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ORIGINAL ARTICLE

Assessment of Uterine Scar and its Possible Defect after Cesarean Section by Transvaginal Ultrasound

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Abstract

Background: ***The assessment of cesarean section scars and their flaws, both before and during pregnancy, has been made easier by advancements in imaging technology. When transvaginal ultrasonography (TVS) is performed in the non-pregnant state, the scar defect manifests as a wedge-shaped cystic or hypoechoic distortion.***

Aim and objectives: ***To describe morphological criteria of cesarean section scars and their defects (niches) detected by transvaginal ultrasonographic scan in non-pregnant women and to associate these criteria with the related gynaecological presentation and risk factors in such patients.***

Subjects and methods: ***In December 2021 to December 2023, 300 multiparous, non-pregnant women with a history of prior cesarean deliveries underwent transvaginal ultrasound examinations at Al-Hussein and Sayed Galal Hospital's delivery and emergency department. This cross-sectional study was conducted on them.***

Result: ***The frequency of CS scar defect increased with increasing number of vaginal deliveries prior to the cesarean sections. However, the relation showed only a trend towards statistical significance ($p=0.077$). Scar defect development was substantially linked ($p<0.001$) with the RVF uterus. The prevalence of CS scar abnormalities was substantially correlated with the number of cesarean sections performed ($p=0.003$).***

Conclusion: ***Transvaginal ultrasonography is a very precise method for identifying scars after cesarean hysterotomies. Multiple cesarean deliveries and labour preceding cesarean delivery were associated with higher rates of cesarean scar defects, which are defined as the presence of fluid within the incision site.***

Keywords: Assessment; Uterine scar; Cesarean section; Transvaginal ultrasound

1. Introduction

Cesarean delivery is the prevailing procedure for doing significant abdominal surgery in women. The prevalence of chronic malnutrition (C.S.C.S.) differs across countries, particularly between low-income and affluent nations. Globally, the estimated incidence is 15%, with variations ranging from 3.5% in Africa to 33% in the United States and reaching a high of 43.9% in Brazil. According to the World Health Organization (WHO), Egypt ranks fourth globally with a C.S.C.S. rate of 51.8%.[1]

The rising incidence and resultant problems of cesarean section (C.S.C.S.) have sparked a keen interest in understanding the characteristics of C.S.C.S. scars and their potential for causing morbidity.[2]

Furthermore, the occurrence of uterine rupture in studies including vaginal birth after cesarean section (VBAC) has remained consistent, with an estimated frequency ranging from 0.2% to 3.8%.[3]

The C.S.C.S. scar defect was initially documented using hysterosalpingography in 1961 by Poidevin.[4] Subsequently, trans-abdominal sonography (T.A.S.) was introduced in 1982 by Burger et al.[5] and later, in 1990, transvaginal sonography (T.V.S.) was utilized Demirtaş[6] Chen et al.,[7] Conducted hysterographic examination on 43 women six months after Caesarean section. In their study, the researchers observed a common wedge-shaped morphological anomaly in 27 individuals, which they interpreted as a sign of healing and deemed suitable for future vaginal deliveries. They additionally suggested that a 6-month delay was required prior to hysterography, as an earlier examination might not detect any abnormalities due to swelling from the wound.

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Burger et al. performed Transabdominal Ultrasound (T.A.S.). [5] Among the 48 women who had undergone cesarean section (C.S.C.S.), they reported the presence of a sonolucent area with varying levels of echogenicity at the incision site, located between the front wall and the cavity of the uterus. The pattern was observed in 15 out of the 48 patients included in the study and was categorized as an incompletely healed uterine scar.

Subsequently, Monteagudo et al.[8] introduced the term 'niche'. The niche was characterized via ultrasound as a triangular area without echoes located at the suspected site of the cesarean section incision.

Dicle et al.[9] utilized magnetic resonance imaging (M.R.I.) to analyze the recovery process of the myometrium following a cesarean section (C.S.C.S.). The researchers determined that the formation of scar tissue in the myometrium takes at least three months and that the entire restoration of the zonal anatomy and recovery is not accomplished until six months later. However, the evidence necessary to establish a connection between the presence of the scar and the functional integrity was unavailable.

This study aims to provide a detailed description of the morphological characteristics of cesarean section scars and any associated deficiencies (known as niches) identified using transvaginal ultrasonographic scans in women who are not currently pregnant. Additionally, the study attempts to establish a correlation between these morphological criteria and the gynaecological symptoms and risk factors observed in these patients.

