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Uterine Niche: A Long Term Complication of Caesarean Section: A Prospective Observational Study

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ABSTRACT

With the rising incidence of caesarean section all around the world, it becomes important to study short and long term risks associated with it. We at Meenakshi Mission Hospital and Research Centre, Tamilnadu decided to study about prevalence and symptoms associated with "Niche" also known as "Isthmocele" or "Caesarean Scar Defect", one of the long term side effect of Caesarean Section. The prospective observational study was done over period of two years from September 2017 to September 2019. A total of 131 women were with history of previous caesarean section underwent transvaginal ultrasound by a single consultant. The ones who had other pelvic pathologies and other conditions which might have been responsible for their presenting complaints were excluded from study. Niche was found in 47% of studied women. Among them 87% were symptomatic with abnormal uterine bleeding reported in 49% of women. Other symptoms reported were dysmenorrhoea 10%, chronic pelvic pain 7%, brownish vaginal discharge 11%, secondary infertility 7% and urinary urge incontinence 3%. Among women who reported abnormal uterine bleeding, 27% reported post menstrual spotting, being the most common symptom reported, 11% reported inter menstrual bleeding and 11% reported heavy menstrual bleeding. The study shows significance of Niche causing symptoms and emphasis the fact that clinicians should have this as differential diagnosis while treating the patient.

OPEN ACCESS

Key Words
Uterine niche, complication, caesarean section

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INTRODUCTION

Caesarean section is one of the most commonly done procedures in the field of obstetrics and gynecology. The rate of Caesarean Section in India has been reported anywhere between 22 to whooping 82% depending on the state and sector data was collected from[32]. A study done by IIT researchers discovered that there was sharp rise in number of caesarean section between 2016 and 2021 (17.2-21.5%). World Health Organization has made the recommendation that the ideal rate of caesarean sections is between in 10-15% and this has been in place since 1985. However, when we consider the changing demographics of obstetric patients with more number of complicated cases requiring caesarean section, it hard to keep up to the standard of 10-15%. Also, privatization of healthcare, better socioeconomic status, increased afford ability has got maternal request caesarean section on rise. The art of practicing medicine is changing as well. Over the years we have moved from paternalism to patient's autonomy. Some of world's largest obstetrics and gynecology bodies like RCOG and ACOG now recognize maternal request as an indication for a caesarean section. As clinicians it becomes our duty to counsel this women of benefits and risks of caesarean section, in order to encourage informed decision making. Some of the complications of caesarean section is well known and mentioned to patient while consenting, like pain, infection, bleeding, risk of pelvic organ injury, possible complications in future pregnancies like placenta praevia, accreta spectrum, scar dehiscence, pelvic adhesions. Uterine Niche is a relatively new complications which has come into light, which is causing significant gynecological morbidity to women. It was in 1995, Dr Hugh Morris studied 51 hysterectomy specimens to see for changes that are present in the area of caesarean section scar and noted significant pathological changes and hypothesized that it could be the cause of abnormal bleeding patterns which had led to hysterectomy[3]. Later in 1999, Thurmond AS, *et al.* described a previously unknown cause for abnormal uterine bleeding. 9 of 310 evaluated women had 8-17 mm gap in anterior lower uterine segment[4]. Since then several papers have been published defining the caesarean scar defect, providing theories about pathophysiology, symptoms and treatment of the same. The Caesarean Section Scar defect or Caesarean Scar Dehiscence or Isthmocele is a pouch like defect of anterior uterine segment at the site of prior caesarean section. Monteagudo A, *et al.* coined the term **"Niche"** and defined it as an indentation at the site of caesarean section scar with a depth of at least 2 mm[2].

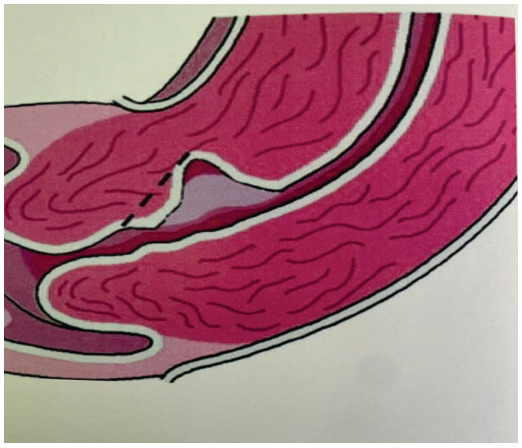

Fig. 1: Schematic Diagram of Niche

Aims and Objectives: A prospective study was designed with an aim to see prevalence and impact of Uterine Niche.

