

The Impact of Post Cesarean Section Surgical Site Infection on Development of Scar Niche at Maternity Hospital Minia University A Prospective Observational Study

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ABSTRACT

Objective: This study aimed to evaluate the impact of surgical site infection on development of Cesarean Section scar niche and if there is risk factors that increase its development.

Methods: This a prospective cohort study that was conducted in Maternity Hospital Minia University, 100 cases that were complicated by superficial or deep surgical site infection after cesarean section were recruited in the study during the period from June 2022 till June 2023. Analysis of cases developed scar niche was done. scar niche was diagnosed by using saline infusion sonohysterography.

Results: This study revealed niche prevalence 84% among studied cases. Its incidence was 75% in cases of superficial surgical site infection and 90.1% in deep type, potential risk factors of niche development among the studied cases were increase BMI and CS during intense uterine contraction.

Conclusion: Surgical site infection has great impact in development of scar niche formation, especially in deep type, increase BMI and CS during intense uterine contraction are risk factors of development of niche in these cases.

Key Words: Cesarean section, scar niche, sonohysterography, SSI.

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INTRODUCTION

Define a niche as any indentation representing myometrial discontinuity at the site of the Cesarean scar that communicates with the uterine or cervical cavity^[1]. Imperfect healing of the incision of Cesarean Section may lead to a depression in the scar, which eventually forms a fluid-filled pouch within anterior uterine wall known as niche^[2]. The niche is usually seen within the anterior uterine wall, Or in the endo-cervical canal or the mid-uterine body^[3] Prevalence of Cesarean scar defect (CSD) ranged from 24% to 70%.

Long-term sequelae of niche development appear to be on the rise of prevalence in caesarean scar pregnancy, increased incidence of placenta previa, placenta accreta that associated with major maternal morbidity and even mortality^[4].

Multiple growth factors and cytokines secreted at the wound site strictly control the process of wound healing^[5]. Any factors that impair the healing processes can aggravate the tissue damage and lengthen period of repair. Infections, and underlying disorders, are factors that might lead to imperfect healing. medical disorders such as pre-eclampsia

or diabetes mellitus, emergency CS during labor, operative factors such as site of incision, suturing materials and suturing technique, and finally postoperative fever and blood loss affecting development of CSD^[6].

Though most women developed niche are asymptomatic, they may complain of post-menstrual spotting, dysmenorrhea, persistent pelvic pain and dyspareunia^[7].

Several imaging modalities have revealed a uterine niche as a cystic or hypoechoic distortion in the scar. A niche can be quantified using 2D or 3D transvaginal ultrasound without contrast, saline or gel contrast, or magnetic resonance imaging (MRI)^[8]. Contrast enhanced ultrasonic imaging, which has greater detection rates than TVUS, looks to be the current imaging standard^[9].

PATIENTS AND METHODS

This prospective cohort study that was conducted in Maternity Hospital Minia University. One hundred cases who developed surgical site infection after CS were recruited. Cases with surgical site infection developed within the first 4 weeks postoperative were followed up 6

weeks after CS using saline sonohysterography to diagnose the development of scar niche.

Inclusion criteria

Non-pregnant females who had undergone at least one previous caesarean section and had a post-CS surgical site infection: Infection that developed within the first 4 weeks postoperative.

Exclusion criteria

Women who had uterine surgery other than CS or with any localized lesions, such as fibroids.

All study details were explained to cases prior to their recruitment. Verbal and written consent was taken.

Ethical Approval

Study goal was explained to all patients. And was approved by faculty of medicine, Minia University ethical committee with approval No.394:9/2022

All cases undergone detailed history, ultrasonographic evaluation and assessment of the CS scar using saline sonohysterography. Patient put in lithotomy position for fixation of pediatric foley catheter then injection of saline in the endometrial cavity and examine the cavity using TVUS probe central frequency 6.5 MHz to detect CS scar niche and measure its length, width and depth (Figure 1).



Fig. 1: SIS of CS scar niche

All data were collected, tabulated and statistically analyzed using SPSS 26.0 for windows (SPSS Inc., Chicago, IL, USA). We collected 112 cases but 12 cases refused to continue in our study (Figure 2).

