Role Of Ultrasound And Doppler In Management Of Retained Placenta.

Thesis Submitted

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ABSTRACT:

PPH and retained placenta are main complications for the third stage of labor.many modalities have been tried to deliver the placenta with wide range of success rates. UVI with 20 iusyntocinon in 20 ml saline has shown a great success rate with partially separated placenta diagnosed with u/s .

Key words: UVI, MROP, COLOR DOPPLER, U/S , THIRD STAGE OF LABOR, RETAINED PLACENTA.

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Introduction

Introduction

Post-partum haemorrhage is a significant cause of maternal mortality in the non-industrialized world. Many cases of post-partum haemorrhage are associated with retained placenta, a condition that affects 0.6 – 3.3% of normal deliveries. Where there is easy access to hospital care and blood transfusion, mortality from this condition is very low **(Tandberg A, 1999).**

The most recent triennial report describes a death from post-partum haemorrhage secondary to retained placenta for the first time in 30 years, from these data, the estimated death rate in UK is 1 in every 1.5 million deliveries, or an estimated 1 death in every 30,000 retained placentae .Case fatality rate is high when facilities for manual removal of placenta (MROP) are not immediately available or when traveling times to hospital is long. Clearly, an effective medical treatment could have major implications for the reduction of maternal mortality**(Weeks A D, 2002).**

There is no consensus as to the length of the third stage after which a placenta is called "retained". Various authorities have suggested anything between 20 min and 2 h. indeed , there is no increase in the heamorrahge rate until 30 min have elapsed **(Enkin M W,1995).**

The use of prophylactic oxytocics has marked effects on the length of the third stage. In the Cochrane review, the mean length of the third stage in those who had physiological management was 15.5 min compared with 8.8 min in those

who had active management. This also translates into a reduction in the number of placentae stil in situ at 20and 40 min. when the number who actually need manual removal is compared, however, there is no difference between the two groups **(Prindiville W J,2003).**

The differentiation between trapped and adherent placenta is not easy until ultrasound is used. Placenta accreta is very rare in women having a vaginal delivery, and an attempt at manual removal should always be made unless a definitive diagnosis has been made prior to delivery. Clues to a trapped placenta will be if the fundus feels small and contracted, or if the edge of the placenta is palpable through a tight cervical os. Alternatively, Herman et al. suggests that ultrasound should be used to differentiate between a trapped and adherent placenta. With a trapped placenta, the myometrium is seen to be thickened all around the uterus and a clear demarcation is often seen between the placenta and the myometrium. In contrast, with an adherent placenta, the myometrium will be thickened in all area except where the placenta is attached where it will be very thin or even invisible **(Herman A,1993).**

If the placenta is trapped , then the use of tocolytics may be attempted to release the placenta. The woman should be kept under close observation following their administration as heamorrahge may follow uterine relaxation **(Thiery M, 2003).**

Aim of the work

Aim of this study is:

1. To determine a reliable method to diagnose retained placenta due to various causes and to proceed to the most appropriate interference .

2. To find out an excellent protocol for management of retained placenta to minimize maternal mortality and morbidity due to postpartum bleeding

Human Placenta

The human placenta is discoidal, villous, and hemochorial in structure. The arrangement of its maternal and fetal blood flows is in accord with the multivillous type of exchange system. These basic structural characteristics are realized by the following design: The human placenta at term is a local, disk-like thickening of the membranous sac that is achieved by splitting the membranes into two separate sheets, the chorionic plate and the basal plate. Both sheets enclose the intervillous space as cover and bottom. The intervillous space is perfused with maternal blood, after leaving the spiral arteries which circulates, directly around the trophoblastic surfaces of the placental villi. The maternal blood is outside, the confines of the endothelium of the maternal vascular system(**Kaufmann,et al 2006**).

The development of the placenta has always been of interest to anatomists, researchers, obstetricians, and ultrasonographers. Combined studies, using transvaginal ultrasonography, chorionic villus sampling, and hysteroscopy specimens from the first trimester of pregnancy, have recently indicated the absence

of continuous blood flow in the intervillous space before 12 weeks of gestation **(Hagen-Ansert, 2007)**.

It is recognized that the anatomic components of the placenta are discernible from as early as the 7^{th} to 8^{th} week of gestation. By the end of the first trimester, sonography can determine the location and position of the placenta and identify specific components of the placenta. **(Hagen-Ansert, 2007)**.

