

Chapter One

Introduction

1.1 Introduction:

Threatened Abortion is the most common complication in the first half of pregnancy. Its incidence varies between 20-25%.

The main reasons for vaginal bleeding in early pregnancy are subchorionic haemorrhage, subchorionic haematoma and rupture of a marginal placental sinus.(Saurbrei1986)

In majority of the cases of threatened abortion the bleeding is of unknown origin and usually slight. Most of these pregnancies continue to term with or without treatment. Spontaneous abortion occurs in less than 30% of the women who experience threatened abortion .(Arias F.1997)

The symptoms and signs of threatened abortion are so variable that the outcome of the pregnancy cannot be reliably predicted by clinical features at presentation. Thus various biochemical and biophysical tests have been applied extensively in attempts to improve the accuracy of predicting the outcome of these pregnancies(Stabile 1989 .) Threatened abortions have been shown to be associated with increased incidence of antepartum haemorrhage, preterm labor and intra uterine growth retardation.(Baztofen 1984 .)

The clinical features of threatened abortion are vaginal bleeding before 20 weeks of gestation, accompanied by cramping pain, and sometimes without changes of the cervix .(Sotiriadis A 2004),Other than clinical symptoms, ultrasound examination is an important auxiliary procedure for diagnosis of abortion.The sonographic findings using conventional ultrasound have been assessed and are considered to have a prognostic value that interacts with other clinical and maternal factors analyzed .

Diagnostic ultrasound is the most common imaging technique used to supplement the physical and clinical examination of the threatened abortion and is an accurate means of evaluating many

associated sonographic findings Of the sonographic factors used in the assessment and prognosis of fetal viability in early pregnancy, the presence and significance of subchorionic bleeding have received scant attention. (Carol M. Rumack 2011.)

A cross-sectional study was conducted to evaluate the threatened abortion in first half of pregnancy, sonographic appearance, and natural history of subchorionic bleeding on sequential scans, correlating it with fetal motion, cardiac activity, and the long-term prognosis.

1.2 Problem:

Abortion is the most common complication in the first half of pregnancy and threatened abortion had been shown to be associated with increased incidence of antepartum haemorrhage, preterm labour and intra uterine growth retardation. So this study was to asses the role of ultrasound in threatened abortion to prevent spontaneous pregnancy loss.

1.3 Objective:

1.3.1 General objective:

The purpose of this study is to prospectively investigate the role of ultrasound in characterization of threatened abortion .

1.3.2 Specific objective:

To determine the ultrasound findings that associated with the threatened abortion.

To asses of ultrasound findings in hematoma .

To examine the possible relationship of duration of vaginal bleeding, sub-chorionic hematoma size, and gestational age.

.1.4 Overview of study:

This study consist of five chapters , Chapter One contents Introduction, hypothesis, objectives and overview of the study. Chapter tow deals with Literature reviewwhich includes anatomy, physiology and pathology of female genital tract, ultrasound physics and normal and abnormal sonographic features of threatened abortion and previous studies. Chapter Three contains methodology of the study. Chapter four contains results of the study. Chapter five contains Discussion of the results, Conclusion and recommendation, finally there are list of refrences and appendices which include ultrasound images

Chapter Two

Literature Review

2.1 Embryology of the female reproductive tract:-

In females the genital organs comprise of gonads, reproductive ducts and external genitalia. Gonadal differentiation occurs before the end of the embryonic period, Both the reproductive ducts and external genitalia differentiate before the end of the first trimester (Moore KL, Persaud 2012)

Development of the female genital tract continues in utero, Maturation of the genital tract is continuous during childhood through to puberty. The postnatal development of the reproductive tract is discussed in Normal Pubertal Development and Growth. (Moore KL, Persaud 2012)

2.2 Indifferent gonadal phase:-

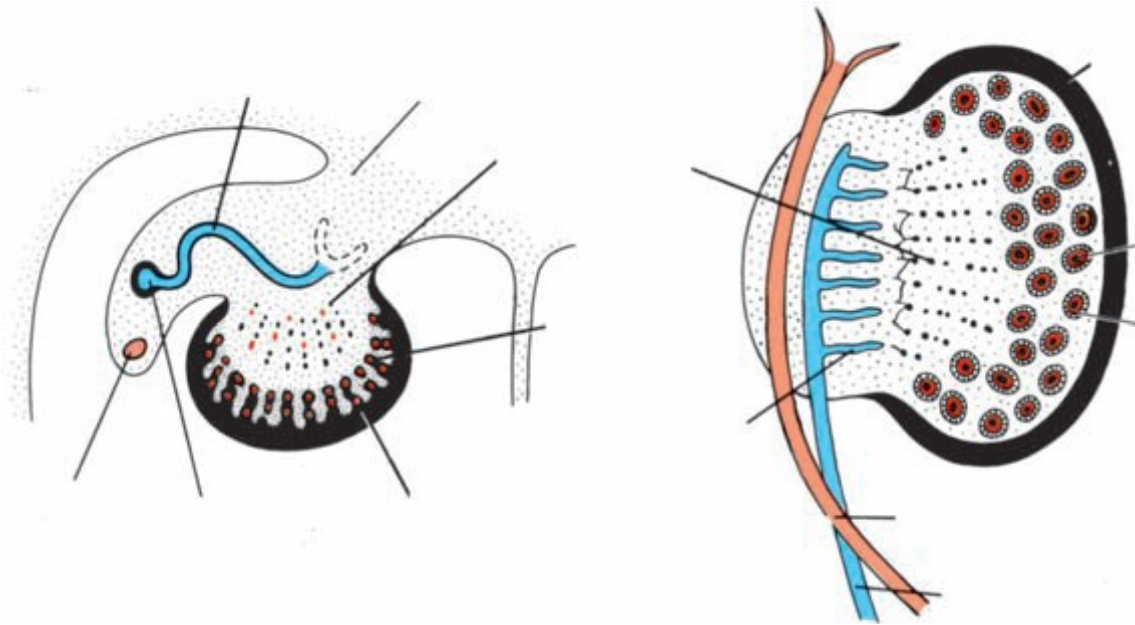
The gonads develop from primitive germ cells, the mesothelium of the posterior abdominal wall and adjacent mesenchyme. Gonadal development begins in the fifth fetal week. The mesothelium medial to the mesonephros of the developing kidneys thickens, yielding the paired gonadal (urogenital) ridges, transient epithelial finger-like structures, referred to as the primary sex cords, form and extend into the supporting mesenchyme. The gonadal ridges remain similar in both male and female fetuses until the seventh week. The indifferent (undifferentiated) gonads are located inside the Wolffian body on the medial aspect of the urogenital ridge, either side of the spine. (Moore KL, Persaud 2012)

2.3 The ovary:-

In female embryos with an XX sex chromosome complement and no Y chromosome, primitive sex cords dissociate into irregular cell clusters, these clusters containing groups of primitive germ cells, occupy the medullary part of the ovary. Later, they disappear and are replaced by a vascular stroma that forms the ovarian medulla (Fig. 2.1). The surface epithelium of the female gonad, unlike that of the male, continues to proliferate.

In the seventh week, it gives rise to a second generation of cords, cortical cords, which penetrate the underlying mesenchyme but remain close to the surface (Fig. 2.1). In the third month, these cords split into isolated cell clusters.

Cells in these clusters continue to proliferate and begin to surround each oogonium with a layer of epithelial cells called follicular cells. Together, the oogonia and follicular cells constitute a primordial follicle (Fig. 2.1), It may thus be stated that the genetic sex of an embryo is determined at the time of fertilization, depending on whether the spermatocyte carries an X or a Y chromosome. In embryos with an XX sex chromosome configuration, medullary cords of the gonad regress, and a secondary generation of cortical cords develops . In embryos with an XY sex chromosome complex, medullary cords develop into testis cords, and secondary cortical cords fail to develop . (Moore KL, Persaud 2012) .



Figure(2.1). Transverse section of the ovary at the seventh week, showing degeneration of the primitive (medullary) sex cords and formation of the cortical cords. Ovary and genital ducts in the fifth month. Note degeneration of the medullary cords. The excretory mesonephric tubules (efferent ductules) do not communicate with the rete. The cortical zone of the ovary contains groups of oogonia surrounded by follicular cells.

2.4 Genital Ducts

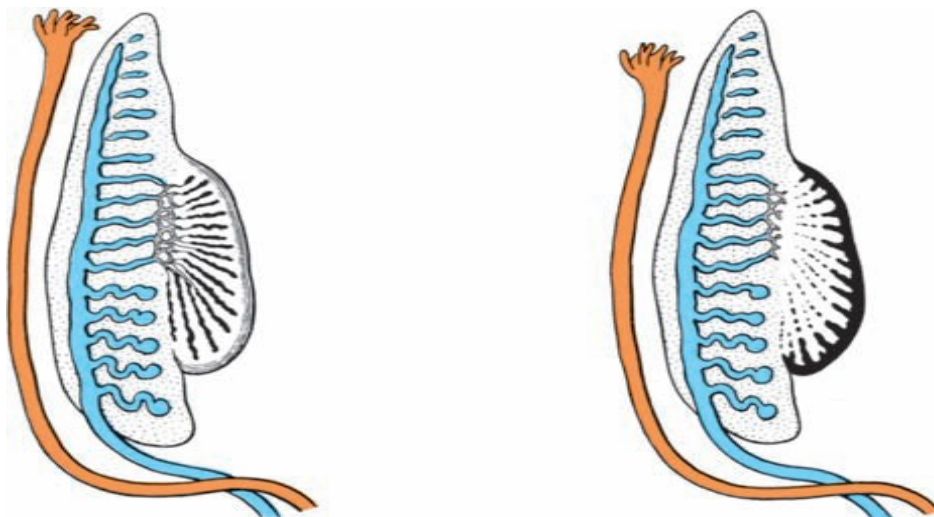
2.4.1 Indifferent Stage

Initially, both male and female embryos have two pairs of genital ducts: mesonephric (wolffian) ducts and paramesonephric (müllerian) ducts.

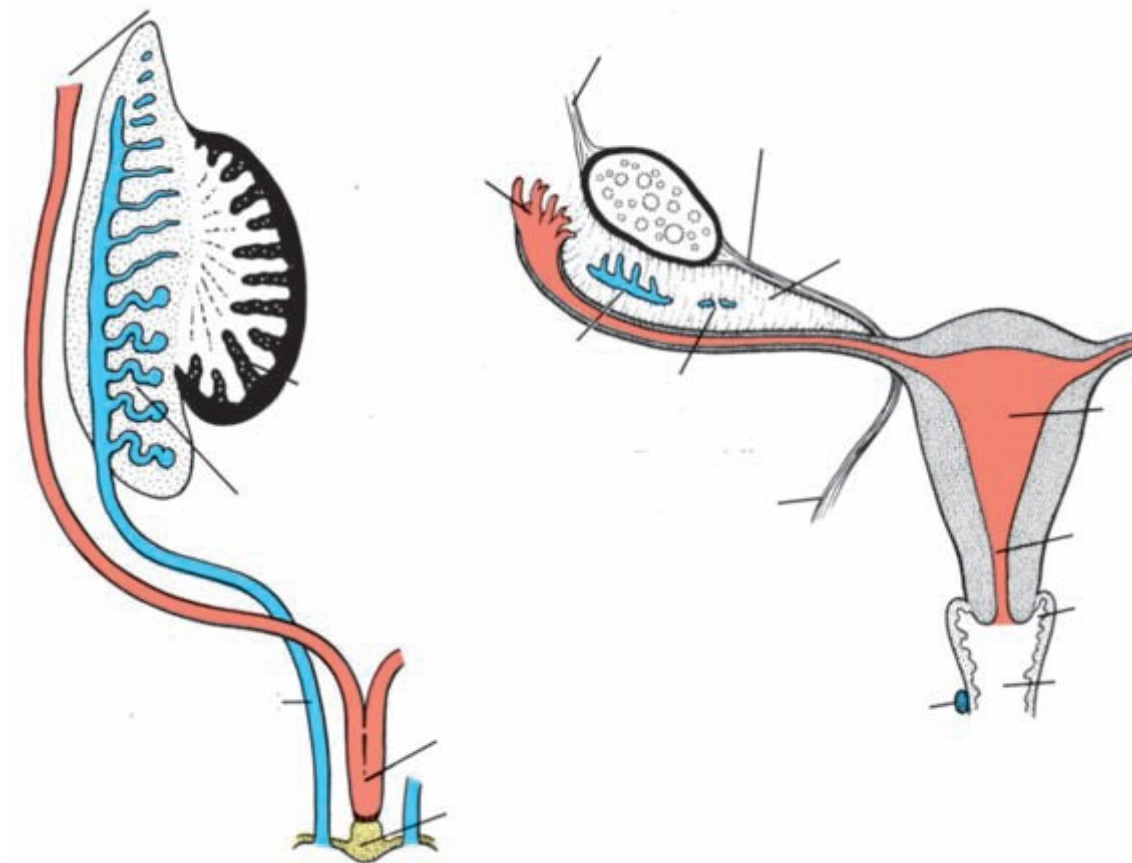
The paramesonephric duct arises as a longitudinal invagination of the epithelium on the anterolateral surface of the urogenital ridge (Fig. 2.2).

