placenta will be considerably larger than for a single pregnancy. This also increases the chance of placenta previa. (Wasington, DC 2009).

Placenta previa may cause a number of problems. It is thought to be responsible for about 5% of all miscarriages. It frequently causes very light

bleeding (spotting) early in pregnancy. Sometime after 28 weeks of pregnancy (most pregnancies last about 40 weeks), placenta previa can cause episodes of significant bleeding. Usually, the bleeding occurs suddenly and is bright red. The woman rarely experiences any accompanying pain. The bleeding usually stops on its own. Sometimes, placenta previa does not cause bleeding until labor has already begun. (Wasington, DC 2009).

Placenta previa puts both the mother and the fetus at high risk. The mother is at risk of severe and uncontrollable bleeding (hemorrhage), with dangerous blood loss. If the mother's bleeding is quite severe, this puts the fetus at risk of becoming oxygen deprived. The fetus' only source of oxygen is the mother's blood. The mother's blood loss, coupled with certain changes that take place in response to that blood loss, decreases the amount of blood going to the placenta, and ultimately to the fetus. Furthermore, placenta previa increases the risk of preterm labor, and the possibility that the baby will be delivered prematurely.(Wasington, DC 2009).

Diagnosis of placenta previa is suspected whenever bright red, painless vaginal bleeding occurs during the course of a pregnancy. The diagnosis can be confirmed by performing an ultrasound examination. This will allow the location of the placenta to be evaluated. Ultrasound is the primary imaging modality for evaluation of uterine, cervical, and amniotic fluid abnormalities; placental and umbilical cord problems; and determination of gestational age, fetal congenital abnormalities, and fetal presentation. the major indications During second and third trimesters for its use are in the initial assessment of vaginal bleeding. Emphasis will be placed on a focused or goal-directed ultrasound examination to rapidly measure fetal cardiac activity, estimate gestational age, and exclude placenta previa. (Wasington, DC 2009).

1.2 Problem of the study:

Placenta Previa is a major cause of life-threatening maternal hemorrhage. The most common morbidity with this problem is the necessity for operative delivery and the risks associated with surgical intervention

1.3 Objectives:

1.3.1 General Objective:

Study of placenta previa using ultrasounography.

1.3.2 Specific Objectives:

- To study the characteristic of normal sonographic appearance of placenta .
- To differentiate the types of placenta previa by ultrasound.
- To monitoring factors that determine persistence of placenta previa.
- To evaluate the risk factor for placenta previa.
- To study location of placenta previa.

1.4 Over view of the study:

This thesis is conducted with the role of ultrasound in diagnosing placenta previa, it is divided into the following chapters: Chapter one: - Introduction, Chapter two: Literature review, and Previous Studies, Chapter three: Material and Method use in this study.

Chapter four: Results. Chapter five: Discussion of the results, Conclusion of thesis brief summary of the new results and recommendation for future work. Also, References and Appendices.

Chapter Two

Literature Review &

Previous Study

Chapter Two

Literature review & Previous Study

2.1 Placenta Development:

At the beginning of the second week, the blastocyst is partially embedded in the endometrial stroma. The trophoblast differentiates into (a) an inner, actively proliferating layer, the cytotrophoblast, and (b) an outer layer, the syncytiotrophoblast, which erodes maternal tissues.By day 9, lacunae develop in the syncytiotrophoblast. Subsequently, maternal sinusoids are eroded by the syncytiotrophoblast, maternal blood enters the lacunar network, and by the end of the second week, a primitive uteroplacental circulation begins. The cytotrophoblast, mean while, form scellular columns penetrating into and surrounded by the syncytium. These columns are primary villi. (T.W Sadler- 2009).

By the beginning of the third week, the trophoblast is characterized by primary villi that consist of a cytotrophoblastic core covered by a syncytial layer. During further development, mesodermal cells penetrate the core of primary villi and grow toward the decidua. The newly formed structure is known as a secondary villus. By the end of the third week, mesodermal cells in the core of the villus begin to differentiate into blood cells and small blood vessels, forming the villous capillary system. Capillaries in the villi are in contact with vessels in the chorionic plate and in the connecting stalk, which in turn are connected to intra embryonic vessels, or definitive placental villus. These vessels, in turn, establish contact with the intraembryonic circulatory system, connecting the placenta and the embryo. Hence, when the heart begins to beat in the fourth week of development, the villous system is ready to supply the embryo proper with essential nutrients and oxygen.(T.W Sadler-2009).

Meanwhile, cytotrophoblastic cells in the villi penetrate progressively into the overlying syncytium until they reach the maternal endometrium. Here they establish contact with similar extensions of neighboring villous stems, forming a thin outer cytotrophoblast shell . Villi that extend from the chorionic plate to the decidua basalis are called stem or anchoring villi. Those that branch from the sides of stem villi are free (terminal) villi, through which exchange of nutrients and other factors will occur. The chorionic cavity, meanwhile, becomes larger, and by the 19th or 20thday, the embryo is attached to its trophoblastic shell by a narrow connecting stalk. The connecting stalk later develops into the umbilical cord, which forms the connection between placenta and embryo. As the fetus grows, its demands for nutritional and other factors increase causing major changes in the placenta. Foremost among these is an increase in surface area between maternal and fetal components to facilitate exchange. The disposition of fetal membranes is also altered as production of amniotic fluid increases(T.W Sadler-2009).

2.1.2 Changes in the Trophoblast:

By the beginning of the second month, the trophoblast is characterized by a great number of secondary and tertiary villi that give it a radial appearance. The villi are anchored in the mesoderm of the chorionic plate and are attached peripherally to the maternal decidua by way of the outer cytotrophoblast shell. The surface of the villi is formed by the syncytium, resting on a layer of cytotrophoblastic cells that in turn cover a core of vascular mesoderm. The capillary system developing in the core of the villous stems soon comes in contact with capillaries of the chorionic plate and connecting stalk, thus giving rise to the extra embryonic vascular system .(T.W Sadler-2009).

During the following months, numerous small extensions sprout from existing villous stems into the surrounding lacunar or intervillous spaces.

Initially these newly formed villi are primitive , but by the beginning of the fourth month, cytotrophoblastic cells and some connective tissue cells disappear. The syncytium and endothelial wall of the blood vessels are then the only layers that separate the maternal and fetal circulations. Frequently the syncytium becomes very thin, and large pieces containing several nuclei may break off and drop into the intervillous blood lakes. These pieces, known as syncytial knots, enter the maternal circulation and usually degenerate without causing any symptoms. Disappearance of cytotrophoblastic cells progresses from the smaller to larger villi, and although some always persist in large villi, they do not participate in the exchange between the two circulations. (T.W Sadler-2009).

2.1.3 Chorion frondosum and Decidua basalis:

As pregnancy advances, villi on the embryonic pole continue to grow and expand, giving rise to the chorion frondosum. Villi on the abembryonic pole degenerate and by the third month this side of the chorion, now known as the chorion laeve, is smooth. The difference between the embryonic and abembryonic poles of the chorion is also reflected in the structure of the decidua, the functional layer of the endometrium, which is shed during parturition. The decidual layer over the abembryonic pole is the decidua capsularis. With growth of the chorionic vesicle, this layer becomes stretched and degenerates. Subsequently, the chorion leave comes into contact with the uterine wall (decidua parietalis) on the opposite side of the uterus and the two fuses, obliterating the uterine lumen. Hence the only portion of the chorion participating in the exchange process is the chorion frondosum, which, together with the deciduas basalis, makes up the placenta. Similarly, fusion of the amnion and chorion to form the amniochorionic membrane obliterates the chorionic cavity. It is this membrane that ruptures during labor (breaking of the water). (T.W Sadler-2009).

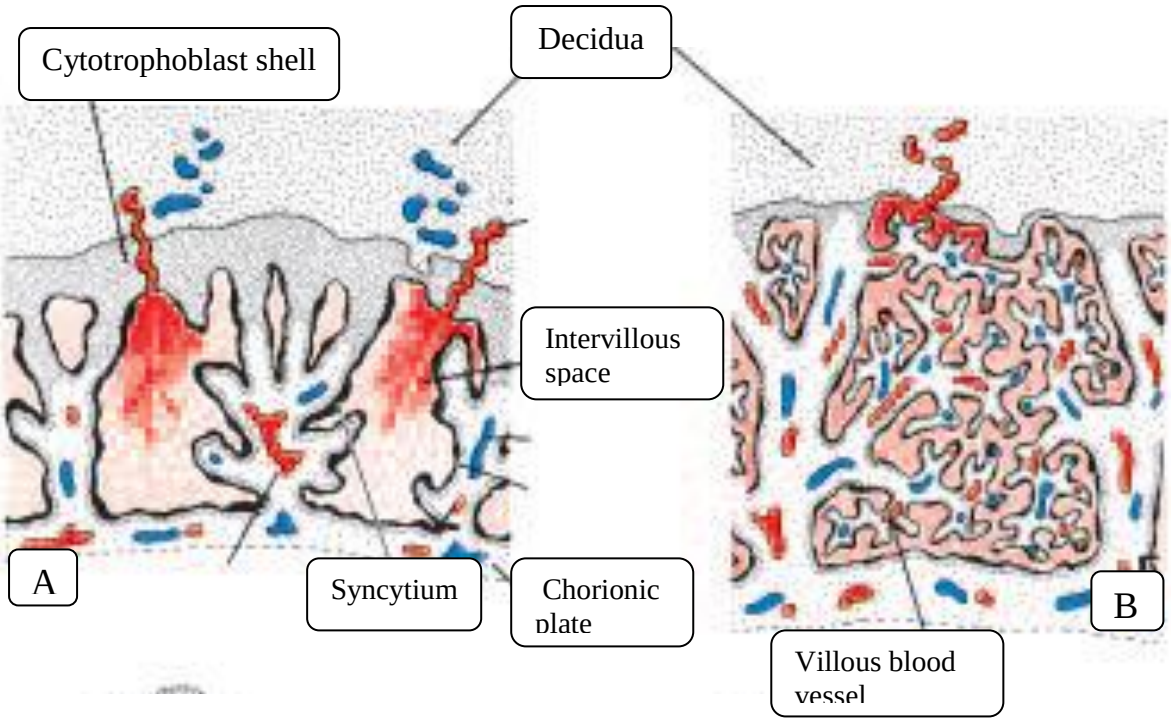


Figure (2.1) Structure of villi at various stages of development**.** A. During the fourthweek. The extraembryonic mesoderm penetrates the stem villi in the direction of thedecidual plate. B. During the fourth month. In many small villi the wall of the capillariesis in direct contact with the syncytium. (T.W Sadler- 2009).

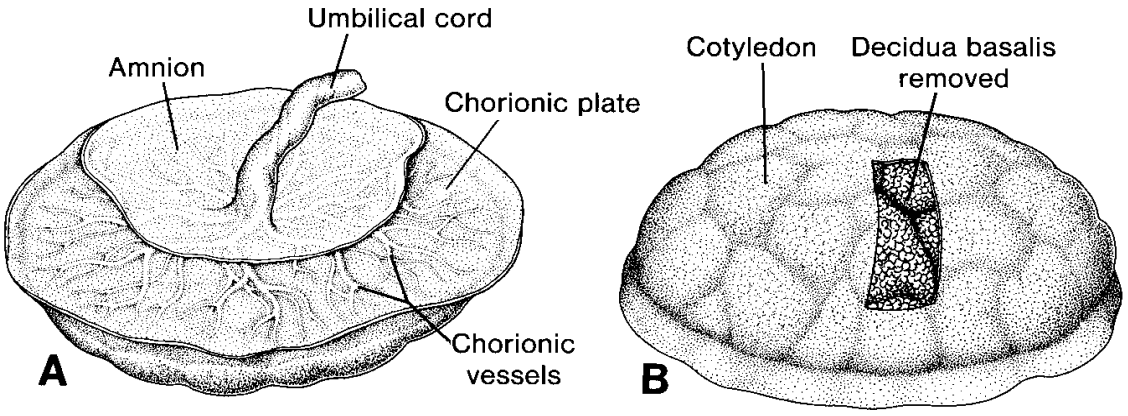
2.1.4 Structure of the Placenta:

By the beginning of the fourth month, the placenta has two components: (a) afetal portion, formed by the chorion frondosum; and (b) a maternal portion, formed by the decidua basalis. On the fetal side, the placenta is bordered by the chorionic plate ; on its maternal side, it is bordered bythe decidua basalis. During the fourth and fifth months the decidua forms a number of decidual septa, which project into intervillous spaces but do not reach the chorionic plate. These septa have a core of maternal tissue, but their surface is covered by a layer of syncytial cells. As a result of this septum formation, the placenta is divided into a number of compartments, or cotyledons. As a result of the continuous growth of the fetus and expansion of the uterus, the placenta also enlarges. Its increase in surface area roughly parallels that of the expanding uterus and throughout

pregnancy it covers approximately15 to 30% of the internal surface of the uterus. The increase in thickness of the placenta results from arborization of existing villi and is not caused by further penetration into maternal tissues.(T.W Sadler-2009).

2.1.5 Full-Term Placenta:

At full term, the placenta is discoid with a diameter of 15 to 25 cm, is approximately3 cm thick, and weighs about 500 to 600 g. At birth, it is torn from the uterine wall and, approximately 30 minutes after birth of the child, is expelled from the uterine cavity. After birth, when the placenta is viewed from the maternal side, 15 to 20 slightly bulging areas, the cotyledons, covered by a thin layer of decidua basalis, are clearly recognizable. Grooves between the cotyledons are formed by decidual septa. The fetal surface of the placenta is covered entirely by the chorionic plate. A number of large arteries and veins, the chorionic vessels, converge toward the umbilical cord. The chorion, in turn, is covered by the amnion. Attachment of the umbilical cord is usually eccentric and occasionally even marginal. Rarely, however, does it insert into the chorionic membranes outside the placenta (velamentous insertion),(T.W Sadler-2009).



Figur (2.2) A full-term placenta. A. Fetal side. The chorionic plate and umbilical cord are covered by amnion. B. Maternal side showing the cotyledons. In one area the decidua has been removed. The maternal side of the placenta is always carefully inspected at birth, and frequently one or more cotyledons with a whitish appearance are present because of excessive fibrinoid formation and infarction of a group of intervillous lakes.(T.W Sadler- 2009).