The Objectives were:

- To study the prevalence of Niche on TVUS in women who have undergone caesarean section.
- To study the symptoms in women with Uterine Niche.

MATERIALS AND METHODS

The prospective, observational study was conducted in Department of Obstetrics and Gynecology, Meenakshi Mission Hospital and Research Centre, Madurai, Tamilnadu over period of 2 years from September 2017 to September 2019. All perimenopausal women seen in the department who had previous caesarean section were included in the study. Women who did not consent to be part of the study and women with other known pathologies like fibroid, polyps, evaluator disorders etc. were excluded from study. Sample size was calculated by statistician as 75, using the formula n=[DEFFxNp (1-p)]/[d^2/Z^2 1-alpha/2x(N-1)+px(1-p)] with confidence interval of 95% based on the article "Caesarean Scar Defect: Co relation between caesarean scar number, defect size, clinical symptoms and uterine position" published in Journal of Ultrasound in Obstetrics and Gynecology, Vol 34, issue 1, June 2009, by Wang[14]. Women who fulfilled the inclusion criteria underwent transvaginal ultrasound (Voluson S6). The ultrasound was done by a single consultant over 2 years to reduce inter observer variation. The definition of Niche was taken as defect in anterior uterine segment at the site of prior caesarean section of depth >2 mm according to Monteaguado *et al.* Prevalence and gynecological symptoms associated with it was studied. The information was recorded in master chart. Statistical analysis was performed on a computer by SPSS 23.0. In descriptive statistics, the continuous variable is

expressed as mean and standard deviation. Categorical variables is expressed as frequency and percentage. Non parametric test is used for data which do not follow normality. Chi-square test and Fisher's exact testis used to find out association between the categorical variables. P<0.05 is considered as statistically significant. This study did not include any experimentation.

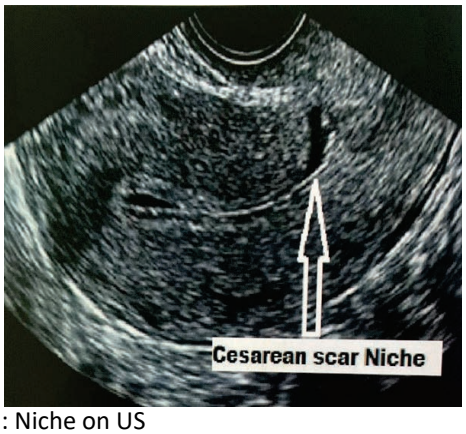

Fig 2: Niche on US

RESULTS AND DISCUSSIONS

During the study period of two years between September 2017 to September 2019, 131 women were studied who fit in the criteria as described earlier. Mean age of patients in the study was 35.3 years with standard deviation of 7 years and 8% of these women were <25 years of age. This indicates the long years of gynecological morbidity these women have to live with during their lifetime after a caesarean section. 47% of screened women had Niche on transvaginal ultrasound. When other studies were reviewed, there was a wide variation in prevalence ranging between 7% and 88%. Wang *et al.*, 2009 had 209 women in the study, Niche was described as hypoechogenic area within myometrium of lower uterine segment with prevalence of 7%[14]. Bi de Vatte *et al.,* 2011 studied 225 women, Niche was described as anechoic area at the site of CS with depth of at least 1 mm and prevalence in this study was 24%[6]. Chang *et al.,* 2009 studied 57 women with prevalence of 88%[15]. Such a wide difference might have been caused by variation in definitions, level of awareness and inter observer variation.

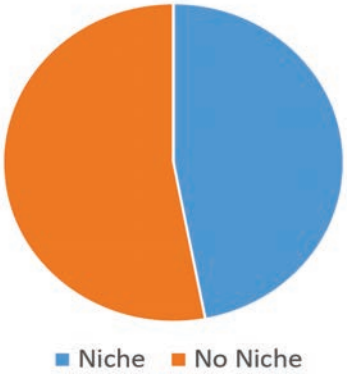

Fig. 3: Prevalence of Niche

Among the women who had Niche, 87% were symptomatic. Wang *et al.,* 2009 reported symptoms in 64% of women with Niche[14]. Fabres *et al.,* reported abnormal uterine bleeding in 83% of women with Niche[19].

