Ultrasound Evaluation of Recent Uterine Wound after Cesarean Section

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Abstract: Objective: We evaluate the uterine wound thickness after cesarean section by repeated ultrasound and correlate the finding according to the various factors that may cause uterine scar defect. **Design:** Prospective cohort study. **Methods:** Ultrasonographic follow-up of the uterine scar thickness was performed at 1 week, 6 weeks, 3 months, and 6 months post c.s for measuring the thickness of residual myometrium and presence of defects. The patient's criteria were scrutinized and correlated according to the state of scar whether intact or not. **Results:** Scar defects were found in 48 patients (24%). The mean age of the patients was 27.21±4.77, 14 patients had DM, 7 patients had collagen diseases (chronic steroid treatment during pregnancy), and 19 patients developed wound infection.8 patients (17%) had RVF uterus. **Conclusion:** Factors that were associated with deficient scars: increase maternal age, history of DM, chronic steroid treatment during pregnancy, wound infection, uterine retro-flexion.
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Key words.CS scar defect – Transvaginal US.

1. Introduction

Cesarean section (Cs) is one of the most frequent abdominal surgical operations carried out in the world. The Cs rate increased from 12.2% to 30.1% in the USA between 1990 and 2008 [1] c.s rate in Egypt increased from 15.3% in 1992 to 20.9% in 2000. [2]**.**

Patients with C.S.S.D ranged between 22-40% in patients with gynecological symptoms[3].

Patients with C.S.S.D presenting with clinical symptoms such as postmenstrual spotting, dysparunia, and chronic pelvic pain[4]**.**

The uterine scar is evaluated with ultrasonography as discontinuity in the architecture of the uterus in the midsagittal plane and is manifested by either hyperechoic or related to the presence of uterine nicheshypoechoic line perpendicular to the wall of the uterus [5].

A recent systemic review in 2014, included all studies published on uterine niche, none of these studies evaluated the recent uterine wound or the risk factors [6].

2. Patients and Methods

A prospective cohort study was done between May 2015 and May 2016 at the Ultrasound unit of Obstetrics and Gynecology Department, Al-Azhar University Hospital (New Damietta). The study included 200 women who had given their full term and singleton pregnancy by an elective cesarean section since one week. patients with history of pelvic inflammatory disease, Uterine anomalies such as uterus bicornutus, fibroid uterus, Adenomyosis, Multiple gestation, preterm labor, Emergency CS, uterine surgery rather than CS, who developed polyhydraminos, oligohydraminos and who loss follow up till time of delivery were excluded from the study. The study was approved by the local ethical committee of the hospital. All participants were informed about procedure, value and possible discomfort associated with the TVS examination and accordingly they provided a written consent for participation.

Careful obstetric history was taken especially a history of previous cesarean, number of cesarean deliveries with its indication, any operative and\or post -operative complication. Past history including medical diseases (DM, Hypertension, cardiac, collagen disease.)

All women were subjected to transvaginal sonographic (TVS) examination by phone for 6 months after their cesarean section started 1 week post c.s and then follow up measurement at 6 weeks, 3 months and 6 months postoperatively for evaluation of CS scar and Residual myometrium.

The sonography machine used was Voluson 730 Pro. (USA) or Medison 8000 sp live, Korea, equipped with a 7-9 MHz transvaginal probe. TVS was performed for assessment of the cervix, uterus, and thickness of residual myometrium, presence or absence of uterine scar defect (niche) and their size, if present.

Cesarean section scar defect was diagnosed as a hypoechogenic area (a filling defect) within the myometrium of the lower uterine segment, at the site of a previous cesarean incision **(Fig.1).**

The studied women were classified into two main groups (Group 1: are women who didn't have a defect in the myometrium at the site of CS scar). (

Group 2: are patients who had a defect in the myometrium at the site of Cs scar).

For each group the patients' criteria were scrutinized and correlated according to the state of scar whether intact or not.

Fig. (1): TVS image showing residual myometrium and CS scar defect.

Statistical analysis:

The collected data were organized, tabulated and statistically analyzed using statistical package for social sciences (SPSS) version 19 (SPSS Inc, Chicago, USA), running on IBM compatible computer. For qualitative data, frequency and percent distributions were calculated. For comparison between two groups, the independent samples (t) were used. Pearson correlation co-efficient (r-test) was used. For quantitative data, mean, standard deviation (SD), minimum and maximum were calculated. For all tests p value < 0.05 were considered significant. For all tests p value >0.05 were considered insignificant.