2.1.6 Circulation of the Placenta:

Cotyledons receive their blood through 80 to 100 spiral arteries that pierce the decidual plate and enter the intervillous spaces at more or less regular intervals. The lumen of the spiral artery is narrow, so blood pressure in the intervillous space is high. This pressure forces the blood deep into the intervillous spaces and bathes the numerous small villi of the villous tree in oxygenated blood. As the pressure decreases, blood flows back from the chorionic plate toward the decidua, where it enters the endometrial veins Hence, blood from the intervillous lakes drains back into the maternal circulation through the endometrial veins. Collectively, the intervillous spaces of a mature placenta contain approximately150 ml of blood, which is replenished about 3 or 4 times per minute. This blood moves along the chorionic villi, which have a surface area of 4 to 14 m2. However, placental exchange does not take place in all villi, only in those whose fetal vessels are in intimate contact with the covering syncytial membrane. In these villi, the syncytium often has a brush border consisting of numerous microvilli, which greatly increases the surface area and consequently the exchange rate between maternal and fetal circulations. The placental membrane, which separates maternal and fetal blood, is initially composed of four layers: (a) the endothelial lining of fetal vessels; (b) the connective tissue in the villus core; (c) the cytotrophoblastic layer; and (d) the syncytium. From the fourth month on, however, the placental membrane thins, since the endothelial lining of the vessels comes in intimate contact with the syncytial membrane, greatly increasing the rate of exchange. Sometimes called the placental barrier, the placental membrane is not a true barrier, since many substances pass through it freely. Because the maternal blood in the intervillous spaces is separated from the fetal blood by a chorionic derivative, the human placenta is considered to be of the hemochorial type.(T.W Sadler-2009).

2.1.7 Placental Changes at the End of Pregnancy:

At the end of pregnancy, a number of changes that occur in the placenta may indicate reduced exchange between the two circulations. These changes include (a) an increase in fibrous tissue in the core of the villus, (b) thickening of basement membranes in fetal capillaries, (c) obliterative changes in small capillaries of the villi, and (d) deposition of fibrinoid on the surface of the villi in the junctional zone and in the chorionic plate. Excessive fibrinoid formation frequently causes infarction of an intervillous lake or sometimes of an entire cotyledon. The cotyledon then assumes a whitish appearance.(T.W Sadler-2009).

2.1.8 Fetal Membranes in Twins:

Arrangement of fetal membranes in twins varies considerably, depending on the type of twins and on the time of separation of monozygotic twins.

2.1.8.1 Dizygotic Twins

Approximately two-thirds of twins are dizygotic, or fraternal, and their incidence of 7 to 11 per 1000 births increases with maternal age. They result from simultaneous shedding of two oocytes and fertilization by different spermatozoa. Since the two zygotes have totally different genetic constitutions, the twins have no more resemblance than any other brothers or sisters. They may or may not be of different sex. The zygotes implant individually in the uterus, and usually each develops its own placenta, amnion, and chorionic sac. Sometimes, however, the two placentas are so close together that they fuse. Similarly, the walls of the chorionic sacs may also come into close apposition and fuse. Occasionally, each dizygotic twin possesses red blood cells of two different types, indicating that fusion of the two placentas was so intimate that red cells were exchanged.(T.W Sadler-2009).

2.1.8.2 Monozygotic Twins

The second type of twins, which develops from a single fertilized ovum, is monozygotic, or identical, twins. They result from splitting of the zygote at various stages of development. The earliest separation is believed to occur at the two-cell stage, in which case two separate zygotes develop. The blastocysts implant separately, and each embryo has its own placenta and chorionic sac . The two can be recognized as partners of a monozygotic pair by their strong resemblance in blood groups, fingerprints, sex, and external appearance. Splitting of the zygote usually occurs at the early blastocyst stage. The inner cell mass splits into two separate groups of cells within the same blastocyst cavity . The two embryos have a common placenta and a common chorionic cavity, but separate amniotic cavities . In rare cases these paration occurs at the bilaminar germ disc stage, just before the appearance of the primitive streak . This method of splitting results in formation of two partners with a single placenta and a common chorionic and amniotic sac. Although the twins have a common placenta, blood supply is usually well balanced. Although triplets are rare, birth of quadruplets, quintuplets, and so forth is rarer. In recent years multiple births have occurred more frequently in mothers given gonadotropins (fertility drugs) for ovulatory failure.(T.W Sadler-2009)

2.1.9.The normal umbilical cord:

Is 51-60 cm long and 2-2.5 cm in diameter. Should have abundant Wharton's jelly with no true knots. Contains two umbilical arteries and one umbilical vein. Can arise from any point on the fetal surface of the placenta; it usually arises in the centre or just off-centre. Has a length not associated with length, weight or gender of the baby. (T.W Sadler-2009).

2.1.10 Placental Size:

Placental length is approximately six times its maximal width at 18 to 20 weeks' gestation. The mean thickness of the placenta in millimeters in the first half of pregnancy closely approximates the gestational age in weeks.

If the placenta thickness is greater than 4 cm (40 mm) before 24 weeks, an abnormality should be suspected. These abnormalities include ischemic-thrombotic damage, intraplacental hemorrhage, chorioangioma, and fetal hydrops. The placenta dramatically increases in size until approximately 15 to 17 weeks' gestation. From this point, there is a fourfold increase in placental size until delivery, whereas the fetus has a 50-fold increase in size until delivery.18 Midtrimester placental volume is associated with maternal nutritional status, birth weight, and pregnancy outcome. (Rumack et al 2011).

2-1.10.1 placental weight:

A number of risk factors for both high and low placental weight. Some factors are associated either before, after or both accounting for birth weight.(Helen McNamara et al 2014).

Low placental weight:

chronic hypertension (before and after accounting for birth weight). Pre-eclampsia (before, but not after adjustment for birth weight). (Helen McNamara et al 2014).

High placental weight:

Anemia (before and after adjustment for birth weight),Gestational diabetes (before and after adjustment for birth weight), Smoking (after adjustment for birth weight).Placental and cord determinants include chorioamnionitis, chorangioma/chorangiosis, Circumvallate placenta and marginal cord insertion. (Helen M.cNamara et al 2014).

21.11 Placenta location:-

Normal placenta location is near the fundus of the uterus along the anterior or posterior wall. The placental location should not be definitively assessed before the end of the second trimester since the placenta previa of an early pregnancy can become a normal or low line placenta due to stretching of the uterine cervix (distance to internal cervical os less than 5 cm).(Cande V -2005).

2-1.12.PlacentaDuring Labor and Postpartum:

Third Stage of Labor:

Ultrasound may have some role during the third stage of labor, the time from delivery of the neonate to delivery of the placenta. A prolonged third stage, with the placenta retained, has various etiologies. If the placenta does not separate, a placenta accreta could be present. A prolonged third stage may also be caused by retention of a detached placenta from poor contractility or atony of the uterus, sometimes from infection. These abnormalities are treated differently, and ultrasound may help differentiate the various causes of a prolonged third stage of labor and lead to improved patient care. The mechanism of placental separation has been reported using gray-scale sonography. Color Doppler ultrasound provides information on the phases of placental separation during the third stage of labor by specifically assessing blood flow between the myometrium. (Rumack et al 2011).

2.2 Function of the Placenta:

Main functions of the placenta are (a) exchange of metabolic and gaseous products between maternal and fetal bloodstreams and (b) production of hormones.(T.W Sadler-2009).

2.2.1 Exchange of Gases:-

Exchange of gases, such as oxygen, carbon dioxide, and carbon monoxide, is accomplished by simple diffusion. At term, the fetus extracts 20 to 30 ml

of oxygen per minute from the maternal circulation and even a short-term interruption of the oxygen supply is fatal to the fetus. Placental blood flow is critical to oxygen supply, since the amount of oxygen reaching the fetus primarily depends on delivery, not diffusion.(T.W Sadler-2009).

2.2.3 Exchange of Nutrients and Electrolytes:-

Exchange of nutrients and electrolytes, such as amino acids, free fatty acids, carbohydrates, and vitamins, is rapid and increases as pregnancy advances.(T.W Sadler-2009).

2.2.4 Transmission of Maternal Antibodies:-

Immunological competence begins to develop late in the first trimester, by which time the fetus makes all of the components of complement. Immunoglobulins consist almost entirely of maternal immunoglobulin G (IgG) that begins to be transported from mother to fetus at approximately 14 weeks. In this manner, the fetus gains passive immunity against various infectious diseases. Newborns begin to produce their own IgG, but adult levels are not attained until the age of 3 years.(T.W Sadler-2009).

2-2- 5. Hormone Production:

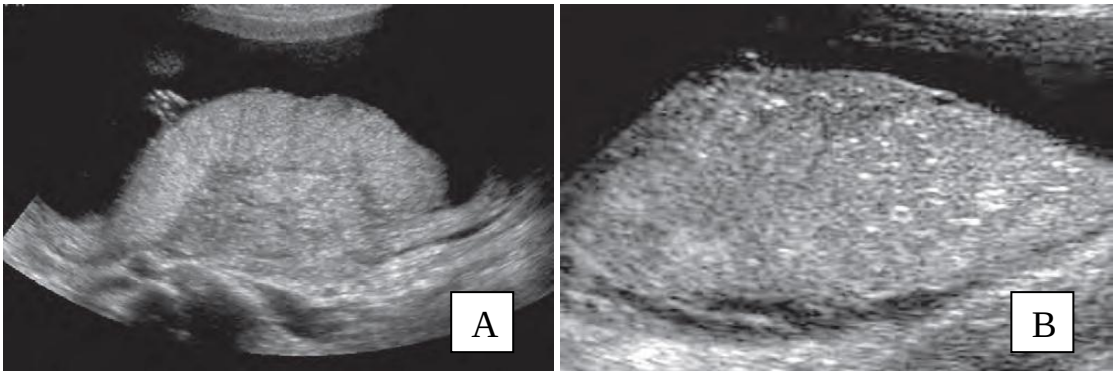
By the end of the fourth month the placenta produces progesterone in sufficient amounts to maintain pregnancy if the corpus luteum is removed or fails to function properly. In all probability, all hormones are synthesized in the syncytial trophoblast. In addition to progesterone, the placenta produces increasing amounts of estrogenic hormones, predominantly estriol, until just before the end of pregnancy, when a maximum level is reached. These high levels of estrogens stimulate uterine growth and development of the mammary glands. During the first two months of pregnancy, the syncytiotrophoblast also produces human chorionic gonadotropin (hCG), which maintains the corpus luteum. This hormone is excreted by the mother in the urine, and in the early stages of gestation, its presence is used as an indicator of pregnancy. Another hormone produced

by the placenta is somatomammotropin (formerly placental actogen). It is a growth hormone-like substance that gives the fetus priority on maternal blood glucose and makes the mother somewhat diabetogenic. It also promotes breast development for milk production.(T.W Sadler-2009).

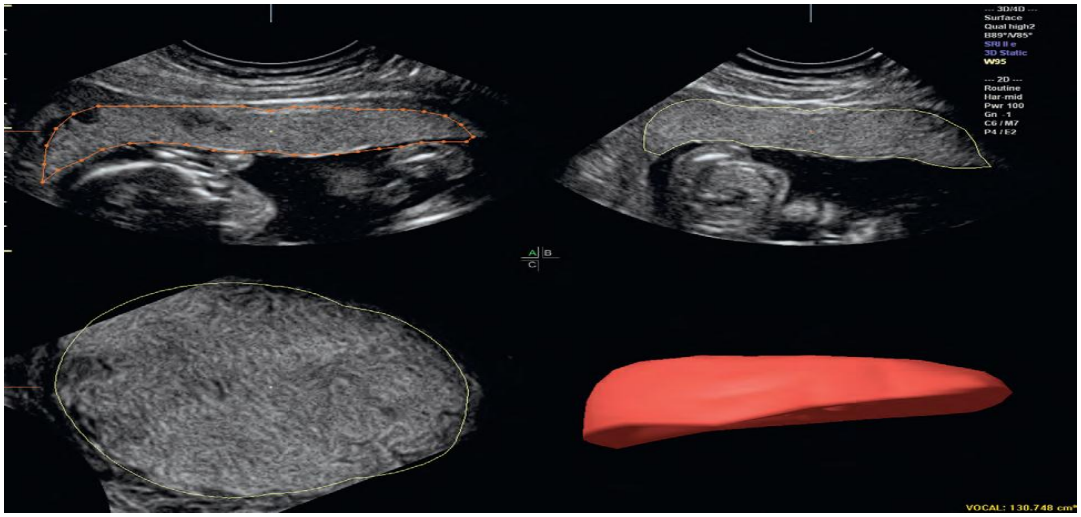
2. 2.6.The Placental Barrier:

Most maternal hormones do not cross the placenta. The hormones that do cross, such as thyroxine, do so only at a slow rate. Even more dangerous was the use of the synthetic estrogen diethylstilbestrol, which easily crosses the placenta. This compound produced carcinoma of the vagina and abnormalities of the testes in individuals who were exposed to it during their intrauterine life. Although the placental barrier is frequently considered to act as a protective mechanism against damaging factors, many viruses, such as rubella, varicella, measles, and poliomyelitis virus, traverse the placenta without difficulty. Once in the fetus, some viruses cause infections, which may result in cell death and birth defects. Unfortunately, most drugs and drug metabolites traverse the placenta without difficulty, and many cause serious damage to the embryo.(T.W Sadler-2009)

2.3 Normal Sonographic Appearance of Placenta:



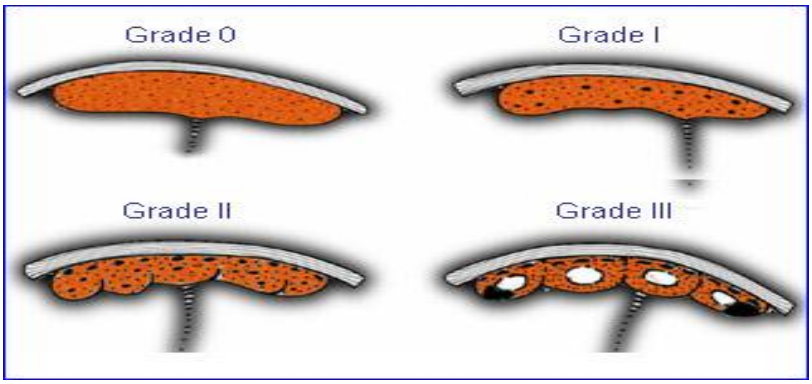
Figur (2.3)Normal sonographic appearance of placentaA- At 18 weeks, note the uniformly echogenic appearance of theplacenta.B-Note the increasing echogenicity in the placenta as it matures.(Rumack et al2011).



Figur (2.4) Three-dimensional assessment of placental volume in second trimester. (Rumack et al 2011).

2.3.1 Placental grading:

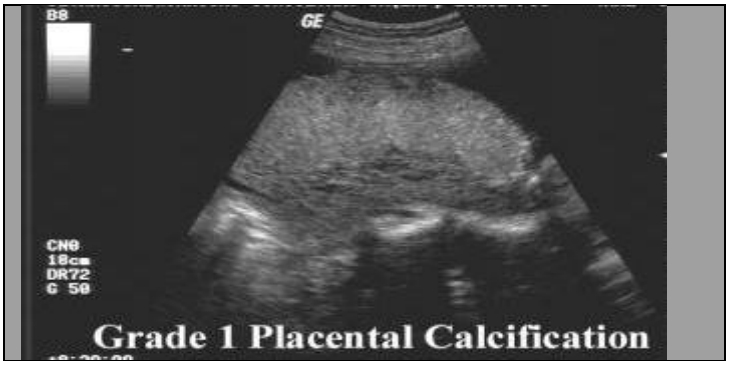
(Grannum classification) refers to an ultrasound grading system of the placenta based on its maturity. This primarily affects the extent of calcifications which occurs in normal placental tissue, Deposited primarily along the basal plate and along the septa separating placental lobes, 50% will have some calcification after 33 weeks.(Bhargava, S. K. 2009).



