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Review Article

**SONOGRAPHIC EVALUATION OF UTERINE NICHE -
A SYSTEMATIC REVIEW**Dr Nazish Zulfiqar¹, Syeda Khadija², Meryem Zulfiqar³, Noraiz Ali³,
Dr Tayyab Mughal⁴¹ MRCOG, University of Lahore, Pakistan² M.Phil (ultrasound), PHD*, University of Lahore, Pakistan³ MsDU, University of Lahore, PakistanFCPS, Sheikh Zayed Hospital Lahore, Pakistan⁴**Article Received:** October 2020**Accepted:** November 2020**Published:** December 2020**Abstract:****Objective:** To describe the role of sonography in diagnosis of uterine niche in patients with previous cesarean section delivery.**Method:** The English literature (MEDLINE, PUBMED, OBGYN.ONLINELIBRARY) was searched using keywords Niche Sonography, Isthmocele, Cesarean Scar defect Transvaginal sonography. All abstracts were prospective studies between 2000-2020. Relevant articles were assessed.**Results:** Most selected studies show the prevalence of niche on GIS more than TVS.

Not all but majority of women undergone cesarean-section delivery have a triangular anechoic area uterine niche, and complain of postmenopausal bleeding.

Conclusion: Ultrasound specially Gel instillation and saline instillation sonography plays a vital role in detection of uterine niches. Majority of females undergone C-section have cesarean scar defect.**Keywords:** Cicatrix, Scar, Isthmocele, Wound dehiscence, Uterine niche**Corresponding author:****Nazish Zulfiqar,**

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INTRODUCTION:

In 1970's the cesarean section rate began to increase in most western countries (Notzon FC, Placek PJ, Taffel SM 1987).

Apart from abnormal uterine bleeding and symptoms like chronic pain, another complication known as niche has been observed by researchers. A niche is a sonographic finding and is defined as triangular anechoic area at presumed site of incision (Monteagudo A, Carreno C, Timor Tritsch IE 2001)

After incomplete healing of the uterine C-section scar a niche can be observed. A niche is a disruption of integrity of myometrium at the site of cesarean scar it can be visualized by sonohysterography or hysteroscopy. Although many studies have evaluated the development of niches and associated symptoms, there is no standardized guideline for their examination, measurement or description (Bijl D, Vaate AJ, Vandervoet, LF Naji 2014)

A niche can be examined using two dimensional 2D or three dimensional 3D transvaginal ultrasound with or without saline or gel contrast, Magnetic resonance imaging and hysteroscopy (Van der Voet LF, Bijl D, Vaate AM, Verseema S 2014)

At present there is no consensus regarding the gold standard for detection and measurement of niche. As not all women with history of cesarean section develop a niche. It is of interest to identify the risk factors that may predict their development (Bijl D, Vaate AJ, Broilmann HA, Vander voet 2011) (Fabris C, Ariles G, De La Jara 2003)

The purpose of this systematic overview of available literature to sonographically evaluate the niche.

MATERIAL/SUBJECTS/PATIENTS AND METHODS:**SEARCH STRATEGY:**

We searched PUBMED, MEDLINE, OBGYN.ONLINE LIBRARY. For words in title abstract and MeSH terms. All words like scar, niche, isthmocele, cesarean scar defect, Transvaginal ultrasound, Gel instillation sonography, Saline instillation sonography were used.

STUDY SELECTION:

We reviewed multiple articles, then excluded retrospective, case control and case reports from data, we applied additional methodological filter for paper selection and selected papers published between 2000-2020.

Only prospective studies reporting on prevalence, risk, symptoms, using Transvaginal sonography GIS, SIS, SHG were included.

RESULTS:

Total of 10 original articles were reviewed which addressed the role of sonography in evaluation of uterine niche and other associated factors.

In a prospective study conducted by Ana Monteagudo et al in 2001 included Forty-four patients with histories of cesarean delivery who underwent saline infusion sonohysterography for a variety of gynecologic indications were included. During the procedure, the area below the bladder recess was examined using transvaginal sonography. A filling defect or "niche" was defined as a triangular anechoic structure at the presumed site of a previous cesarean delivery scar.