3. Results

Flow Chart

The mean age of the studied group was 26.08±4.41 years. The median parity was 1(range: 1-4). The median of number of CS was 1(range: 1-4). 115 of the participants (57.5%) had a history of one previous cesarean section, 63 women (31.5%) had two, 18 women (8%) had three and 4 (2%) had four Previous cesarean sections, low socio economic state (SES) (75.5%), moderate SES (25.5%), BMI (27.16±4.95 kg/m^2 and pre delivery hemoglobin (9.91±0.79 g/dl).

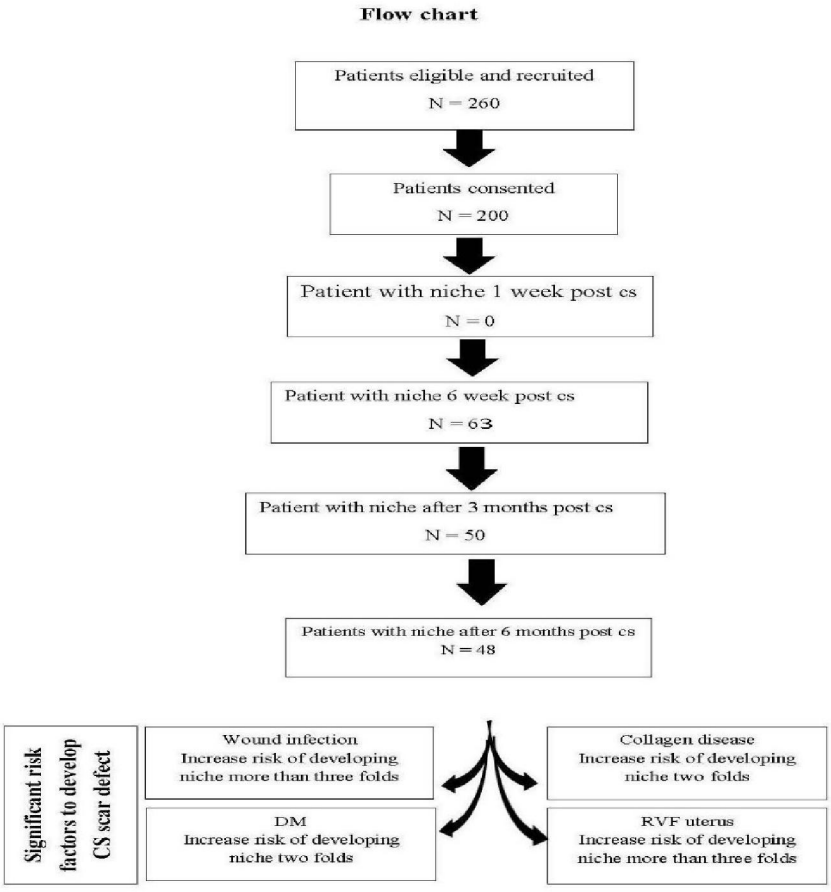

Table (1): Socio demographic data of studied patients

Items	**n=200**
Age (years) Mean ± SD (Min-Max)	26.08±4.41 (18.0-43.0)
Parity; median (range)	1 (1-4)
Previous CS; median (range)	1 (1-4)
Socioeconomic state (SES); no. (%)	
• **Low**	150 (75)
• **Moderate**	50 (25)
BMI (kg/m^2) Mean ± SD (Min-Max)	27.16±4.95 (17.0-42.0)
Pre delivery HG (g/dl) Mean ± SD (Min-Max)	9.91±0.79 (8.0-12.0)

Table (2): Associated-comorbidities in studied patients

Comorbidities	n=200	
	N	%
Hypothyrodism	7	3.5
Hyperthrodism	7	3.5
DM	20	10.0
HTN	18	9.0
Collagen diseases	9	4.5
Cardiac disease	17	8.5

Table (3): Ultrasound findings one week post C.s

Items		n=200	
Uterus size	Length (cm) **(Mean ± SD)**	12.2±1.87	
	Width (cm) **(Mean ± SD)**	5.07±1.01	
Endometrial thickness (ET) (mm) **(Mean ± SD)**		10±0.85	
Residual myometrial thickness (RMT) (mm) **(Mean ± SD)**		22.44±3.601	
Scar continuity		**N**	**%**
	• 1/3	193	96.5
	• 2/3	7	3.5
Position		***N***	***%***
	AV*F*	180	*90*
	RVF	20	10
CS defect		0	0.0

Table (4): Comparison between ultrasound finding in cases with and without c.s scar defect at 6 weeks post CS

