EVALUATION OF UTERINE SCAR AND ITS POSSIBLE DEFECT AFTER CESAREAN SECTION BY TRANSVAGINAL ULTRASOUND

Thesis

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Abstract

This cross-sectional study was intended to describe morphological criteria of cesarean section scar and or their defects (*niches*) through examination by transvaginal ultrasonography (TVS) during the non-pregnant state and to associate the CS defects with the related gynecological presentation and risk factors in such patients. The study involved 100 multiparous women with history of at least one previous CS recruited from the outpatient clinic of Aswan Teaching Hospital during the period from January 2011 to February 2013.

Key Words: transvaginal ultrasonography (TVS) - cesarean section scar defects - post menstrual spotting.

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INTRODUCTION

Cesarean delivery is the most commonly performed major abdominal operation in women. The rate varies between low-income and affluent countries, with global estimates of 15% worldwide, ranging from a low of 3.5% in Africa, to 33% in the United States, to a high of 43.9% in Brazil ***(Rebelo et al., 2010).***

The increasing cesarean section (CS) rate and its associated complications have stimulated an interest in the behavior of CS scars and their associated potential morbidity ***(Hamar et al., 2007).*** In addition, the incidence of uterine rupture in trials of vaginal birth after Cesarean section (VBAC) has remained static with a frequency estimated at 0.2–3.8 % ***(Ofili-Yebovi et al., 2008).***

Improvement in imaging techniques has facilitated the evaluation of CS scars and or their defects both before and during pregnancy, scar defect appears as a wedge-shaped cystic or hypo echoic distortion in the scar by transvaginal ultrasonography TVS in the non-pregnant state ***(Yazicioglu et al., 2006)***.

CS scar defect was first described using hysterosalpingography in 1961 by ***Poidevin et al,*** then by trans- abdominal sonography TAS in 1982 by ***Burger et al,*** and finally using TVS in 1990 by ***Chen et al. Poidevin et al. (1961)*** performed hysterographic examination on 43 women 6 months after CS. They described a typical small wedge-shaped morphological ‘defect’ in 27 patients, which they believed was an indication of healing and considered this safe for vaginal delivery in the

future. They further proposed that a 6-month wait was necessary before hysterography, as an earlier examination may reveal no deformity owing to wound edema ***(Poidevin et al., 1961).***

Transabdominal Ultrasound (TAS) performed by Burger et al., (1982) on 48 women who had undergone CS, they described a sonolucent area with varied degrees of echogenicity at the wound site between the anterior wall and the cavity of the uterus. This pattern was found in 15 out of the 48 patients involved in the study, and was classified as an incompletely healed uterine scar ***(Burger et al., 1982).***

Transvaginal Ultrasound (TVS) has, since offered, a further tool for observing the uterine scar after CS. ***Chen et al. (1990)*** described a wedge-shaped hypo echoic area at the CS wound site that was easily distinguishable from the neighboring part of the lower uterine segment LUS. They used Doppler velocimetric studies to show that the scar is relatively a vascular, and found that the longer the time elapsed since surgery the smaller the wedge-shaped 'defect' become ***(Chen et al., 1990).***

At a later stage the word 'niche' was introduced by ***Monteagudo et al. (2001).*** They described the 'niche' using ultrasound as a triangular anechoic area at the presumed site of CS incision ***(Monteagudo et al., 2001)***.

The healing period of the myometrium after CS examined by *Dicle et al. (1997)* using magnetic resonance imaging (MRI). They concluded that myometrial scar tissue takes at least 3 months to form, and that complete involution and recovery of the zonal anatomy is not

achieved until 6 months later ***(Dicle et al., 1997).*** However the data to link the appearance of the scar to functional integrity was missing.

There are now many studies clearly describing the morphological features of cesarean section scars. However, important questions remain to be answered. The principal among these questions is whether a scar classified as deficient using ultrasound leads to an increased risk of failed VBAC or uterine rupture in labor, and if it is associated with other complications such as menstrual problems and subfertility. A recent publication has suggested a possible relationship between the non-pregnant appearance of a cesarean section scar and scar performance in a subsequent pregnancy. However, the number of cases included in the study was too small to draw definitive conclusions ***(Osser et al., 2010***).

AIM OF THE WORK

This study aims to describe morphological criteria of cesarean section scar and or their defects (niches) detected by transvaginal ultrasonographic scan in non-pregnant women and to associate theses morphological criteria with the related gynecological presentation and risk factors in such patients.

CHAPTER I

UTERINE WOUND IN CESAREAN SECTION

INTRODUCTION

Cesarean delivery is defined as the birth of a viable 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 case of rupture of the uterus or in case of an abdominal pregnancy ***(Cunningham et al., 2010).***

A low transverse uterine incision is performed in over 90% of all cesarean deliveries. Advantages of the low transverse uterine incision include less bladder dissection, easier entry into the uterine cavity, less blood loss, and lower risk of uterine rupture in a subsequent pregnancy ***(Rayburn & Schwartz, 1996).***

A vertical uterine incision may be considered when the lower uterine segment is not developed enough to accomplish an easy delivery to the fetus and a less trauma to the mother. The most common indication for a vertical uterine incision is a premature infant in a non-vertex presentation. Vertical uterine incision can be easily extended if necessary to accommodate the fetal head ***(Rayburn & Schwartz, 1996).*** The next most common indication for a vertical uterine incision is a back-down transverse lie. With this presentation, the fetal feet may be difficult to grasp through a low-transverse incision with resultant trauma to either the uterus and or the fetus ***(Cunningham et al., 2010).*** In cases when the placenta is implanted in the lower uterine segment, the vasculature may

be very prominent in the lower uterine segment. By performing a low vertical uterine incision the vessels can be avoided ***(Bethune & Permezel, 1997)***.

