# INTRODUCTION

Abortion is the termination of pregnancy by any means, resulting in the expulsion of an immature, nonviable fetus. A fetus of less than 20 weeks gestation, counting from the first day of the last menstrual period, or a fetus weighing less than 500 grams, is considered an abortus. The term miscarriage has been used for all pregnancy losses. Although imprecise, its use is preferred in discussions with patients, as the word abortion is not liked by many (**Cunningham et al., 2005**).

The United States Centers for Disease Control and Prevention (CDC) reported that 7 percent of abortions were performed between 14 to 20 weeks and 1.3 percent at or after 21 weeks. Second trimester abortion is associated with more morbidity and mortality and for some women more social or emotional challenges than first trimester terminations. Legal induced abortion is rarely associated with death; in 2008, there were only 12 deaths associated with the over 800, 000 abortions reported to the CDC, but the mortality risk increases by 38 percent for each successive gestational week after eight weeks **(Pazol et al., 2012)**.

Incomplete abortion is a major problem that should be effectively managed with safe and appropriate procedures. Different medical and surgical methods are used to manage

incomplete abortion. Surgical evacuation of the uterus for management of incomplete abortion usually involves vacuum aspiration or sharp curettage. Dilatation and curettage alone is may be an inadequate diagnostic and therapeutic tool for all cases. This technique may miss intrauterine disorders or remnants of conception in many cases as confirmed in the removed uterus. Incomplete abortion is more common in second trimester induction abortion than in surgical abortion (1 to 7 versus 0 percent) (**Bryant et al., 2011**).

A known complication after abortion at 14 to 20 weeks gestation is retention of part of the placenta. From clinical experience it is well accepted that macroscopic evaluation does not exclude the possibility that the placenta has been incompletely delivered. Although standardized removal of the placenta with curettage solves this problem, this procedure can induce such complications as Asherman's syndrome, infertility, bleeding abnormalities, uterine perforations, and risk of complications of anesthesia, such as aspiration pneumonitis. Several investigators demonstrated that retained placental tissue can be visualized in women with excessive post-abortive bleeding by means of ultrasonography, thus allowing operative interventions to be limited. It must be noted that in these studies, the reliability of distinguishing placental tissue from blood clots varied (**Abassi et al., 2008**).

Uterine synechiae also known as Asherman's syndrome are the result of scarring within the uterine cavity. The synechiae may range from inconsequential filmy adhesions to very thick scars that obliterate the endometrium, leading to amenorrhea/ hypomenorrhea and infertility. The major risk factor for developing uterine synechiae is curettage of a pregnant or recently pregnant uterus, particularly in the setting of an infection, and the risk appears to increase with the number of surgical procedures **(Kerns et al., 2013).**

Routine evaluation for retained products of conception (RPOC) after all cases of miscarriage or pregnancy termination is likely to result in false positive diagnoses and unnecessary interventions since RPOC do not always lead to morbidity. On the other hand, evaluation is indicated in women whose symptoms fall outside the normal range, such as those with bleeding that is heavy or prolonged, and those with fever, uterine tenderness, or significant abdominopelvic pain. Combined clinical, laboratory, and sonographic evaluation of these patients can help direct management **(Wolman et al., 2009)**.

Diagnosing retained products of conception in a woman presenting with post-abortive bleeding presents a clinical challenge. Ultrasonographic examination may be potentially useful in detecting retained products of conception. Ultrasound

(US) evaluation of the female pelvis has been dramatically improved in recent years **(Wong et al., 2002).**

Power Doppler indirectly confirms the presence or absence of vascularity within the residual trophoblast. To date, there are no published data specifically looking at the association between subjective power Doppler colour scores (PDCS) of retained products of conception (RPC) and subsequent successful expectant management in women with an incomplete miscarriage. There are also no data evaluating the PDCS and volume of RPC. Therefore, the aim of this study was to evaluate whether the use of power Doppler to confirm the presence or absence of blood flow within RPC in women with an incomplete miscarriage can predict subsequent successful expectant management **(Ishwari et al., 2011)**.

While few complications occur, some patients may have persistent bleeding or fever after an abortion and are then often referred for US evaluation to detect abnormalities such as retained products of conception. To interpret these US examinations correctly, the normal appearance of the uterus after an elective termination of pregnancy needs to be known (**Wong et al., 2002**).

# AIM OF THE WORK

The aim of this study is to evaluate combined use of pelvic ultrasound and color Doppler examination for diagnosis of retained products of conception after second trimesteric miscarriage (14-28 weeks).

# ROLE OF ULTRASOUND AND DOPPLER IN DIAGNOSIS OF REMNANTS OF CONCETION

## Ultrasonography in diagnosis of miscarriage:

**History and physics of ultrasound:**

The human ear can detect sound with frequency between 20 Hz and 20 kHz.

Ultrasound is very high frequency sound, mechanical vibrations at frequencies above 20 kHz are defined as ultrasound.

