Comparative Assessment of Isthmocele Development after Cesarean Section Using Transvaginal Ultrasound (TVUS) and Saline Infusion Sonohysterography (SIS).

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Abstract: Introduction: The aim of this study was to investigate the prevalence of post-cesarean isthmocele after 6 months and to compare between transvaginal ultrasonography and saline infusion sonohysterography in assessment of isthmocele. **Material and methods:** A prospective observational cohort study was carried out at Al-Zahraa University Hospital – Al-Azhar University. Isthmocele measurements were taken for 202 women with a history of one low transverse CS. women delivered by cesarean section (n = 202) were examined with transvaginal ultrasonography (TVUS) and sonohysterography (SIS) six months after cesarean section. The main outcome measure was the prevalence of isthmocele using TVUS and SIS. Secondary outcome measures were characteristics of isthmocele. **Results:** In our study, the isthmocele had a prevalence of 73.8%. Most isthmocele had a triangular (65.4%) or semicircular shape (10.4%). The prevalence of isthmocele was 25.4% based on TVUS and 45.6% based on SIS. Sensitivity and specificity for TVUS was 51.3 and 100%, respectively, when compared with SIS. Therefore, half of the defects (48.7%) diagnosed with SIS remained undiagnosed with TVUS. **Conclusions:** The study provides confirmatory data that SIS is more sensitive and most accurate for prediction of isthmocele 6 months after caeserian section in compare with TVUS. TVUS may lead to an underestimation of the prevalence of isthmocele. Thus, SIS should be considered as a method of choice in diagnostics of isthmocele.
[Taiseer M. Mohamed and Doaa Saleh. **Comparative Assessment Of Isthmocele Development after Cesarean Section Using Transvaginal Ultrasound (TVUS) and Saline Infusion Sonohysterography (SIS).** *Nat Sci* 2018;16(11):163-166]. ISSN 1545-0740 (print); ISSN 2375-7167 (online). http://www.sciencepub.net/nature. 22. doi:10.7537/marsnsj161118.22.

Key words: Cesarean section, Isthmocele, Transvaginal ultrasound, Saline infusion sonohystrography.

1. Introduction

A cesarean-induced isthmocele is a reservoir-like pouch defect on the anterior wall of the uterine isthmus located at the site of a previous cesarean delivery scar. There is no consensus regarding the definition of an isthmocele or a standardized approach for its assessment. The prevalence of an isthmocele in a random population with a history of CS differs between 24 and 70% for transvaginal ultrasound (TVUS) (1).

In the last few decades, the cesarean section (CS) rate has increased worldwide. Together with the growing CS rate, the complications related to CS have also increased. One of the known complications is a defect of the uterine wall at the site of the CS scar called isthmocele or niche. It has been associated with adverse pregnancy outcome, higher risk of complications during gynecologic procedures as well as clinical symptoms such as postmenstrual bleeding (2).

The diagnosis of Isthmocele after a cesarean section was based on TVUS or hystroscope. The use of TVUS to dignose a cesarean scar was reported in 1990, with the following four key sonographic findings: a wedge defect, inward protruding of the scar, outward protruding and hematoma, or retraction of the scar. Others have described a cesarean scar on TVUS as a triangular anechoic area with the apex pointing anterior or a filling defect on the anterior isthmus. The type of isthmocele in TVUS was divided into: triangle, semicircle, rectangle, circle, inclusion cyst and droplet (3).

Transvaginal ultrasonography (TVUS) has been considered an accurate method for detecting isthmocele. However, saline infusion sonohysterography (SIS) seems to facilitate its detection and measurement in non-pregnant woman. (4).

The aim of this study was to determine the prevalence of isthmocele and, more specifically, to compare TVUS with SIS in the detection of isthmocele.

2. Material and methods

This prospective observational study was initially designed to assess the prevalence and clinical outcome of cesarean scar defect. Here we report the results of comparison of TVUS and SHG in evaluation of CS scar.

All women who delivered by CS at Al-Zahraa University Hospital consecutively between October 2017 and June 2018 were examined by TVUS and SIS

after CS by 6 months. Written informed consent was obtained from all participants. Exclusion criteria were twin, a known anomaly of uterus, preterm labour and age under 16.

Transvaginal sonography

Women were examined in lithotomy position with an empty bladder using a Voluson E10 Ultrasound.