Figur (2.5)diagram illustrate classification of Placental grading:(The Ultrasound of Life 2013).

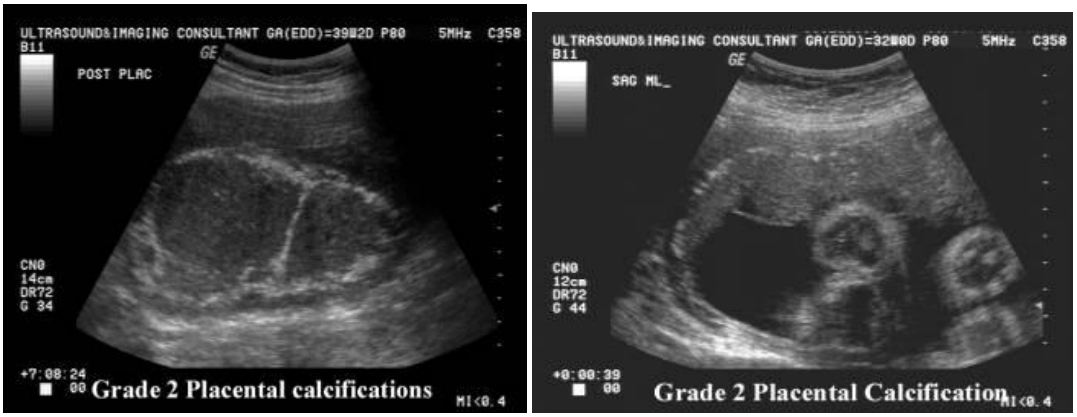
2-3-1.1.Grade 0 : Uniform granular appearance. No visible calcification. Smooth chorionic plate on fetal surface. The placental tissue and basal plate are homogenous. No highly reflective foci (calcifications) are present.(Bhargava, S. K. 2009).

2.3.1.2.Grade 1 : Early indentation (undulation) of the chorionic plate. Scattered highly reflective areas (calcification) parallel to the basal plate.(Bhargava, S. K. 2009).



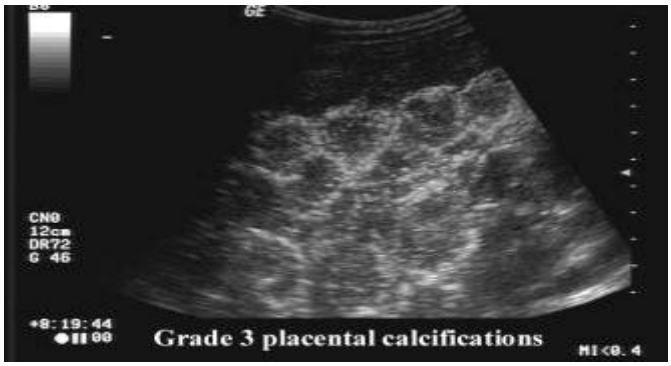
Figur(2.6) Grade 1 : Early indentation (undulation) of the chorionic plate (The Ultrasound of Life 2013)

2.3.1.3 Grade 2 : Increased basal echogenicities and commalike echogenicities extending into the placenta from indentations of the chorionic plate. Indentations of the chorionic plate do not reach the basal plate, which is well defined by small linear highly reflective areas.(Bhargava, S. K. (2009).



Figur (2.7) Grade 2Increased basal echogenicities and commalike echogenicities extending into the placenta from indentations of the chorionic plate. (The Ultrasound of Life 2013).

2.3.1.4.Grade 3 = Extensive basal echogenicities and curvilinear echogenicities extending from the chorionic plate to reach the basal plate (does not reliable indicate fetal lung maturity). This results in the placenta being divided into compartments containing central echo-free areas.(Bhargava, S. K. 2009).



Figur (2.8) Grade 3 Extensive basal echogenicities and curvilinear echogenicities extending from the chorionic plate to reach the basal plate(The Ultrasound of Life 2013).

2.4 Placenta – Abnormalities:

Multiple abnormalities associated with placental development and function can be identified by prenatal sonography. Sonographers and sonologists need to understand the basic anatomy and physiology of the placenta so that abnormal findings on prenatal sonography can be acknowledged, to achieve the best possible outcome for mother and neonate. (Rumack et al 2011).

2.4.1. Placenta Variants:

Circumvallate placenta.

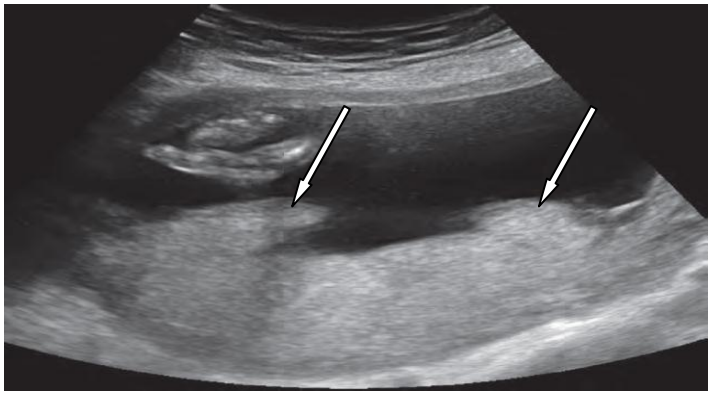
Succenturiate placenta.

Bilobed Placenta.

Placenta Membranacea.

2.4.1.1.Circumvallate placenta:

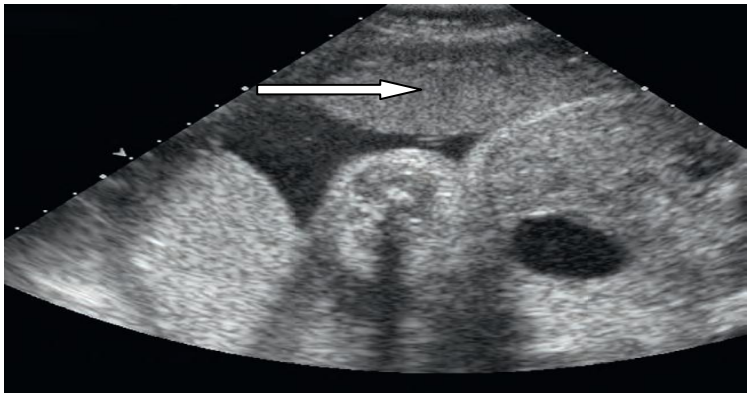
Placentas are generally round or oval in shape and can also be "irregular" (multilobate, "star") shapes. These irregular shaped placentas have been associated with lower birth weight for placental weight suggesting an altered function. Circumvallate placenta has the sonographic appearance of a rolled edge of membranes at the placental edge inserting toward the center of the placental chorionicdisc. (Rumack et al 2011).



Figur(2-9) Circumvallate placentaTransabdominal sonogram in the early third trimester shows rolled edges of the placenta (arrows).(Rumack et al 2011).

2.4.1.2 Succenturiate lobe:

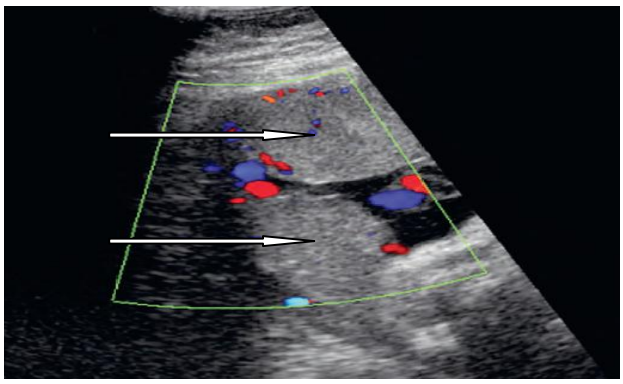
Succenturiate lobes, or accessory lobes, of the placenta can be a single lobe or multiple lobes in addition to the main placental lobe. Placental tissue is present in the accessory lobe, there must be arterial and venous connections to the main portion of the placenta. Succenturiate lobes are associated with retained placenta and increased risk of postpartum infection and hemorrhage. They appear to be associated with increasing maternal age and are more common in women who have received invitro fertilisation (IVF).(Rumack et al 2011).



Figur (2-10)Succenturiate lobeTransabdominal sonogram of a third-trimester pregnancy shows a portion of placenta(arrow) separate from the main placental disc. (Rumack et al 2011).

2.4.1.3.Bilobed placentas:

Bilobed placentas consist of two similarly sized placenta llobes separated by intervening membranes. There must be some vascular connection between the lobes, and the umbilical cord may insert between the lobes in the membranes. Although rare, a bilobed placenta can be regarded similar to succenturiate lobes, with similar risks. Bilobed placentas may have more unprotected vessels, however, reinforcing the need for careful evaluation of the placental vasculature in such cases.(Rumack et al 2011).

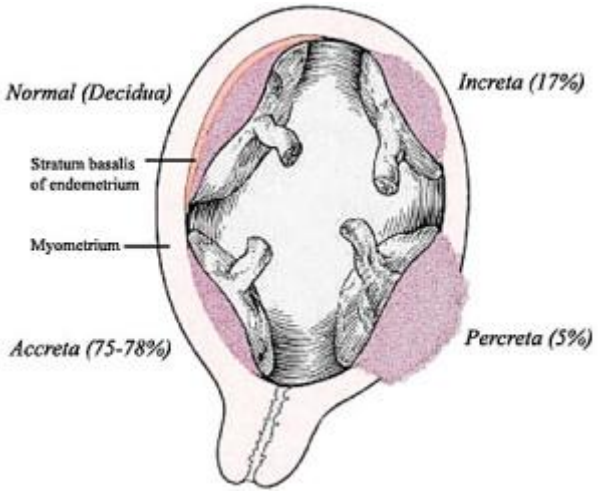


Figur (2-11)Transabdominal sonogram of a third-trimester bilobed placenta. Both placental discs are of comparable size *(arrows).*(Rumack et al 2011).

2.4.1.4 Placenta Membranacea:

A rare placental abnormality where either all (diffuse placenta membranacea) or part (partial placenta membranacea) is covered by chorionic villi (placental cotyledons). Clinically the abnormality presents with vaginal bleeding, in the second or third trimester or during labor, due to an associated placenta previa. Ultrasound has been used to detect this condition.(Atif Ahmed et al 2003).

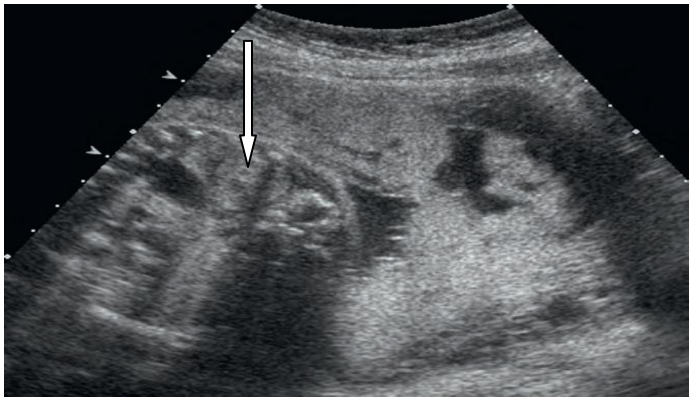
2.4.2 Placental Implantation Abnormalities:



Figur (2-12) Diagram illustrate Placental Implantation Abnormalities (John Yanson.et al. 2006).

The normal placenta invades the inner third of the myometrium. At delivery, the placenta separates at the decidual plane, with an abrupt cessation of intra placental flow as the myometrium contracts. A placenta that is abnormally adherent to the uterine wall after delivery is termed placenta accreta. Placenta increta occurs if the placenta invades the myometrium more deeply, and placenta percreta refers to a placenta that at least in part protrudes through the uterine serosa. Placenta accreta, increta, and percreta are serious complications of pregnancy associated with maternal blood loss, need for hysterectomy, and retained products of

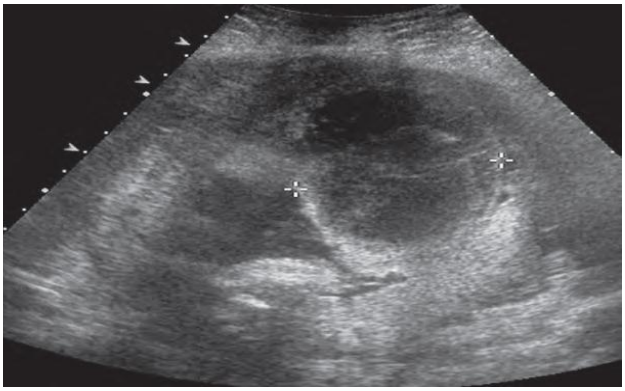
conception. With ultrasound, placenta accreta can be identified antenatally so that delivery plans can be made prospectively, improving the outcome for mother and child. (Rumack et al 2011).



Figur (2-13) Placenta accreta with placental lakes. Transabdominal sonogram of a third-trimester placenta shows a placental (venous) lake *(arrow)*. (Rumack et al 2011).

2.4.3 Placental Abruption:

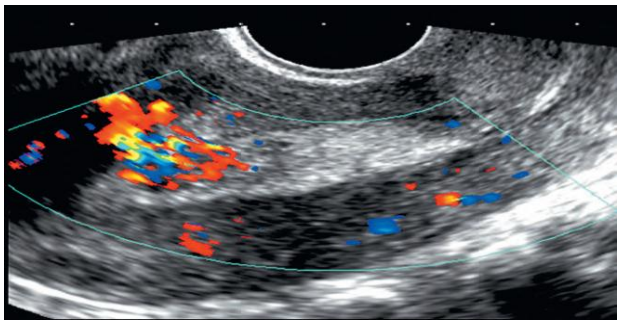
Placental abruption is one of the worrisome causes of vaginal bleeding in the latter part of pregnancy because it contributes to perinatal mortality. Patients typically present with third-trimester vaginal bleeding associated with abdominal or uterine pain and labor. History of prior abruption, hypertension, prolonged rupture of membranes, IUGR, chorioamnionitis, polyhydramnios are all risk factors for placental abruption. The diagnosis of placental abruption istypically made based on clinical findings; the retroplacental clot is frequently isoechoic to the placenta or myometrium and cannot always be identified sonographically. A sub placental hematoma between the placenta and uterine wall is a placental abruption. This should be differentiated from a subchorionic hematoma, in which the hematoma is underneath the chorion, not the placenta. Although a subchorionic hematoma can occur anytime during pregnancy, it is more common in the first half of pregnancy. (Rumack et al 2011).



