International Journal of Clinical Obstetrics and Gynaecology

ISSN (P): 2522-6614
ISSN (E): 2522-6622
Indexing: Embase
Impact Factor (RJIF): 6.71

www.gynaecologyjournal.com
2025; 9(6): 132-136
Received: 02-09-2025
Accepted: 05-10-2025

Dr. Guduri Amulya
Postgraduate, Department of Obstetrics and Gynaecology, GITAM Institute of Medical Sciences and Research, Visakhapatnam, Andhra Pradesh, India

Dr. Onimi Syamala
Professor, Department of Obstetrics and Gynaecology, GITAM Institute of Medical Sciences and Research, Visakhapatnam, Andhra Pradesh, India

Corresponding Author:
Dr. Guduri Amulya
Postgraduate, Department of Obstetrics and Gynaecology, GITAM Institute of Medical Sciences and Research, Visakhapatnam, Andhra Pradesh, India

Association of caesarean scar defects in abnormal uterine bleeding: A clinical study

Guduri Amulya and Onimi Syamala

DOI: https://doi.org/10.33545/gynae.2025.v9.i6b.1739

Abstract
Background: The increasing global rate of Caesarean section (CS) deliveries has coincided with a rise in Caesarean Scar Defect (CSD) also known as Isthmocele, which is emerging as a significant cause of Abnormal Uterine Bleeding (AUB). Despite their clinical relevance, Caesarean Scar Defects remain underdiagnosed.
Objective: To determine the Association of Caesarean Scar Defects (CSD) among women presenting with Abnormal Uterine Bleeding (AUB) with a prior history of Caesarean Section.
Methods: A Prospective Observational study was conducted at GITAM Institute of Medical Sciences and Research, Visakhapatnam, from February 2025 to August 2025 involving 189 women aged 18-45 years presenting with Abnormal Uterine Bleeding (AUB) with ≥1 prior Caesarean Section. Clinical evaluation and Transvaginal sonography (TVS) were performed to detect Caesarean Scar Defects.
Results: Among 189 women, 8 (4.2%) were diagnosed with Caesarean Scar Defects on Transvaginal sonography (TVS). In the present study women with two or more caesarean deliveries exhibited a substantially higher CSD association (12.2%) compared to those with a single caesarean section (1.4%). Postmenstrual bleeding (PMB) was observed in 20.5% of women without a CSD and in 50% of those with CSD. No association was found with the Age, Parity, Interval since last Caesarean Section (CS).
Conclusion: Caesarean Scar Defects association among Abnormal Uterine Bleeding (AUB) cases with prior Caesarean Section (CS) was 4.2%. Integration of routine Transvaginal sonography (TVS) evaluation in women with Abnormal Uterine Bleeding (AUB) and previous Caesarean Section (CS) delivery may support early diagnosis and management.

Keywords: Caesarean scar, caesarean scar defect, isthmocele, abnormal uterine bleeding, transvaginal sonography

Introduction
Caesarean section (CS) constitutes one of the most frequently executed obstetric surgeries globally, with its prevalence escalating much beyond the World Health Organization's advised rate of 10% [1]. Although caesarean section is essential for safeguarding maternal and neonatal well-being, its rising prevalence has heightened awareness of long-term postoperative consequences.[2] One such complication is the development of a caesarean scar defect (CSD) also known as an Isthmocele is characterized by a niche or indentation at the site of the uterine incision due to incomplete myometrial healing [3, 4].
The prevalence of CSD fluctuates significantly, from 6.9% and 69%, contingent upon the diagnostic approach and the study cohort [3]. While several affected women exhibit no symptoms, CSD is significantly linked to various gynecological complications, particularly abnormal uterine bleeding (AUB), notably postmenstrual spotting [2, 5]. Additional reported symptoms encompass chronic pelvic pain, dysmenorrhea, dyspareunia, and secondary infertility [2]. The factors contributing to AUB in women with CSD are believed to include retention of menstrual blood within the defect, compromised drainage due to fibrotic tissue, and localized vascular or inflammatory alterations [1, 6].
This study seeks to examine the relationship between CSD and AUB, specifically focusing on postmenstrual spotting, to offer evidence-based insights on their clinical correlation and implications for gynecological care.