Cranially, the duct opens into the abdominal cavity with a funnel-like structure. Caudally, it first runs lateral to the mesonephric duct, then crosses it ventrally to grow caudomedially (Fig. 2.2) .

In the midline, it comes in close contact with the paramesonephric duct from the opposite side. The two ducts are initially separated by a septum but later fuse to form the uterine canal (Fig. 2.3). The caudal tip of the combined ducts projects into the posterior wall of the urogenital sinus, where it causes a small swelling, the paramesonephric or müllerian tubercle (Fig.2.3). The mesonephric ducts open into the urogenital sinus on either side of the müllerian tubercle. (Moore KL, Persaud 2012) .



(Figure 2.2): Genital ducts in the sixth week in the male A and female B. The mesonephric and paramesonephric ducts are present in both. Note the excretory tubules of the mesonephros and their relation to the developing gonad in both sexes.



(Figure 2.3): Genital ducts in the female at the end of the second month. Note the paramesonephric (müllerian) tubercle and formation of the uterine canal. B. Genital ducts after descent of the ovary. The only parts remaining from the mesonephric system are the epoophoron, paroophoron, and Gartner's cyst. Note the suspensory ligament of the ovary, ligament of the ovary proper, and round ligament of the uterus.

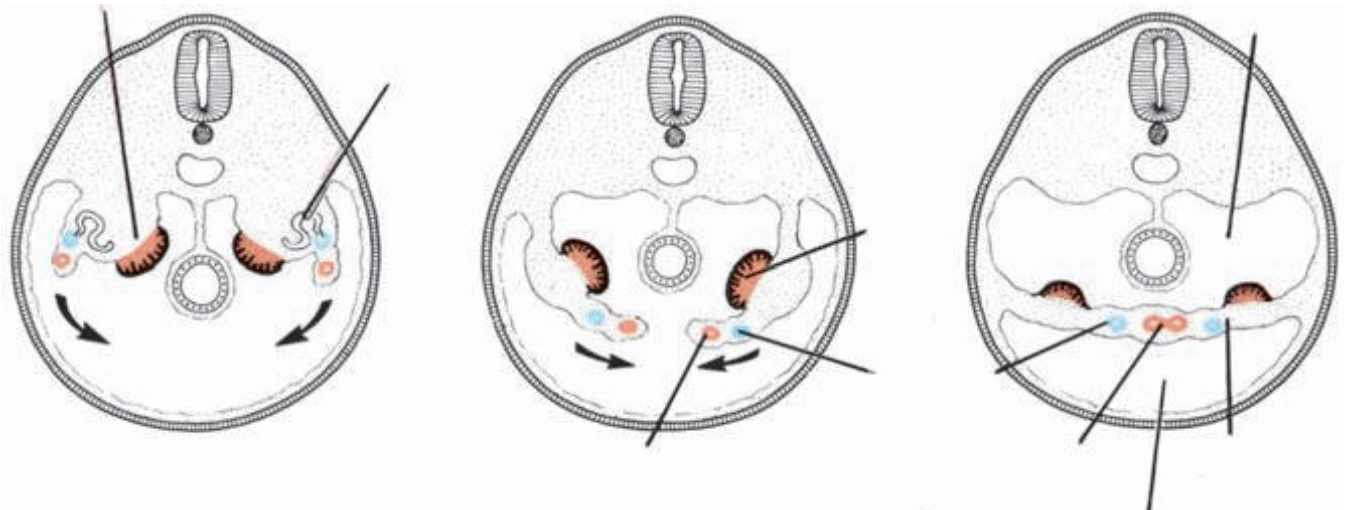
2.4.2 Genital ducts in the female

The paramesonephric ducts develop into the main genital ducts of the female. Initially, three parts can be recognized in each duct: (1) a cranial vertical portion that opens into the abdominal cavity, (2) a horizontal part that crosses the mesonephric duct, and (3) a caudal vertical part that fuses with its partner from the opposite side (Fig. 2.3). With descent of the ovary, the first two parts develop into the uterine tube (Fig. 2.3), and the caudal parts fuse to form the uterine canal.

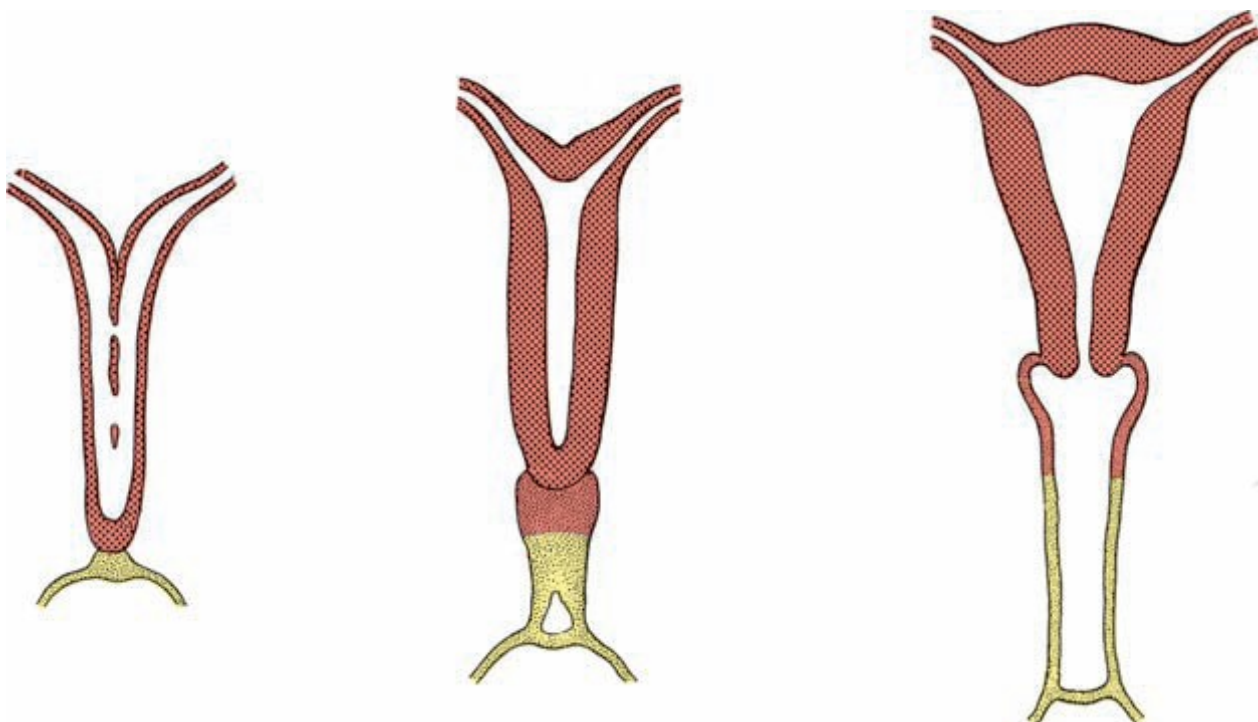
When the second part of the paramesonephric ducts moves mediocaudally, the urogenital ridges gradually come to lie in a transverse plane (Fig. 2.3A,B).

After the ducts fuse in the midline, a broad transverse pelvic fold is established (Fig. 2.4C). This fold, which extends from the lateral sides of the fused paramesonephric ducts toward the wall of the pelvis, is the broad ligament of the uterus. The uterine tube lies in its upper border, and the ovary lies on its posterior surface (Fig. 2.4C). The uterus and broad ligaments divide the pelvic cavity into the uterorectal pouch and the uterovesical pouch. The fused paramesonephric ducts give rise to the corpus and cervix of the uterus.

They are surrounded by a layer of mesenchyme that forms the muscular coat of the uterus, the myometrium, and its peritoneal covering, the perimetrium. (Moore KL, Persaud 2012)



(Figure 2.4): Transverse sections through the urogenital ridge at progressively lower levels. A,B. The paramesonephric ducts approach each other in the midline and fuse. C. As a result of fusion, a transverse fold, the broad ligament of the uterus, forms in the pelvis. The gonads come to lie at the posterior aspect of the transverse fold.



(Figure 2.5) Formation of the uterus and vagina. A. 9 weeks. Note the disappearance of the uterine septum. B. At the end of the third month. Note the

tissue of the sinovaginal bulbs. C. Newborn. The fornices and the upper portion of the vagina are formed by vacuolization of the paramesonephric tissue, and the lower portion of the vagina is formed by vacuolization of the sinovaginal bulbs.

2.4.3 Vagina

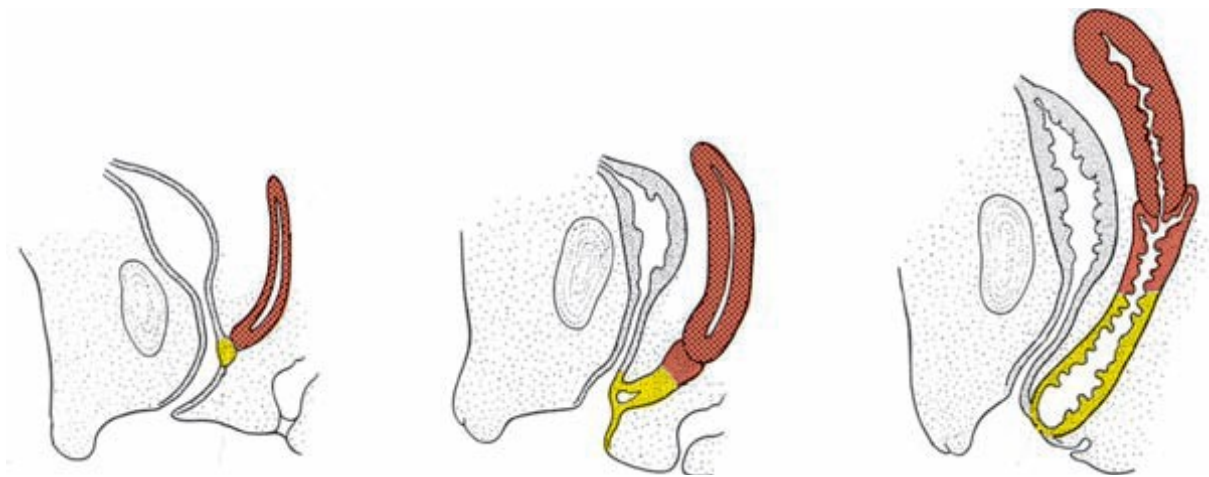
Shortly after the solid tip of the paramesonephric ducts reaches the urogenital sinus (Figs. 2.5A and 2.6A), two solid evaginations grow out from the pelvic part of the sinus (Figs. 2.5B and 2.6B). These evaginations, the sinovaginal bulbs, proliferate and form a solid vaginal plate. Proliferation continues at the cranial end of the plate, increasing the distance between the uterus and the urogenital sinus. By the fifth month, the vaginal outgrowth is entirely canalized. The wing-like expansions of the vagina around the end of the uterus, the vaginal fornices, are of paramesonephric origin (Fig. 2.6C).

Thus, the vagina has a dual origin, with the upper portion derived from the uterine canal and the lower portion derived from the urogenital sinus.

The lumen of the vagina remains separated from that of the urogenital sinus by a thin tissue plate, the hymen (Figs. 2.5C and 2.6C), which consists of the epithelial lining of the sinus and a thin layer of vaginal cells. It usually develops a small opening during perinatal life. The female may retain some remnants of the cranial and caudal

excretory tubules in the mesovarium, where they form the epoophoron and paroophoron, respectively (Fig. 2.3B).

The mesonephric duct disappears except for a small cranial portion found in the epoophoron and occasionally a small caudal portion that may be found in the wall of the uterus or vagina. Later in life, it may form Gartner's cyst (Fig. 2.3B). (Moore KL 2012)



(Figure 2.6)Sagittal sections showing formation of the uterus and vagina at various stages of development. A. 9 weeks.B. End of third month. C. Newborn.