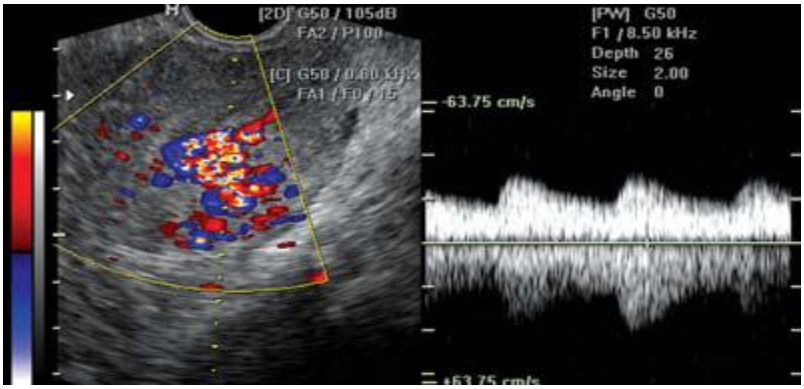
Figur (2-14) Placental abruption. Transabdominal sonogram of the placenta with a hematoma *(calipers)* lifting the placenta away from the uterine wall.(Rumack et al 2011).

2-4.4 Retained Products of Conception:

Retained products of conception after an abortion or delivery may cause secondary hemorrhage or may serveas a nidus for infection. Sonographically, an echogenic mass in the endometrial cavity suggests this diagnosis although blood clot may also present as amass. Calcifications may be seen within the mass and strongly suggests retained placental tissue. The calcification is caused by retained mature placenta or the chronicity of the process. Endometrial thickness is variable, however, when the endometrial thickness is less than10 mm and there is no endometrial mass, either in the post abortion or postpartum state, the likelihood of clinically significant retained products is low. Vascularity within the mass or thickened endometrium suggests retained products, whereas absent vascularity favors blood clot. However, absent vascularity does not exclude retained products.(Rumack et al 2011).



Figur (2-15) Retained products of conception: Color Doppler ultrasound sagittal transvaginal scan in a postabortion patient shows thickening of the endometrium with a focal area of increased vascularity.(Rumack et al 2011).



Figur (2-15) Retained products of conception Color Doppler showing high vascularity in the region of increased echogenicity with low resistance flow (indicated by significant diastolic flow) confirming in complete abortion. (Bhargava S.K, 2010).

2.4.5 Gestational Trophoblastic Neoplasia

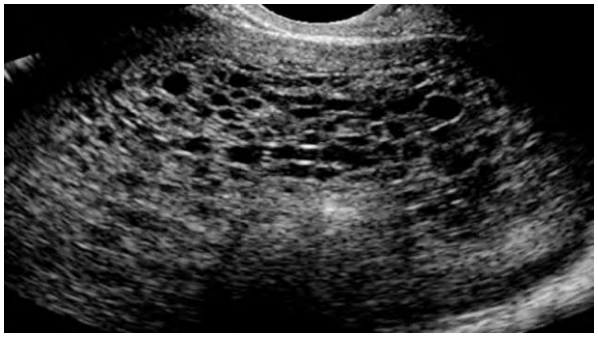
Gestational trophoblastic neoplasia (GTN) represents a spectrum of conditions, including hydatidiform molar pregnancy, invasive mole, choriocarcinoma, and placental-site trophoblastic tumor. The latter three conditionsare referred to as persistent trophoblastic neoplasia (PTN). All these conditions show abnormal trophoblastic proliferation histologically. (Rumack et al 2011).

2.4.5.1 Hydatidiform Mole:

Hydatidiform molar pregnancy is the most common and benign form of GTN There is an increased risk in teenagers, in women over years of age, and in women with a previous molar pregnancy. The risk also increases with the number of previous spontaneous abortions. Molar pregnancy is characterized histologically by cystic (hydatidiform) degeneration of chorionic villi, with absent or inadequate vascularization and abnormal trophoblastic proliferation. The most frequent presenting symptom is vaginal bleeding, which occurs in more than 90% of cases. Passage of vesicles (hydropic villi) through the vagina occurs frequently and is considered specific for the diagnosis of molar pregnancy. The uterus may be enlarged for dates, and there may also be rapid uterine enlargement.(Rumack et al 2011).

2.4.5.1.1Complete Molar Pregnancy:

Complete molar pregnancy is characterized by a diploid karyo type of 46, XX This occurs when an ovum with absent or inactive maternal chromosomes is fertilized bya normal haploid sperm. Occasionally, fertilization of an empty ovum by two haploid sperm results in a 46, XY pattern. As the embryo dies at an early stage, no feta parts are seen. The placenta is entirely replaced by abnormal, hydropic chorionic villi with excessive trophoblastic proliferation. The classic sonographic features of complete molar pregnancy include an enlarged uterus with a central heterogeneous echogenic mass that expands the endometrial canal. The mass contains multiple cystic spaces of varying size, representing the hydropic villi .These cystic spaces may vary in size from a few millimetres to 2 to 3 cm. (Rumack et al 2011).

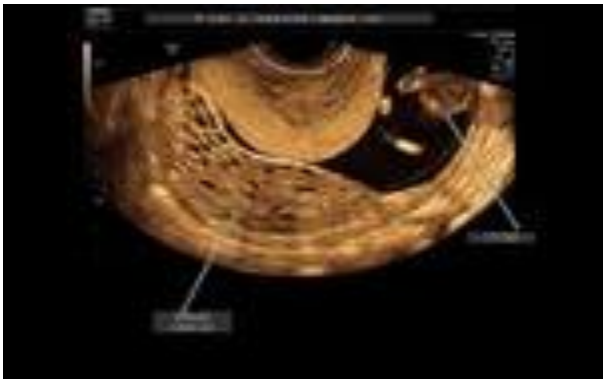


Figur (2-16) Complete molar pregnancy: Transabdominal scan shows a vesicular echogenic mass distending the endometrium. The mass is filled with innumerable uniformly distributed cystic spaces that corresponded to hydropic chorionic villi at pathology consistent with hydropic villi. (Rumack et al 2011).

2.4.5.1.2 Partial Molar Pregnancy:

Partial molar pregnancy has a triploid karyo type of 46, XX. Most partial moles have one set of maternal chromosomes and two sets of paternal chromosomes, resulting from fertilization of a normal ovum by two haploid sperm. Triploidy of maternal origin is not associated with GTN. Pathologically, partial molar pregnancy has well-developed but generally anomalous (triploid) fetal tissues. Hydropic degeneration of placental villi is focal, interspersed with normal placental villi. Trophoblastic

proliferation is mild. Symptoms and signs are less frequent and less severe because of the mild trophoblastic proliferation. The sonographic features of partial molar pregnancy are less frequently described and overlap with other conditions, such as an an embryonic pregnancy or an incomplete abortion. In partial molar pregnancy, the placenta is excessive in size and contains numerous cystic spaces distributed in a nonuniform manner. (Rumack et al 2011).



Figur (2-17) Partial molar pregnancy at 8 weeks' gestation. Transvaginal scan shows a gravid uterus with a yolk sac and live 8-week embryo *(arrow).* On the right is a large placenta with multiple small cystic spaces consistent with hydropic villi. Pathology confirmed partial mole.

2.4.5.1.3.Mesenchymal Dysplasia of the Placenta:

Mesenchymal dysplasia of the placenta resembles apartial hydatidiform mole both grossly and microscopically, with a thickened placenta and small cystic lesions. In contrast to partial moles, mesenchymal dysplasia of the placenta may be associated with a normal fetus, although IUGR is common. There is also an association with Beck with-Wiedemann syndrome. The villi in these cases are cystic with dilated vasculature. The karyo type is usually normal.(Rumack et al 2011).

2.4.6 Persistent Trophoblastic Neoplasia:

Persistent trophoblastic neoplasia is a life-threatening complication of pregnancy that includes invasive mole, choriocarcinoma, and the extremely rare placental-sitet rophoblastic tumour. PTN occurs most often after molar

pregnancy; up to 20% of complete moles develop persistent disease requiring additional therapy. Complete moles with severe degrees of trophoblastic proliferation are at the highest risk, with persistent disease developing in 50% or more of these patients. The risk is also increased in patients over 40 years of age and in women who have had multiple molar pregnancies. The risk of persistent disease after partial molar pregnancy is much lower; PTN develops after a normal term delivery, spontaneous abortion, or rarely an ectopic pregnancy. (Rumack et al 2011).

2.4.6.1 Invasive Mole:

Invasive mole is the most common form of PTN, accounting for 80% to 95% of cases. Patients usually present with vaginal bleeding and persistent elevation of serum hCG within 1 to 3 months after molar evacuation. Histologically, invasive mole is characterized by the presence of formed chorionic villi and trophoblastic proliferation deep in the myometrium. It is considered biologically benign and is usually confined to the uterus; rarely, molar tissue can penetrate the whole thickness of the myometrium, leading to uterine perforation, which may cause severe haemorrhage. Lesions can invade beyond the uterus to parametrial tissues, adjacent organs, and blood vessels. Rarely, invasive molar villi may embolize to distant sites, including the lungs and brain. (Rumack et al 2011).

2.4.6.2 Choriocarcinoma:

Choriocarcinoma is an extremely rare malignancy .As with other forms of PTN, the most important risk factor for choriocarcinoma is molar pregnancy. gives rise to choriocarcinoma. Choriocarcinoma is a purely cellular lesion characterized histologically by the invasion of the myometrium by abnormal, proliferating trophoblast and the absence of formed villi. Haemorrhage and necrosis are prominent features. Early vascular invasion is common, resulting in distant metastases, most frequently affecting the lungs, followed by the liver, brain, gastrointestinal

tract, and kidney. Respiratory compromise may be the initial presentation. Venous invasion and retrograde metastases to the vagina and pelvic structures are also common.(Rumack et al 2011).

2.4.6.3 Placental-Site Trophoblastic Tumour:

Placental-site trophoblastic tumour (PSTT) is the rarest and most fatal form of PTN. As with choriocarcinoma and invasive mole, PSTT can follow any type of gestation, but in more than 90% of cases it develops after a normal term delivery. The tumour may occur from as early as 1 week to many years after pregnancy. Vaginal bleeding is the most common symptom, although some women may present with amenorrhea. Histologically, PSTT is distinct from other forms of trophoblastic neoplasia. It arises from nonvillous, "intermediate" trophoblast that infiltrates the decidua, spiral arteries, and myometrium at the placental bed. PSTT may be confined to the uterus, may be locally invasive in the pelvis, or may metastasize to the lungs, lymph nodes, peritoneum, liver, pancreas, or brain. Serum hCG is not a reliable marker for PSTT; it is usually negative or only mildly elevated. Histochemical staining of intermediate trophoblast for hCG is weak or absent, whereas staining for human placental lactogen (hPL) is strongly positive. Unfortunately, serum hPL is not a reliable predictor of tumour behaviour. Surgical therapy is recommended because these lesions tend to resist chemotherapy and have a high risk of metastasis. (Rumack et al 2011).

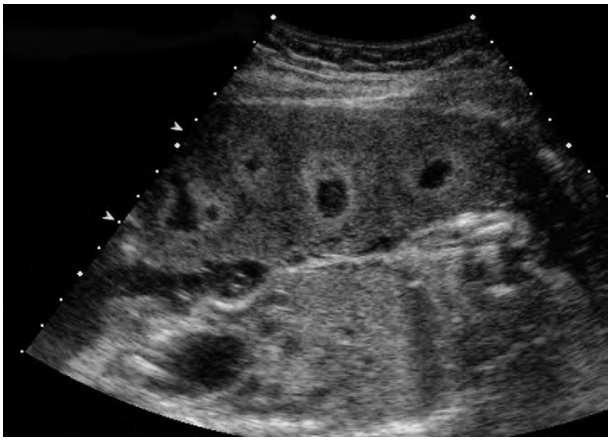
2.4.6.4 Sonographic Features of PTN:

The most frequently described sonographic abnormality in PTN is a focal, echogenic myometrial nodule. The lesion usually lies close to the endometrial canal, but it may be found deep in the myometrium. Lesions may appear solid and uniformly echogenic, hypoechoic, or complex and multicystic, similar to molar tissue. Thick walled, irregular anechoic areas may be seen, resulting from tissue necrosis and haemorrhage. In other

cases, anechoic areas within lesions represent tvascular spaces. When tumour replaces the entire myometrium, the uterus is enlarged, with the myometrium appearing heterogeneous and lobulated. The tumour may extend beyond the uterus to the parametrium, pelvic sidewall, and adjacent organs. In extreme cases, PTN appears as a large, undifferentiated pelvic mass. Sonography can be diagnostic in the correct setting. After effective therapy, sonographic lesions become progressively more hypoechoic and smaller in size. (Rumack et al 2011).

2-4.7 Placental Infarction:

Placental infarctions can occur focally or throughout the placenta and are thought to have a vascular etiology. Maternal floor infarction is a diffuse entity over taking the villi with a fibrinoid deposition at the maternal surface and basal plate, reaching into the placental substance. The presence of this fibrin surrounding the villi obstructs nutrient exchange from mother to fetus. Both abnormalities are associated with oligohydramnios, umbilical artery Doppler abnormalities, IUGR, central nervous system injury, and fetal demise. Infarctions larger than 3 cm or involving more than 5%of the placenta are associated with increased perinatal morbidity. The sonographic finding include a hyperechoic placental mass or placental thickening. These can be a normal finding, especially with mature placentas. Hyperechoic placental masses may be associated with central hypoechoic spaces as they organize. Subchorionic cysts are also commonly present with maternal floor infarction. Placental infarctions caused by maternal vascular disease often result in uteroplacental ischemia and infarction of the villi. These appear as echogenic rimmed cystic lesions within the placenta.(Rumack et al 2011).



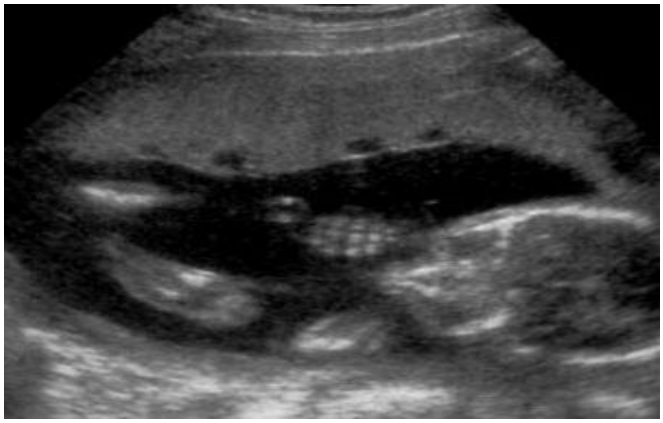
Figur (2-18) Placental infarctions in patient with severe preeclampsia. Transabdominal sonogram of a third-trimester placenta demonstrates multiple hyperechoic bordered cysts with sonolucent cores. (Rumack et al 2011).