The depth of the niche was measured. Uterine size, the presence of fibroids and polyps, and the number of previous cesarean deliveries were noted. All patients had a niche indenting the anterior uterine-cervical wall. The mean \pm SD depth of the niche was 6.17 ± 3.6 mm. There was no correlation between the number of cesarean deliveries and the depth of the niche (Monteagudo A, Carreno C, Timor Tritsch IE 2001)

A prospective study conducted by Vanessa Armstrong in 2003 included asymptomatic, parous volunteers underwent TVS of cervix, uterus and adnexa. Uterine measurements, the presence or absence of cesarean scar, and presence of a scar defect, defined as fluid in scar, were recorded. All subjects completed self-report questionnaire regarding obstetric history. Total 70 subjects were enrolled. On these, 38 women had a prior vaginal delivery and 32 women a prior cesarean delivery. One woman with bicornuate uterus and three cesarean deliveries was excluded from analysis. Fluid was visualized with I the scars of 13 of 31 subjects (42%) with prior CS delivery. All 13 were found among 23 subjects (56%) who labored prior to CS delivery. Women with cesarean scar defect had greater number of cesarean deliveries than women without scar defect (Vanessa Armstrong, Wendy F Hansen, Bradley J Van Voorhis. 2003)

Prospective study conducted by C. Regnard in 2004 included 33 women with past history of C-section who were planning a further pregnancy were involved in the study. Saline contrast sonohysterography SCSH was performed after 3 months of C-Section. The thickness of the residual myometrium, the thickness of myometrium bordering the scar and depth of the filling defect in the scar were re-evaluated in each

case. A dehiscence was defined as a niche whose depth was at 80% of anterior myometrium. In 19/33 (57.5%) patients a niche with a depth of 4.2 ± 2.5 (range 6.9-13.9) mm was identified. In these patients the residual myometrium measures 6.5 ± 2.7 (range, 0-10.9) mm vs 8.9 ± 2.0 (range, 6.9-13.9) mm in the remaining 14 patients without a niche. Within the 19 niches, two dehiscences were identified (C Regnard, M Nosbusch, C Felleman 2004).

Study conducted by Hiromi Hayakawa in 2006 was a prospective study, including women undergoing caesarean operation ($n=137$) were examined by transvaginal ultrasound one month after surgery to assess the appearance of lower uterine scars. Multivariate logistic regression analysis was performed to identify associations of perioperative parameters and methods for lower myometrium closure with abnormal wedge formation. Wedge defects were observed in a total of 27 patients (19.7%). The analysis revealed Groups B and C to have reduced risks with odds ratios of 0.28 and 0.07, respectively, as compared to Group A. Furthermore, increasing gestational week at delivery, plural fetal pregnancies, premature rupture of membranes and pre-eclampsia were also linked with an increased risk, with odds ratios of 1.4–8.9 (Hiromi Hayakawa, Atsuol-bakarv, Takashi Mitsui 2006).

Study conducted in 2009 by O.Vikhareva Osser on Two hundred and eighty-seven women underwent transvaginal ultrasound examination 6–9 months after delivery. None of the 125 vaginally delivered women had a visible scar in the uterus, whereas all women who had undergone Cesarean section had at least one visible scar. Median myometrial thickness at the level of the isthmus was 11.6 mm in women who had only been delivered vaginally, and 8.3 mm, 6.7 mm and 4.7 mm in women who had undergone one, two and at least three Cesarean sections, respectively ($P < 0.01$). Scar defects were seen in 61% (66/108), 81% (35/43) and 100% (11/11) of the women who had undergone one, two and at least three Cesarean sections ($P = 0.002$); at least one defect was classified as large by the ultrasound examiner in 14% (15/108), 23% (10/43) and 45% (5/11) ($P = 0.02$), and at least one total defect was seen in 6% (7/108), 7% (3/43) and 18% (2/11) ($P = 0.33$). In women who had undergone one Cesarean section, the median distance between an intact scar and the internal cervical os was 4.6 (range, 0–19) mm, and that between a deficient scar and the internal cervical os was 0 (range, 0–26) mm ($P < 0.001$) (O Vikhareva Osser, L Jokubkiene and L. Valentin 2009).