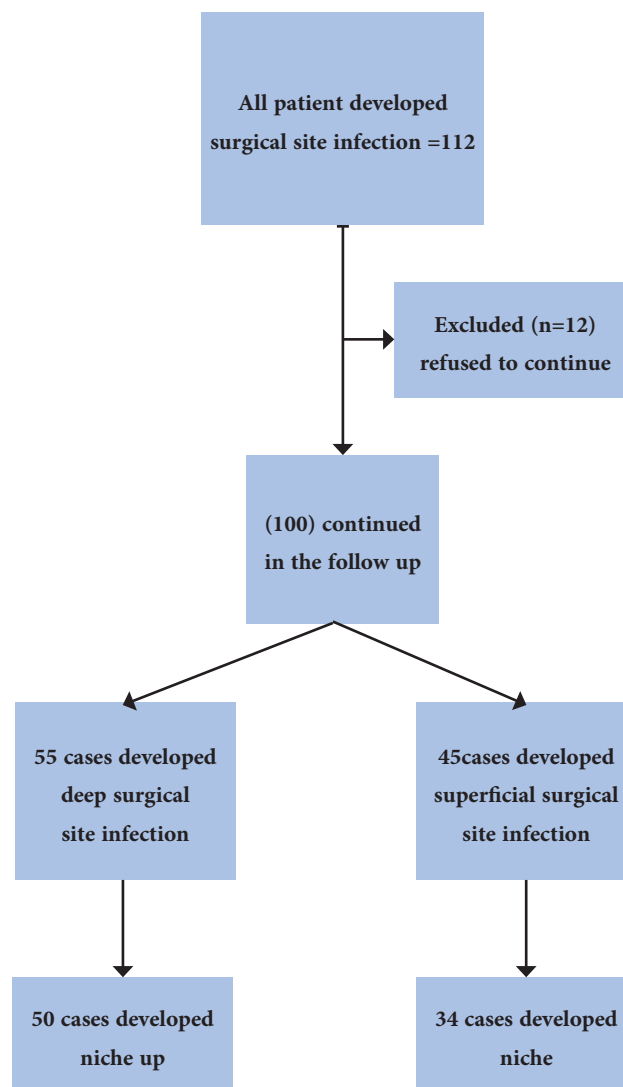


Fig. 2: Flow chart of our participants

RESULTS

Our results showed that 84% of cases had niche, the mean Length was 15 ± 2.1 mm, the mean depth was 6.22 ± 5.21 mm. shape of the niche in 71% was triangular niche, 26% was Semicircular niche while 3% was droplet like.

Also our results showed that 55% of cases had deep SSI and 45% of cases had superficial SSI. The mean onset of development of SSI after CS was 7 ± 2 days. Also there was a significant association between niche and BMI as 48.8% of patients developed niche were obese. Prevalence of niche was higher emergency CS than elective (61.9%) versus (38.1%) respectively (Tables 1-3).

Table 1: Socio-demographic data among our cases

Age, years	
Mean \pm SD	33.2 \pm 3.5
Median (Minimum - Maximum)	35 (20 - 38)
Parity	
Mean \pm SD	2.5 \pm 0.7
Median (Minimum - Maximum)	2.7 (0 - 4)
Parity categories	
(primigravida)	8 (8%)
Multigravida	86 (86%)
Grand multipara	6 (6%)

This table shows The mean Parity was 2.5 \pm 0.7.

Table 2: Association between scar niche and obstetric and medical history

	Positive niche (n=84)	Negative niche (n=16)	Test	P value
Preeclampsia	9 (10.71%)	3 (18.75%)	0.82	0.36
PROM	14 (16.7%)	3 (18.75%)	0.82	0.76
Gestational diabetes mellitus	12 (14.3%)	4 (25%)	2.74	0.09
Placenta previa	10 (12%)	1 (6.25%)	0.8	0.16
IDDM	7 (8.33%)	3 (18.75%)	0.85	0.71
Chronic HTN	8 (9.5%)	5 (31.25%)	0.08	0.8
SLE	6 (7.1%)	2 (12.5%)	0.12	0.72

X2: Chi square, *p* value >0.05: non significant, *p* value <0.05 significant, premature Rupture of membranes (ROM), , Insulin Dependent Diabetes mellitus (IDDM), Hypertension (HTN), Systemic lupus erythematosus (SLE)