2.4.8 Placental insufficiency:

Placental insufficiency or utero-placental insufficiency is the failure of the placenta to deliver sufficient nutrients to the fetus during pregnancy, and is often a result of insufficient blood flow to the placenta. The term is also sometimes used to designate late decelerations of fetal heart rate as measured by electronic monitoring, even if there is no other evidence of reduced blood flow to the placenta, normal uterine blood flow rate being 600mL/min. (Cande et al 2005).

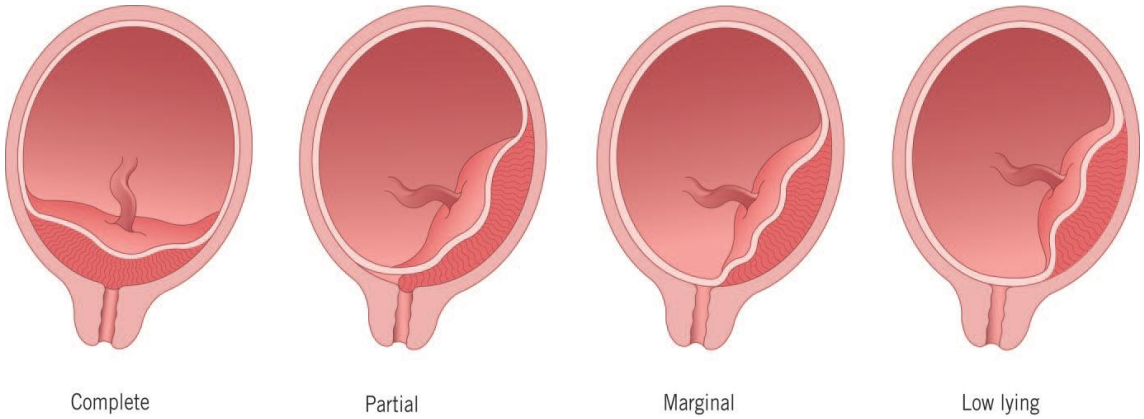
2.4.9 Placental lakes:

Placental lakes are pools of blood that are visible on scans as black areas on the surface of the placenta, or deeper inside. As worrying as this may sound, almost all placentas have one or more lakes by the third trimester, and it shouldn't affect the baby. It's only significant if the placental lake is large and takes up more than 10 per cent of the placenta, or if the baby is small for stage of pregnancy.(L.L.C. 2017).



Figur (2-19) This image shows the placenta. The lakes are above the baby on the front wall of the uterus (womb), and can be seen as three small black areas on the surface of the placenta.(BabyCenter, L.L.C. 2017).

2.4.10 Placenta Previa:



Figur 2-20Types of placenta previa.
.diagram illustrate the Location of placenta previa. (John Yanson.et al. 2006).

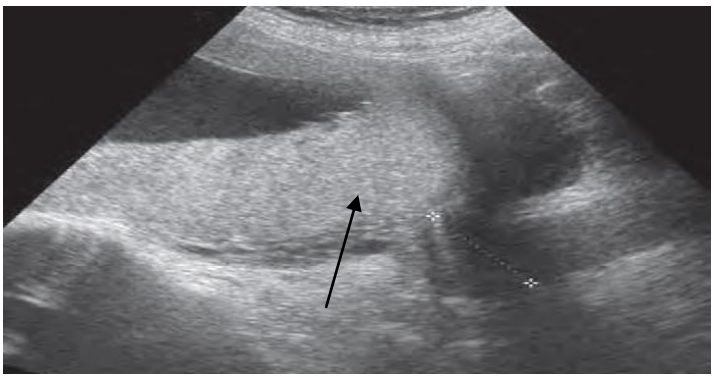
2.4.10.1 Location of placenta previa:

The term “placenta previa” refers to a placenta that is “previous” to the fetus in the birth canal. Bleeding in the second and third trimesters is the hallmark of placenta previa. This bleeding can be life threatening to the mother and fetus. With expectant management and caesarean delivery, both maternal and perinatal mortality have decreased over the past 40years. Accurate diagnosis of placenta previa is vital to improve the outcome for mother and neonate. The differentiation of placental positions has historically been performed by digital assessment of the lower uterine segment and placenta through the cervix. Using this potentially hazardous

method of evaluation, placental position was classified as complete placenta previa, partial placenta previa, incomplete placenta previa, marginal placenta previa, low-lying placenta, andplacenta distant from the internal cervical os. These classifications do not directly apply to the ultrasound examination of placental position relative to the cervix. The use of ultrasound to evaluate the position of the placenta in the uterus has both improved knowledge of the placenta within the uterus and simplified terminology with respect to placental position. Traditionally, four grades of placenta previa were used, however now it is more common to simply differentiate between 'major' and 'minor' cases Minor: Placenta is in lower uterine segment, but the lower edge does not cover the internal os. Major: Placenta is in lower uterine segment, and the lower edge covers the internal os. The four generally recognized subtypes are:(Rumack et al 2011).

2.4.10.1.1 Complete placen taprevia:

Describes the situation in which the internal cervical os is totally covered by the placenta. (Rumack et al 2011).



Figur (2-21) Complete placenta previa *(arrow).*The maternal cervix is demarcated by the calipers.(Rumack et al 2011).

2.4.10.1.2 Marginal placenta previa:

Denotes placental tissue at the edge of or encroaching on the internal cervical os.(Rumack et al 2011).

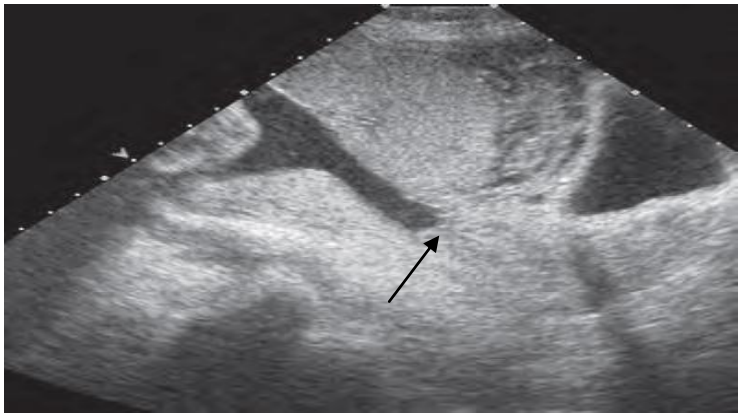


Figure (2-22) Marginal placenta previa. The internal cervical os is indicated by the arrow.(Rumack et al 2011).

2-4.10.1.3.A low placenta:

Is one in which the placental edge is within 2 cm, but not covering any portion, of the internal cervical os.(Rumack et al 2011).

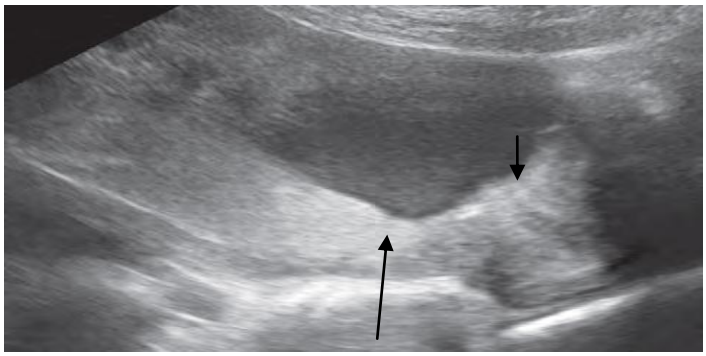


Figure 2-23Low placenta. The long arrow indicates the placental edge and the short arrow indicates the internal cervical os. (Rumack et al 2011).

The terms “incomplete placenta previa” and “partial placenta previa” have no place in the current sonographic assessment of placental position and should be used only by a clinician performing a digital examination when a “double setup” is necessary to determine where the leading edge of the placenta lies.(Rumack et al 2011).

2.4.10.2 Signs and symptoms of placenta previa:

Women with placenta previa often present with painless, bright red vaginal bleeding. This commonly occurs around 32 weeks of gestation, but can be as early as late mid-trimester. This bleeding often starts mildly and may increase as the area of placental separation increases. Previa should be suspected if there is bleeding after 24 weeks of gestation. Women may also present as a case of failure of engagement of fetal head. (Farine D. A_2009).

2.4.10.3 Causes of placenta previa:

Exact cause of placenta previa is unknown. It is hypothesized to be related to abnormal vascularisation of the endometrium caused by scarring or atrophy from previous trauma, surgery, or infection. These factors may reduce differential growth of lower segment, resulting in less upward shift in placental position as pregnancy advances. (Farine D. A_2009).

2-4.10.4.Complications of placenta previa:

During labor, the cervix will open to allow the baby to move into the vaginal canal for birth. If the placenta is in front of the cervix, it will begin to separate as the cervix opens, causing internal bleeding. This can necessitate an emergency C-section, even if the baby is premature, as the mother could bleed to death if no action is taken. Vaginal birth also poses too many risks for the mother, who could experience severe hemorrhaging during labor, delivery, or after the first few hours of delivery. (Shannon Johnson-2016).

2.4.10.5 Apperance of placenta previa:

Transabdominal scanning can be used to visualize the internal cervical os and to determine the relation of the placenta to the cervix in most cases. Factors that can adversely affect the visualization of the cervix include: prior abdominal surgery, obesity, deep or low position of the fetal head or presenting part, overfilled or under filled maternal bladder, or uterine

contractions. Although placenta previa can occur in nulliparas, risk factors include number of prior caesarean deliveries, increasing parity independent of number of prior caesarean deliveries, and increasing maternal age. (Rumack et al 2011).

Care should be taken not to mistake a more serious situation, such as placental abruption or placenta accreta, for placenta previa, because the management of these conditions is different. In addition, the radiologist must avoid satisfaction-of-search errors. The possibility of one of these diagnoses complicating placenta previa must be excluded.(Shannon Johnson-2016).

The likelihood of congenital anomalies and transverse fetal positioning is slightly higher in patients with placenta previa than in others. Special care should be taken to document such findings. (Shannon Johnson-2016).

2.4.10.6 Treatment for placenta previa:

Once diagnosed, placenta previa will usually require bed rest for the mother and frequent hospital visits. Depending on the gestational age, steroid shots may be given to help mature the baby's lungs. If the mother experiences bleeding that cannot be controlled, an immediate cesarean delivery is usually done regardless of the length of the pregnancy. Some marginal previa can be delivered vaginally, although complete or partial previa would require a cesarean delivery.

Most physicians recommend women who are experiencing placenta previa to avoid intercourse, Limit traveling and avoid pelvic exams. (Farine D. A_2009).

2.5 The ultrasound physics:

Ultrasound relies on high frequency sounds to image the body and diagnose patients. Ultrasounds are therefore longitudinal waves which cause particles to oscillate back and forth and produce a series of compressions and rarefactions. The amplitude is the distance a particle moves back or forth. Compressions are areas of the wave where particles are close together and there is high pressure. (Trish Chudleigh, et all 2004).

2.5.1 Production of sound waves:

Ultrasound waves are produced when an electrical signal is applied to a piezoelectric crystal, it is produced by a piezoelectric crystal that has a dipole regions of positive and negative charges, when the piezoelectric crystal is stimulated electrically ,the crystal expands a long its short axis. If the polarity of the electric signal changed is reversed, the crystal will contract. When the crystal regains its original size and shape, it emits ultrasound waves Conversely if the ultrasound waves hits the piezoelectric crystal, it will produce the same shape deformity and after stability it will produce an electrical signal. (Trish Chudleigh, et all 2004).

2.5.2 Frequencies used in ultrasound diagnosis:

Ultrasound uses high frequency sounds that are higher than the human ear can hear. ie. 20 000 Hz. Ultrasound can't detect objects that are smaller than its wavelength and therefore higher frequencies of ultrasound produce better resolution. On the other hand, higher frequencies of ultrasound have short wavelengths and are absorbed easily and therefore are not as penetrating. For this reason high frequencies are used for scanning areas of the body close to the surface and low frequencies are used for areas that are deeper down in the body. (Trish Chudleigh, et all 2004).

Figer (2-24). Ultrasound machine (sonosolustion-2017)

2.5.3 Ultrasound transducers:

Transducers convert electrical energy into mechanical energy to produce ultrasound and vice versa. The part of the transducer which does this work is a piezo electric crystal. It can be synthetic or natural. They have an inherent property of vibrating when an electric current is applied and thus produce ultrasonic waves and conversely produce electric impulse when vibrated thus helping the acquisition of data for the formation of image. This effect is called "Piezoelectric effect". (Trish Chudleigh, et all 2004).

Figure (2-25). Ultrasound Transducers curvilinear probe. (Trish Chudleigh, et all 2004).

2.5.4 Doppler Basics

Doppler imaging can determine the presence and the direction of blood flow. The movement of the blood cells toward the transducer compresses the sound waves and creates shorter wavelengths and higher frequencies than those emitted by the transducer and called a positive shift or red shift.

The movement of the blood cells away from the transducer expands the sound waves and creates a longer wavelengths and lower frequencies than those emitted by the transducer which is called a negative shift or Blue shift. (Trish Chudleigh, et all 2004).

2.6 Previous Studies

Association of placenta previa with repeat cesarean section in Sudan and SaudiArabia2014-2015 done by; (Abdelraheem M et al 2016) the total number of deliveries in hospital of Omdurman city in Sudan during the study period was 200 pregnant women. Out of them 87 (43.5%) delivered vaginally, 66(33%)deliver by cesarean section subdivided into four groups, one SC 22(11%), tow CS 29 (14.5%) three CS 2(1%) and 47 (23.5%) were prime gravid a, compare with 200 pregnant women in najran city in KSA 108 (54%)delivered vaginally 64(32%) deliver by cesarean section subdivided into three groups, one SC 26(13%), tow CS 23 (11.5%) and three CS 15(8%).The prevalence of PP in this study increase with increasing number of previous CS, and was associated with adverse feto-maternal outcome .

Placenta previa is a common obstetrical problem associated with considerable maternal and fetal morbidity & mortality. Done by; (Sitana Alamin Butran Abd-Allh Sudan university Msc degree 2013).

From the total of 48 pregnancies with history of cesarean section, 12 (25%) had one CS, 14(29.2%) had two CS, 10 (20.8%) had three section.10 (20.8%) had four section. and tow pregnant (4.2 %) had five SC. The percentage of PP associated with the number of cesarean section was 0%, 100%, 70%and 50% respectively.

Frequency of Placenta previa and Maternal Morbidity Association with Previous Cesarean delivery. Done by : (Nankali N et al 2014)

Result: Among 2696 women, 98 cases had PP (3.63%). The mean age was30 years,76.5%(75cases) had gravidity 2and 3, 87.8% (86) cases had parity 1-3. Anterior location of placenta was44.9 %while posterior was 55.1%. 48% were complete PP, 32.7% low line PP, 13.3% marginal PP, and 6% partial PP. 26.5% has a history of abortion. 55.1% of patient had male fetus. There was an increase in frequency of placenta previa with just

one previous c-section (74.5%). Frequency of accreta PP 32% (n = 7), increta (14.3%, n = 3) and percreta (28% n = 6). Among those who underwent emergency hysterectomy (21 cases) 23.8% case had no abnormal placentation30.6% of newborns had birth weight <2500 g. Conclusion we concluded that patient with history of one previous c-section delivery and had more previous PP and need to hysterectomy were more than those with history of 2-3previous c-section.