In 2010 A.J.M Bij Deevate conducted Observative

prospective cohort study 255 women were included and examined with both TVS and GIS, 6-12 months after C-Section. In case of niche, the depth, volume and residual myometrium were measured and shape was assessed according to specified classification.

A questionnaire and pictorial blood loss assessment chart were filled in. Niche on TVS 24%, Niche on GIS 56%.

Niche was considered to be present if the depth at least 1 mm visualized with GIS. Post-menopausal bleeding was reported in 33.6% of women with niche and 15.2% of women without niche (Bij De Vaate AJ, Brolmann HA, Vander Voet. 2011).

In 2012 Oronzo Ceci conducted a study the study sample consisted of two groups of 30 singleton primiparae at term who delivered by elective low segment cesarean section. In the first group, uterine closure was done with locked continuous single-layer sutures and in the second group, with single-layer interrupted sutures. Patients were assessed by transvaginal ultrasound and hysteroscopy, between the 6th and the 12th month after delivery, and again at the 24th month. Ultrasound measurements were made of the pouch area, if present. A bell-shaped uterine wall defect was seen at ultrasound in 36 (85.71%) of 42 patients who completed the follow up at the 24th month. It was larger in the group of patients with closure by continuous sutures (6.2 [2.1–14.7] mm²) as compared to interrupted sutures (4.6 [1.9–8.2] mm², $P = 0.03$). Hysteroscopy confirmed the presence of the wall defect in all 36 cases, but different hysteroscopic outcomes were observed (Oronzo Ceci, Clementina Cantatore, Marco Scioscia 2012).

L.F Vander Voet conducted a prospective cohort study in 2013 in which TVS and Gel instillation sonohysterography GIS were performed at 6-12 weeks after C-Section. Women were followed by questionnaire and menstruation score chart at 6-12 weeks, 6 months and 12 months after C-Section. Out of 263 women. Niche prevalence was 49.6% on TVS and 64.5% on GIS. Women with niche measured by GIS reported post-menopausal spotting than women without niche. Women with residual myometrium at the site of uterine scar measuring <50% of adjacent myometrium thickness had spotting more often than women with >50% of adjacent myometrium thickness (Van der Voet LF. Bij D.Vaate AM, Overseer S 2014). Prospective study conducted by Michal Pomorski starting in 2005, the study included 308 nonpregnant women with history of low transverse cesarean section.

Sonographic parameters such as RESIDUAL

MYOMETRIUM THICKNESS (RMT) and the width (W) and depth (D) of triangular hypoechoic scar niche. During 8 years of followup, 41 women were referred to department for delivery. In all cases a repeat cesarean section was performed and lower uterine segment was assessed. Two statistical methods namely the logit model and decision tree analysis were used to determine the relation between the appearance of CS scar in the non-pregnant state and the performance of the scar in the next pregnancy. The logit model revealed that the D/MRT ratio showed significant correlation with CS scar dehiscence (P-value of 0.007). Specifically, a D/MRT ratio value greater than 1.30 indicated that the likelihood of dehiscence was greater than 50%. The decision tree analysis revealed that a diagnosis of dehiscence versus non-dehiscence could be based solely on one criterion a D/MRT ratio of at least 0.78. The sensitivity of this method was 71% and specificity was 94% (Michal Pomorski, Tomasz Fuchs and Mariusz Zimer 2014)

In 2017 L.F Vandervoet conducted a Proof-of-concept study, prospective cohort study. Twenty women who delivered by their first CS were evaluated by both transvaginal sonography and GIS 2 months and 1 year after CS. A niche was defined as an anechogenic space at the uterine caesarean scar with a depth >2 mm. The primary outcome was any change in the thickness of the residual myometrium (RMT) as evaluated by GIS. Mean RMT changed in time from 11.9 mm at 2 months to 6.5 mm at 12 months after the CS ($p < 0.001$). Niche prevalence did not change. The adjacent myometrium (AM) reduced from 15 to 12.4 mm ($p = 0.04$). The ratio between RMT and AM with GIS decreased from 0.80 at 2 months to 0.54 at 12 months ($p = 0.002$) (Lucy F vander Voet, Inge PM Jordans, Hans A.M Brolman 2017)