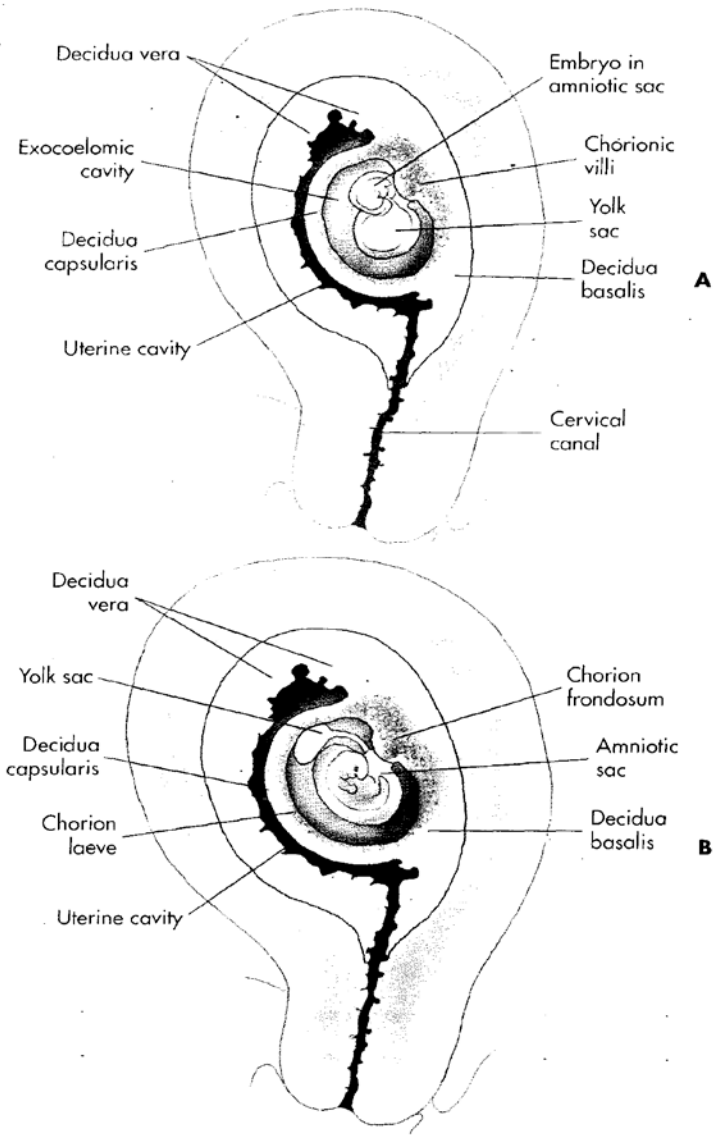


Figure (1): Early development of embryo **.**

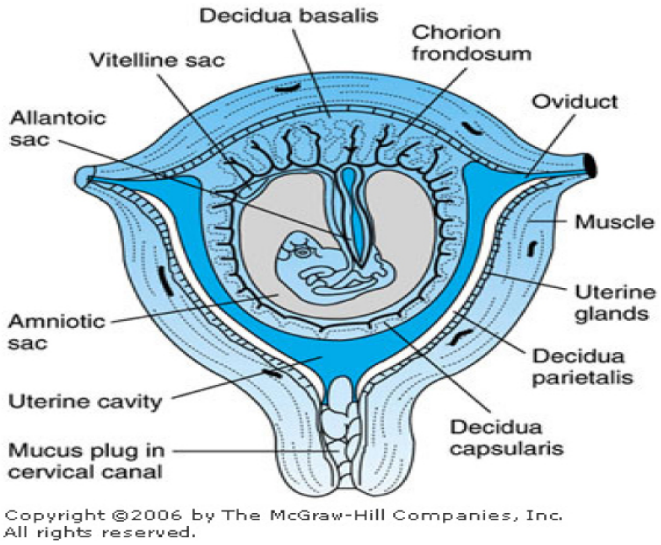
Embryogenesis:

Within a few hours after implantation, the trophoblast invades the endometrium and begins to produce human chorionic gonadotropin (hCG), which is thought to be important in converting the normal corpus luteum into the corpus luteum of pregnancy. As the cytotrophoblasts (Langhans' cells) divide and proliferate, they form transitional cells that are ultrastructurally more mature and a likely source of hCG. Next, these transitional cells fuse, lose their individual membranes, and form the multinucleated syncytiotrophoblast. Mitotic division then ceases. Thus, the syncytial layer becomes the front line of the invading fetal tissue. Maternal capillaries and venules are tapped by the invading fetal tissue to cause extravasation of maternal blood and the formation of small lakes (lacunae), the forerunners of the intervillous space. These lacunae fill with maternal blood by reflux from previously tapped veins. An occasional maternal artery then opens, and a sluggish circulation is established (hematotropic phase of the embryo).