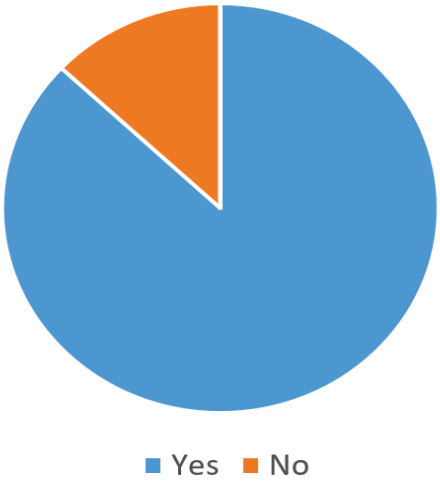

Fig. 4: Symptoms

Among the 62 women who had Niche, 54 were symptomatic and 8 were asymptomatic. Of the 69 women who did not have Niche, 49 (71%) were symptomatic and 20 (29%) were asymptomatic. When statistical analysis was done comparing the two groups, women who had Niche were significantly more symptomatic than the ones without (p 0.025).

Variable	Niche+(63)	Niche-(68)	P 0.025
Symptoms +	87% (54)	71% (49)	78% (103)
Symptoms -	13% (8)	29% (20)	22% (28)
Total	100%	100%	100%

The most common presenting complaint was abnormal bleeding patterns reported in 49% of women. Other symptoms reported were dysmenorrhoea 10%, chronic pelvic pain 7%, brownish vaginal discharge 11%, secondary infertility 7% and urinary urge incontinence 3%. Among women who reported abnormal uterine bleeding, 27% reported post menstrual spotting-the most common symptom reported, 11% reported inter menstrual bleeding and 11% reported heavy menstrual bleeding. In the studies which were performed in a random population by Valenzano *et al* and Thurmond *et al.,* it was found that abnormal uterine bleeding was more frequent in women with CS defect supporting the results found in this study[10]. Van der Voet *et al.* and Bij de Vaate *et al.,* reported post menstrual spotting being more common in women with Niche as compared to women without Niche[6]. Wang *et al.,* reported post menstrual spotting in 64% of women with Niche[14] and Fabres *et al.,* in 76% of women[19].

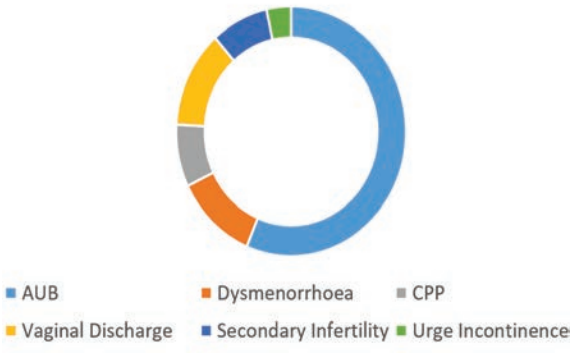

Fig. 5: Symptoms

Among the 10 women who had dysmenorrhoea and chronic pelvic pain, ultrasound and MRI had been normal and the only finding was CS Niche which could explain the symptoms. 7 patients who presented with vaginal discharge described it as watery/ mucoid/brownish/blackish. PID was ruled out in these women. 4 patients presented with secondary infertility. 2 were found to have additional male factor along with Niche. 2 had unexplained infertility. Niche could have been contributing factor. 2 patients with urge urinary incontinence had clinical, laboratory and radiological evaluation which was all normal. They were offered urodynamic study, however they deferred from further evaluation. Significance of number of caesarean section on prevalence on Niche was also studied and was seen it was not significant (P0.257). It suggests that women can experience these symptoms even if they had single CS.