2.5 Anatomy:

2.5.1 Uterus:

Is a small, thick-walled, hollow, muscular organ, shaped very like a pear, placed in the pelvis between the bladder and rectum, and lying with its long axis forwards, so that when the woman is standing upright the uterus is almost horizontal. For convenience, the organ is considered as consisting of two portions, a corpus or body, and a cervix or neck. The junction of the two is marked upon the outer surface by a slight bend. The body is slightly bent forwards on the cervix. The whole uterus, though best described as pear-shaped, is distinctly flattened anteroposteriorly in the body.

There is also a slight rotation of the organ to the right so that the left edge is slightly nearer to the front of the pelvis than the right edge. The cervix is practically cylindrical in shape. Although the uterus is hollow its walls are normally almost in contact. When these are separated the cavity of the body is about 1 inch (2.5 centimeter) wide at the fundus (the uppermost and widest part), by 1.5 inch (3.5 centimeter) long; it contracts at the level of the isthmus to form the internal os, continues in the cervix as a narrow spindle-shaped tube, and contracts again at the lower end of the cervix to form the external os. The cervical cavity is about 1 inch long, so that the total length of the uterine cavity is about 2.5 inches (6.25 centimeter).

The fallopian or uterine tubes join the uterus at the extremities of its greatest transverse diameter (the cornua or angles of the uterus). The external measurements of the uterus are Length, 3 inches, or 7.5 centimeters. Breadth, 2 inches, or 5 centimeters (measured between fallopian tubes). Thickness, 1.5 inches, or 3.75 centimeter (measured between fallopian tubes). The uterus weighs about 1.5 ounces, or 42 grams. The uterine walls are about 0.5 inch (1.25 centimeters) thick. All the above-mentioned measurements and weight refer to the normal adult virgin uterus. After pregnancy they are increased and in old age often much diminished. In childhood they are naturally much less. The cavity of the uterus is lined with a special kind of mucous membrane, which is called the endometrium, and which is actively concerned in the phenomena of menstruation and pregnancy. The uterine cavity communicates through the external os with the peritoneal cavity or coelom . That is called the vaginal cervix or portio vaginalis; the upper part of the neck of the uterus which lies above the cervico-vaginal attachment is called the supravaginal cervix or the portio supravaginalis. In certain forms of abnormal elongation of the cervix an intermediate portion is also referred to for descriptive purposes. In multiparous women the vaginal cervix is cone-shaped with the apex of the cone directed downwards, and the external os presents as a small rounded opening. After pregnancy the opening is a transverse site, and definite anterior and posterior lips can be noted (often scars and laceration also). The portio vaginal is covered by a reflection of the vaginal mucous membrane, which is firmly a bed to it. The cervix is loosely united to the bladder above the vagina by cellular

tissue; laterally it forms attachments to the pelvic connective tissue. The uterus is almost entirely covered with peritoneum, back and front, but at the sides there are small portions without any such covering. The cervix is not covered at the front and sides, LMT posteriorly there is peritoneum over the supravaginal cervix forming part of the pouch of Douglas. The abdominal peritoneum passing down the anterior abdominal wall onto the bladder forms a pelvic fold between the bladder and the uterus, which is known as the utero vesical pouch. This pouch is bounded by two thickened edges, the utero-vesical ligaments. The pelvic peritoneum up joins the uterus at the isthmus and covers the anterior surface, the fundus, and the posterior surface of that organ. At the point where the cervix meets the vagina the peritoneum is continued onto the posterior vaginal wall, dips down for inch or so, and then becomes reflected onto the anterior wall of the rectum, thus forming the utero-vagino-rectal pouch of Douglas. As the peritoneum passes up wards from Douglas' pouch posteriorly, it gradually surrounds the bowel more and more until it finally completely encloses it and forms its mesentery.

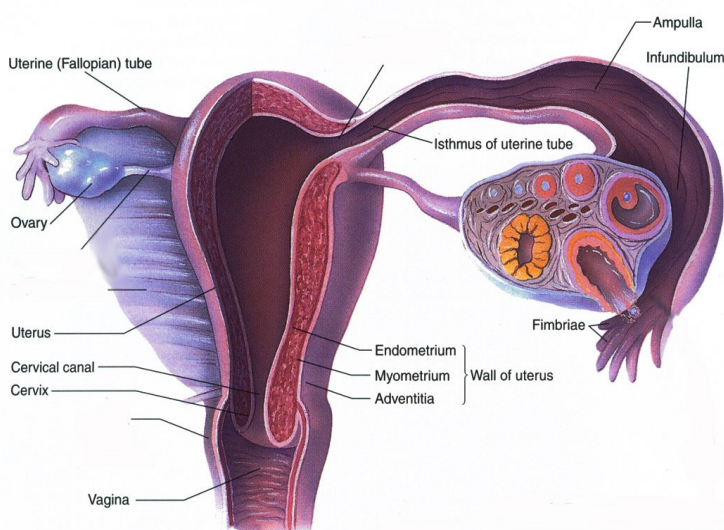


figure 2.7 shows the anatomy of uterus ovaries and fallopian tubes .

2.5.2 The fallopian tubes :

Uterine tubes, oviducts connect the ovary with the uterus. They also connect the uterus with the peritoneal cavity, so that in the female it may be said that there is a direct passage from the exterior of the body to the peritoneum. It is true that under ordinary conditions this passage is not actually patent, but it is a very important factor to bear well in mind with regard to the spread of infective inflammations. The Fallopian tubes are hollow muscular tubes, about 4 inches (10 centimeters) long, and varying from 3 to 6 millimetres) in thickness. They extend outwards from the uterus, and arch over the ovaries to which they are usually connected by one firming or firming which surround the abdominal opening so tubes. Morphologically, the Fallopian tubes represent the upper portions of the Mullerian ducts. For purposes of description four parts of the tube are referred to. They are the uterine or interstitial portion (one inch long), the isthmus or inner third. (Note.-{1) and (2) portions will admit a bristle.) The ampulla, the widest portion, which will admit a uterine sound. The infundibulum, the fringed extremity of the ampulla which opens into the coelom.

2.5.3 The ovaries:

Are the essential organs of the generative system of the female. They are ductless glands attached to the posterior layer of the broad ligament on each side of the uterus. Though attached to the posterior layer they are actually situated between the two layers, i.e. Intraligamentous. Their level in the pelvis is about that of the pelvic brim, but the position of their long axis differs so much even in perfectly normal and healthy women, that it can only be said to vary from horizontal to vertical. The average ovary is about 1 inch long, 1 inch wide, and 1/2 inch thick; its average weight is 1 Drachm. It is held in position (1) by the attachment of its anterior edge to the broad ligament;

(2) by a thick band running from its upper and inner end to the cornu of the uterus = the ovarian ligament; (3) by the ovarian fimbria of the Fallopian tube, which is attached to the lower and outer end of the ovary; (4) by the so-called "suspensory ligament" of the ovary (infundibulo-pelvic ligament), which is attached to the side wall of the pelvis and is really the free edge of the broad Ligament.

The posterior edge of the ovary is free and convex in outline, the anterior is straight and attached as already described. The left ovary lies in close relationship to the rectum, hence the reason why many ovarian complaints are made worse by constipation. Each ovary actually lies in a depression on the surface of the obturator internus muscle. The most important part of the ovary is the cortex, which consists of germinal epithelium, primary ovarian or Graafian follicles, and connective tissue. The medullary portion of the ovary is composed of connective tissue, unstriated muscle, blood-vessels, nerves and lymphatics. The Germinal Epithelium is the source from which ova are derived. Processes of connective tissue grow out from just below this epithelium and surround a number of the cuboidal cells. In this way a primary ovarian or Graafian follicle is produced. Each follicle contains an ovum surrounded by a number of flattened cuboidal epithelial cells; as the follicle grows in size the surrounding cells rapidly multiply and a certain amount of fluid distends it (vesicular ovarian follicle). When ripe and protruding from the

Surface of the ovary it becomes so distended that it bursts and liberates the ovum (ovulation). A mature Graafian follicle, then, consists of a follicle proper and a surrounding fibrous and vascular sheath (tunica externa or fibrosa and tunica internal layers of epithelioid cells, which contain a bright yellow pigment). The follicle proper is composed of the following parts from without inwards:- Several layers of the membrane granulosa, which at one part is very much thickened and contains a large number of heaped-up cells, forming a mass known as (2) the discus proligerus or ovular cumulus, inside which is contained the ovum. The cavity of (3) the liquor folliculi.

The cells, just round the ovum, seem to be arranged in a radiating fashion, and to them the name of "corona radiata" has been given. Part of this layer sticks to the ovum when it escapes from the follicle. Coronaradiata is known as the zona pellucida, or zona striata, or colemma; then follows a minute cavity, the primitive line space, inside which lies the ovum surrounded by a fine membrane, the vitelline membrane.

2.5.4 The vagina:

Is the communicating canal between the uterus and the vulva. It runs at an angle of about 60° to the horizontal and lies between the bladder and the rectum. It has an anterior and a posterior wall, a roof composed of both walls plus the uterine cervix, and a floor formed by the hymen. The urethra opens into the lower portion of its anterior wall, and the bladder some what loosely to the upper portion. Round the cervix the vaginal roof is arched, and anterior and posterior, and right and left fornices are described. The posterior is much deeper than the others, and just above it, abdominally, lies the pouch of Douglas. The bladder is situated a little above the anterior fornix, whilst around the lateral fornices is the cellular tissue in the base of the broad ligaments. The anterior wall is about 3 inches long and the posterior about 4 inches. Both walls exhibit transverse folds or rugae, and sometimes there is a median longitudinal elevation in each (median vaginal column), the appearance then resembling the os of the cervix. At the lower end of the vagina is the ostium (or introitus) vaginal marked by the hymen in the virgin or simply concealed by the labia in cases where the hymen has disappeared.

2.6 Reproductive physiology:

In the normal female between the age of 9 and 16, cyclic changes occur in the ovaries and the 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 ovary are known as the ovarian cycle whereas those 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. 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 phases. It is customary to assign the first day of menstruation as the first day of the cycle. (Devin, et al, 1992)

2.6.1 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 Graafian 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. 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 changes, 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. The theca interna cells of multiple secondary follicles fulfill an endocrine function as they differentiate into estrogen-secreting cells. The hormone estrogen promotes proliferation of the endometrium while many follicles develop in the ovaries in response to follicle stimulating hormone (FSH), only one follicle matures completely to be released at ovulation. Most of the follicles undergo follicular atresia beyond the stage of secondary follicle. One secondary follicle continues to mature to become a Graafian follicle prior to ovulation. The ovum continues to mature through meiotic division, forming the secondary oocyte. Now the oocyte floats freely within the enlarged follicular antrum of the Graafian follicle.

The follicular cells of the cumulus oophorus now completely surround the zona pellucida and the secondary oocyte, and is called the corona radiata. The theca interna cells of graafian follicle continue to produce estrogen. The graafian follicle migrates to the surface of the ovary, while the remaining secondary follicle undergo atresia. At approximately day 14 of the ovarian cycle, the mature ovum is expelled into the peritoneal cavity. The fimbria of the oviduct draws the released egg into the infundibulum. At ovulation, 5 to 10 ml of follicular fluid is released into the peritoneal cavity, settling into the posterior cul de sac. The ruptured graafian follicle collapses, fills with blood, and is transformed into a temporary endocrine gland. This begins the luteal phase of the ovarian cycle (day 15 to 28). The remaining follicular structure is now called corpus luteum and contains a central blood clot surrounded by granulosa luteal cells, theca luteal cells, and the theca externa. The granulosa luteal cells enlarge and secrete progesterone which promotes glandular secretion of the endometrium. The theca luteals continue the estrogen secretion of their precursor (theca interna), maintaining the proliferated endometrial lining of the uterus. The outer theca externa cells support the rich vascular network characteristic of an endocrine gland. Luteinizing hormone (LH) is produced by the anterior pituitary gland throughout the ovarian cycle. This hormone promotes secretion of estrogen and progesterone by the ovary. Both estrogen and LH peak immediately prior to ovulation, while the corpus luteum is dependent on LH, progesterone negatively inhibits the production of LH stimulation, and only a fibrous tissue mass, called the corpus albicans, remains in the ovary. When the levels of the estrogen and progesterone diminish, the thickened endometrial lining of the uterus is shed through menstruation. In the fertilized ovum, human chorionic gonadotropin (HCG) is secreted by the developing placenta. This hormone has an analogous function to LH, maintaining the corpus luteum. Thus, during

pregnancy, the corpus luteum continues to secrete estrogen and progesterone throughout the first trimester. The placenta ultimately takes over this endocrine function and the corpus luteum regresses, forming the corpus albicans .