Medical imaging uses frequencies that are much higher than 20 kHz; the range normally used in obstetrics and gyaenecology is from 3 to 5 MHz **(Hedrick et al., 1995)**.

Materials exist which produce an electric current when pressure is applied to their surface. This is known as the piezoelectric effect and the inverse effect occurs when a current is applied to the material causing it to expand and contract. An ultrasound transducer for pulse-echo imaging houses one or more slabs of piezoelectric material. An ultrasound pulse is generated and reflected from the target structures. The reflected

echoes are then detected. This process is repeated in many directions to allow the target structures to be displayed on the screen.

Present day equipments employs real time imaging as opposed to static, and this provides an immediate image and reveals movement of the structures being examined.

Most of the probes are now electronically driven rather than elements mounted in line. Sets of elements are pulled in sequence to produce a rectangular field of view. For the obstetric use curved array transducers are utilized which give a slightly wider field of view and are easier to manipulate on the lower abdomen in early pregnancy. Transvaginal probes work on the same principle (**Callen, 2000**).

**Indications of transvaginal sonograpgy:**

**1) In early pregnancy:**

High resolution of the transvaginal probe enables us to study early pregnancy more accurate with greater details.

By transvaginal ultrasound a yolk sac in the gestational sac can be identified at G.S.D 0.6 cm, whereas, it can't be seen by transabdominal probe until the G.S.D is at least 1cm. The fetal pole can be detected if the M.S.D is 0.9cm, which corresponds to 4.3- 5.3 weeks G.A.

In addition to that, the fetal heart can be detected if the fetal pole is 0.4 cm, in contrast, the transabdominal probe can identify fetal heart only if the fetal pole is 1cm.

Hence, transvaginal sonography can accurately diagnose early fetal demise if no fetal heart activity in MSD= 25m, CRL=7m (**Callen, 2000**).

**2) Diagnosis of bleeding in early pregnancy:**

- **Threatened miscarriage:**

In these patients there is retrochorionic bleeding behind the chorion which appears as a hypoechoic area surrounding the gestational sac. The relative size of the retrochorionic haemorrahge can be quantified in relation to the size of the gestational sac itself. It has been shown that the relative size of the retrochorionic haemorrhge has some implications for the progress of pregnancy. When the area of the haemorrhage is less than 1/4 of the G.S it is likely that pregnancy will continue. **(Uerpairojkit et al., 2001).**

- **Inevitable miscarriage:**

Inevitable miscarriage was defined as an intrauterine gestational sac less than 45 mm or embryonic pole less than 40 mm and opened cervical os in PV examination with active vaginal bleeding **(Creinin et al., 2006).**

- **Missed miscarriage:**

Diagnosed by irregular appearance of the normal echogenic double ring with unclear structures of the decidua / chorion complex which appears oedematous with hyper and hypoechoic areas. Also, there is shrinking of the amniotic sac with complete detachment from any supporting decidual tissue. The fetus itself may undergo degenerative changes which appear as amorphous irregular echogenic tissues without fetal heart activity **(Jauniaux et al., 2005).**

**Incomplete miscarriage:**

Spontaneous incomplete abortion is usually passage of the fetus or embryo with retained choriodecidua. This tissue typically appears as echogenic material within the uterine lumen. The choriodecidua is irregular and the gestational sac itself appears deflated **(Fleischer et al., 1991).**

The incidence of incomplete abortion after curettage may be reduced by using of transvaginal sonography following uterine drainage during the first trimester of pregnancy. Evaluation of endometrial thickness is of crucial importance **(Caserta et al., 2008).**

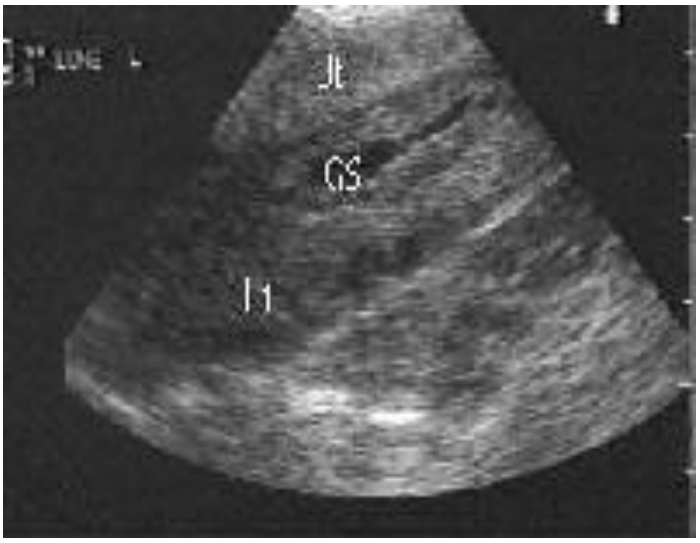


**Fig. (1):** This image shows an endovaginal longitudinal view of a low-lying gestational sac (GS) within the uterus (Ut), representing an incomplete miscarriage **(Tayal et al., 2004).**