The lacunar system is separated by trabeculae, many of which develop buds or extensions. Within these branching projections, the cytotrophoblast forms a mesenchymal core. The proliferating trophoblast cells then branch to form secondary and tertiary villi. The mesoblast, or central stromal core, also formed from the original trophoblast, invades these columns to

form a supportive structure within which capillaries are formed. The embryonic body stalk (later to become the umbilical cord) invades this stromal core to establish the fetoplacental circulation. If this last step does not occur, the embryo will die. Sensitive tests for hCG suggest that at this stage, more embryos die than live. **(Jaffe et al., 2008)**.

Where the placenta is attached, the branching villi resemble a leafy tree (the chorion frondosum), whereas the portion of the placenta covering the expanding conceptus is smoother (chorion laeve). When the latter is finally pushed against the opposite wall of the uterus, the villi atrophy, leaving the amnion and chorion to form the 2-layered sac of fetal membranes (Fig 2).



Relationships of structures in the uterus at the end of the seventh week of pregnancy.

The fetal chorion is the fusion of the trophoblast and extraembryonic mesenchyme. There are two types of trophoblastic cells: the syncytiotrophoblast is the outer layer made of multinuclear cells, and the cytotrophoblast is the inner layer made of mononuclear cells. Around 40 days after conception, the trophoblast has invaded approximately 40–60 spiral arterioles, of which 12–15 may be called major arteries. The pulsatile arterial pressure of blood that spurts from each of these major vessels pushes the chorionic plate away from the decidua to form 12–15 "tents," or maternal cotyledons**.** The remaining 24–45 tapped arterioles form minor vascular units that become crowded between the larger units. As the chorionic plate is pushed away from the basal plate, the anchoring villi pull the maternal basal plate up into septa (columns of fibrous tissue that virtually surround the major cotyledons). Thus, at the center of each maternal vascular unit there is 1 artery that terminates in a thin-walled sac, but there are numerous maternal veins that open through the basal plate at random. The human placenta has no peripheral venous collecting system. Within each maternal vascular unit is the fetal vascular "tree," with the tertiary free-floating villi (the major area for physiologic exchange) acting as thousands of baffles that disperse the maternal bloodstream in

many directions. A cross-sectional diagram of the mature placenta is shown in Fig 3. **(Jaffe et al., 2008)**.

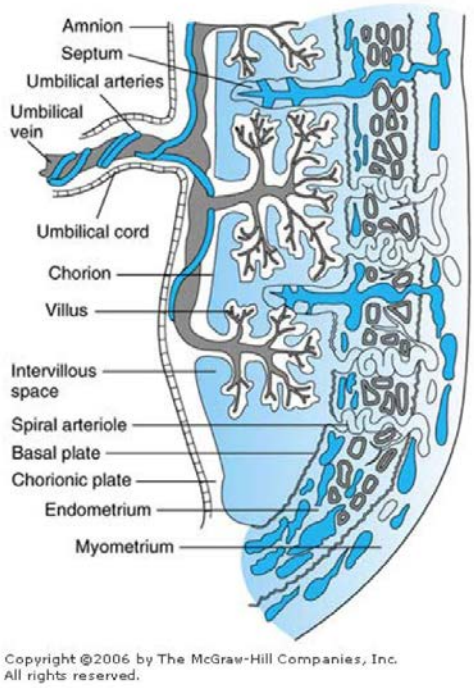


Figure 3.
Schematic cross section of the circulation of the mature placenta. (Reproduced, with permission, from Benson RC: *Handbook of Obstetrics & Gynecology*, 8th ed. Lange, 1983.)

The major functioning unit of the placenta is the chorionic villus. Within the chorionic villus are the intervillous spaces. The maternal blood enters the intervillous spaces. The cotyledons are cobblestone in appearance and composed of several mainstem villi and their branches. They are covered with a thin layer of the decidua basalis. **(Hagen-Ansert, 2007)**.Table

1 summarizes the major morphologic-functional correlations that take place during placental development.