Materials and Methods
Study Design and Setting
This prospective observational clinical study was conducted at the Department of Obstetrics and

Gynaecology, GITAM Institute of Medical Sciences and Research, Visakhapatnam, Andhra Pradesh, India, for a period of seven months from February 2025 to August 2025 after obtaining ethical clearance from IRB and informed consent from the participants.

Sample Size and Participants:
A total of 189 participants were included in the study, with the sample size determined using 4pq/d [2]. The calculation was based on a reported 63.3% prevalence of CSD from previous research, assuming a 95% confidence interval, 7% margin of error, and 80% study power [3]. The study population comprised women aged 18-45 years who presented with AUB and had undergone at least one prior lower segment CS.

Eligibility criteria
The study included women aged 18-45 years with a history of at least one previous Caesarean section who presented with AUB at the GITAM Institute of Medical Sciences and Research Outpatient Department. Eligible participants were those experiencing AUB for a minimum duration of six months and with no prior uterine surgery other than the Caesarean section. Women with known uterine pathologies that could account for AUB such as endometrial hyperplasia, polyps, fibroids, adenomyosis, or cervical causes as well as those with congenital uterine anomalies, were excluded from the study.

Clinical Evaluation
All clinical evaluations and imaging assessments were conducted by a single trained author to minimize interobserver bias. A comprehensive clinical history was obtained, including details on menstrual pattern, symptom duration, and the number of previous Caesarean sections, followed by per speculum and pelvic examinations.

Imaging
Transvaginal sonography (TVS) was performed by the same calibrated author using a standardized protocol. The diagnosis of CSD was established by identifying a hypoechoic or anechoic triangular defect in the anterior uterine wall at the site of the previous Caesarean section scar, with measurements of defect depth, width, and residual myometrial thickness recorded whenever feasible.

Statistical analysis
Statistical analysis was performed using IBM SPSS Statistics version 23.0. Descriptive statistics, including frequency and percentage, were used to summarize the demographic and clinical characteristics of the study participants.

Results
Among the 189 AUB participants, the prevalence of CSD was identified as 4.2%, based on findings from TVS. (Figure 1)

Age Distribution
The majority of participants were aged 26-35 years (59.3%), followed by 36-45 years (23.8%) and 18-25 years (16.9%). Among those with CSD, 62.5% were in the 26-35-year age group, 25% in the 36-45-year group, and 12.5% in the 18-25-year group, indicating that CSD was most frequent among women aged 26-35 years (Table 1).

Parity
Most participants were para 1 (44.4%) or para 2 (37.6%), with 18% having parity ≥3. The proportion of CSD increased with parity: 25% among P1, 37.5% among P2, and 37.5% among those with ≥P3. This suggests a trend of rising CSD prevalence with higher parity (Table 1).

Number of Previous Caesarean Sections (LSCS)
Of the study group, 74.1% had one previous LSCS, while 25.9% had two or more LSCS. Among those with CSD, 75% had ≥2 caesarean deliveries, compared to 25% with a single LSCS, confirming a strong association between multiple caesarean sections and CSD occurrence (Table 1).

Interval Since Last LSCS
A majority of participants (69.3%) had an interval of ≥2 years since their last caesarean delivery. CSD was identified in 37.5% of women with an interval <2 years and 62.5% with an interval ≥2 years, showing no consistent pattern between interval duration and CSD presence (Table 1).

Presenting Symptoms
The most common symptom among all women was persistent prolonged bleeding (56.1%), followed by intermenstrual bleeding (22.2%) and postmenstrual spotting (21.7%). However, among those with CSD, postmenstrual spotting (50%) and intermenstrual bleeding (37.5%) were predominant, while only 12.5% presented with prolonged bleeding. This indicates that postmenstrual and intermenstrual bleeding were more strongly associated with CSD than persistent bleeding (Table 1).
Among the eight women diagnosed with Caesarean Scar Defect (CSD), various management approaches were adopted based on symptom severity and reproductive preferences (Table 2). The majority of cases (50%) were managed medically with hormonal therapy and follow-up. Total abdominal hysterectomy was performed in 42.5% of patients who had completed their families and presented with persistent symptoms. Hysteroscopic resection was undertaken in 12.5% of cases to excise the niche and restore normal uterine contour (Table 2).