DISCUSSION:

In random population of women with a history of CS, the prevalence of niche range from 24 % to 70% and 56% to 84% when assessed by TVS and SHG respectively (Bij Di Vaate, AJ. Vandervoet, LF Naji 2014)

A defect or niche is able to identify by using SIS in all patients who had 1 or more C-Section (Monteagudo A, Carreno C, Timor Tritsch IE 2001) Zilberman et al and Blancho Sancho and Cler were among the first to evaluate the cesarean delivery scar using hysterosalpingography (Zilberman A, Sharf M, Polishuk WZ 1968) (Blancho Sancho R, Cler F. 1969).

In some cases uterine niche can be detected using conventional TVS (Chen HY, Chen SJ, Hsich FJ

1990) (Jarvela IY, Slad Kivicius P, Kelly S 2002) but we believe that the SCCHS may facilitate the detection of a niche and allow its depth to be measured (Monteagudo A, Carreno C, Timor Tritsch IE 2001) (Phillipe HJ, Karanoun S, Rozenberg 1997) Two recent studies also using SCCHS reported that a niche after a cesarean section may be associated with spotting or bleeding suggested that the uterine scar may be a reservoir of menstrual blood (Monteagudo A, Carreno C, Timor Tritsch IE 2001) (Thurmond AS, Harvey WJ, Smith SA 1999).

It has also been reported that the wedge defects in cesarean section scar are associated with significant pathological changes, fragmentation, breakdown of endometrium or exposure of fibrous tissue to uterine cavity (Rozeberg P, Goffinet F, Phillipe HJ 1996) Regnard et al found that the cesarean scar defect (termed niche) are linked with thinning of residual myometrium (C Regnard, M Nosbusch, C Felleman 2004)

Ofilo-Yebovi et al defined a “severe defect” as one with “loss of more than 50% of myometrial mantle at the scar level” (D Ofilo- Yebovi, J Ben Nagi, J Yazbek. 2008).

The thickness of myometrium at the level of isthmus uteri decreases as the prevalence of scar defects and large scar defects increases with number of cesarean sections, Vikhareva Osser et al reported that 83% niches were triangular 2% were round and 4% were oval and 10% showed no remaining myometrium over defect (O Vikhareva Osser, L Jokubkiene and L. Valentin 2009).

All cesarean section scars could be identified by GIS. Using this technique, the prevalence of niche was high (64.5%) in random population. Comparing the results of Transvaginal ultrasound and Gel instillation ultrasound niche prevalence was higher, measured niche depth was greater and myometrium was thinner detected by GIS. Postmenstrual spotting 1 year after Cesarean section was strongly related to the presence of a niche detected by both TVS and GIS (Van der Voet LF. Bij D.Vaate AM, Overseer S 2014).

These studies confirm that TVS imaging plays an important role in detection of uterine niche. However current data is limited better modalities or techniques can be introduced in future.

CONCLUSION:

From all the literature reviewed we came to a conclusion that transabdominal ultrasound evaluation does not participate much in evaluation of uterine

niche whereas conventional Transvaginal ultrasound plays an important role, Gel instillation sonography GIS and Saline instillation sonography SIS can be considered a gold standard in all this procedure as it allows accurate imaging, measurement and depth of uterine niche. Depth of niche and Residual Myometrium Thickness RMT are inversely proportional, larger the niche depth lesser the RMT.

Uterine niche is related to many other problems such as postmenstrual bleeding/spotting, pelvic pain, dysmenorrhea. It is assumed that uterine niche also effect fertility however more studies are required to confirm this statement.

Disclaimer:

This article has never been presented or published in any conference, or published in an abstract book.

Conflict of interest:

None to declare

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