Isthmocele was defined as an anechoic defect communicating with the endometrial cavity at the anterior wall of lower uterine segment. In longitudinal plane, the scar was identified, and the depth and width of a possible isthmocele was measured. The length of the isthmocele was measured in transverse plane. If there was a visible isthmocele, the residual myometrial thickness (RMT) overlying the isthmocele and the adjacent myometrial thickness fundal to the isthmocele were measured.

The US measurements are described in detail in Figure 1.

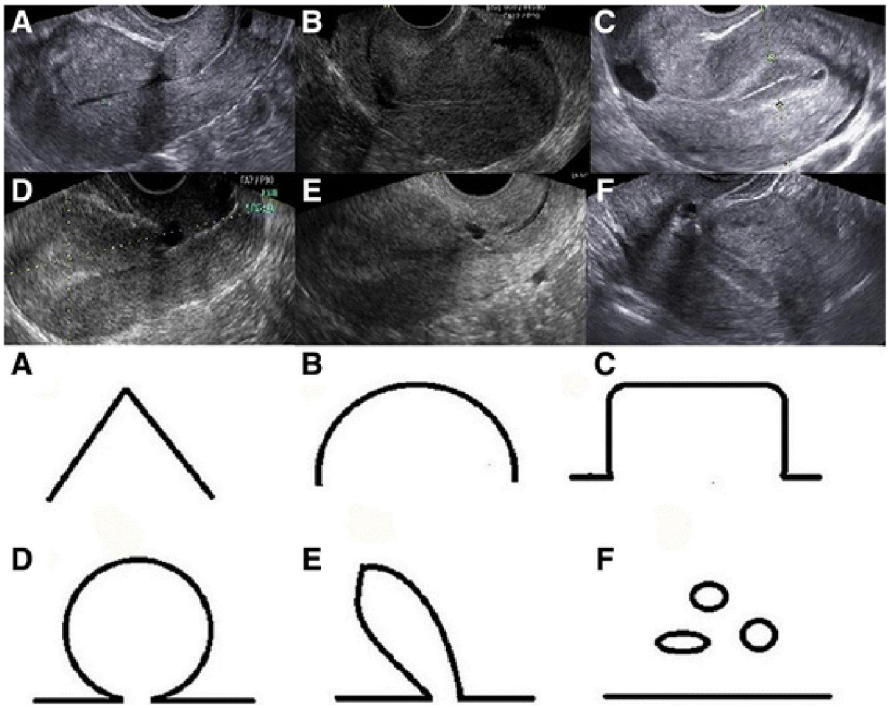

Fig 1: The type of isthmocele was categorized into triangle (Fig. 1a), semicircle (Fig. 1b), rectangle (Fig. 1c), circle (Fig. 1d), droplet (Fig. 1e) and inclusion cysts.

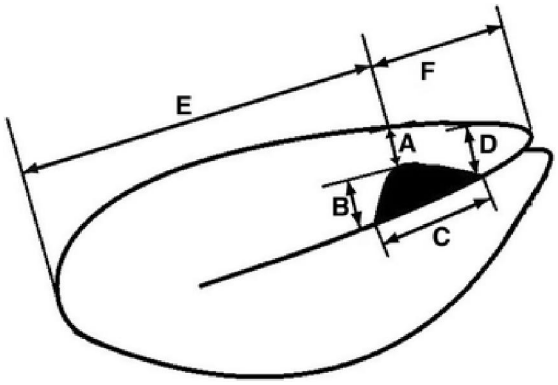

Fig. 2 Schematic diagram demonstrating measurement of isthmocele in the longitudinal plane. a Residual myometrial thickness; b Depth of isthmocele; c Width of isthmocele; d Cervical thickness; e Distance from uterine fundus to isthmocele; f Distance from isthmocele to cervix.

The isthmocele in the uterus was measured and saved in the longitudinal plane. The residual myometrial thickness (A), depth of the isthmocele (B), width of the isthmocele (C), cervical thickness (D), distance from the uterine fundus to the isthmocele (E), and distance from the isthmocele to the cervix (F) were measured in the sagittal plane (Fig. 2).

Sonohysterography

Sonohysterography was performed after the TVUS. A small catheter was inserted into the uterus and sterile saline was flushed until the site of the cesarean scar was visualized. The volume of saline solution used was measured. In SIS analyses, equal measurements of the uterus were performed as described for TVUS examinations (Fig. 1) and the same definition of isthmocele was used.