2.6.2 Endometrial cycle

With each menstrual cycle, and in step with ovarian activity, 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, 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.

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. The menstrual cycle is a continuous ongoing cycle but for descriptive purposes 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 reality the length of the normal menstrual cycle may vary .(Devin ,1992)

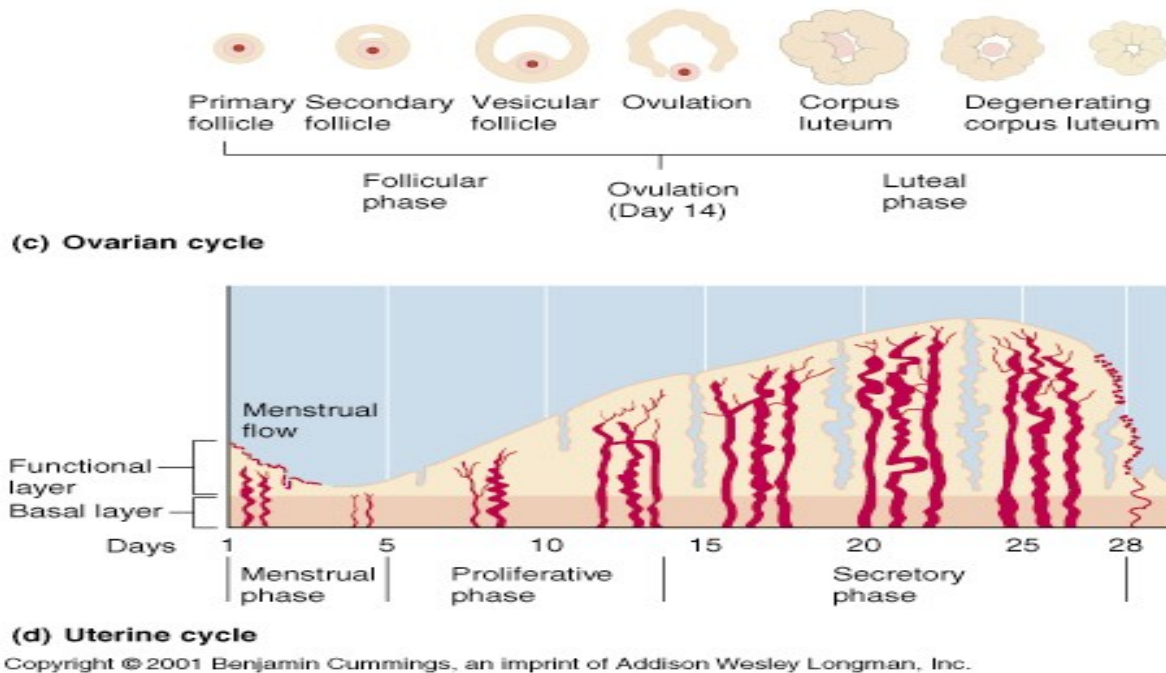


Figure 2.9 shows the physiological change In ovarian and endometrial cycles.

2.7 Pathology

Miscarriage is classified as threatened, missed incomplete and complete based on the ultrasound findings.

2.7.1 Threatened abortion

Threatened abortion defines a woman who presents during the first half of pregnancy with mild vaginal bleeding and uterine cramping without cervical dilatation. Threatened abortion is the most common clinical indication for ultrasound evaluation of an early pregnancy. Threatened abortion occurs in about one-quarter (25%) of all pregnancies; about one-half (50%) of women presenting with threatened abortion have a poor

outcome (e.g. go on to abort). In the group of patients presenting with threatened abortion who subsequently abort, the embryo (fetus) is usually already dead at the time of ultrasound evaluation. Spontaneous expulsion of the pregnancy (spontaneous abortion) normally occurs in patients who present with TA but may be delayed by as much as two weeks.

All pregnant women who present with vaginal bleeding during the first trimester of pregnancy are also potentially “rule out ectopic pregnancy” therefore a primary goal of ultrasound evaluation is to determine if the pregnancy is intrauterine or ectopic.

Assuming an intrauterine pregnancy (IUP) is diagnosed, the second goal of ultrasound evaluation is to identify an embryo(s) and determine if it is alive or dead.

If an embryo is not seen, the sonographer should determine if one should be based on the size of the gestational sac or other sonographic criteria.

If a live embryo is detected, an ancillary goal of the ultrasound study is to search for sonographic findings that are associated with a high risk of subsequent demise or fetal anomaly. If a live intrauterine embryo is detected, the pregnancy can be managed expectantly.

If a nonviable IUP is indicated with certainty, the uterus may be evacuated (dilatation and evacuation or D&E). If the sonographic findings are inconclusive, a follow up study at an appropriate interval (7 to 14 days depending on the findings of the initial ultrasound study).

In many women, because the embryo is not detected at the time of the initial

sonographic study, the diagnosis of early embryonic demise cannot be made on the

basis of embryonic cardiac activity; in these women, it may still be possible to make the

diagnosis of early pregnancy failure on a single study by assessing the gestational sac.

A small number of pregnant women have some vaginal bleeding, with or without

abdominal cramps, during the first trimester of pregnancy. This is known as a threatened abortion. Most of these pregnancies go on to term with or without treatment. Spontaneous abortion occurs in just a small percentage of women who have vaginal bleeding during pregnancy.

When spontaneous abortion occurs, the usual cause is fetal death. Such death is typically the result of a chromosomal or developmental problem.

2.7.1.1 Other possible causes include:

- ▢ Defects in the mother's anatomy
- ▢ Endocrine factors
- ▢ Immune system factors
- ▢ Infection
- ▢ Systemic disease in the mother

About half of all fertilized eggs abort on their own, usually before the woman knows she is pregnant. The rate of spontaneous abortion is very low among known pregnancies. These usually occur 7 - 12 weeks into the pregnancy

2.7.1.2 Risks of threatened abortion are higher in:

- ▢ Women over age 35
- ▢ Women with a history of 3 or more spontaneous abortions
- ▢ Women with systemic disease (such as diabetes or thyroid dysfunction)

2.7.1.3 Symptoms:

- ▢ Abdominal cramps with or without vaginal bleeding

▯ Vaginal bleeding during the first 20 weeks of pregnancy (last menstrual period

was less than 20 weeks ago)

Note: With true miscarriage, low back pain or abdominal pain (dull to sharp, constant to intermittent) typically occurs and tissue or clot-like material may pass from the vagina.

2.7.1.4 Exams and Tests:

Pelvic exam shows a cervix that isn't thinned (effaced) or open (dilated). Either of these can suggest that a miscarriage will soon occur.

2.7.1.5 Other tests include:

▯ Beta HCG (quantitative) test over a period of days or weeks to confirm whether

the pregnancy is continuing or the fetus has died

▯ CBC to find out the amount of blood loss

▯ Serum HCG to confirm that the woman is pregnant

▯ Ultrasound to detect fetal heartbeat

▯ WBC with differential to rule out infection

This disease also can change the results of the serum progesterone test.

2.7.1.6 Treatment

Bed rest or pelvic rest (not having intercourse, douching, or using tampons) may be recommended, but there is no evidence to show that these actually reduce the miscarriage

rate.

The use of progesterone is controversial. It might relax smooth muscles, including the muscles of the uterus. However, it also might increase the risk of an incomplete abortion or an abnormal pregnancy. Unless there is a luteal phase defect, progesterone should not be used.

2.7.1.7 Outlook (Prognosis)

The outcome is good when the pregnancy continues to progress and all the symptoms disappear.

2.7.1.8 Possible Complications

- Anemia
- Dead fetus syndrome
- Infection
- Moderate-to-heavy blood loss
- Spontaneous abortion

2.8 Subchorionic Hesmatoma (SCH)

Subchorionic Hematoma is a hematoma that forms beneath the chorion and expands in the uterine cavity. Partial separation of the chorion frondosum is indicated when the

hematoma is seen behind the chorion frondosum. SCH is also known as intrauterine hematoma, retrochorionic hematoma, and submembranous hematoma. The exact etiology of SCH is uncertain but is postulated to be related to rupture of basal veins at the edge of the chorion frondosum (may be referred to as marginal sinus rupture). SCH may be asymptomatic however in most cases is associated with vaginal bleeding. The prognosis associated with SCH is questionable however small collections are generally associated with a better prognosis.

Generally, larger SCH are associated with a worse prognosis.

Ultrasound/Doppler - The echogenicity of a SCH depends on the age of the

hematoma and also on technical factors such as transducer frequency and gain setting. Echogenicity decreases with the age of the hematoma; a fresh SCH may appear anechoic at low gain settings and when viewed with a low frequency TAS transducer; the same SCH may appear diffusely echogenic when evaluated with a higher frequency EVS transducer. The shape of a SCH varies with the scanning plane and on the relative size of the hematoma; in general, a SCH has a crescent or wedge shape consistent with the uterine cavity.



FIGURE 2.10. Moderate subchorionic bleed. Sagittal transvaginal scan of an 8-week gestation with no spotting. The moderate subchorionic bleed (*) is seen adjacent to the gestational sac. The live embryo was not in the field of view. The bleed resolved and pregnancy continued uneventfully. Carol M. Rumack, 2011.)

2.9 Other types of miscarriages:-

2.9.1 Missed miscarriage

Missed miscarriage is defined as the retention of a gestational sac within the uterus following embryonic or early fetal death. The diagnosis is usually based on the absence of cardiac activity within the fetal pole. The terms 'blighted ovum' and 'anembryonic pregnancy' have been used to describe a gestational sac without a detectable fetal pole.

These terms should be avoided because there is usually histological or biochemical evidence of early embryonic death in nearly all cases. The ultrasound diagnosis of missed miscarriage is straightforward when the embryo is relatively large.

However, when the embryonic echoes are very small or non-detectable it is difficult to differentiate between a very early normal pregnancy and a missed miscarriage .

2.9.2 Diagnostic errors have been reported in such cases.

The Royal College of Obstetricians and Gynaecologists (RCOG) has proposed a set of guidelines to establish embryonic death by ultrasound. According to these guidelines, the absence of cardiac activity in an embryo of crown-rump length (CRL) > 6 mm, or the absence of a yolk sac or embryo in a gestation sac of mean diameter > 20 mm, enables conclusive diagnosis of a missed miscarriage.

In pregnancies in which the embryo and sac are smaller than 6 mm or 20 mm, respectively, a repeat ultrasound examination 1 week later is necessary to clarify the diagnosis (RCOG 1995).

2.9.3 Complete and incomplete miscarriage

The diagnosis of complete and incomplete miscarriage depends even more on the experience and skill of the operator than the diagnosis of missed miscarriage. Complete miscarriage is usually diagnosed when the endometrium is very thin and regular. The ultrasound appearances are therefore comparable to those of the non-pregnant uterus in the early proliferative phase.

The diagnosis of incomplete miscarriage is more controversial and diagnostic criteria of endometrial thickness vary between 5 and 15 mm. The main difficulty with using predefined cut off levels is the inability to differentiate between blood clots, which are often seen within the uterine cavity at the time of miscarriage and retained products. We therefore favor subjective assessment of the endometrium in preference to quantitative criteria.

Retained products are usually seen as a well-defined area of hyperechoic tissue within the uterine cavity as opposed to blood clots that are more irregular. Blood clots will be also seen sliding within the uterine cavity when pressure is applied on the uterus by the transvaginal probe. However, even with a Doppler examination the diagnosis of incomplete miscarriage is difficult and ultrasound should always be combined with clinical and biochemical assessment to rule out the possibility of ectopic in these cases.



FIGURE 2.11. Retained products of conception. A, Sagittal transvaginal scan of a 22-year-old woman who presented 5 weeks after a suction dilation and curettage (D&C) therapeutic abortion with vaginal bleeding. The endometrial canal is

distended with a 1.8 – 2.5-cm echogenic mass (arrows). Carol M. Rumack, 2011.)

2.9.4 Management of miscarriage

Surgical evacuation of retained products has become universally accepted as the method of choice for the management of miscarriage. When it was introduced (in the 1960s) the rationale for the use of curettage was a perceived risk of sepsis and hemorrhage associated with spontaneous abortion. It is likely that a number of complicated miscarriages at that time represented retained products following illegal abortions, which contributed to the severity of clinical presentation. Women's general health has improved considerably in the intervening 50 years and most infections can now be treated effectively using antibiotics. Legalisation of abortion has eliminated problems caused by criminal abortion in many developed countries.