Items		Cases without uterine scar defect n=137	Cases with uterine scar defect n=63	test of significance
Uterus size (Mean ± SD)	Length (cm)	7.93±1.16	7.98±1.19	p=0.037*
	Width (cm)	4.01±1.06	3.82±0.67	p=0.231
ET (mm) (Mean ± SD)		6.02±0.72	5.96±0.52	p=0.317
RMT (Mean ± SD)		19.27±5.64	12.48±6.9	p<0.001*
Scar continuity		**NO (%)**	**NO (%)**	
	• 1/3	29 (21.1)	60(95.2)	p<0.001*
	• 2/3	108 (78.8)	3(4.7)	
Position	• AVF	127(92.7)	53(84.1)	p<0.001*
	• RVF	*10(7.29)*	*10(15.9)*	

Table (5): Comparison between cases with and without c.s scar defect at 3 month post c.s

Items		Cases without uterine scar defect n=150	Cases with uterine scar defect n=50	test of significance
Uterus size (Mean ± SD)	• Length (cm)	7.03±1.18	7.63±1.26	p<0.001*
	• Width (cm)	2.63±0.53	3.84±0.7	p=2.12
ET (mm) (Mean ± SD)		5.43±0.81	5.16±0.67	p=0.207
RMT (Mean ± SD)		11.21±2.43	6.2±3.34	p<0.001*
Scar continuity		**NO (%)**	**NO (%)**	
	1\3	0(0.0)	45(90)	p<0.001*
	2\3	26(17.7)	5(10)	
	3\3	124(82.6)	0(0.0)	
Position	• AVF	139(92.6)	41(85.4)	p<0.001*
	• RVF	*11(7.3)*	*9(18)*	

Table (6): Comparison between Ultrasound findings in cases with and without CS scar defect at 6 month post c.s

Items		Cases without uterine scar defect n=152	Cases with uterine scar defect n=48	test of significance
Uterus size (Mean ± SD)	• Length (cm)	7.01±1.12	7.38±1.16	p<0.001*
	• Width (cm)	3.71±0.81	3.71±0.69	p=0.211
ET (mm) (Mean ± SD)		5.43±0.81	5.16±0.67	p=0.237
RMT (Mean ± SD)		11.70±1.26	5.0±2.49	p<0.001*
Scar continuity		**NO (%)**	**NO (%)**	
	• 1/3	0(0.0)	44(83.0)	p<0.001*
	• 2/3	6(4)	8(16.6)	
	• 3/3	146(96)	0(0.0)	
Position	• AVF	140 (92)	40 (83.3)	p<0.001*
	• RVF (r)	12(8)	8 (16.6)	

Table (7): Demographic background variables for all women and results of Univariate logistic regression analysis of factors affecting cs scar defect at 6 months post CS

6 months	**Cases without uterine scar defect n=152**	**Cases with uterine scar defect n=48**	**test of significance**	**OR (95% CI)**
Age (years) Mean ± SD	25.69±4.24	27.21±4.77	p=0.03*	1.07 (1.006-2.720)
BMI (kg/m^2) Mean ± SD	26.64±4.53	28.39±5.87	p=0.09	
Pre delivery Hb (g/dl) Mean ± SD	10.15±0.67	9.32±0.79	P=0.07	
Post-delivery Hb (g/dl) Mean ± SD	11.83±0.51	8.36±0.63	P=0.08	
Parity	1(1-4)	1(1-4)	P=0.288	
Number of Cs	*1(1-4)*	*1(1-4)*		
Socioeconomic state (SES)				
• *Low*	*120(79)*	*30(62.5)*	P=0.07	
• Moderate (r)	32(21)	18(37.5)		

6 months	Cases without uterine scar defect n=152	Cases with uterine scar defect n=48	test of significance	OR (95% CI)
Comorbidities				
Hypothyrodism	6(4)	1(1.9)	P=0.34	
Hyperthrodism	3(2)	4(7.5)	P=0.08	
DM	6(4)	14(34.0)	P<0.001*	2.26 (2.03-8.64)
HTN	10(0.6)	8(15.1)	P=0.052	
Collagen diseases	2(1.4)	7(14.5)	P=0.002*	2.73 (2.15-8.47)
Cardiac disease	8(5.6)	9(17.0)	P=0.6	
Surgeon				
• Resident	136(89.5)	36(75)	P<0.001*	
• Specialist (r)	16(10.5)	12(25)		
Wound infection (one week)	59(39)	19(39.5)	P<0.001*	3.51 (8.35-45.59)
Pyrexia (one week)	3(2.1)	27(50.9)	P<0.001*	48.46 (13.69-171.55)
Position				
• AVF	140(92)	40(83.3)	P<0.001*	3.22 (3.85-17.55)
• RVF (r)	12(8)	8(16.6)		1

4. Discussion

The increasing rate of Cesarean section and its complications has awakened an interest in Cesarean section scars [7, 8]**.** Cesarean scar defects, considered as deficient uterine scars or scar dehiscence following a cesarean section, involve myometrial discontinuity at the site of a previous Cesarean section scar [4, 9].