3. Results

The study group included 202 women with a mean age of 31.01 ± 1.60 years. The gestational age at CS varied from 26 to 40 weeks with a median value of 37 gestational weeks. A total of 149 (73.8%) women who underwent CS had an isthmocele (the isthmocele group), and 53 (26.2%) women had no isthmocele (without isthmocele group) with intact caesarean scars.

	Without Isthmocele	With Isthmocele	p-Value
Number	53	149	
age	32.64 ± 4.80	33.19 ± 4.19	0.269

The shape of isthmocele was categorized into the following 6 groups: triangle (65.4%); semicircular, (10.4%); rectangle (8.4%); circle (7.4%); droplet (4.4%), inclusion cyst (4.0%).

The prevalence of isthmocele was 25.4% based on TVUS and 45.6% based on SIS. Sensitivity and specificity for TVUS was 51.3 and 100%, respectively, when compared with SIS. Therefore, half of the defects (48.7%) diagnosed with SIS remained undiagnosed with TVUS.

The median depth of isthmocele was 3.0 mm (± SD 1.1 mm) with TVUS compared with 3.3 mm (± SD 1.8 mm) with SIS.

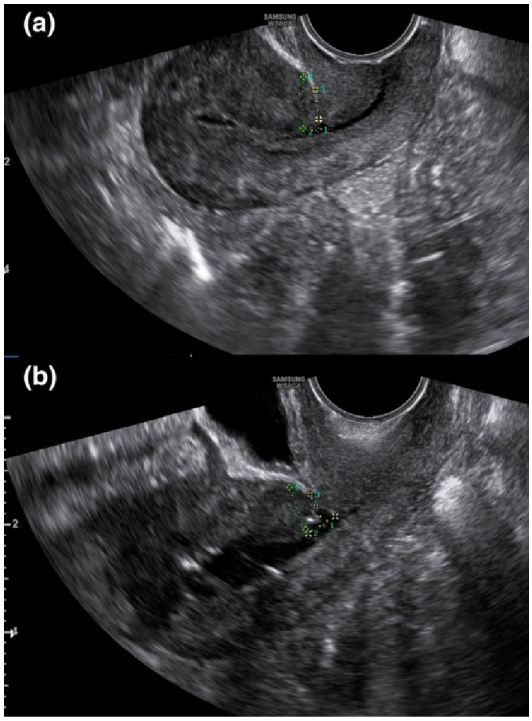

Figure 3: An isthmocele which seems to be unimportant with transvaginal ultrasonography (a) but which reveals a more obvious defect with sonohysterography (b).

4. Discussion

In our study, two different methods were compared in the diagnosis of cesarean scar defect. According to our results, TVUS leaves approximately half of the isthmoceles undiagnosed. These include even large isthmocele defects, which may be clinically relevant (5).

In this comparative study of two different methods, it can also be regarded as a strength that all participants were examined by both TVUS and SHG at the same time point. Thus, the circumstances and the menstrual cycle point were constant (6).

It is a limitation of the study that the same investigator performed both examinations. Another limitation of the study is the lack of an objective reference when comparing these two methods of imaging (7).

In our study, the prevalence of isthmocele was 25.4% based on TVUS and 45.6% based on SIS. Sensitivity and specificity for TVUS was 51.3 and 100%, respectively, when compared with SIS. Therefore, half of the defects (48.7%) diagnosed with SIS remained undiagnosed with TVUS (8).

Van der Voet et al. (9) found a clearly higher prevalence in their population (49.6 and 64.5% with TVUS and SHG, respectively) but they performed ultrasound examination as early as 6–12 weeks after CS, which may have influenced the obtained result, since the wound healing process may still have been ongoing. We decided to perform the examinations six months after CS because it has been suggested that the cesarean wound healing process will take up to at least six months.

Conclusion

Several previous studies have attempted to evaluate isthmocele using TVUS or SHG in non‐pregnant women. To the best of our knowledge, our study is the first study that compares the value of these two methods in a large prospectively collected unselected population examined at one visit. Our results suggest that the use of only TVUS may lead to an underestimation of the prevalence of isthmocele and that SIS should be considered the method of choice in diagnostics of isthmocele. We also

acknowledge that the clinical outcome and significance of isthmocele detected by SIS will be ascertained only in the course of follow up of our prospective study cohort.

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10/28/2018