2. Patients and methods

This study is a cross-sectional investigation conducted on a sample of 300 multiparous non-pregnant women who had previously undergone a cesarean delivery. These women underwent transvaginal ultrasound examinations at Al-Hussein and Sayed Galal Hospital's delivery and casualty department between December 2021 and December 2023.

Inclusion criteria: Female during reproductive age (19-39 years), Examination by transvaginal ultrasound done at least six months post C.S.C.S., and during cycle days 8-11 (proliferative phase of the menstrual cycle).

Exclusion criteria: Previous uterine or cervical operation other than C.S.C.S., women during menstruation, operative and postoperative complications in the previous C.S.C.S. (such as postoperative infection, which may affect C.S.C.S. scar healing) and past medical diseases which may affect C.S.C.S. scar healing such as(D.M.D.M. and renal diseases).

Method:

Following the explanation of the study, the objective of the work, and the examination methodology, all patients underwent a comprehensive assessment, including detailed medical history, thorough general and abdominal Examination, and a transvaginal ultrasound scan.

History taking: Personal history regarding the name, age, duration of marriage, residency, occupation, and special habits. Menstrual history of being sure that the women were during cycle days 8-11, asking about the menstrual index, asking about menstrual regularity and asking about postmenstrual spotting, the character of vaginal bleeding and the amount of bleeding. Obstetric history, including full details of gravidity, parity number of vaginal deliveries before and after cesarean section, time interval between previous cesarean section, The relevant factors to consider include the indication for the previous cesarean section, the fetal weight of the previous birth, and the details of previous pregnancies including the date, outcome, onset, manner of delivery, and any related intrapartum and postpartum complications such as postpartum infection that may impact the healing of the cesarean section scar. Past medical and surgical history (history of D.M.D.M., renal disease, chest troubles and history of laparotomies or other operations), to exclude any operative and postoperative complications and any medical disorders as D.M.D.M. (which may affect the healing of the scar).

Physical Examination:

Comprehensive Assessment: Vital Signs: Heart rate, blood pressure, body temperature.

Abdominal Examination: with special emphasis on the presence of scar of previous C.S.C.S., description of the site and size of the scar, description of the type of scar healing (primary or secondary), tenderness of the scar and the presence of pelviabdominal masses.

Local Examination: to assess the cervix to exclude any cervical pathology (cervical polyp, infection or ectopy), uterus (uterine position A.V.F. or RVF), adnexa and uterine measurements.

Transvaginal ultrasound:

Timing: All 300 women in this study underwent a transvaginal ultrasound on days 8-11 of their menstrual cycle, specifically during the proliferative phase. This phase is characterized by a thin and homogeneous normal endometrium, which enables a more accurate assessment of any previous cesarean section scars in the myometrium.

Preparation and precautions for transvaginal ultrasound examination:

Once the patient had completely emptied their bladder, they were instructed to lie on their back with their thigh and knees bent, allowing the probe to move freely in a horizontal direction.

Procedure:

The transvaginal probe tip was lubricated with coupling gel to prevent the entrapment of air, and inserted into the finger of a disposable plastic glove that was similarly coated with gel. The transvaginal ultrasonography probe with a frequency of 7.5 MHz was inserted into the vaginal opening and moved in both vertical and horizontal directions towards the front and back of the tissues being studied (lower uterine segment and cervix). Sonography detects a cesarean scar by first observing a bright, straight density in the tissue at the internal os, which extends to the vesico-uterine interface in the sagittal plane. Significantly, a scar defect will exhibit a fluid accumulation along this line and directly connect with the endocervical canal. The presence or absence of Cesarean scars was documented.

The diameters of cesarean scar defects were assessed in two planes: sagittal (anterior-posterior and cephalad-caudal) and coronal (transverse). The largest diameter observed in the sagittal view was utilized for comparison. The frequency of scar identification and the presence of fluid within the scar (referred to as "scar defect") was documented and subsequently compared with self-reported obstetric history. The photo documentation includes a cervical view indicating the presence or absence of fluid within the scar. The data collected from the questionnaires and ultrasound scans were entered into the system independently. The acquired data was organized into tables and analyzed using appropriate statistical methods.