The classical Cesarean section: *involving* a midline longitudinal incision which allows a large space to deliver the baby. However it is rarely performed today as it is more prone to complication ***(Dodd et al., 2008).***

Closure of CS uterine incision starts with identification of the angles and an absorbable No. 0 or No. 1 suture is begun just beyond one angle and run the length of the incision using a continuous-locking suture technique traditionally, a second layer of suture is then placed, imbricating the first. However, when hemostasis is adequate with a single layer closure, a second layer is unnecessary. Single layer uterine closure was compared with traditional double-layer closure the results were almost comparable**.** If hemostasis is not achieved with a single-layer closure, direct pressure or an interrupted or figure-of-eight suture may be placed along the incision line The uterine closure may be performed either with the uterus within the peritoneal cavity or following removal of the uterus through the abdominal incision ***(Bujold et al., 2009).***

Healing of Cesarean Section Wound

It was believed that it healed by regeneration of the muscular fibers and by scar formation. This conclusion was based upon the findings at histological examination:

- **First** upon inspection of the opened uterus at time of repeat cesarean section the site of the previous incision is usually found as a trace of the former incision or an almost invisible linear scar.

- **Second** when the uterus is removed often no scar is visible after fixation, only a shallow vertical furrow in the external and internal surface of the anterior uterine wall is seen, with no trace of the scar between them ***(Washington, 1998).***

It is generally agreed that an incised wound in the skin and subcutaneous tissue always heals by formation of a fibrous tissue scar which unites the cut surface**,** the healing of a wound in muscle is not so simple, in favorable conditions; a cesarean section wound in the uterus can heal by formation of new plain muscle and without any scar tissue however, in unfavorable conditions (wound sepsis or incomplete haemostasis for instance) scar formation between the opposed wound surfaces of the uterus is the rule, the scar may be composed entirely of fibrous tissue and may be a thin linear scar or a wide one, or it may contain a few regenerated muscle fibers. Further, the scar may extend through the whole thickness of the wound from the serosal surface to mucosal surface, or it may be confined to a part of it so that a gutter is apparent on both aspects of the anterior wall of the uterus**.** The upper uterine segment is more liable to rupture in subsequent labor or

pregnancy due to bad healing compared to that of the lower uterine segment scar ***(Myerscough, 1988).***

Martin, (1997) documented that possible reasons for this weakness may be due to difficult coaptation of the fibers exactly; in consequence, small pocket of blood collects which, whether infected or not are likely to result in weakness of the scar:

1. The wound is state of tension, alternate contractions and relaxations occur during the early days of the puerperium in the active contractile upper segment, hence, the sutures are being disturbed and dragged upon; consequently they become relaxed, with the result that the two surfaces of the wound tend to be in less intimate apposition and the stitches may even become undone.

2. If the decidua has not been carefully excluded, a gutter runs along the scar on its inner surface, this constitutes permanent weakness and in a subsequent pregnancy that favors the occurrence of a hernia of the membranes which gradually protrude through the wall that is the usual way in which rupture in a subsequent pregnancy or labor occurs, so it is recommended that the decidua must be excluded from the sutures.

3. If the placenta is situated on the anterior wall (40 % of the cases), the edges of uterine wound are difficult to coapt exactly, because the surface is very friable and contains large sinuses.

4. If at subsequent pregnancy the placenta happens to be implanted over the scar (which occurs once in every two or three cases), the destructive action of the chorionic villi on the fibrous tissue become

pronounced. Wound healing is a complex process, which includes inflammation, angiogenesis, new tissue formation and tissue remodeling and which finally leads to an at least partial reconstruction of the wounded area**. *(Martin, et al., 1997*).**

In this cascade of events, evidence revealed a pivotal role of growth factors, step-by-step released from the serum of the injured blood vessels and by degranulating platelets, neutrophils, monocytes, lymphocytes, fibroblast and tissue specific cells, the involvement of transforming growth factor beta (TGF–β) and its isoforms TGF-β1 and B3, connective tissue growth factor (CTGF), basic fibroblast growth factor (BFGF), vascular endothelial growth factor (VEGF) and tumor necrosis factor alpha (TNF–α) in the scarring process has been demonstrated ***(Werner and Grose, 2003).***

The difference in the biologic behavior of the LUS transverse section scarring process at the time of the first cesarean section may explain the variable clinical phenotype of the LUS in a subsequent pregnancy ***(Pollio et al., 2006).***

Balanced collagen deposition in the wound that is under growth factor control also is a key step for good wound healing outcome and tissue function restitution ***(Werner and Grose, 2003).***

TGF-β plays an important role in wound healing by stimulating angiogenesis, fibroblast proliferation, myofibroblast differentiation, matrix deposition, and granulation tissue formation ***(Werner and Grose, 2003).***