In the current study, CS scar defect were detected in 24% of the study sample. CS scar defects were associated with significantly thinner mean residual myometrium than cases without defects (21,12,6,5 mm vs 22,19,11,10 mm, p<0.001). On the other hand, there was statistically significant increase of the mean length of the uterus in scar defect than in intact scar (12.2, 8,7,6 cm Vs 12,7.9,7.03,7.01 cm) and there was no statistically significant of the mean width of the uterus in both groups (5.07, 4,3.83,3.71 cm) at 1 week, 6 week, 3 months and 6 months respectively. These results was agreed with that reported by Bij de vaate *et al*. [9]**.**

In the present work, the age ranged from 18-43 years with a mean of 26.08 ±4.41 years and there was statistically significant increase of age (more than one fold) in scar defect cases in comparison to scar intact cases (27.21 ± 4.77 Vs 25.69 ±4.24 years respectively). The mean age of cases with scar defect is in agreement with those reported by Wang et al. [4], who reported that, the mean age of patient with scar defect was 35.2 ± 6.1 years.

As regard to parity, in this study it was ranged between 1-4 and there was no statistically significant increase of parity in cases with scar defect in comparison to cases with intact scar and this results in agreement with Ofilli-yebovi et al. [10], who reported that, the mean parity of cases with intact scars was 2 (1-4) compared to 2 (1-3) of cases with scar defect.

As regard to number of previous caesarean section in this study 115(57.5%) had undergone one Cs,63(31.5%) two Cs,18(9%) three Cs, and 4(2%) four Cs. and there was no statistically significant increase of number of previous caesarean section in cases with scar defect in comparison to those with intact scar and this was in agreement with Armstrong et al. [11], who reported that trial of labour carried greater risk and graver outcome of uterine rupture than elective repeated caesarean section, although absolute risks were low.

As regard uterine position, it was AVF in 92% of cases and RVF in 8% in the studied sample (12 cases, 8% with RVF uterus among cases with intact scar and 8 cases 17% with RVF uterus among those with scar defect) with statistically significant increase of RVF cases in scar defect (in comparison to scar intact cases (17% Vs 8% respectively). RVF uterus increase the risk of developing niche more than three folds. These results was agreed with that reported by Ofili-Yebovi et al. [10], who reported that there was significant increase of RVF cases in group with scar defect in comparison to those with intact scar.

As regard wound infection, It was observed in 61(30.5%) of total studied sample.13 cases (6% with cellulites, 2.6% with necrotizing fasciitis) among those

with intact scar and 7 cases (6.25% with cellulitis,8.4% with necrotizing fasciitis) among those with scar defect. With statistically significant increase of cellulitis and necrotizing fasciitis among cases with scar defect in comparison to those with intact scar (6.25%,8.4% Vs 6%,2.6%) respectively. Wound infection (cellulitis and necrotizing fasciitis) increase the risk of developing niche more than one fold.

As regard to DM disease, It was observed in 20(10%) of total studied cases and there was statistically significant increase between cases with scar defect and those with scar intact (12.5% Vs 9.2%) respectively. DM increase the risk of developing niche more than two folds.

As regard to collagen disease (chronic steroid treatment during pregnancy), It was observed in 9(4.5%) of total studied cases and there was statistically significant increase between cases with scar defect and those with intact scar (6.25% Vs 4%) respectively. Collagen disease (chronic steroid treatment during pregnancy) increase the risk of developing niche more than two folds.

As regard to Hypertension, cardiac disease, Hypothyroidism and hyperthyroidism, there were not significant in cases with scar defect in comparison to those with intact scar.

As regard socioeconomic state, BMI, and predelivery Hb there were not significant in cases with scar defect in comparison to those with intact scar and these were in agreement with Hayakawa et al [12].

As regard to years of surgeon experience (Residant, specialist), c.s scar defect was observed in 36(21%) of cases performed with resident and 12(25%) performed with specialist and this misleading result could be explained by the fact that more complicated c.s was performed by senior staff.

In short the present study shed light on the role of ultrasound in early diagnosis of cesarean scar defect. In addition, the possible relation between these scars defect and characteristics of those patients. It appears that postnatal scanning of Cs scar is mandatory in every case during routine TVS and it will not add much extra time but seems to add much to the survey of the risk factors for Cs scar defect.

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