Caesarean section has been indeed a boon to obstetrics. Back in the day, NumaPompilius the Roman King (715 BC-673 BC) proclaimed in his 'Lex Regalia' that 'it is forbidden to bury a pregnant woman before her foetus has been cut from the womb'. This may be the first description of caesarean section. The name 'caesarean section' has always been associated with Julius Cesar (100-44 BC). The 'Lex Regalia' became the 'Lex Caesarea' in his rule. He first fully authenticated and documented case of a caesarean section performed on a living woman took place in Wittenberg, Germany on 21st April 1610. Ursula Otiz had an accident during pregnancy resulting in huge abdominal hernia through which the uterus protruded. When the labour started it was clear spontaneous delivery was impossible. After consulting 3 physicians, midwives and priests a caesarean section was performed by surgeon Jeremias Trautmann. The patient died from infection 25 days later and child Martin lived for 9 years. A successful caesarean being defined as survival of both mother and child for 1 month following procedure was reported by Ynzonides in Netherlands. 95 cases were described from 1637-1874. Infection and bleeding were the principal cause of maternal death. The turning point was when uterine incision was closed which reduced maternal mortality by 50%. 17 operations were performed with uterine closure by Frank Polin in 1852 in USA. Then came successful introduction of anaesthesia with ether by Jackson and Morton in Boston in 1846, the technique of asepsis by Ignace Semmelweis in Vienna in 1847, antisepsis by Lord Lister in Edinburgh in 1867 which changed history of surgery[1]. Caesarean Section has evolved from being a lifesaving procedure to most commonly performed procedure in obstetrics. But it goes without saying that a new invention comes with its own set of risks. In recent years gynecological symptoms in women with previous caesarean section has taken the stage light and many articles have come out studying the uterine "Niche". Several methods have been used to detect and measure Niche. The most commonly applied techniques are transvaginal sonography, hysteroscopy and sonohysterography. On TVUS it is noted at anechoic or hypoechoic defect in the anterior lower uterine segment at the site of previous CS[6-8]. On hysteroscopy it is noted as out pouching in the anterior lower uterine segment[12]. Sonohystero graphy is proposed to be more accurate as it provides improved delineation of the borders of a Niche in comparison to TVUS[6,7,9,10]. It is also observed during hysterosalphingography, however it may be less precise for this objective and small niches may be missed[13]. Various niche shapes have been described. Bij de Vaate *et al.,* reported 83% of defects were triangular in shape, 10% were total defects with no residual myometrium, 4% were oval in shape and 2% had round shaped defect[6]. Chen HY *et al.,* used different kind of classification. Defects were divided as inward protrusion (6%), outward protrusion (15%), haematoma (4%) and inward retraction(4%)[17,18]. Jordans IP *et al.,* described ultrasound evaluation of Niche[5]. Uterus is studied in sagittal section. Endometrium is ignored and niche measurements are based only on myometrium.

The Following Features were Described:

- **Length of Niche:** Distance between the proximal and distal point on the base of Niche.
- **Depth of Niche:** Distance between base and apex of Niche.
- **Width of Niche**: Transverse section is used to measure the width.
- **Residual Myometrial Thickness:** Thickness of Myometrium over the thinnest point, measured perpendicular to serosa.
- **Niche to Vesico Vaginal Fold Distance:** Distance between top of Niche where residual myometrial thickness is thinnest to Vesico Vaginal Fold.

- **Niche to External Os Distance:** Distance between the distal point of Niche to External Os, measured parallel to cervical canal.

As not all women with a history of caesarean section develop a Niche, it is a subject of interest to identify risk factors for development of Niche. Number of articles have been published hypothesizing the risk factors. Risk factors can be classified into four categories.

Closure Technique:

- Double layer closure technique is associated with lesser incidence of Niche due to better approximation[11,20,21].
- Full thickness suturing is associated with lesser incidence probably due to better approximation again[22].
- Continuous locking sutures is supposed to cause larger defects as compared to interrupted sutures probably due to greater ischemic effect[23].

Labour Factors[11,20,22]:

- Duration of active labour >5 hours.
- Cervical dilatation >5 cm.
- Advanced station of presenting part.
- Use of oxytocin during labour prior to CS.
- Premature Rupture of Membranes.
- Gestational age <37 weeks.
- Incision at the level of internal os.

Factors with Potential Negative Influence on Wound Healing[8,11,14,20,24]:

- Retroflexed uterus.
- Multiple CS.
- Pre eclampsia.
- Interestingly there was no association between peripartum infection, postpartum infection or maternal BMI.
- Number of women were too small to comment about diabetes and steroid during pregnancy.

Miscellaneous Factors:

- Number of vaginal births, placenta praevia, intra operative blood loss, Hb levels, platelet levels, foetal weight, regional or general anaesthesia, operating time was not found to be associated with Niche formation[11].
- While Vikhareva Osser[11] found maternal age as one of the risk factor, two other studies[20,24] (Hayakawa H *et al.,* Ofili-Yebovi D *et al)* found it was not linked.
- Multiple pregnancies again hasn't been clearly established as risk factor.

During the original study by Dr Morris[3], he found the following pathological changes in hysterectomy specimens in the Niche area.

- Distortion and widening of lower uterine segment 75%.
- Overhang of congested endometrium above scar recess 61%.
- Polyp conforming to scar recess 16%.
- Moderate to marked lymphocytic infiltration 65%.
- Residual suture material with foreign body giant cell reaction 92%.
- Capillary dilatation 65%.
- Free red blood cell in the endometrial stroma of the scar 59%.
- Fragmentation and breakdown of the endometrium of the scar 37%.
- Iatrogenic adenomyosis 28%.