Conclusion :Finding of this study showed that frequency of placenta previa was 3.63% among patient with history of previous Cesarean delivery. 74% of patient with placenta previa had history of one previous C- section and the rate of the need of hysterectomy in these patient was 47.6%. the most common type of abnormal placentation was accrete, perecreta, and increta respectively.

Incidence Causing and Outcome of placenta previa, done by (Farhat Nasreen -1995). In a prospective study.100 cases of pregnancy beyond 28 weeks of gestation, complained by placenta previa were identified. The total number of deliveries were 2828, patients presented with PP were 100. Patient with PP were 100 giving and incidence of 3.5%. of 3.5% major degree of PP were 2.3% while 1.2% were type I and II. The maximum number of patient were 35 years and above .There were 7 times as many multipara having PP as nullipara, repeated myometrial\endometrial damage due to repeat pregnancy being the most common cause. About 60% of patients at least one or more gynaecol\obstet procedures before the present pregnancy. Incidence of patient with PP was significantly higher in patient with P C-S (5.3%) than over all incidences of (3.5%). However, in our study cases were thrice as likely to have had curettage 46% than previous CS 15.9%.

Chapter Three

Material and methods

Chapter Three

Material and method

3.1 Materials

3.1.1 Patient population:-

A total of 42 pregnant women at second and third trimester selected randomly. The patient differ in age (46 – 16) years old and show similar sonographic finding.

3.1.2 Machine:-

All patient were subjected to be examined by U\S scanning using mindaryDC-6- North America -issue date 2012-09 and general electric scanners with 3.5 MHz probe.

3.1.3 Area of the study:-

This study will be conducted in Khartoum state, Omdurman Obstetrics& Gynecology Hospital.

3.2 Method:-

Selection of study cases those are pregnant lady in their second and third trimester all women with or without symptoms who are complaining of PP showing placental implantation in lower uterine segment on US were documented. Then women with PP were further examined for detailed obstetrical history especially the history of previous CS, parity and maternal age.

3.2.1 Method of data collection:

Observational of direct ultrasound examination of placenta . Data collected on data collecting sheets.

3.2.2 Data presentation:

Data will be presented in tables and figures.

3-3 Inclusion criteria

Any pregnant lady with history of previous CS attending to antenatal clinic in their second and third trimester.

3-4 Exclusion criteria of the study cases:-

This study excluded :

(a) Known study cases have a not placenta previa andprevious CS.

(b)Patients have placenta previa with missed data.

3-5 Technique:-

All the pregnant ladeis were examined in the supine position with convex low frequency transducer 3.5MHz.A clear gel is applied to the area of the body being studied to help the transducer make secure contact with the body and eliminate air pockets between the transducer and the skin.If the internal cervical os can be visualized and if no placental tissue overlies it, placenta previa is excluded. However, an attempt must be made to identify the inferior-most aspect of the placenta and to determine the distance between it and the internal os. The conditions that are most commonly misdiagnosed as placenta previa are an over distended bladder and myometrial contractions. Over distention of the maternal urinary bladder further imaging should be performed after the patient empties her bladder. During a myometrial contraction, Findings from repeat imaging performed after 30 minutes should be sufficient to exclude this condition.

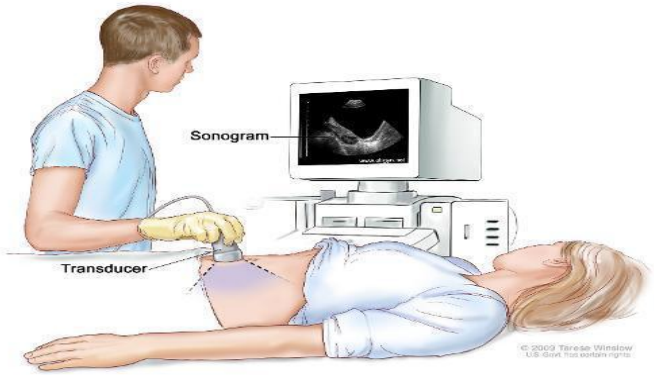


Figure (3.1) Diagram illustrate obstetric transabdomenal ultrasound technique

3.6 Ethical consideration:-

A written permission is issued and taken from the hospital director. To collect the suitable data for the study; personal information from any patient written in the collection sheet as well as the results. this include : clinical information and Ultrasound finding .See the append

3.7 Data analysis:

Finally these data was tabulated described and analyzed using SPSS versi. Answer from data collection sheet will be coded and put into statistical package to make data matrix this study is a correlation search study.

Chapter Four

Results

Chapter Four

4. Results:

Table (4.1) show statistical parameters for the age to all patients:

	Mean	Median	SD	Min	Max
Age	30.47	30	6.21	17	46

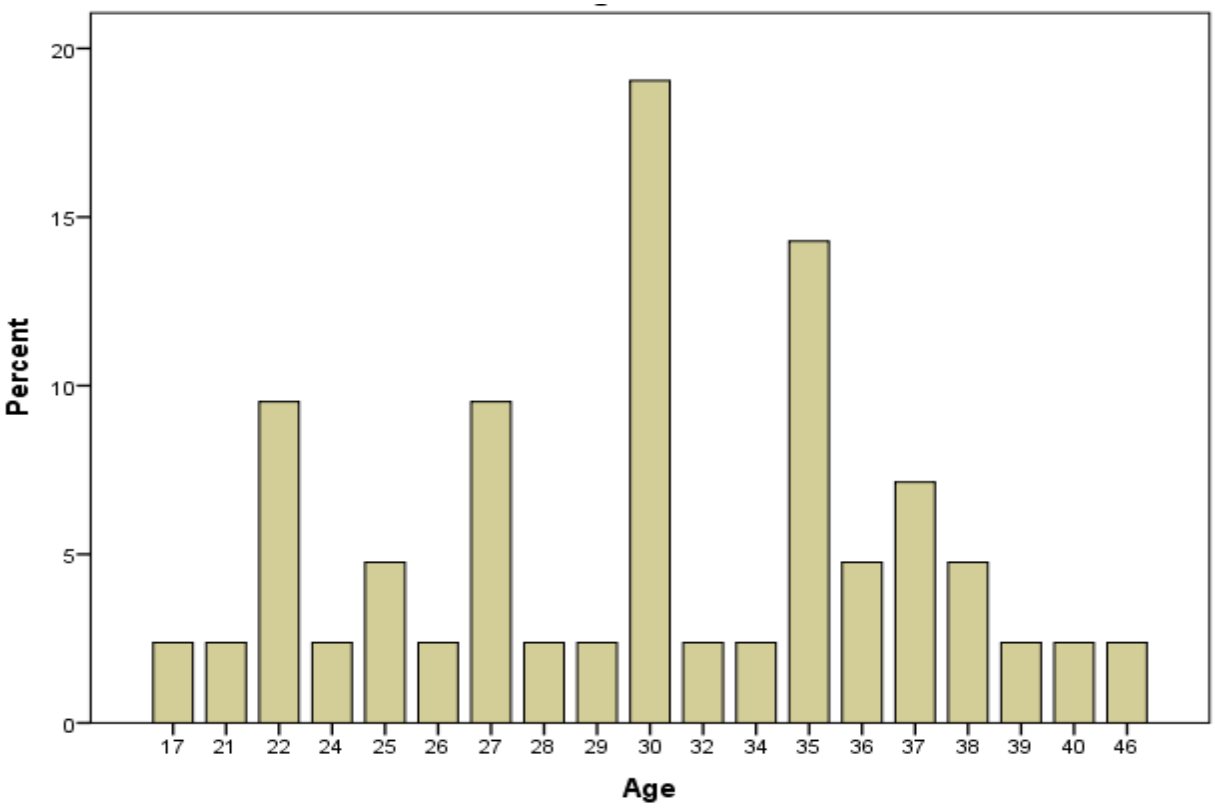


Figure (4.1) show frequency distribution for age among all patients.

Table (4.2) show frequency distribution for Sign and Symptoms.

Sign and Symptoms	Frequency	Percent
None	26	61.9%
Painless V. Bleeding	16	38.1%
Total	42	100%

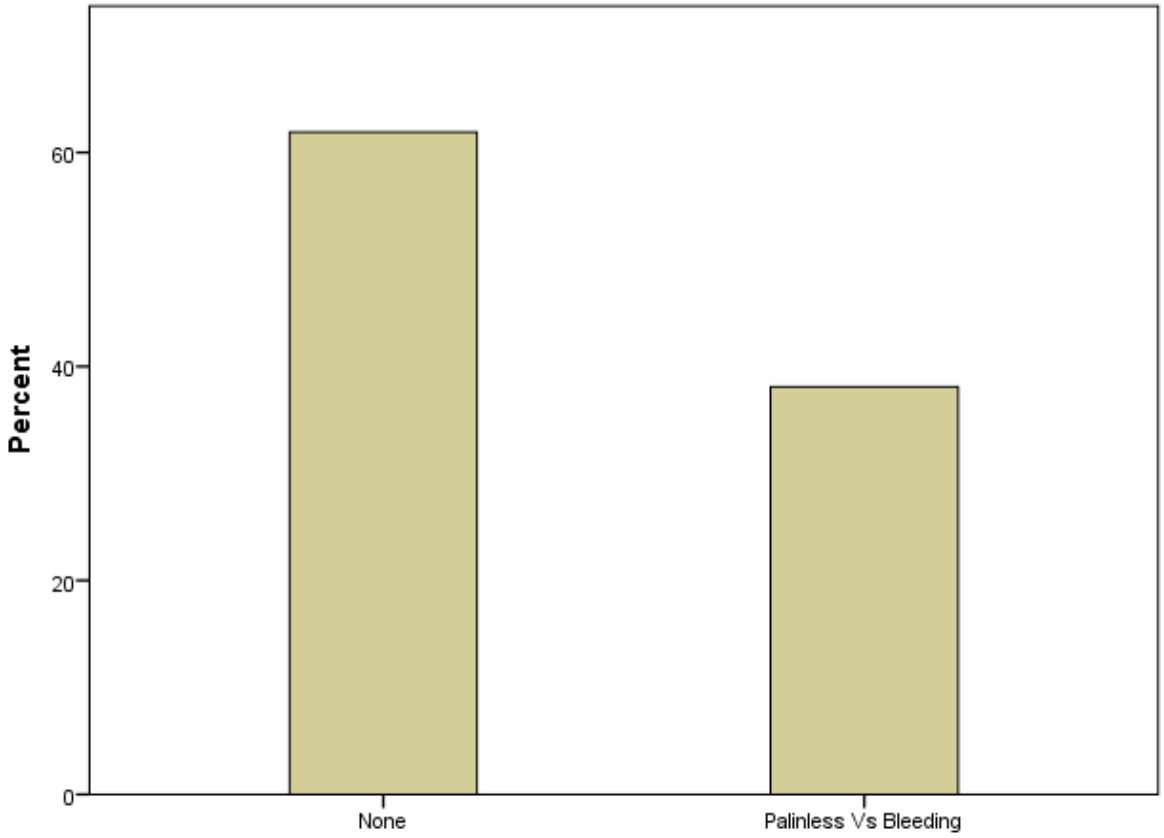


Figure (4.2) show frequency distribution for Sign and Symptoms.

Table (4.3) show frequency distribution for Parity.

Parity	Frequency	Percent
0	6	14.3%
1	5	11.9%
2	6	14.3%
3	6	14.3%
4	8	19.0%
5	4	9.5%
6	2	4.8%
7	2	4.8%
8	2	4.8%
9	1	2.4%
Total	42	100%

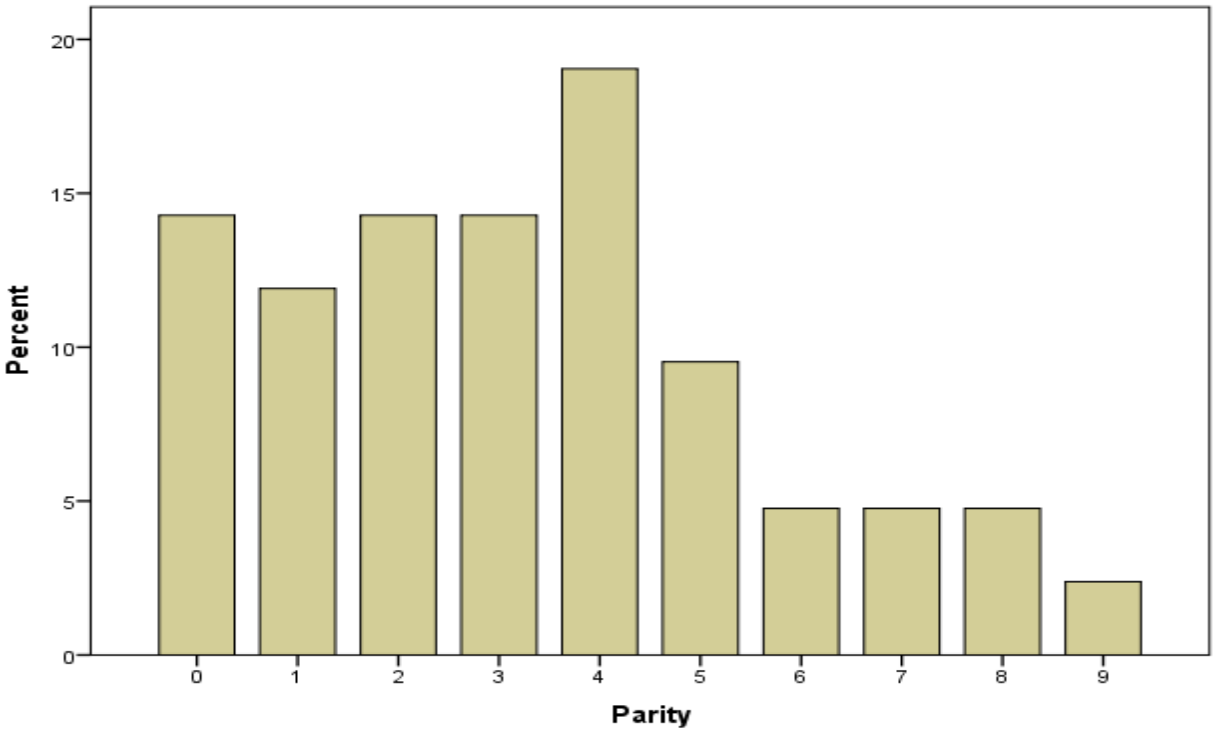


Figure (4.3) show frequency distribution for Parity.