However, there is now a growing concern about the unconditional and non-selective use of surgery for the treatment of miscarriage. There is also concern about morbidity caused by surgical and anesthetic complications. Expectant management of incomplete miscarriage is an attractive option in this context. It follows the natural history of the disease, avoids iatrogenic problems associated with both medical and surgical treatment and, as such,

is likely to be cost effective. In cases of missed miscarriage, both expectant and medical management are relatively ineffective and are suitable only for individual, highly motivated women or those who have difficulty in accepting the diagnosis of a failed pregnancy and feel unable to make a rapid decision about surgical treatment. (Trish chudleigh 2004).

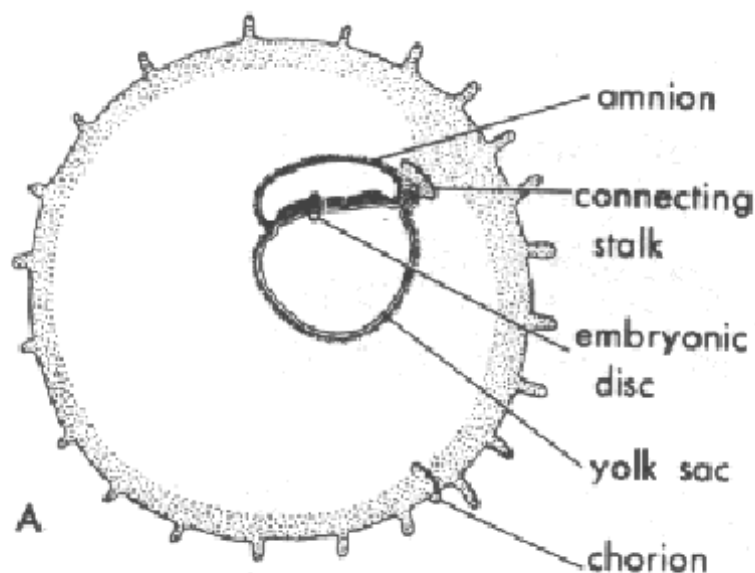
2.10 Anatomic Structure of the Early Pregnancy:

The recently implanted embryonic cell mass forms an interface with the endometrial decidual, the trophoblastic cell layer identified as the chorionic layer. The cell mass actually implants into the substance of the decidua, and the overlying decidual covers the implanted mass. Because of this the early development of the gestation appears to occur within the decidual layer, and enlarges to fill the endometrial cavity later.

Following implantation, a cavity or sac develops which lies inside the chorionic layer. This subchorionic layer contain the yolk sack (secondary) and the embryonic disk (early embryonic cell mass) surrounded by its own small amniotic cavity.

At about 5 weeks the gestational sac shows a well-defined yolk sac within the chorionic cavity

(Extraembryonic coelom). The embryo and amniotic cavity very small. The gestational sac grows at a rate of about 1mm per day. As a rule of thumb, the menstrual age in days can be estimated by adding 30 days (first appearance of sac) to the sac size in mm (1mm = 1 day)



As gestation progresses, the embryo and amniotic cavity grow rapidly and crowd out the chorionic cavity, and subsequently bulge into and then fill the endometrial (subchorionic) cavity.

By high resolution ultrasound examination these structures can be clearly delineated:

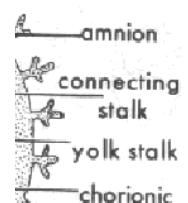
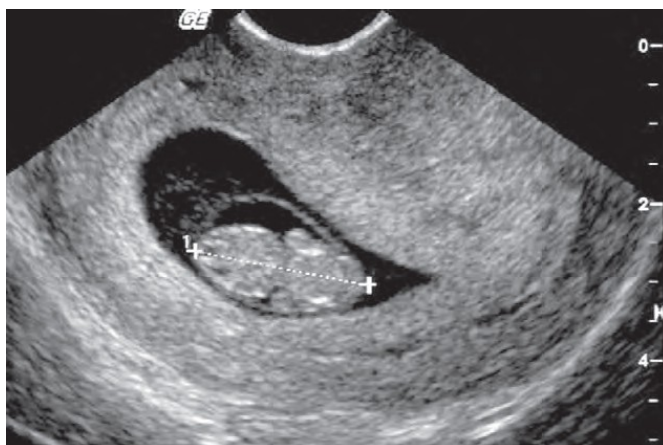
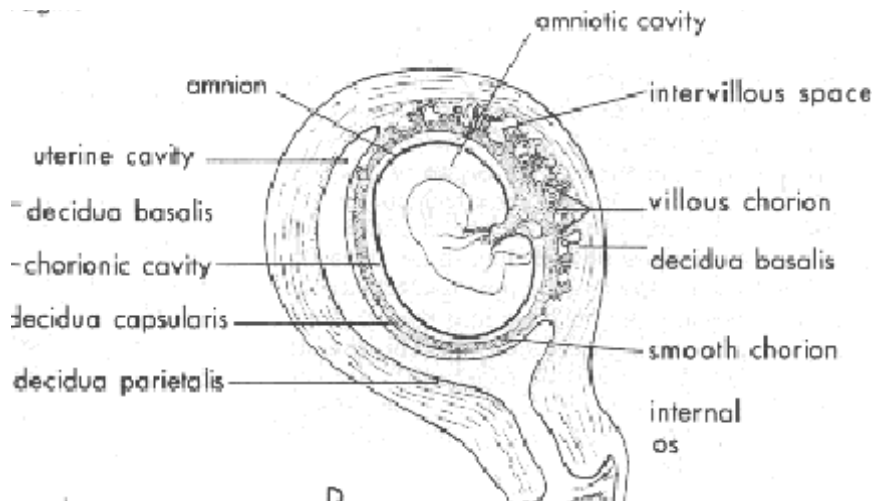


FIGURE 2.12. Normal 9-week embryo/amnion. Normal separation of amnion (arrow) and chorionic sacs at 9 weeks. Transvaginal sonography shows the embryo (calipers) and the amnion (AM).

As the Gestation enlarges, the portion of the chorionic trophoblast destined to form the placenta enlarges and remains in intimate apposition to the underlying decidua (decidua basalis). The portion of the chorion on the cavity side of the gestation expands to form as the

decidua capsularis, which comes into contact with the lining of the free endometrial cavity, now called the decidua parietalis.



Anatomic Points important to Ultrasound Interpretation are:

- 1.) True gestational sacs implant into the endometrial lining, and are seen eccentric to the endometrial canal. Fluid collections within the canal are not true gestational sacs.
- 2.) The Gestational sac and yolk sac (secondary yolk sac) are seen beginning at 4.5-5 weeks, before a recognizable embryo is seen.
- 3.) As the gestation enlarges into the endometrial cavity, only the early placenta need be in tight contact with the decidua. Small amounts of bleeding into the cavity are commonly seen, and may surround much of the gestational sac, but if the decidua basalis remains intact, the gestation can and usually does continue to develop normally.

2.11 Physical and Technical Principals

Ultrasound is the term applied to mechanical pressure waves with frequencies

above 20,000 Hz (beyond the audible range).

A medium must be present for ultrasound propagation to occur. In biological tissues, ultrasonic energy is propagated mainly in the form of longitudinal waves, as it is in fluid. The ultrasound wave can be both emitted and received by a piezoelectric transducer. The piezoelectric transducer is able to change electrical signals into mechanical waves, that is, transmitting ultrasound (= reverse piezoelectric effect), and vice versa to change mechanical pressure (reflected ultrasound waves, “echoes”) into electrical signals (= direct piezoelectric effect).

Ultrasound in the MHz range (high-frequency) can be emitted as a directional beam, comparable to a light beam, from transducers of practical size.

Ultrasound waves propagate in biological tissue at an average speed of 1540 meters (m) per second, with the exception of bones, where the waves move at more than 3000m per second. Ultrasound waves interact with biological tissue in various ways; they are partially absorbed by the tissue, which means that their energy is converted into heat. This is important for safety reasons.

Ultrasound waves can also be reflected (interference > beam diameter) or (back-) scattered on their way through the tissue. Whether reflected or back-scattered, echoes are received by the transducer.

These echoes are the source of the diagnostic information.

The echoes are analyzed first with regard to their site of origin (time– distance principle), and secondly with regard to their intensity.

This information B-scan technique). One of the preconditions is that only a small part of the ultrasound is reflected at each interface, and most of the ultrasound is transmitted to deeper levels. Only bones, gas, and foreign bodies (metallic or nonmetallic) cause a very strong reflection (acoustic shadow); thus no information is obtainable from regions behind such obstacles.

Absorption, reflection, and scattering cause a permanent attenuation of ultrasound energy of approx. 1 decibel per cm of propagation in the tissue traversed per 1MHz of frequency. The ultrasound attenuation must be corrected by amplifying echoes as a function of distance from the transducer (TGC), in order to get a homogeneous display of the echoes. Nevertheless this attenuation can seriously limit the depth of penetration of higher

frequencies (the so-called small part transducers are suitable for small and superficial organs only!).

The ultrasonic field is a geometric description of the region encompassed by the ultrasound beam. There are two main sectors, the near field (interference field), located between the ultrasound transducer and the (natural) focus, and the far field.

The lateral boundary of the ultrasound field is not sharp, because the beam intensity falls off continuously with distance from the center.

The lateral resolution depends on the diameter of the ultrasound beam: the smaller the diameter, the better the resolution. The resolution therefore is best in the focal area.

The ultrasound beams are focused (mainly electronically by modern techniques), enabling the clinician to always focus on the region of interest.

The axial resolution depends on the length of the emitted ultrasound pulses and finally on the wave length, i.e., the frequency.

These basic physical principles are still important in regard to the quality of ultrasound equipment despite the advances in electronic techniques:

the higher the frequency, the better the resolution on the one hand, but the higher the attenuation in the tissue on the other hand, which means a limited penetration depth. For small and superficial parts, therefore, high frequency transducers (5–10 MHz) should be used, whereas for the abdomen or in late pregnancy, transducers with lower frequencies (2–5 MHz) are necessary.

2.11.1 Imaging Techniques

The echo principle forms the basis of all of the commonly used diagnostic ultrasound techniques. These are:

A-scan

M-scan

B-scan

2.11.2 Doppler techniques

A-scan (amplitude modulation) is a one-dimensional technique. The echoes received are displayed on a screen as vertical deflections. This technique is rarely used today except for measurements.

B-scan (brightness modulation) is a technique in which the echo amplitude is depicted as dots of different brightness (gray scale). It is mostly used as a two-dimensional B-scan to form a two-dimensional ultrasound image by multiple ultrasound beams, arranged successively in one plane.

The images are built up by mechanically or electronically regulated scanning in a fraction of a second. The image rate of more than 15 per second enables an impression of “permanent” imaging during the examination (real time).

M-scan (also sometimes referred to as TM-scan) is a way to display motion, e.g. of parts of the heart. The echoes produced by a stationary ultrasound beam are recorded over time, continuously.

Doppler techniques use the Doppler effect as a further source of information:

if the ultrasound waves are reflected by an interface moving towards the transducer or away from it, the reflected frequency will be higher or lower respectively than the transmitted frequency.

The difference between the emitted and received frequencies is proportional to the speed of the moving reflector. This phenomenon is called the Doppler effect, and the difference is called the Doppler frequency or Dopplershift.

The Doppler shift depends on the ultrasonic frequency (f), the velocity of the reflector (v), and the angle between the ultrasound beam and the blood stream. Information can only be achieved if the angle is less than

60°. An angle of 90° has the cosine $\alpha = 0$, which means no Doppler shift = no signal.

Doppler Formula: $\Delta f = 2f / c \cdot v \cdot \cos \alpha$.

There are various Doppler techniques:

Continuous wave Doppler (cw Doppler): the transducer is divided in two parts: one crystal transmits ultrasound permanently, the other crystal receives all the echoes. There is no information about the distance of the reflector(s), but only about the velocity, at which the reflector (the blood stream) moves.