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 cutoff levels is the inability to differentiate between blood clots, whichare often seen within the uterine cavity at the time of miscarriage and retained products. We therefore favor subjective assessment of 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 transvaginal probe **(Chudleigh et al., 2004).**

Ultrasound diagnosis of an incomplete miscarriage or retained products of conception (RPOC) use the endometrial thickness and the appearance of the midline echo but no agreement on the appropriate cut-off for endometrial thickness. The endometrial thickness of 15 mm is commonly used for diagnosis ofretained products of conception, and no threshold has been proven to be reliable **(Sawyer et al., 2007).**

However, endometrial thickness criteria for intervention vary among studies and multiple investigators have questioned whether such measurement is clinically useful **(Reynolds et al., 2005).**

**Complete miscarriage:**

Its diagnosis is relatively difficult and includes history of positive pregnancy test and previous ultrasound showing clear intrauterine pregnancy. The uterus appears larger than normal and may contain blood clot or just a hyperechogenic structure continuing into the cervical canal and consisting of firm blood clot **(Jauniaux et al., 2005).**

In completed miscarriages, there is close apposition of relatively thin and regular endometrial interfaces. To be sure of such diagnosis, serial B-HCG values will typically fall precipitously **(Timor – Tritsch and Rottem, 1991).**

It usually diagnosed when the endometrium is very thin and regular. The ultrasound appearance is therefore comparable to that of the non-pregnant uterus in early prolifrative phase **(Chudleigh et al., 2004).**

## Role of transvaginal sonography in diagnosis of retained products of conception

Early pregnancy loss is the commonest complication of pregnancy and represents a major clinical workload for gynecologist. Surgical evacuation of the uterus has become the treatment of choice for this condition, since its introduction into clinical practice in the 1930(**Dunn, 1994).**

Thus, the conventional method for evacuation of the uterine cavity in the first trimester is dilatation suction and or curettage. This invasive and blind procedure carries the risk of complications such as hemorrhage, infection, perforation and retained products of conception (RPOC). Current estimates of the general rate of complications range from 1.4% to 8.4 % (**Zhou et al., 2002).**

**Fig. (2):** Transvaginal sonography of normal thin endometrium, measuring 4.2mm in thickness (**Brown et al., 2005).**

The incidence of RPOC after first trimester termination of pregnancy (TOP) has been reported as 1-3% and the reduction of this relatively high incidence is a very worthwhile goal (**Creinin et al., 2001).**

While few complications occur, some patients may have persistent bleeding or fever after an abortion and are then referred for ultrasound evaluation to detect abnormalities such as retained products of conception **(Wong et al., 2002).**

Retainedproducts of conception (RPOC) may cause endometritis, which in turn may be associated with intrauterine adhesions and impairment of future fertility (**Di Salvo, 2003).**

The diagnosis of RPOC is based on clinical presentation, bimanual examination, sonographic finding and histopathological

confirmation of the presence of chorionic villi which are obtained from repeated curettage or operative hysteroscopy. Obviously, re-evacuation of the uterine cavity can cause additional complications, such as bleeding, perforation, infection, intrauterine adhesions and future infertility (**Di Salvo, 2003).**

Pelvic ultrasound is now being widely used to confirm presence of RPOC in suspected patients. It is also used to allocate patients to conservative or surgical management (**Debby et al., 2006).**

Transvaginal Sonography is a useful supplement to clinical assessment in women with a spontaneous first trimester abortion. Use of transvaginal Sonography should reduce unnecessary general anesthesia and uterine curettage (**Wong et al., 2002).**

The presence of endometrial mass, thick endometrium, irregular myometrial endometrial interface, complex endometrial fluid or echogenic focus without apparent endometrial mass are the sonographic feature that may indicate presence of retained products of conception(RPOC) **(Brown et al., 2005).**

Among these features, endometrial thickness is a commonly used parameter **(Ustunyurt et al., 2008).**

Transvaginal sonography examination at the end of uterine evacuation for termination of pregnancy is recommended and when the endometrial thickness at this stage is more than 8 mm, a repeat curettage should be performed (**Debby et al., 2006).**

**Ustunyurt et al. (2008)** concluded that an endometrial thickness of 13 mm or more, detected by transvaginal sonography, has the optimal diagnostic efficacy to detect retained products of conception (RPOC) following first trimester abortion **(Ustunyurt et al., 2008).**

**Wong et al. (2002)** suggested a cut-off value of 8mm for a two layer endometrial thickness to identify prospectively retained products of conception **(Wong et al., 2002).**


**Fig. (3):** Transvaginal US scan of a thick endometrium (arrows), more than 13mm. There were retained products of conception present on subsequent dilatation and evacuation **(Bronz et al., 1997).**