First Trimester Uterine Scar Assessment by Transvaginal Ultrasound

Thesis

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بِسْمِ اللّهِ الرَّحمَنِ الرَّحيمِ

[...رَبِّ اَوزِعنِي اَن اَشكُرَ نِعمَتَكَ
الَّتِي اَنعَمْتَ عَلَيَّ و عَلى والِدَيَّ
و اَنْ اَعْمَلَ صَالِحاً تَرْضَاهُ و اَدْخِلْنِي
بِرَحْمَتِكَ فِي عِبَادِكَ الصَّالِحِينَ]

صدق الله العظيم

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List of Abbreviations

BFGF	: Basic fibroblast growth factor
CRL	: Crown rump length
CS	: Cesarean section
CTGF	: Connective tissue growth factor
HS	: Highly significant
LR	: Likelihood ratio
LSCS	: Lower-segment cesarean section
LUS	: Lower uterine segment
NS	: Non significant
PCDS	: Previous caesarean delivery scar
PDGF	: Platelet-derived growth factor
S	: Significant
SD	: Standard deviation
SPSS	: Statistical package for social science
TAS	: Transabdominal sonography
TGF-β	: Transforming growth factor beta
TNF-α	: Tumor necrosis factor alpha
TVS	: Transvaginal sonography
US	: Ultrasonorgraphy
VBAC	: Vaginal birth after caesarean section
VEGF	: Vascular endothelial growth factor
WHO	: World Health Organization

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Introduction

The number of deliveries by Cesarean section (CS) has been increasing steadily worldwide in recent decades. Although it is often assumed that Cesarean section improves neonatal outcomes, there is no hard scientific evidence to support this view. The safety of Cesarean section, however, has increased owing to improvements in surgical and anesthetic techniques, increased safety of blood transfusion and routine use of antibiotics and thromboprophylaxis. Cesarean section is also associated with long-term risks such as postoperative pelvic adhesions, uterine scar rupture, and placental complications such as placenta previa and accreta. The latter two complications are likely to be associated with the poor uterine scar healing following Cesarean sections. Uterine scar dehiscence may present as an acute event in the antenatal or intrapartum period, leading to significant fetal and maternal morbidity. The frequency of uterine rupture is estimated at 0.2–3.8% and that of uterine dehiscence is between 0.6 and 3.8% ***(Ofili-Yebovi et al., 2008).***

Uterine scar dehiscence during pregnancy, defined as asymptomatic thinning or separation of a prior uterine scar. Previous CS, prior myomectomy and uterine perforation have all been associated with increased risk of scar rupture or dehiscence, usually presenting in the third trimester ***(Hamar et al., 2003).***

Routine surveillance of Cesarean section scars by ultrasonography during pregnancy has been proposed by some authors, in an attempt to identify 'silent' or asymptomatic scar dehiscence ***(Armstrong et al., 2003).***

Several studies have attempted to assess scar integrity during pregnancy, but the sonographic detection of uterine scars is easiest in the non-pregnant state. Scar integrity has also been assessed by saline contrast sonohysterography, in order to delineate scar deficiency more accurately. However this method of assessment is not without risks and therefore is limited in its practical application ***(Ofili-Yebovi et al., 2008).***

According to scarred lower uterine segment (LUS) appearance categories that were proposed by Cheung et al (modified from those of Michaels et al and Fukuda et al.), LUS can range from normal-appearing LUS (practically indistinguishable from an unscarred one) to paper-thin LUS (a thinned LUS but not thin enough to visualize the\ uterine contents). Sometimes, scarred LUS is interrupted, which results in uterine dehiscence (subperitoneal separation of the uterine scar, with chorioamniotic membrane visible through the peritoneum of the LUS) ***(Pollio et al., 2006).***

The incidence of uterine dehiscence after a low transverse CS is approximately 1%, whereas the risk of uterine rupture has been reported recently to globally occur in approximately 1 : 2900 deliveries, which confirms previous literature. Uterine dehiscence most often occurs at the time of a repeat CS in an asymptomatic manner. Considering that

abnormal LUS thinning (paper-thin LUS) and uterine dehiscence represent risk factors of symptomatic uterine rupture ***(Pollio et al., 2006).***