Statistical methodology:

The statistical package for social sciences, version 15, or S.P.S.S., was used on an IBM-compatible computer to analyze the data in the following ways: Quantitative variable descriptions include mean, S.D.S.D., and range. Quantitative and percentage descriptions of qualitative characteristics. The qualitative variables were compared between groups using the chi-square test. Sensitivity is the test's capacity to identify +ve instances. False (–)ve plus true (+)ve equals sensitivity. The test's capacity to weed out negative cases is known as its specificity. False (+)ve + true (-)ve divided by true (–)ve equals specificity. The percentage of genuine (+)ve cases to all positive cases is the positive predictive value or PPV. PPPV is equal to true (+)/true (+)ve + false (+)ve. Negative predictive value, or N.P.V., is the percentage of genuine negative cases. False (–)ve + true (-)ve equals N.P.V. Total accuracy equals sample / true (+)ve + true (-)ve. There are three levels of significance: P value>0.05, P<0.05, and P<0.001.

3. Results

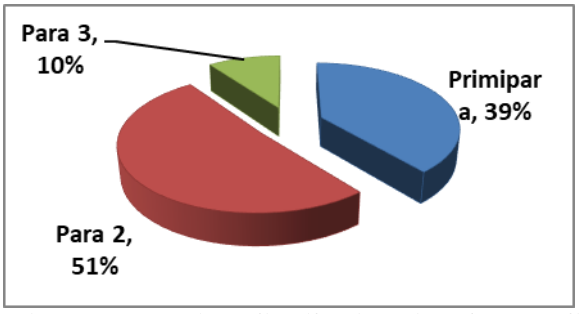

Figure 1. Parity distribution in the studied group.

The study involved 300 consecutive females with previous history of caesarean deliveries. Their ages ranged from 23 to 39 years old, with a mean of 32.1±2.7.Menarche occurred at 12.7±1.4 years of age. P<0.001 is extremely significant while P<0.05 is significant (range: 11-18 years). Regarding parity; 117 (39%) women were primipara while 183 (61%) women were multipara (153 women were para 2 and 30 women were para 3), the median parity was 2 (range: 1-3).

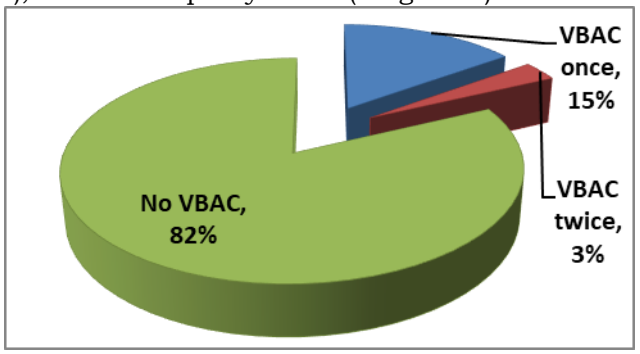

Figure 2. How often the group under study gave birth vaginally after a cesarean section (VBAC).

One hundred and seventy one (57%) women had a history of 1 previous cesarean delivery, while 129 (43%) women had previous 2 cesarean deliveries. The median number of previous cesarean sections (CS) was 1 (range: 1-2). Cesarean deliveries were elective in 81% of the studied group. Vaginal birth after cesarean section (VBAC) was reported in only 54 women (18%) of the studied group. VBAC was reported once in 45 women and twice in the remaining 9.

Table 1. Causes of uterine over distension in previous pregnancies (N= 63).

UTERINE OVER DISTENSION CAUSE	NUMBER	PERCENTAGE
MACROSOMIC FETUS	26	41.3%
POLYHYDRAMNIOS	11	17.5%
TWIN	21	33.3%
TRIPLET	5	7.9%

Examination of the position of the uterus showed that 72% of the participating women had anteverted anteflexed (AVF) uterus while 28% had retroverted (RVF) uterus. Sixty three women reported history of uterine over-distension during

previous pregnancy. The most common cause of over-distension was fetal macrosomia.

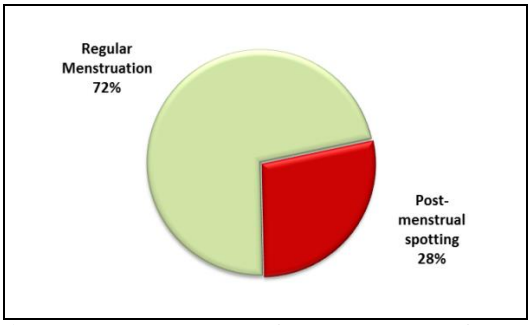

Figure 3. Frequency of postmenstrual spotting in the studied group.