Table (4.4) show frequency distribution for previous cesarean section (PC-S).

PC-S	Frequency	Percent
0	24	57.1%
1	5	11.9%
2	2	4.8%
3	8	19.0%
4	2	4.8%
5	1	2.4%
Total	42	100.0%

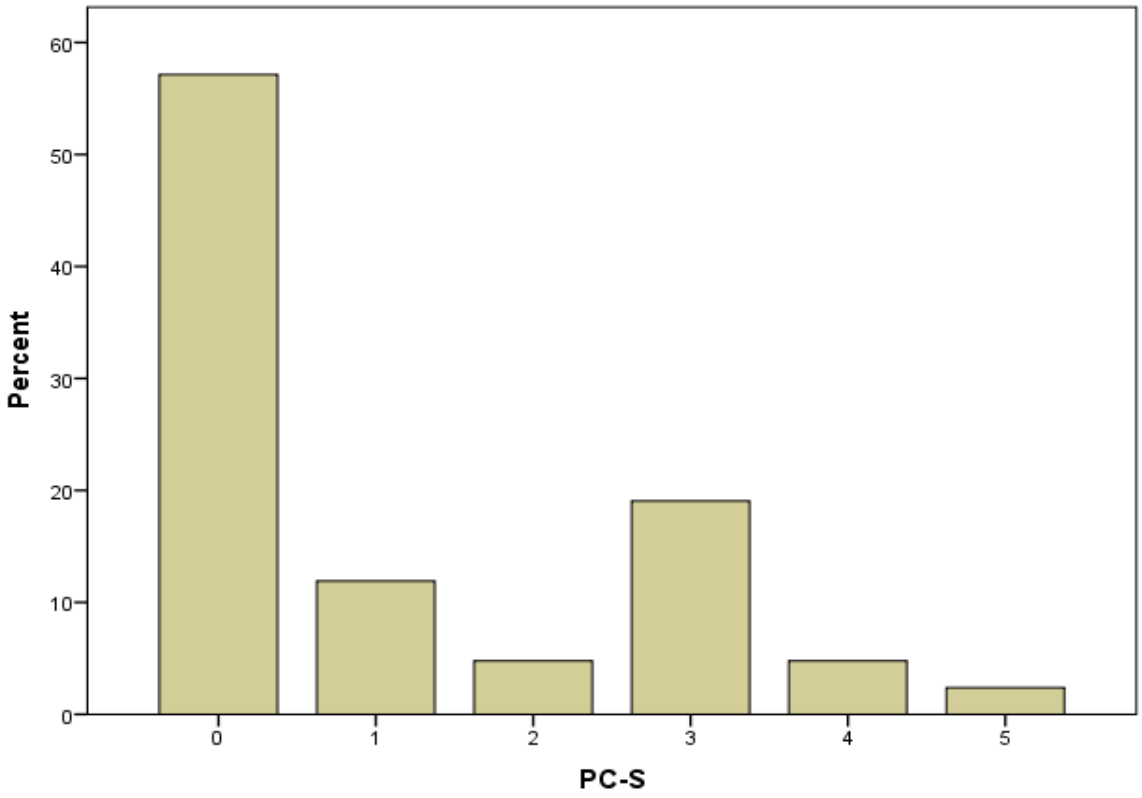


Figure (4.4) show frequency distribution for PC-S.

Table (4.5) show frequency distribution for Placenta Location.

Placenta Location	Frequency	Percent
A	19	45.2
P	13	31.0
Lat	10	23.8
Total	42	100.0

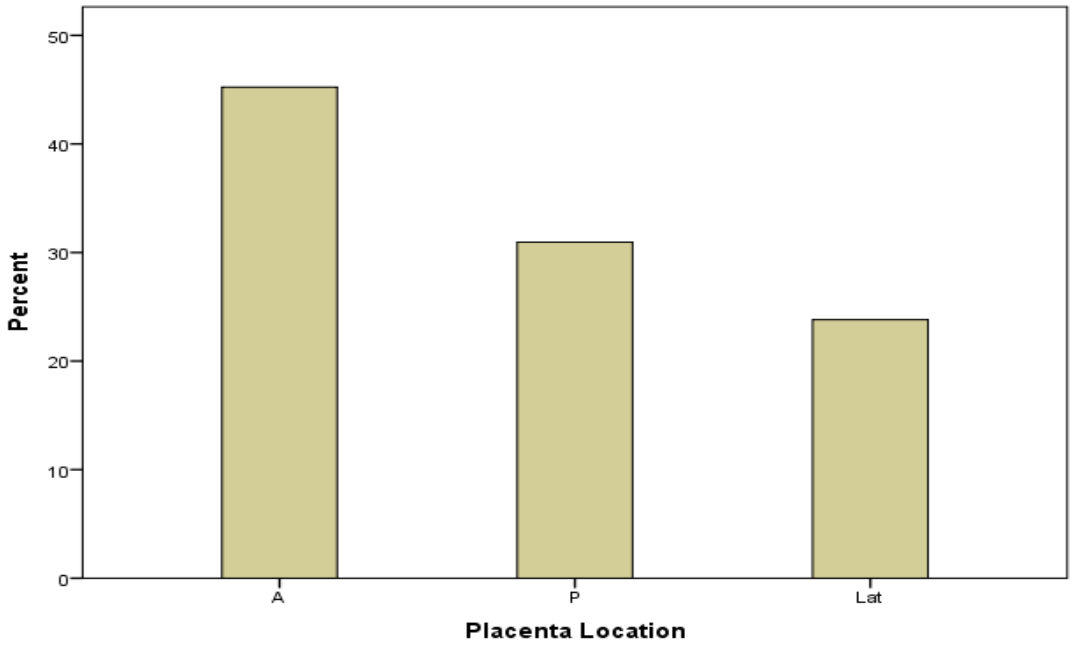


Figure (4.5) show frequency distribution for Placenta Location.

Table (4.6) show frequency distribution for type of placenta previa:

Placenta type	Frequency	Percent
Minor	22	52.4
Major	20	47.6
Total	42	100.0

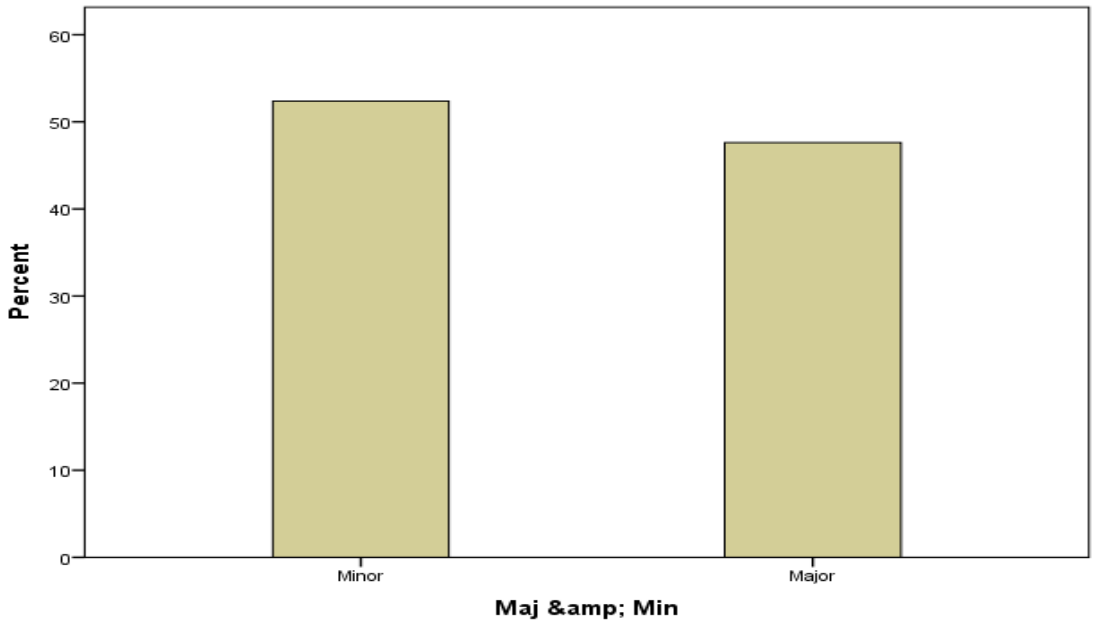


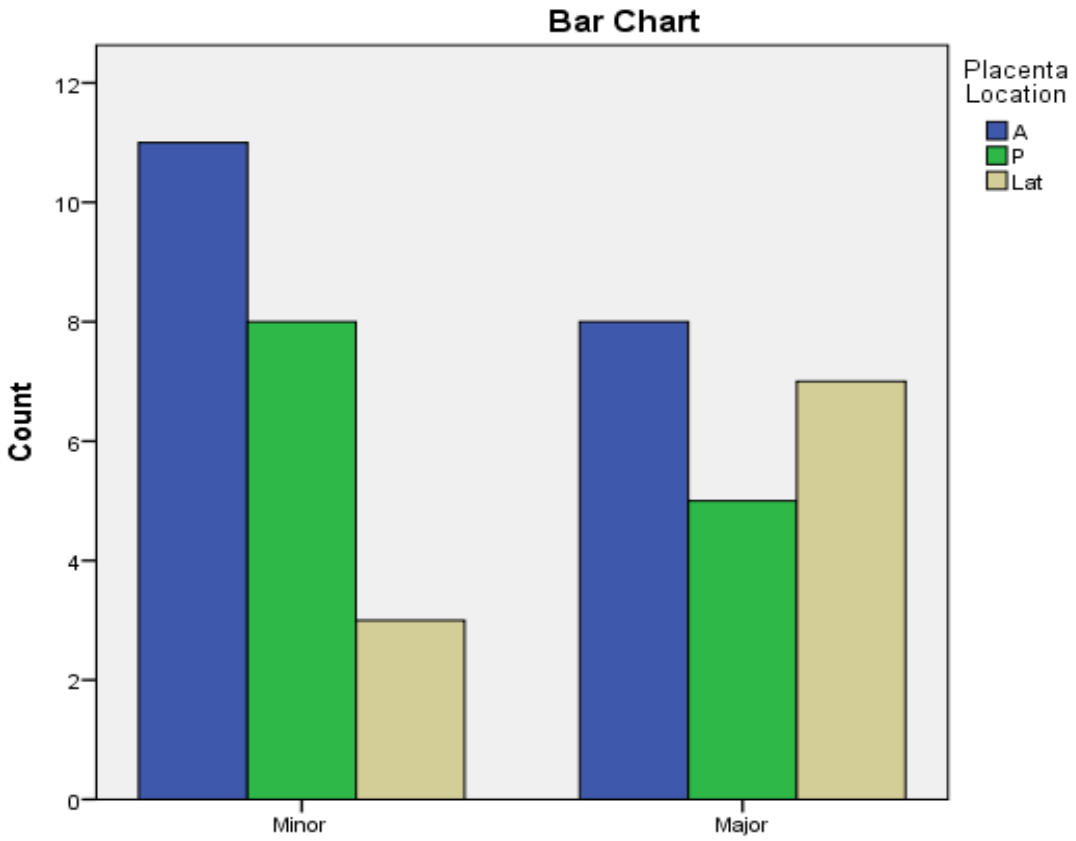
Figure (4.6) show frequency distribution for Placenta type (major & minor).

Table(4.7) show Correlation between placenta types with Placenta location.

Placenta type* Placenta Location Crosstabulation

Count

Placenta type		Placenta Location			Total
		A	P	Lat	
	Minor	11	8	3	22
	Major	8	5	7	20
Total		19	13	10	42



Placenta types & location.

Figure (4.7) show Correlation between Placenta typeswith Placenta location.

Table (4.8) show Correlation between Age with Placenta location.

Age * Placenta Location Crosstabulation

Count

		Placenta Location			Total
		A	P	Lat	
Age	17	1	0	0	1
	21	1	0	0	1
	22	2	2	0	4
	24	0	1	0	1
	25	1	1	0	2
	26	0	1	0	1
	27	2	1	1	4
	28	1	0	0	1
	29	1	0	0	1
	30	4	0	4	8
	32	0	1	0	1
	34	0	1	0	1
	35	2	2	2	6
	36	0	1	1	2
	37	2	1	0	3
	38	1	0	1	2
	39	1	0	0	1
	40	0	0	1	1
	46	0	1	0	1
Total		19	13	10	42

Table (4.9) show Correlation between parity with Placenta location.

Parity * Placenta Location Crosstabulation

Count

		Placenta Location			Total
		A	P	Lat	
Parity	0	3	1	2	6
	1	0	2	3	5
	2	3	3	0	6
	3	2	2	2	6
	4	2	4	2	8
	5	3	0	1	4
	6	2	0	0	2
	7	1	1	0	2
	8	2	0	0	2
	9	1	0	0	1
Total		19	13	10	42

Table (4.10) show Correlation between PC-S with Placenta location.

PC-S * Placenta Location Crosstabulation

Count

		Placenta Location			Total
		A	P	Lat	
PC-S	0	10	9	5	24
	1	0	3	2	5
	2	2	0	0	2
	3	5	1	2	8
	4	1	0	1	2
	5	1	0	0	1
Total		19	13	10	42

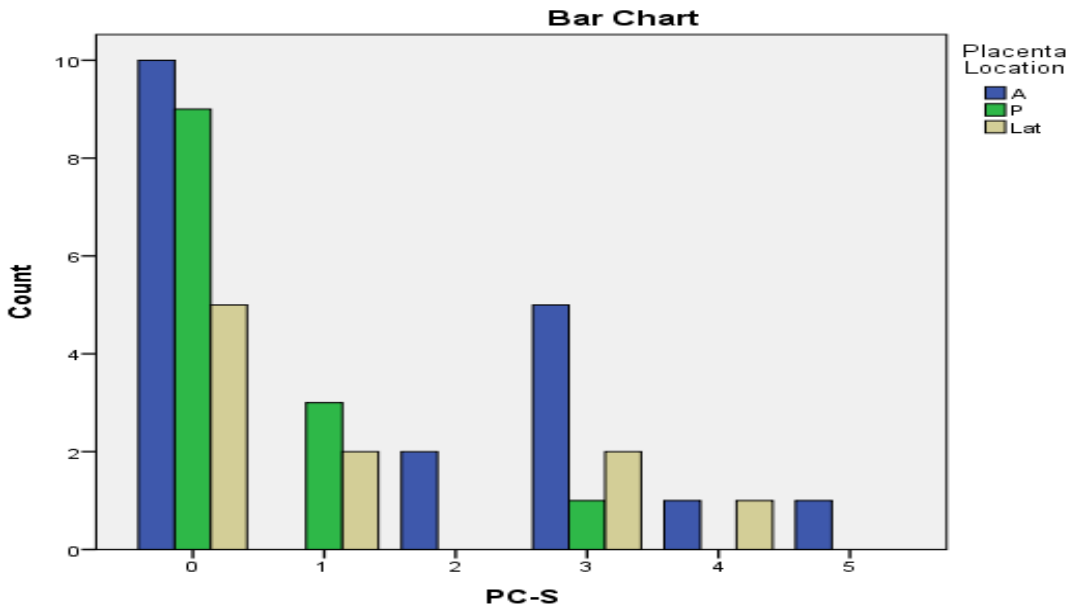


Figure (4.8) show Correlation between PC-S with Placenta location.