As found in my study, women with Niche present with a spectrum of symptoms, the most common being abnormal uterine bleeding which includes post menstrual spotting, inter menstrual spotting, heavy menstrual bleeding. The other symptoms which have been reported are dysmenorrhoea, dyspareunia, chronic pelvic pain, vaginal discharge, secondary infertility, urinary symptoms including stress and urge incontinence[4,6,9,14,16,19,27].

Iannone[24-28] studied pathophysiology of symptoms and hypothesized that following could be the explanations:

- Collection of Blood in the Niche-Menstrual blood accumulate in the niche and then seep out slowly over the days leading to post menstrual spotting and inter menstrual spotting.
- Impaired uterine contractility at the scar area causing disturbance in menstrual flow.
- Anatomical distortion, abnormal myocontracture due to continuous efforts of the uterus to empty the contents of the Niche and lymphocytic infiltration is proposed to cause dysmenorrhoea and chronic pelvic pain.
- Residual menstrual blood in niche causing chronic inflammation, alteration in cervical mucus, sperm motility and implantation affecting fertility.
- Fluid accumulation leading to vaginal discharge and bladder irritation.

Setubal[29] studied treatment for Niche and published it in Journal of minimally invasive gynaecology in 2018. The options include[29-31]:

- **Expectant Management:** When symptoms are mild and not affecting patient's life, they can be counselled about probable pathophysiology and not intervene.
- **Medical Management:** Combined Oral Contraceptives were found to be effective in reducing prolonged menstrual bleeding associated with Niche, reducing mean days of menstrual flow from 10-5 days.
- LNG IUS did not show any improvement in symptoms.

- CoCs were also found to reduce other forms of AUB like inter menstrual spotting and post menstrual spotting.
- CoC seems like an ideal option who need additional contraception.

- **Vaginal Resection and Repair of Niche:** The cervix is pulled with vulsellum, bladder defected off the anterior cervix, uterine isthmus identified, niche is excised and repaired. This needs surgical expertise and if niche is located high, repair becomes difficult. Patients who underwent vaginal Niche excision and repair reported improvement in AUB (85-93%) and there was increase in residual myometrial thickness. Pregnancy was reported in 22% of women and no reported complications.
- **Laparotomy and Resection and Repair of Niche:** In this method, abdomen is opened through transverse incision, UV fold opened and bladder pushed down, the dehiscent myometrium is completely resected and myometrium is approximated in two layers with 2-0-4-0 vicryl with interrupted sutures. 71% pregnancy rate and shorter menstrual period was reported. No complications were noted.
- **Hysteroscopic Resection of Niche:** In this procedure, cervix is dilated to 12 mm and Hysteroscopy introduced. After determining the isthmocele location, a cutting loop is used to remove the fibrotic flap under the pouch like defect, from bottom of the defect to the endocervical canal, the remainder of pouch is cauterized. It has advantage of ease of performing the procedure, minimal recovery time and good symptom resolution. Arguments against this approach include possibility of bladder injury and incomplete defect closure. Persistence of symptoms have been reported in a few of patients (16/120).
- **Laparoscopic Resection and Repair of Niche:** In this procedure, isthmocele is identified by transillumination by hysteroscopy or “slip and hook” technique with Hegar’s dilator. Scar is opened from one end to the other after separating the bladder. Fibrotic tissue is excised from the edges of the defect to access the healthy myometrium. Hegar probe is inserted into cervix to preserve continuity of the cervical canal. Pregnancy rate was reported as 44%. 5/49 patients remained symptomatic after repair.

As of now there is no gold standard defined for niche repair. There is no statistically superior outcome of one method over another. Patients may benefit from hysteroscopic repair for smaller niche <2.5 mm as size is small and may benefit from resection alone as hysteroscopy is a minor procedure. Laparoscopic or vaginal resection and repair may be recommended for women with residual myometrial thickness <2.5-3 mm.

CONCLUSIONS

In conclusion, as the rate of caesarean section rise, clinicians should be aware about all the possible complications associated with procedure and women should be informed about it. Niche should be kept as possible differential diagnosis in women who present with abnormal uterine bleeding, dysmenorrhoea, chronic pelvic pain and other gynecological symptoms in whom no other explanations are found. As there is no gold standard set to manage niche, clinicians should be aware about available options and choose based on patient’s choice, surgeon’s expertise and available resources. More academic papers will help make clinicians aware about the condition and helps in early diagnosis and treatment. The present study has limitations as it included only 131 women due to time constraint. Large number of women with history of CS with other pelvic pathologies were not included in the study. As it was hospital based study, it was not strictly representative of whole population. Only depth of Niche was evaluated, other measurements were not considered.

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