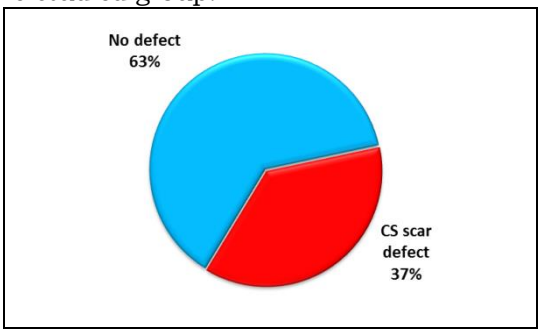

Figure 4. Frequency of cesarean section scar defect in the studied group.

Table 2. Association between number of previous vaginal births (VB) prior to cesarean sections (CS) and presence of CS scar defect.

	CS SCAR DEFECT		TOTAL	CHI SQUARE TEST (P-VALUE)
	Present	Absent		
ONEVB	59 (53.2%)	58 (30.7%)	117 (39.0%)	18.26 (< 0.001) (HS)
TWOVB	39 (35.1%)	114 (60.3%)	153 (51.0%)	
THREEVB	13 (11.7%)	17 (9.0%)1	30 (10.0%)	

HS: highly significant

Apparently the frequency of CS scar defect increased with increasing number of vaginal deliveries prior to the cesarean sections. The relation showed statistical significance (p<0.05).

Table 3. Association between uterine position and CS defect

	CS SCAR DEFECT		TOTAL	CHI SQUARE TEST (P-VALUE)
	Present	Absent		
RETROVERTED FLEXED UTERUS	84 (100%)	0 (0.0%)	84 (100%)	198.65 (<0.001) (HS)
ANTEVERTED FLEXED UTERUS	27 (12.5%)	189 (87.5%)	216 (100%)	

HS: Highly significant.

There was a highly significant association between RVF uterus and the development of scar defect (p<0.001).All of the 84 women with RVF uterus had a CS scar defect, while 27 (12.5%) out of those with AVF uterus; 216 women had a defect.

Table 4. Relationship between postmenstrual spotting, the number of prior cesarean sections (CS), and CS defects.

	CS SCAR DEFECT		TOTAL	CHI SQUARE TEST (P-VALUE)
	Present	Absent		
ONE CS	42 (24.6%)	129 (75.4%)	171 (100%)	26.40 (<0.001) (HS)
TWO CS	69 (53.5%)	60 (46.5%)	129 (100%)	

A higher frequency of CS scar abnormalities was substantially correlated with a higher number of cesarean sections (p<0.001).

Table 5. Association between va.ginal birth after cesarean section (VBAC) and CS scar defect.

	CS SCAR DEFECT		TOTAL	CHI SQUARE TEST (P-VALUE)
	Present	Absent		
VBAC	6 (11.1%)	48 (88.9%)	54 (100%)	18.93 (<0.001) (HS)
NO VBAC	105 (42.7%)	141 (57.3%)	246 (100%)	

HS: Highly significant.

Six women (11.1%) with history of VBAC developed CS scar defect compared to 105 women (42.7%) without history of VBAC (p<0.001).

Table 6. Association between number of vaginal births (VB) after cesarean section (VBAC) and CS scar defect.

	CS SCAR DEFECT		TOTAL	CHI SQUARE TEST (P-VALUE)
	Present	Absent		
ONE VB	3 (6.7%)	42 (93.3%)	45 (100%)	5.40 (0.020) (S)
TWO VB	3 (33.3%)	6 (66.7%)	9 (100%)	

S: Significant

Number of VBAC significantly affected the frequency of CS scar defects (p=0.020).

Table 7. Relationship between the scar imperfection from a cesarean section and its indication.

	CS SCAR DEFECT		TOTAL	CHI SQUARE TEST (P-VALUE)
	Present	Absent		
ELECTIVE	99 (40.7%)	144 (59.3%)	243 (100%)	7.68 (0.006) (S)
SELECTIVE	12 (21.1%)	45 (78.9%)	57 (100%)	

S: Significant

The development of a CS scar defect was significantly correlated with the recommendation of a cesarean section (p=0.006).