Table (4.11) show Correlation between Major and minor with Placenta location.

Placenta type * Placenta Location Crosstabulation

Count

		Placenta Location			Total
		A	P	Lat	
Maj & Min	Minor	11	8	3	22
	Major	8	5	7	20
Total		19	13	10	42

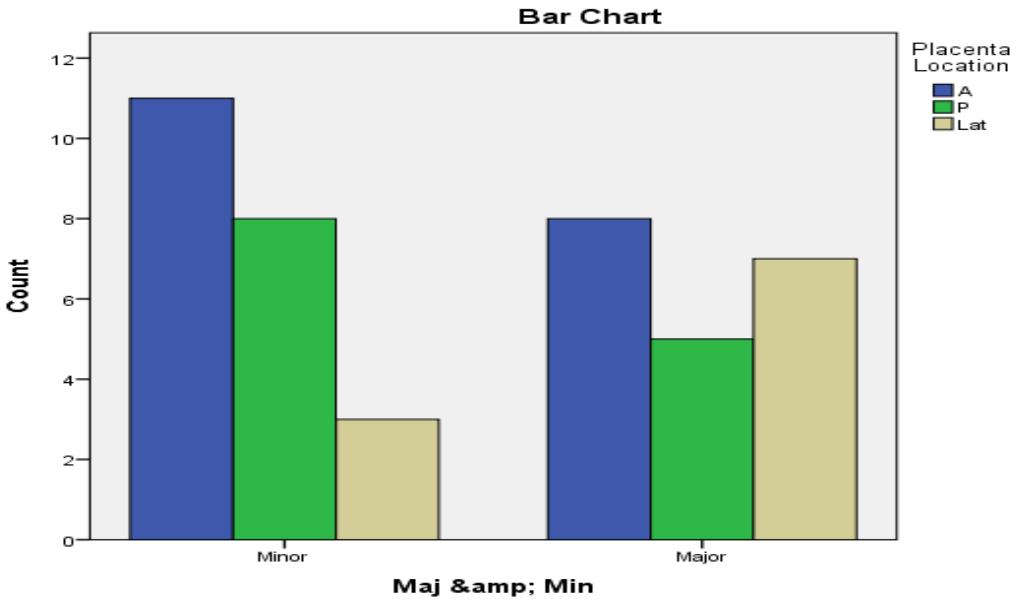


Figure (4.9) show Correlation between placenta type with Placenta location.

Table (4.12) show correlation between PCS with parity for all patients.

parity * PCS Crosstabulation

Count

		PCS						Total
		0	1	2	3	4	5	
parity	0	6	0	0	0	0	0	6
	1	2	3	0	0	0	0	5
	2	4	1	0	0	0	0	5
	3	2	1	0	3	0	0	6
	4	4	0	0	3	1	0	8
	5	2	0	1	0	0	1	4
	6	0	0	1	1	0	0	2
	7	1	0	0	0	0	0	1
	8	2	0	0	0	1	0	3
	9	1	0	0	1	0	0	2
Total		24	5	2	8	2	1	42

Chapter Five

Discussion

Chapter Five

5 Discussion

All patients in this study aged between 17 - 46 years, The mean age is 30.47 years, median is 30 years.(Table 4-1).This result similar to (Nankali N et al 2014) study.

Study found that 26 case (61.9%) asymptomatic and 16 case (38.1) complain of painless vaginal bleeding.(Table 4-2)Relation to parity study showed that a high proportion of patients with placenta previa were multiparous 36 case (85.8%) there was a higher percentage of PP incidence in patient with 4 parity 8 cases (19%). While nuliparous were 6 cases (14.3%). (Table 4-3), agree with (Farhat Nasreen -1995) study.

According to previous cesarean section pregnant have PS 18 cases (42.8%).Women without PS 18 cases (57.1%) out of 42 pregnant women. pregnant have 1 PS 5 cases (27.8%), 2 PS 2 cases (11.1%), 5 PS 1 cases (5.5%), 5 PS 1 cases (5.5%) and recurrent of placenta previa was detected at repeat C-section 3 PS 8 cases (19%) from all cases and (44.4%) in patient with previous scar. Recurrent of placenta previa was detected at repeat C-section 3 times with 8cases (19%). The prevalence of PP in this study increase with history of previous CS, (Abdelraheem M etal 2016) and (Nankali N et al 2014) had same result.(Table 4.4).

According to Placenta Location, anterior location of placenta 19 case (45.2%),while posterior was 13 cases (31.%) and lateral location of placenta repeat 10 times (23.8%).(Table 4.5) disagree with (Nankali N et al 2014) where his study divided Placenta Location into anterior and posterior only above that he had a large sample 98 cases.

Finding of this study showed that types of placenta(major and minor), the minor degree of placenta previa is 22 case (52.4%) higher than major degree of placenta previa 20 patient (47.6%).(Table 4.6)disagree with (Farhat Nasreen -1995) study because he had a large sample 100 cases.

Table 4.8 show Correlation between Ages with Placenta location the incidence of anterior and lateral placental location is higher in patient with 30 ages. Table 4.9 show Correlation between parity with Placenta location, anterior is high with (0-2-5 party) posterior location high occurring 4 times with patient had 4 parity and lateral location diagnosed in patient had 1 parity, Anterior placental location had higher incidence.

Table (4.10) shows Correlation between PC-S with Placenta location, anterior placenta is high with (3 perior C-section) appearing in 5 cases. Posterior location high occurring 3 times with patient had 1 perior C-section and lateral location diagnosed in patient had (1-3) perior C-section equally. Table (4.11) show Correlation between Major and minor with Placenta location, Major and minor types of PP previa correlated with anterior placenta location. Repeated lateral location higher at major type, 7 times compare with 3times at minor type. Table (4.12) show correlation between PCS with parity for all patients.

5.2 Conclusion:

The mean age is 30.47 years, median is 30 years. Study found that pregnant women complain of painless vaginal pleading is less than asymptomatic one. This study demonstrates that a high proportion of patients with placenta previa were multiparous. The risk increases with number of prior cesarean deliveries and advancement of maternal age. According to Placenta Location, anterior location of placenta high percentage while posterior and lateral location of placenta was low incidence.

Finding of this study showed that types of placenta, the minor degree of placenta previa is higher than major degree of placenta previa. Advances in ultrasonography have made it possible to diagnose this condition with reasonable accuracy, which allows appropriate management planning.

5.3 Recommendations:

Early diagnosis of placenta previa, and identification of risk factor such as previous CS, may help in better outcome by reducing the fetomaternal complication.

Training of medical staff on prenatal clinic is important to improve health care.

Patient with placenta previa should be give birth in specialized tertiary center.

Fallow up pregnancy and repeat ultrasound exam at second and third trimester.

The author recommends that, this study should be widening into other stat of Sudan in order to have wide information which may help decision makers on health care planning.

In Future I hope that collage allow student to start their thesis early to giving chance for them to study more patient and increase sample size which help in gaining accurate result.

Appendices

Appendices (1)

Data Sheet

No	Age	Signe & Symptoms	Parity	P C-S	A/p	Other	Major	Minor

Appendices (2)

Images

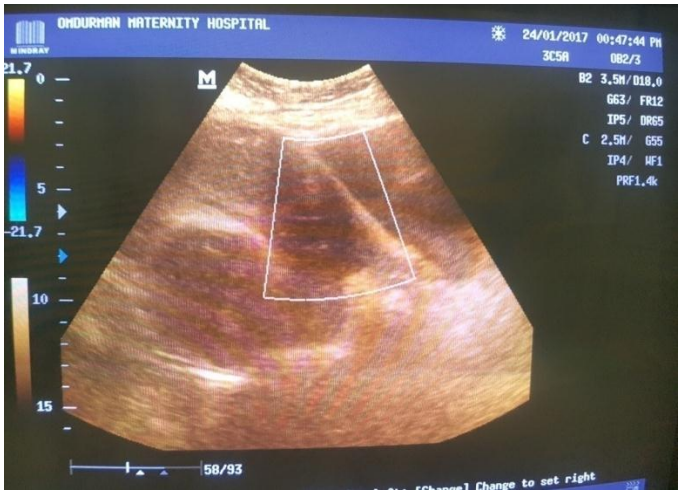


Image (1) 30 years old patient with Painless vaginal bleeding Transabdominal sonogram show PP major.

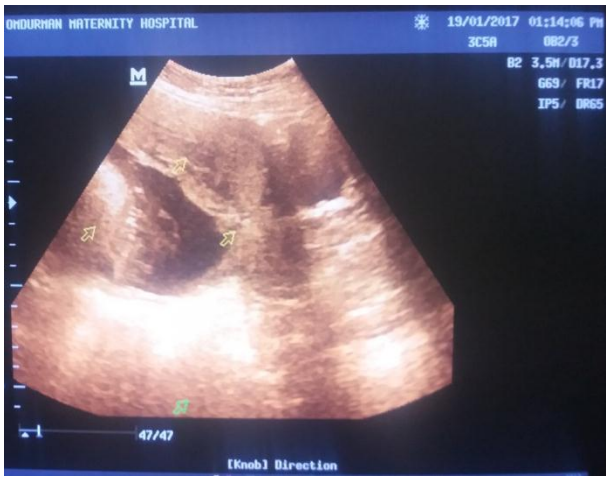


Image (2) 37 years old patient with Painless vaginal bleeding Transabdominal sonogram show Placental edge retching the internal os.

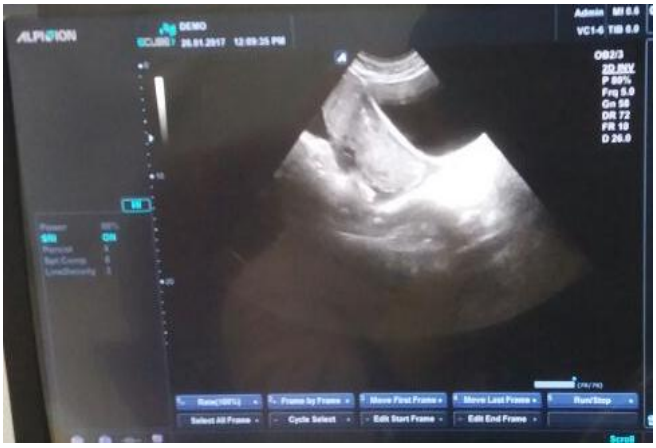


Image (3) 37 years old patient with Painless vaginal bleeding. Transabdominal sonogram shows Placental edge reaching the internal os.

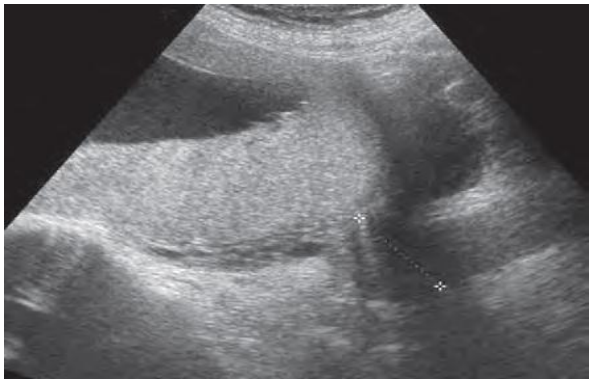


Image (4) 37 years old patient with Painless vaginal bleeding. Longitudinal transabdominal sonogram demonstrates complete symmetric placenta previa.

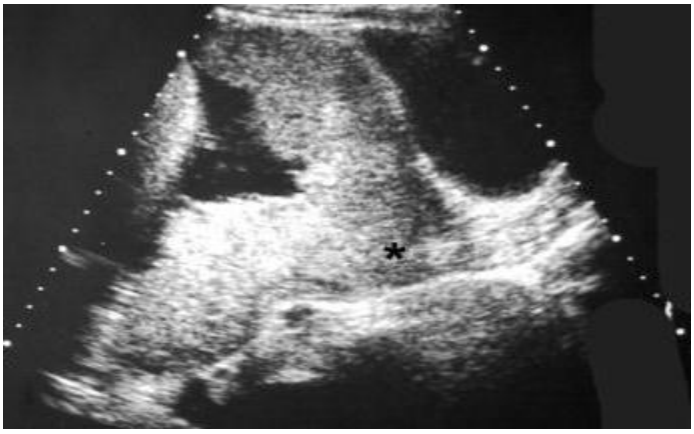


Image (5) 37 years old patient with Painless vaginal bleeding. Longitudinal transabdominal sonogram demonstrates complete symmetric placenta previa.

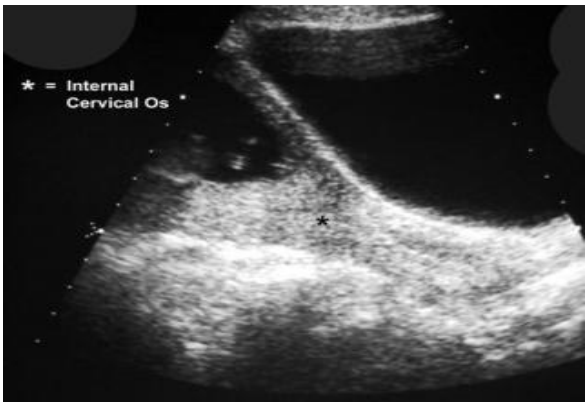


Image (6) 27 years old patient with Painless vaginal bleeding. Ultrasonogram shows asymmetric complete placenta previa. Follow-up examination should be performed after the patient has voided to prevent false-positive results. An overdistended bladder may have the appearance of placenta previa.

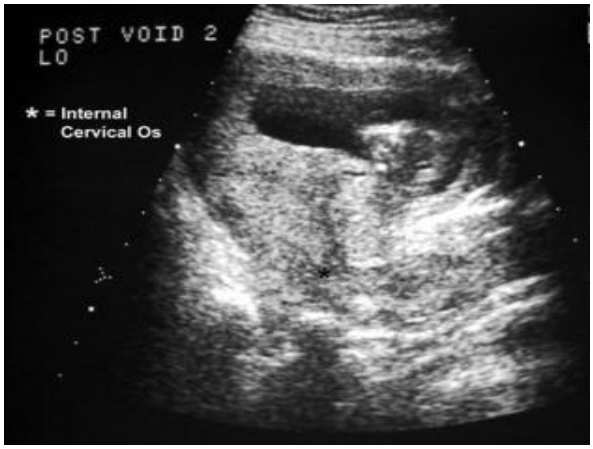


Image (7) 27 years old patient with Painless vaginal bleeding. Postvoiding longitudinal sonogram shows that the findings in a patient are not related to an overdistended bladder but rather to a true placenta previa.

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