Several studies have compared the thickness of the LUS measured by ultrasound with the thickness assessed during surgery. ***In 2005, Cheung et al.*** assessed the accuracy of transabdominal sonography (TAS) in predicting the thickness of LUS during cesarean delivery as a dichotomous categorical variable. In a similar study, Suzuki et al. used presence or absence of subperitoneal separation of the uterine scar in the LUS to diagnose dehiscence. ***In 2004, Sen et al.*** assessed the LUS by categorizing it into 4 grades: grade I indicating a well-developed LUS and grade IV indicating a uterus with a dehisced or a ruptured scar. Although transvaginal sonography (TVS) has been known to produce clearer images of the structures of the female pelvis with proven benefits over TAS ***(Marasinghe et al., 2009)***.

Although most of the attention has focused on second- and third-trimester diagnosis of abnormal placental insertion ***(Wu et al., 2005)*** and risk of rupture during labor in patients with a history of lower-segment cesarean section (LSCS) ***(Landon et al., 2006)*** it may be that first-trimester screening could allow early recognition of patients at risk for any of these perinatal complications.

Indeed, the first trimester is increasingly considered as a starting point for stratifying patients at risk of subsequent obstetric complications, such as placenta previa ***(Mustafa et al., 2002).***

The first trimester is possibly the best time to achieve visualization of the scar and its relationship with the trophoblast, which may suggest or rule out abnormal placental insertions ***(Strineman et al., 2011).***

Aim of the Work

The objective of the study to assess the value of first trimesteric transvaginal U/S in prediction of scar dehiscence at term.

Cesarean Section

Definition;

Cesarean delivery is defined as the birth of a fetus through incisions in the abdominal wall (Laparotomy) and the uterine wall (Hysterotomy). This definition does not include removal of the fetus from the abdominal cavity in the case of rupture of the uterus or in the case of an abdominal pregnancy ***(Cunningham et al., 2007).***

Cesarean delivery is the most common obstetric intraperitoneal operation, and the number of cesarean deliveries is increasing worldwide ***(Malvasi et al., 2009).***

History:

The origin of the name is not clear, and three principal explanations have been suggested, however, abdominal delivery of the fetus was practised upon the dead pregnant women since great antiquity, it was required by an ancient Roman law which was originated by "Numa Pompilus" (the second king of Rome, 762-715 B.C) known as lex regia. By which it was forbidden to bury pregnant woman before the child had been extracted from her abdomen ***(Cunningham et al., 2001).***

Later, in the time of "Julius Caesar" this law became known as the lex caeserea, and this is the most popular derivation of its present name, the legend Caesar himself was born in this manner (a sign of divine honor), with the result that the procedure became known as "Caesarean operation. The

mother of 'Julius Caesar' lived for many years after his birth in 100B.C; the operation was until the end of the 17th century, invariably fatal ***(Shaaban, 2007).***

Lastly, a linguistic explanation states that the word caesarean was derived sometime in the Middle Ages from the Latin verb "Caedera", "to cut", an obvious cognate is the word caesura, a cutting, or pause, in a line of verse. This explanation of the term caesarean seems most logical, but exactly when it was first applied to the operation is uncertain, because "Section" is derived from the Latin verb ‘‘Seco’’, which also mean "cut" ***(Cunningham et al., 2001).***

The first cesarean section was performed on a living patient in 1610 ***(Jennifer B et al., 2008).***

The first major surgical advance in the technique of cesarean section was introduced by Porro in 1876 ***(Miller, 1992).***

Influenced by the prevailing concept of not suturing the uterine incisions, Porro introduced a technique in which the uterine funds was amputated following the delivery of tfie fetxis and the cervical stump marsupialized to the anterior abdominal wall. Although drastic by today's standards, the Porro technique resulted in a dramatic decline in maternal mortality ***(Speert, 1958).***