Table 8. Association between history of uterine over-distension in previous pregnancies and CS scar defect.

	CS SCAR DEFECT		TOTAL	CHI SQUARE TEST (P-VALUE)
	Present	Absent		
PREVIOUS UTERINE OVER DISTENSION	6 (9.5%)	57 (90.5%)	63 (100%)	25.83 (<0.001) (HS)
NO PREVIOUS UTERINE OVER DISTENSION	105 (44.3%)	132 (55.7%)	237 (100%)	

HS: Highly significant.

Six women (9.5%) with history of uterine over-distension in previous pregnancies developed CS scar defect compared to 105 women (44.3%) with no history of uterine over-distension (p<0.001).

4. Discussion

The present study confirms that TVS evaluation can effectively identify cesarean section scar abnormalities. These findings are consistent with the outcomes of prior research.[10,11,12]

An exhaustive analysis of 12 relevant research, encompassing a total of 1834 women, revealed that 6.6% of instances exhibited uterine scar abnormalities.[13]

According to one theory of pathophysiology, a retroflexed uterus places a great deal of strain on the lower uterine segment, which lowers vascular perfusion and impairs the cesarean scar's ability to heal. Moreover, several cesarean sections may obstruct tissue circulation.[14]

Other authors reported higher records. Uppal et al.14 examined the pelvic ultrasound images of 318 women referred for a gynaecological scan. Out of these women, 71 had previously undergone a cesarean section and had pelvic ultrasound images that were of good quality. The incidence of post-cesarean scar deformities was 40%. There was a strong correlation between CS faults and extended durations of postmenstrual spotting. Greater defect size correlated with increased occurrence of abnormal vaginal bleeding.

A prospective cohort study conducted transvaginal sonography (TVS) and gel instillation sonohysterography (GIS) in 263 women 6-12 weeks post cesarean surgery. The prevalence of niche was 49.6% when using TVS and 64.5% when using GIS. Those who had a niche saw a higher incidence of postmenstrual spotting compared to those who did not have a niche.[15]

The association between abnormal uterine haemorrhage and niche was the subject of prospective cohort research. Regardless of their obstetric history, all women who had a cesarean section were included in the study. In women who have had a previous cesarean section, the authors showed a strong correlation between the presence of a niche as detected by GIS and postmenstrual spotting. Of the women who reported postmenstrual spotting, 15.2% of those without a niche and 33.6% of those with a niche did so (p=0.002). A niche's association with postmenstrual spotting was unaffected by smoking, nursing, amenorrhea, polyps, intrauterine devices, or oral contraceptive usage.[15]

Another study by Muendane et al.[11] discovered that the number of prior CS significantly increased the number of scar deformities. The authors reported the percentages of women with one, two, or three or more CS to be 61%, 81%, and 100%, respectively. In a similar vein, the current study found a significant correlation between the frequency of CS scar abnormalities and the number of cesarean sections performed (p=0.003).

A strong correlation (p < 0.001) was seen in the current study between the development of scar defect and RVF uterus. This result was first published by Wu et al.[16]

Hassan et al.[17] showed that patients with retroflexed uteri had deeper CS scar defects than patients with anteflexed uteri. This was also reported by Ofili-Yebovi et al.[3] and Mundane et al.[11]

Only women who had given birth prior to a cesarean section were found to have CS scar defects in one cohort analysis.[7] The current investigation found a correlation between a larger number of vaginal deliveries before cesarean sections and an apparent, though not statistically significant, increased frequency of scar abnormalities (p=0.077).

In conclusion, it is anticipated that the gynecologic effects and complications of CS scar abnormalities will become significant clinical issues as the number of cesarean sections performed rises. Faults in computer science are widespread; 37% of the examples in this analysis had faults. The range of reported prevalence is 7% to 88%. TVS allows for the precise identification of CS scar flaws. Some claim that the best technique is saline-infusion sono hysterography. Postmenstrual spotting, or abnormal uterine bleeding, is a common sign of a CS scar deformity. Postmenstrual spotting was discovered in roughly 76% of the women with defects in the current investigation. Additional potential outcomes could involve discomfort, infertility, or an ectopic pregnancy scar. The study suggested that having a retroverted uterus, having more previous CS cases, and having vaginal deliveries before CS were likely risk factors for scar abnormalities.