Pulsed Doppler: Ultrasound is emitted in very short pulses (as in the A-, B-, and M-scan techniques). Between the pulses the echoes reaching the transducer in a certain time interval are received and analyzed. In this way, the movement of the reflectors in a particular distance (gate, selected by the operator) can be displayed and analyzed. (H.T. Lutz et al. 2006)

is used for example to construct an image (two-dimensional

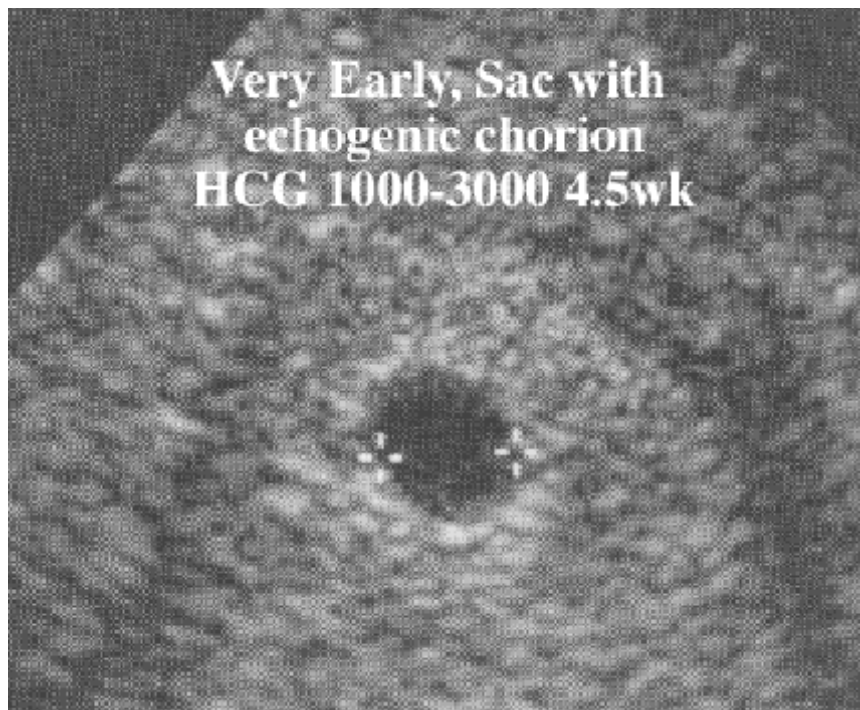


Ultrasonic's is the application of ultrasound. Ultrasound can be used for medical imaging, detection, measurement and cleaning. At higher power levels, ultrasonic's is useful for changing the chemical properties of substances.

2.11.3 Early ultrasound findings in normal pregnancy:

The visualization of early structures benefits from high resolution technique. In most cases, ultrasound probes designed to operate in the vagina provide the best resolution, and a necessary whenever definitive diagnosis cannot be made by standard scanning.

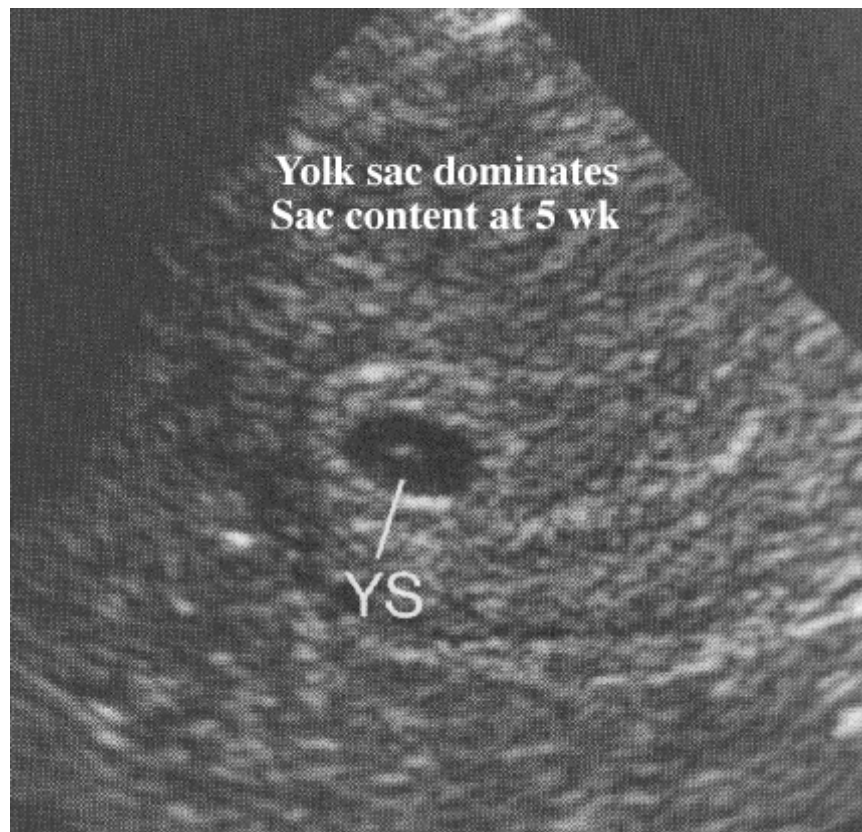
- 1- Early Ultrasound appearance: The earliest visible gestational sac is seen at 4.5 weeks as an echogenic ring, with a tiny central hypoechoic area.



The Nearly horizontal line beneath the sac is the endometrial cavity. Note the gestational sac lies outside the cavity, embedded in the decidua (lining).

This eccentric position is called the intradecidual sign, seen in intrauterine implantations, and different from fluid collections in the endometrial cavity which can be seen in both intrauterine and ectopic pregnancies. Pseudosacs never show the intradecidual sign however. Gestational Age Estimate: Measurement of the mean gestational sac diameter is an effective estimate of gestational age, used between 5 and 5.7-6 weeks. The accuracy in this period is about ± 5 days. As soon as an identifiable embryo crown-rump length (CRL) is measurable (5.7-6 weeks), it should be used. This is because later gestational sac measurements may not reflect the embryonic size (or even its presence), but the embryonic CRL directly reflects embryonic growth. Tables of Mean Sac Size may be used, or as a rule of

- Yolk Sac: The secondary yolk sac is the first element seen in the gestational sac. Because it is reliably seen early, usually by 5 weeks, it is a critical landmark identifying a true gestation sac. Yolk sac should be seen in normal pregnancy when Mean Sac Diameter is 20 mm by transabdominal scan, and 8- mm by high resolution vaginal imaging. It is a spherical membrane, quite echogenic and readily seen.



- Embryo: The embryo is first seen on high resolution scans as a thickening on the margin of the yolk sac. It may be seen at 2-4 mm Crown-Rump Length (CRL - Longest Axis) corresponding to 5.7-6.1 weeks gestational age. With high-resolution, the heartbeat is seen as a regular flutter in the embryo, first evident at 5mm CRL (6.2 week). Thus it is possible to see healthy embryos without heartbeats. In such cases, a follow-up study in 5-7 days will almost always demonstrate the heartbeat in healthy embryos. The presence of a heartbeat is a very positive prognostic sign.

By High resolution vaginal scanning, embryos should be seen at Mean Sac Diameters (MSD) of 18mm, with lower resolution abdominal scanning, embryos should be seen with MSD of 25mm.

2.11.4 Previous Studies:-

Study one :-

Tannirandeny et al Saied:

Pregnant women of under 20 gestational weeks diagnosed clinically as threatened abortion were referred for ultrasound scan - the sonographic findings were reported as viable pregnancy, incomplete abortion and inclusive finding. 150 pregnant patients enrolled. Ultrasound scans demonstrate 75 viable fetus 50%. In complete abortion 33.3% inclusive finding reveal 16.7% the viable pregnancy rate according to maternal age was highest at the maternal age 0-25% 29 years old whereas it was lowest at the maternal age of 40-44 years old 2%.

The viable pregnancy rate according to gestational age was highest at 6 to 8 weeks (6) 2% where it was lowest at 11 to 13 weeks 20%. Sonographic findings in patients with threatened abortion demonstrate viable pregnancies in around wall of the uterus. Use of ultrasound in clinically diagnosed threatened abortion may assist clinicians in

establishing a definite diagnosis so that appropriate care could be offered to the patients. (May 2001)

study two:-

Daiter .E, who showed that the most widely accepted rate of loss for a single spontaneous abortion in an unselected population of couples that is (regardless of characteristic associated with pregnancy loss) was about 15%-20% (1 in 6) of clinically detected pregnancies (where the woman missed menses or otherwise knew that she was pregnant)

Study three:-

Elizabeth study showed that the over all miscarriage rate is reported as 15-20% which mean -20% of recognized pregnancies result in miscarriage, the frequency of spontaneous miscarriage increase with the maternal age .

About 80% of miscarriage occur within the first trimester ,and the frequency of miscarriage decrease with an increasing GA.

Study four :-

Millie A.Behera et al reported that spontaneous abortion with is loss of pregnancy without outside intervention before 20 weeks GA affect up to 20% of recognized pregnancies.

Study five :-

Stopplar ,M. stated that miscarriage occurs on about 15-20% of all recognized pregnancies ,and usually occur before 13th week of pregnancy, the actual percentage of miscarriage is estimated to as high as 50% of all pregnancies, since many miscarriage occur without the women ever having known she had pregnant.

Study six

Sandor Nagy et al Saied:

187 pregnant women with intra uterine hematomas were detected at first trimester ultrasonographic examination. The presents of a viable, singleton gestational between 5 and 13 weeks. Gestational age was calculated based on the last menstrual period. Or was corrected when the crown. Rump length measurement were more than 5 days different from the last menstrual period. The following sonographic factors were evaluated: crown - rump length, in complete abortion fetal heart rate. The site of the gestational sac A hematoma was defined as a crescent - shape sonolucent fluid collection behind the fetal membrane

sub chorionic was defined as being located between the chorion and the uterine wall. The location of the gestational sac was marked as fundal, eccentric - lower. The sonographic evaluation also includes the shape of the gestational sac. 230 patients with hematoma with singleton intrauterine pregnancies. Under routine first trimester obstetric ultrasonographic the hematoma was subchorionic in 91 patient 57%, it was not possible to localize the hematoma in 28 cases because of early gestational age. Less than 7 weeks. The most gestational age were 8-9 weeks at the first ultrasound scan, the most frequent incident were advanced maternal age. The gestational shape were regular 207 92% the most location of gestational sac eccentric 120 patients 52.1% fundal 64 patient 27.9% lower 56 patient 24%. In complete abortion 23 patient 10%.

(1999- 2001)

Study seven

Robertson A, estimated that up to 50% of all fertilized eggs die and are lost (aborted) spontaneously ,usually before the women knows she is pregnant , among known pregnancies the rate of miscarriage is approximately 10% and usually occurs between 7th and 12th weeks of pregnancy .

Chapter Three

Material and Methods

3. Material and Methods

By a sampling of consecutive cases, we included patients who presented to our hospital between 5 to 13 weeks of pregnancy and

were diagnosed with threatened abortion. The patients were recruited according to the following criteria:

Inclusion criteria: patients with pregnancy between 5 to 13 weeks of gestation, who were diagnosed with threatened abortion according to the institutional standards of our hospital. Exclusion criteria: patients with multiple pregnancies,

molar pregnancy, ectopic pregnancy, amenorrhea with different etiologies of pregnancy, maternal history of systemic diseases and uterine anatomic abnormalities. Elimination criteria: patients who did not have their outcome

data through week 20 of gestation due to relocation. Also clinical factors such as medical conditions and obstetric complications were included such as the presence of pelvic pain, vaginal bleeding and cervical features (closed or dilated). These parameters were coded as 1 when present and 0 when absent. Afterward, a transvaginal ultrasound examination was carried out with a high color Doppler

3.1 Methodology

3.1.1 Type of the study

This is cross sectional, descriptive study dialed with pregnant patients who were hospitalized with clinical diagnosis of threatened abortion (with vaginal bleeding, lower abdominal pain , cramping and closed os).

3.1.2 Area of the study

El-Shaikh Mohammed Ali Fadoul Hospital - Omdurman .

3.1.3 duration of the study

This study was carried out during a period from 2014 – 2015 .

3.1.4 Population of the study

Pregnant patients who were hospitalized with clinical diagnosis of threatened abortion and referred to ultrasound department of the study areas at the time of study.

3.1.5 Study sample

They were 50 pregnant patients who were hospitalized with clinical diagnosis of threatened abortion and they selected randomly.

3.1.6 Inclusion criteria:

patients age of 18-46 years old with pregnancy between 5 to 13 weeks of gestation, who were diagnosed with threatened abortion and referred to the ultrasound department.

3.1.7 Exclusion criteria

Pregnant women less than 18 and more than 46 year old with GA less than 5 and more than 13 weeks.