Table 1. Development of the Human Placenta.[1]

Days After Ovulation	**Important Morphologic-Functional Correlations**
6–7	Implantation of blastocyst.
7–8	Trophoblast proliferation and invasion. Cytotrophoblast gives rise to syncytium.
9–11	Lacunar period. Endometrial venules and capillaries tapped. Sluggish circulation of maternal blood.
13–18	Primary and secondary villi form; body stalk and amnion form.
18–21	Tertiary villi, 2–3 mm long, 0.4 mm thick. Mesoblast invades villi, forming a core. Capillaries form in situ and tap umbilical vessels, which spread through blastoderm. Fetoplacental circulation established. Sluggish lacunar circulation.
21–40	Chorion frondosum; multiple anchored villi, which form free villi shaped like "inverted trees." Chorionic plate forms.
40–50	Cotyledon formation: (1)Cavitation. Trophoblast invasion opens 40–60 spiral arterioles. Further invasion stops. Spurts of arterial blood form localized hollows in chorion frondosum. Maternal circulation established. (2)Crowning and extension. Cavitation causes concentric orientation of anchoring villi around each arterial spurt, separating chorionic plate from basal plate. (3)Completion. Main supplying fetal vessels for groups of second-order vessels are pulled from the chorioallantoic mesenchyme to form first-order vessels of fetal cotyledons. (4)About 150 rudimentary cotyledons with anchoring villi remain, but without cavitation and crowning ("tent formation"). Sluggish, low-pressure (5–8 mm Hg) flow of maternal blood around them.
80–225	Continued growth of definitive placenta. Ten to 12 large cotyledons form, with high maternal blood pressures (40–60 mm Hg) in the central intervillous spaces; 40–50 small to medium–sized cotyledons and about 150 rudimentary ones are delineated. Basal plate pulled up between major cotyledons by anchoring villi to form septa.
225–267 (term)	Cellular proliferation ceases, but cellular hypertrophy continues.

[1]Adapted from Reynolds SRM: Formation of fetal cotyledons in the hemichorial placenta. Am J Obstet Gynecol 1966;94:425.(Reproduced, with permission, from Page EW, Villee CA, Villee DB: *Human Reproduction.* Saunders, 1976.)

PLACENTAL BARRIER:

is composed of the following layers: (1) a continuous layer of syncytiotrophoblast covering the villous surface and thus lining the intervillous space; (2) an initially (first trimester) complete, but later (second and third trimesters) discontinuous layer of cytotrophoblast (Langhans' cells); (3) a trophoblastic basal lamina; (4) connective tissue; and (5) fetal endothelium which is surrounded only by an endothelial basal lamina in the last trimester ***(Benirschke and Kaufmann., 2006)***.

A normal placenta has 2 portions. The maternal portion develops from the deciduas basalis, and the fetal portion develops from the chorion frondosum. The fetal tissue combines with the maternal deciduas to form the circulation. The major functioning unit of the placental circulation is the chorionic villi. From there the blood enters the umbilical arteries and moves towards the fetus ***(DiGiacinto et al., 2006)***.

Macroscopic Features of the Delivered Placenta:

The full-term, delivered placenta is, in more than 90% of the cases, a disk-like, flat, round to oval organ. In nearly 10%, it has abnormal shapes, such as placenta bilobata, placenta duplex,

placenta succenturiata, placenta zonaria and placenta membrancea **.** The average diameter is 22cm, the average thickness in the center of the delivered organ 2.5cm, and the average weight 470g. The respective measurements show considerable interindividual variation and strongly depend on such factors as the mode of birth, timing of cord clamping and time elapsed between delivery and examination ***(Benirschke and Kaufmann., 2006)***.

1- **Fetal Surface:**

The fetal (chorionic or amnionic) surface, facing the amnionic cavity, has a glossy appearance because of the intact epithelial surface of the amnion. This membrane covers the chorionic plate, including the chorionic vessels. The latter branch is a star-like pattern positioned centrifugally from the cord insertion over the fetal surface where arteries and veins cross, the arterial branches are usually closer to the amnion; they cross the veins on their amnionic aspect. only about 3% show the opposite condition. According to ***(Boyd and Hamilton 2000)***, the superficial position of one of few venous branches at points of arteriovenous crossing is not unusual.

In the vicinity of the larger chorionic vessels, the chorionic plate normally has an opaque appearance because an increased number of collagen fibers accompany the vessels.