Table 3: Association between type of SSI and Niche

	Superficial	Deep	Test	P value
Length (cm)				
Mean \pm SD	10.9 \pm 2	14.8 \pm 3	4	0.041
Depth (cm)				
Mean \pm SD	4.24 \pm 3.42	8.62 \pm 5.66	12	<0.001
Width (cm)				
Mean \pm SD	2.06 \pm 1.56	6.52 \pm 3.79	16	<0.001
Niche				
Yes	34 (75.6%)	50 (90.9%)	4.34	0.037
No	11 (24.4%)	5 (9.1%)		

T: Two-Sample Independent t Test, *p* value >0.05: non significant, *p* value <0.05 significant

DISCUSSION

Caesarean delivery, being a surgical operation, can result in a variety of results, one of which is surgical site

infection (SSI). The global prevalence of SSI varies from 3% to 15%^[10]. Repeated cesarean section, post-partum hemorrhage, and surgical site infections were all found to be independently predictive of scar niche development^[11].

In terms of niche prevalence in our investigation, the present study found that 84% of participants had a niche. The high incidence of post-CS niche in the study group revealed the substantial relationship between post-CS SSI and the incidence of post-CS niche.

These results agree with Malysheva *et al.*, 2021 who discovered that SSI is a substantial risk factor for the formation of a deficient scar^[12]. (Stegwee *et al.*, 2023) also shown that the prevalence of a niche was 71.2% (1396/1961)^[13]. According to (Madhangi and Ramany, 2020), the prevalence ranges from 6.9% to 69%^[11]. The actual prevalence of CSD is uncertain, however it appears to range from roughly 19% to 100%, depending on the terminology employed, research design, and diagnostic technique^[14].

Park *et al.* (2018) discovered that the niche had a prevalence of 73.8% the relationship between SSI type and niche characteristics, the current study found a strong relationship between SSI type and development of niche. There was a substantial relationship between SSI type and depth and width of niche. The occurrence of niches was substantially higher in the deep than in the superficial (90.9% vs 75.6%)^[15-20].

To the best of our knowledge, this is the first study to look at the relationship between the kind of SSI and niche characteristics. The literature, on the other hand, validated the link between SSI and niche. Madhangi and Ramany, 2020 found that post-CS SSI was an independent predictor of post-c-section scar defect development. In addition, according to Malysheva *et al.*, 2021, infectious problems were found as a substantial risk factor for the formation of a dehiscent scar^[11,12].

Furthermore, (Antila-Långsjö *et al.*, 2018)^[22] discovered that emergency cesarean birth increased the chance of ischiocele (odds ratio, 1.06; 95% confidence range, 1.01-1.11; *P*=.032). In our study, 35% of the participants had an optimum BMI (ideal BMI 18.5:24.9), 50% were overweight, and 15% were underweight.

The current study found a strong relationship between niche and BMI. In line with the current study, Chen *et al.*, 2017 found that niche formation is related to BMI mean (29.45 \pm 3.04).

According to the (Antila-Långsjö *et al.*, 2018)^[22] study, patients with scar niche had greater BMI, with each extra unit of BMI increasing the risk by 6%. However, (Pan *et al.*, 2019)^[23] found no significant relationship between

niche and BMI; the discrepancy may be due to differences in sample size; the same results were reported by (Mousa *et al.*, 2022)^[24].

In our study, 48% were elective CS . 52% were Emergency, with a higher incidence of niche in emergency CS. 61.9%, indicating a substantial relationship between CSD and CS type. According to (Tang *et al.*, 2019)^[25], in our study the mean onset of development of SSI after CS was 7 ± 2 days , all cases subjected to sonohysterography 6 weeks after CS this procedure was in accordance of recommendation of Voet LF *et al* 2014 who reported that early scanning may facilitate the recognition of the location of the caesarean section scar in the uterine wall as a result of incomplete scar healing, and this may increase the detection of small niches. In addition, the related thin endometrium resulting from breastfeeding in the majority of the women may also improve niche recognition and measurement.

CONCLUSION

Finally, the current study found that Cesarean scar deformity is common in our practice. Our study analysis found that surgical site infections lead to development of cesarean section scar defect in (84%), and there is a strong relationship between type of infection and development of niche

CONFLICT OF INTERESTS

There are no conflicts of interest.

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