3.1.8 Study variables

3.1.8.1 Independent variables: Patient age, gestational ages .

3.1.8.2 Dependent variables: gestational sac position, gestational sac shape, presence of subchorionic and yolk sac.

3.2 Instrumentations and equipments

1- fukuda Danish 4000 Diagnostic Ultrasound System, manufactured in Japan With 3.5MHz curve linear probe.

2. Coupling gel.

3- Towel sheath.

4- Thermal paper printer.

5- Digital camera.

6- Data collecting sheets.

3.3 data collection

The data were collected by clinical data sheets, ultrasound imaging and interview with the patients.

3.4 Method

pregnant patients who were hospitalized with clinical diagnosis of threatened abortion. Between 2014 and 2015 came to the ultrasound department of the study area hospital and underwent pelvic ultrasonograph (US), were cross-sectionally reviewed. Evaluation Includes the grey scale ultrasound.

History findings include patient age and GA.

3.5 Scanning technique

Pelvic sonography was performed with the patient lying in a supine position and the towel placed on the lower pelvis . Optimal results were obtained with 3.5 MHz high-frequency curve linear-array transducers. The pelvis were studied with full bladder in two planes (i.e, longitudinal and transverse axes).

The following sonographic findings evaluated:

size, shape, outline, and contents of the gestational sac; the presence or absence of sub chorionic hematoma fetal cardiac activity.

3.6 Data analysis

The Data were analyzed using SPSS program

3.7 Data Representation

The Data were represented inform of cross tabulation and graphs, using Microsoft office Word and Excel programs.

3.8 Ethical consideration

1. The data were collected and used upon patient consent.
2. No identification or individual details were published.
3. No information or patient details were disclosed or used for other reasons than the study.
4. The study was approved by the ethics of the hospital administration.

Chapter Four

Results

4- Result:

This study was carried out on 50 patients with threatened abortion, the following as the results of this study patients collecting data is presented in:

Table 4-1 show the Maternal Age distribution :

Maternal age	Frequency	Percent	
	18-25	20	40.0
	26-35	5	10.0
	36-45	25	50.0
	Total	50	100.0

Figure 4-1 maternal age distribution.

Table 4-2 show the distribution among the gestational age for 50 patients:

Gestational age	Frequency	Percent	
5-7 Week	25	50.0	
7-9 Week	10	20.0	
9-11 Week	9	18.0	
11-13 Week	6	12.0	
Total	50	100.0	

Figure 4-2 shows GA distribution.

Table 4-3 show the gestational sac shape disribusion:

Gestational shape	Frequency	Percent	
Regular	45		90.0
Irregular	5		10.0
Total	50		100.0

Figure 4-3 gestational sac shape distribution

Table 4-4 show the gestational sac position :

Gestational sac position	Frequency	Percent	
lower	5		10.0
Eccentric	15		30.0
fundal	30		60.0
Total	50		100.0

Figure 4-4 gestational sac position distribution

Table 4-5 show the Ultrasound Findings in 50 patients:

Ultrasound Findings	Frequency	Percent	
Subchrionic hematoma	38	76.0	
Abnormal Gestational Sac	5	10.0	
In complete abortion	2	4.0	
Abnormal Heart Beat	5	10.0	
Total	50	100.0	

Figure 4-5 ultrasound finding distribution

Table 4-6 show the correlation between Maternal Age and Ultrasound Findings :

P. value = 0.75 / not significant .

Maternal Age	Ultrasound Findings				Total
	Subchrionic hematoma	Abnormal Gestational Sac	Abnormal Yolk Sac	Abnormal Heart Beat	
36-45	17	3	1	4	25
26-35	5	0	0	0	5
18-25	16	2	1	1	20
Total	38	5	2	5	50

Table 4-7 show the Correlation between Maternal Age and Gestational Sac Shape:

P. value 0.71 / not significant.

Maternal Age	Gestational Sac Shape		Total
	Regular	Irregular	
18-25	22	3	25
26-35	5	0	5
36-45	18	2	20
Total	45	5	50

Table 4-8 show the Correlation between Maternal Age and Gestational Sac Position:

P. value 0.22

Maternal Age	Gestational Sac Position			Total
	LOWE R	INBETWE EN	HIGH FUND AL	
36- 45	1	6	18	25
26- 35	1	3	1	5
18- 25	3	6	11	20
Total	5	15	30	50

Table 4-9 show the Correlation between Gestational Age and Ultrasound Findings:

P. value 0.11/not significant

Gestational Age	Ultrasound Findings				Total
	Subchorionic Hematoma	Abnormal Gestational Sac	Abnormal Yolk Sac	Abnormal Heart Beat	
5-7 Week	16	5	2	2	25
7-9 Week	7	0	0	3	10
9-11 Week	9	0	0	0	9
11-13 Week	6	0	0	0	6
Total	38	5	2	5	50

Chapter five

Discussion, Conclusion and Recommendation

5.1 Discussion:

During the period of the study 50 pregnant attended to ultrasound department for investigation to determine the ultrasound finding of threatened abortion, the sonographic findings were documented and analyzed.

In table 4-1: The most common represented ages were women between (36-45) years old (50%), followed by age groups (18-25) years and (26-

35) years, (40%) and (10%) respectively, which agreed with Tannirandeny et al study done in 2001.

In table 4-2: The study showed that The threatened abortion were most common among the gestational age between 5-7 weeks (50%) followed by gestational age 7-9 weeks (20%), 9-11 weeks (18%) and 11-13 weeks (12%) respectively, which agreed with rearch result of Elizabeth Sep 2011, Tannirandeny et al 2001 and Millie A.Behera et al Oct 2011.

In table 4-3: regular , and irregular shape gestational sac were presented in most cases of the threatened abortion; (90%) and (10%) respectively, agreed with study of Sandor Nagy et al 1999-2001.

In table 4-4: 60% of the represented cases were presented with high fundal gestional sac position, 30% were presented with eccentric gestational sac position and 10% with lower as shown in table (4-4).

In table 4-5: The study showed that Sonographic feature of threatened abortion were Sub chorionic hematoma which is the most significant finding 76% , presence of irregular heart beat 10% , irregular thin walled gestational sac 10% and abnormal yolk sac in 4% which agreed with study of stannirandeny et al 2001.

(Table (4-6) Chi square test shows that the P-value is (0.75), means that there is no significant relationship between the diagnosis and patient age.

5.2 Conclusion:

Diagnostic ultrasound is the most common imaging technique used to diagnose the threatened abortion and is an accurate means of evaluating many associated sonographic findings.

because Sonographic findings are operator-dependent have to be supported by the history and physical exam of the patient.

Most common represented ages were women between (36-45) years old and The threatened abortion were most common among the gestational age between 5-7 weeks (50%) .

The Sonographic features of threatened abortion were Sub chorionic hematoma which is the most significant finding 76% and regular shape gestational sac presented in most cases of the threatened abortion (90%) containing fetus with irregular rapid heart beat 10% and abnormal yolk sac of 4% .

5.3 Recommendation:

1. The study recommended that real time ultrasonography should be the first choice modality for the diagnosis of threatened abortion.
2. All obstetrical ER rooms must include US imaging machine.
3. US request should included brief clinical and historical background which may add in narrowing the deferential diagnosis.
4. ER sinologists have to be adapted and continuously educated to increase their knowledge. Familiarity with the sonographic features of threatened abortion.
5. Women with risk factors may take care and bed rest.

References :-

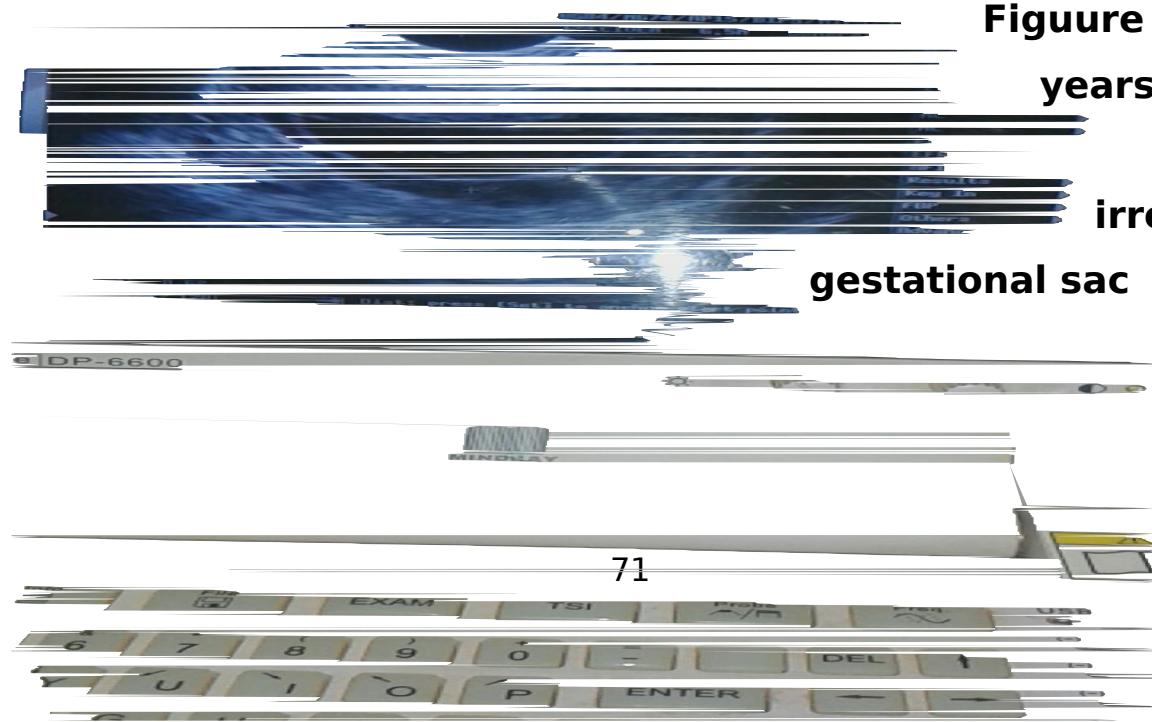
- 1- Arias F. Early pregnancy loss. In practical guide to high risk pregnancy and delivery; 2nd ed. Missouri 1997; 62-7
- 2- Baztofen JH, Fielding WL, Friedman EA. Effect of vaginal bleeding in early pregnancy outcome. Obstet Gynecol 1984;63:515-8.)
- 3- Carol M. Rumack, Stephamie R. Wilson, J. William Charboneau and Deborah Levine. Diagnostic Ultrasound.4th edition Volume one. Elsevier Mosby; Philadelphia: 2011. P.840
- 4- Cunningham FG, GantNF, Leveno KJ, Gilstrap LC III, Health JC, Wenstrom KD. 21st ed. Williams obstetrics. New York: McGraw-Hill,. P. 866-67
- 5- David Deen ,gynecology obstetric ,burwin institute of diagnostic medical ultrasound 1992
- 6- David Shier, Jackie Butler, and Richi Lewis. Human Anatomy and Physiology. 10thed.The Mc Graw-Hill Companies; New York: 2004.P. 835
- 7- Elsevier Mosby; basic of obstetrical and gynecological ultrasonography ,3rd edition , Philadelphia: 2011. P.840-866-869.
- 8- H.T.Lutz H.A.Gharbi , manual of diagnostic ultrasound in infectious tropical disease ,verlage berlin ,germany 2006 P.1-7
- 9- Micael Mc Kinley, and Valerie Dean O'Louchlin. Human Anatomy.Higher Education; New York: 2006.P.822
- 10- Moore KL, Persaud TVN (1998) The urogenital system. In: Moore KL, Persaud TVN (eds) The developing human. Clinically oriented embryology, ed 6. WB Saunders, Philadelphia, pp 303-347.
- 11- obstetrical u\s 3rd edition ,Trish chudleigh and Basky Thilaganathan Elsevier Limited 2004 london p.52-55
- 12- Saurbrei EE, Pham DH. Placental abruption and subchorionic hemorrhage in the first half of pregnancy: US appearance and clinical outcome. Radiology 1986. P.160

- 13- Sotiriadis A, Papatheodorou S, Makrydimas G. Threatened miscarriage: evaluation and management. BMJ 2004;329:152-155
- 14- Stabile I, Campbell S, Grudzinskas JG. Threatened miscarriage and intrauterine haematomas: Sonographic and biochemical studies. J Ultrasound Med 1989;8:289-92