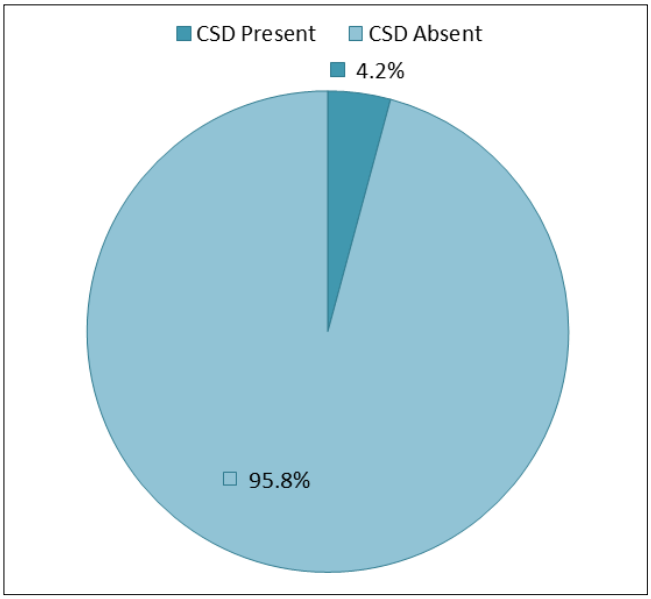

Fig 1: Association of CSD among AUB participants

Table 1: Background characteristics of the study participants with AUB

Variable	Category	CSD Present (n=8)		CSD Absent (n=181)		Total (n=189)	
		N	%	N	%	N	%
Age (years)	18-25	1	12.5	31	17.1	32	16.9
	26-35	5	62.5	107	59.1	112	59.3
	36-45	2	25	43	23.8	45	23.8
Parity	P1	2	25	82	45.3	84	44.4
	P2	3	37.5	68	37.6	71	37.6
	≥P3	3	37.5	31	17.1	34	18.0
No. of Previous LSCS	1	2	25	138	76.2	140	74.1
	≥2	6	75	43	23.8	49	25.9
Interval Since Last LSCS	<2 years	3	37.5	55	30.4	58	30.7
	≥2 years	5	62.5	126	69.6	131	69.3
Presenting Symptoms	Persistent prolonged bleeding	1	12.5	105	58	106	56.1
	Postmenstrual spotting	4	50	37	20.4	41	21.7
	Intermenstrual bleeding	3	37.5	39	21.5	42	22.2
Total	—	8	4.2	181	95.8	189	100

Table 2: Management of CSD cases

	Frequency	Percentage
Hysteroscopic Resection	1	12.5
Total Abdominal Hysterectomy	3	42.5
Medically	4	50

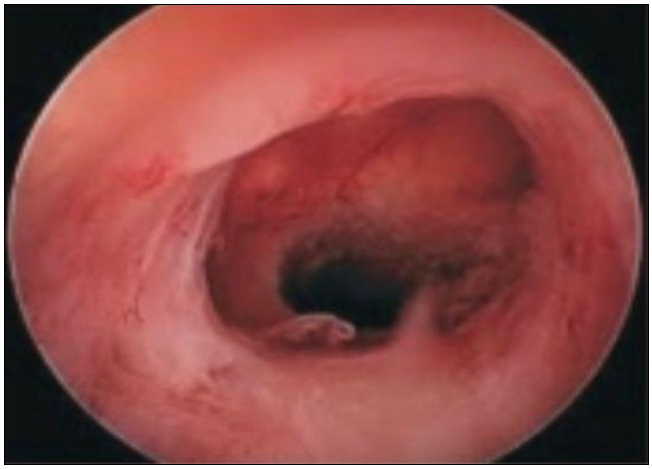

Fig 2: Hysteroscopic image of CSD

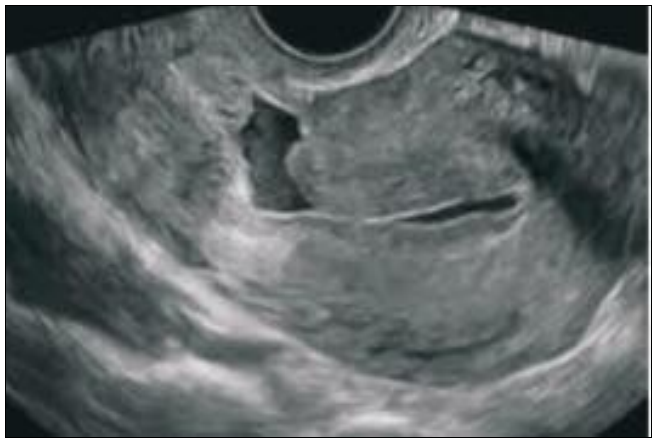

Fig 3: CSD on TVS

Discussion

The exact mechanism behind CSD formation remains uncertain [4]. Bij de Vaate *et al*. classified the contributing factors into four categories: surgical closure technique, incision site and development of the lower uterine segment, wound healing, and other anatomical or physiological influences [6]. Poor scar healing may result from uneven incision edges, suboptimal hysterotomy closure, multiple prior caesarean deliveries, uterine retroversion, or the initial indication for surgery [2].