4. Conclusion

Transvaginal ultrasonography is a very precise method for identifying Cesarean hysterotomy scars. The occurrence of cesarean scar defect, characterized by the presence of fluid within the incision site, was more frequent in cases where labour occurred before the cesarean delivery and in women who had numerous cesarean deliveries. Insufficient Cesarean scars are commonly observed in a group of women who have undergone prior Cesarean operations.

Disclosure

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Authorship

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Conflicts of interest

There are no conflicts of interest.

References

1. Rebelo F, da Rocha CM, Cortes TR, Dutra CL, Kac G. High cesarean prevalence in a national population-based study in Brazil: the role of private practice. Acta Obstet Gynecol Scand. 2010;89(7):903-908.
2. Hamar BD, Saber SB, Cackovic M, et al. Ultrasound evaluation of the uterine scar after cesarean delivery: a randomized controlled trial of one- and two-layer closure. Obstet Gynecol. 2007;110(4):808-813.
3. Ofili-Yebovi D, Ben-Nagi J, Sawyer E, et al. Deficient lower-segment Cesarean section scars: prevalence and risk factors. Ultrasound Obstet Gynecol. 2008;31(1):72-77.
4. POIDEVIN LO. The value of hysterography in the prediction of cesarean section wound defects. Am J Obstet Gynecol. 1961;81:67-71.
5. Burger NF, Darazs B, Boes EG. An echographic evaluation during the early puerperium of the uterine wound after caesarean section. J Clin Ultrasound. 1982;10(6):271-274.
6. Demirtaş, GS. Sezaryen Doğum Sekeli; İstmosel. Kocatepe Tıp Dergisi.2022;23(1): pp.119-124.
7. Chen HY, Chen SJ, Hsieh FJ. Observation of cesarean section scar by transvaginal ultrasonography. Ultrasound Med Biol. 1990;16(5):443-447.
8. Monteagudo A, Carreno C, Timor-Tritsch IE. Saline infusion sonohysterography in nonpregnant women with previous cesarean delivery: the "niche" in the scar. J Ultrasound Med. 2001;20(10):1105-1115.
9. Dicle O, Küçükler C, Pirnar T, Erata Y, Posaci C. Magnetic resonance imaging evaluation of incision healing after cesarean sections. Eur Radiol. 1997;7(1):31-34.
10. Gan RX, Li Y, Song J, et al. Pregnancy Outcomes of Different Endometrial Preparation in Patients With a History of Cesarean Section. Front Endocrinol (Lausanne). 2022;13:813791.
11. Muendane, A., Optimierung der Uterotomie-Wundheilung durch Intervention im Rahmen der Re-Sectio caesarea (Doctoral dissertation, Dissertation, Halle (Saale): Martin-Luther-Universität Halle-Wittenberg, 2021).
12. Zhong, Y.; Liu, X.; Zhu, H., et al. Current research on Chinese and Western medicine treatment of prolonged menstruation due to uterine scar diverticulum. International Journal of Frontiers in Medicine.2023;5(4).
13. Abou-shehata, RA.; Oun, A.; Mahmoud, MS. 2023. Three-dimensional Ultrasound versus Hysteroscopy in Diagnosis of Cesarean Scar Defect. International Journal of Medical Arts.2023; pp.3501-3506.
14. Guerrouij M, Uppal CS, Alklabi A, Douketis JD. The clinical impact of bleeding during oral anticoagulant therapy: assessment of morbidity, mortality and post-bleed anticoagulant management. J Thromb Thrombolysis. 2011;31(4):419-423.
15. Vissers J, Hehenkamp WJK, Brölmann HAM, Lambalk CB, Huirne JAF. Reproductive outcomes after laparoscopic resection of symptomatic niches in uterine cesarean scars: Long-term follow-up on the prospective LAPNICHE study. Acta Obstet Gynecol Scand. 2023;102(12):1643-1652.
16. Wu, Z.; Liu, S.; Huang, F., et al. The Diagnosis and Treatment of Caesarean Scar Defect: Progress and Controversies. Clinical and Experimental Obstetrics & Gynecology.2023; 50(6): p.116.
17. Hassan, MNE.; Abdullah, HEDS.; Abdelmeged, AN., et al. Evaluation Of The Caesarean Scar Niche In Women With Previous Caesarean Section 2D Saline Sonohystrography Versus 3D Saline Sonohystrography. Journal of Pharmaceutical Negative Results. 2023; pp.178-180.