The appendices :-



**Figure (1) 38
years old
show
irregular
gestational sac**



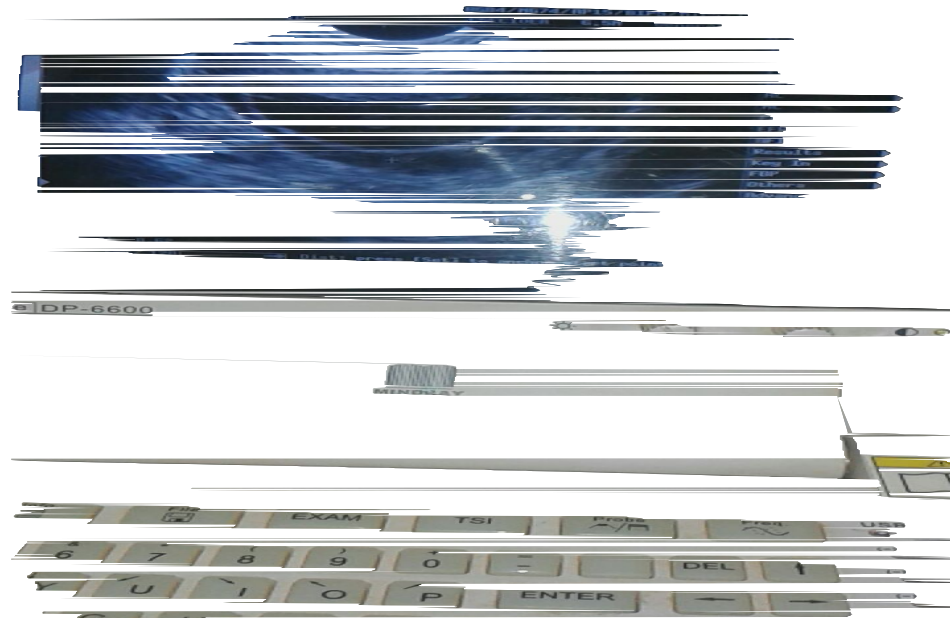
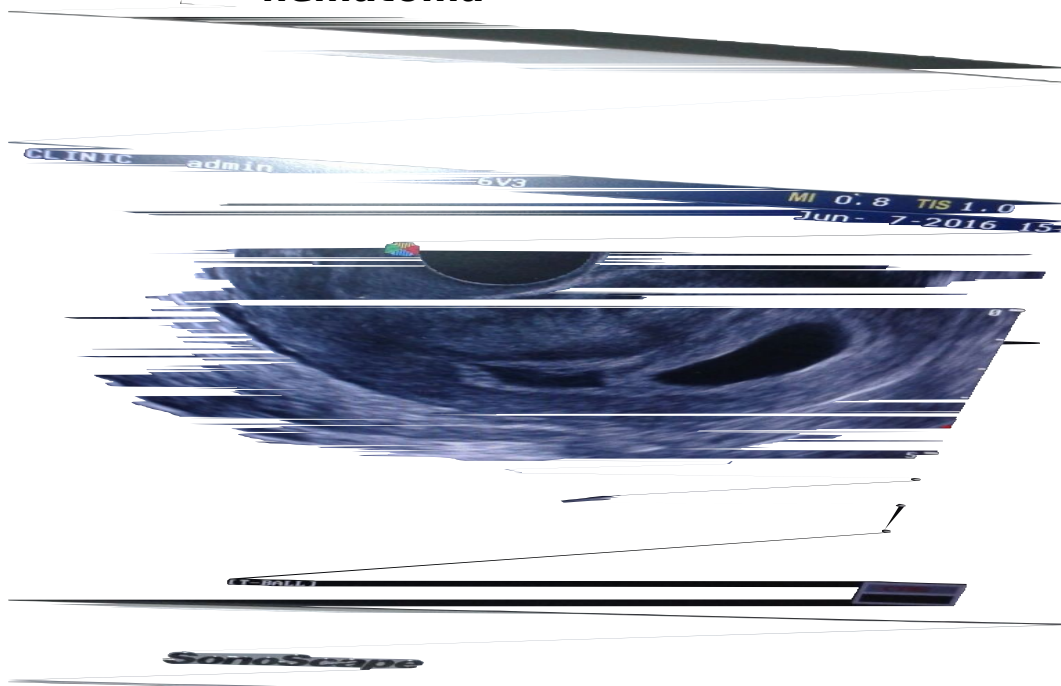


Figure (2) 29 years shows lage subchorionic hematoma

figure (3) figure (3) 29 years shows lage subchorionic hematoma



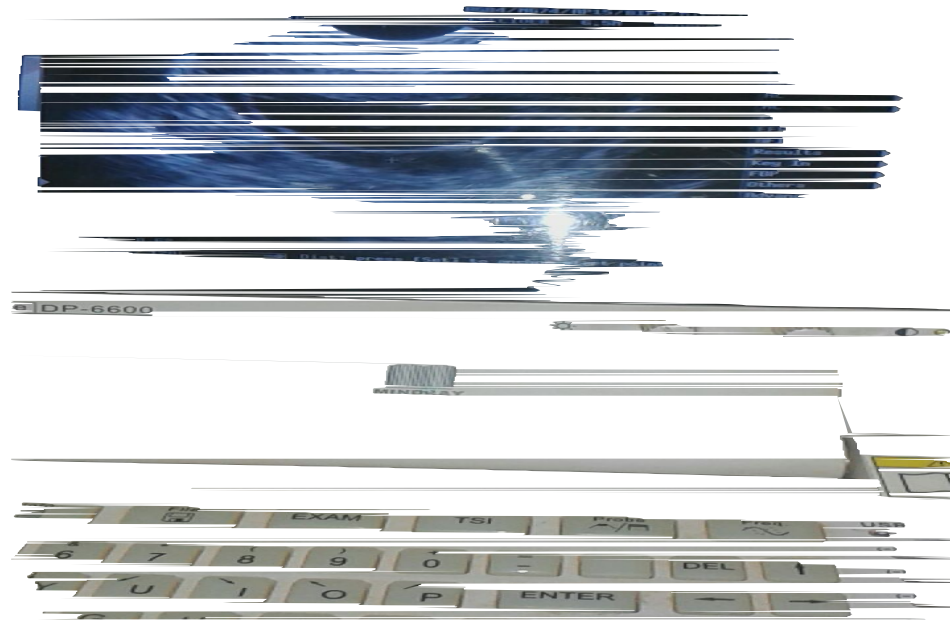


figure (4) 31 years shows empty gestational sac with subchorionic hematoma

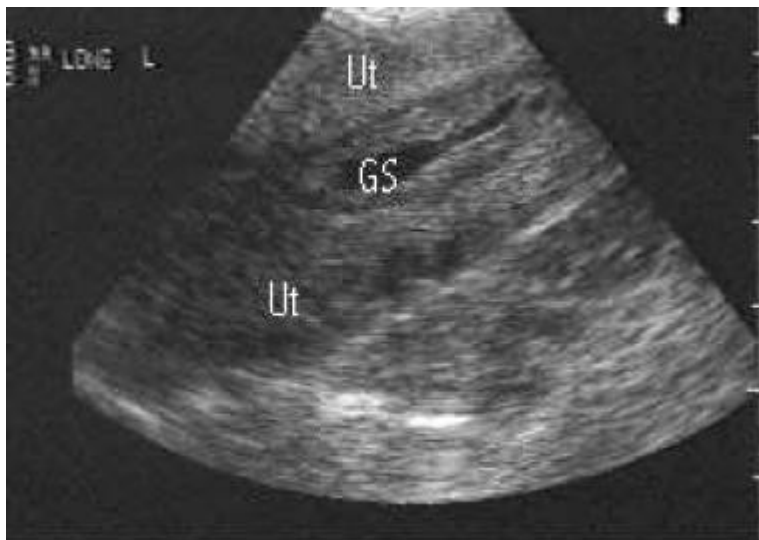


Figure (5) 27 years old shows irregular thin walled GS without embryo.



Figure (6) 38 years old shows large subchorionic hematoma with viable intrauterine fetus.



Figure (7) 29 years old shows large GS containing small viable embryo.

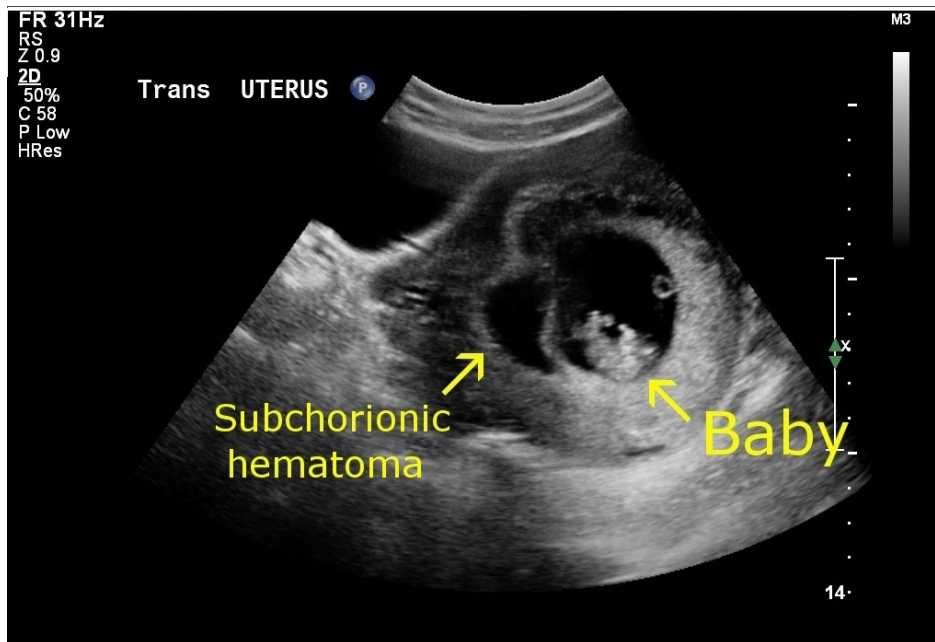


Figure (8) 37 years old shows large subchorionic hematoma with viable embryo.

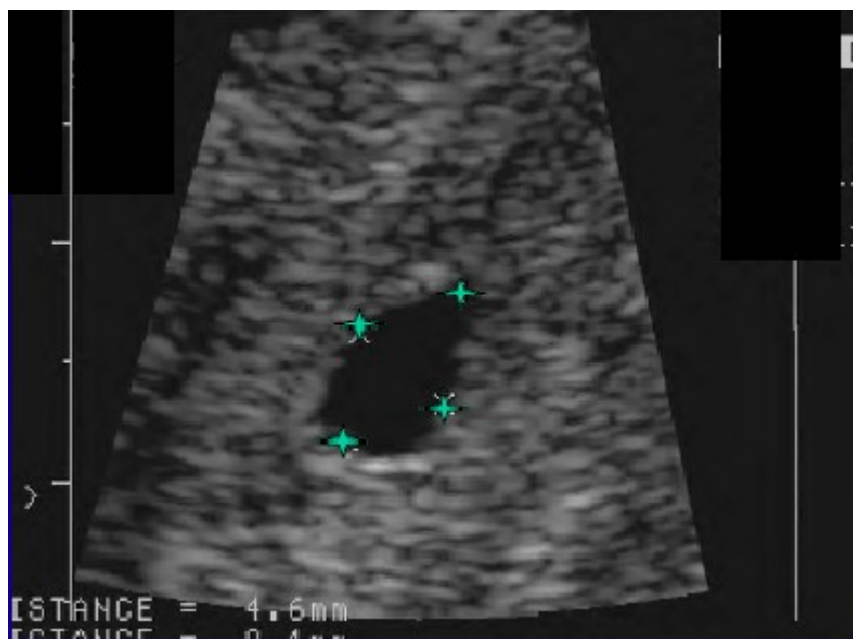


Figure (9) 41 years old shows irregular sac in fundus



Figure (10) 23 years old shows subchorionic hematoma

Appendix-2
Sudan University
Data Collection Sheet

UltraSound Finding Of Threatened Abortion

Date:

No ()

• Patient Data:

• Maternal age

- Gestational age in weeks:

(5-7) ☐ (7-9) ☐ (9-11) ☐ (11-13) ☐

- Gestational sac shape:

Regular ☐ Irregular ☐

- Gestational sac position:

Lower ☐ In-between ☐ Fundal ☐

- CRL Size mm:

< 55-10> ☐ 10 ☐ findings: ☐

Subchorionic hematoma ☐ Abnormal ☐ Gestational
sac ☐
Incomplete abortion ☐ abnormal heart beat ☐