AUB is the most frequent symptom associated with CSD, often presenting as postmenstrual spotting or prolonged bleeding lasting more than ten days per cycle [1]. The underlying mechanisms are thought to involve menstrual blood retention within the defect, impaired drainage, local inflammation, and defective endometrial repair. Histopathological evidence supports these theories, showing fibrosis, necrosis, adenomyosis, and inflammatory infiltration at the scar site, all of which may disrupt normal hemostasis and contribute to AUB [5, 6].

The present clinical study, conducted among 189 women presenting with AUB, aimed to determine the association between AUB and CSD. The prevalence of CSD in the current cohort was 4.2%, which was within the lower range of rates reported in existing literature. Previous studies have documented a wide variation in CSD prevalence, ranging from 0.3% to 19.4% [7-9]. Wang *et al*. reported a prevalence of 6.9%, whereas Tahara *et al*., reported 7% and Ofili-Yebovi *et al*. documented a higher prevalence of 19.4% in their 18-month study of 354 women [8-10]. In contrast, Bulbul and Kumari reported a markedly higher rate of 63.3%, while Antila *et al*. observed an Isthmocele prevalence of 46.3% [3, 11]. These discrepancies likely reflect differences in diagnostic criteria, imaging modalities, and study populations.

In the present study, majority of participants were within the 26-35 years age group, representing the typical reproductive demographic undergoing caesarean delivery. Similar findings were reported by Tang *et al*., who also observed no significant correlation between maternal age and CSD occurrence.[4] In contrast, Antila *et al*. identified a significant relationship between age and CSD prevalence in their cohort assessed using saline contrast sonohysterography (SHG), suggesting that increasing maternal age may be associated with impaired uterine healing and scar integrity in certain populations [11].

With respect to parity, the current study a slightly higher association was observed among multiparous women (≥P3). These observations align partially with the findings of Tang *et al*., who similarly found no significant relationship between parity and CSD [4]. Conversely, Antila *et al*. reported a significant correlation between higher parity and increased CSD prevalence, potentially due to greater uterine wall stress and repeated myometrial trauma associated with multiple pregnancies and deliveries [11].

In the present study women with two or more caesarean

deliveries exhibited a substantially higher CSD association (12.2%) compared to those with a single caesarean section (1.4%). This finding suggests that repeated uterine incisions may compromise myometrial healing, predisposing to scar thinning and niche formation. These results were consistent with prior research identifying multiple caesarean deliveries as a key risk factor for CSD development. Antila *et al*. similarly demonstrated a significant correlation between the number of prior caesarean sections, while Bulbul *et al*. also reported a higher prevalence of Isthmocele in women with multiple caesarean deliveries [3, 11]. However, Tang *et al*. found no significant association between the number of caesarean sections and CSD, underscoring potential differences in study populations, diagnostic techniques, and evaluation criteria [4].

In the present study, postmenstrual bleeding (PMB) was observed in 20.5% of women without a CSD and in 50% of those with CSD. This finding underscores the strong link between CSD and postmenstrual spotting, a pattern frequently documented in prior research. Bulbul and Kumari similarly reported that 92% of women with CSD experienced postmenstrual spotting compared to 45% without CSD ($p < 0.01$), confirming a significant correlation between the presence of CSD and abnormal uterine bleeding patterns [3]. Bij de Vaate *et al*. also observed a two-fold increase in the prevalence of postmenstrual spotting among women with Isthmocele compared to those without the defect, while Van der Voet *et al*. found 28.9% of women with CSD exhibited postmenstrual spotting versus 6.9% in those without [6, 12]. Consistent with these findings, Antila *et al*. reported postmenstrual spotting in 20% of women with CSD compared to 8.3% without, with a significant p-value of 0.004 [11]. Juhasz *et al*., who proposed that abnormal uterine bleeding following caesarean delivery may be related not only to the presence of CSD but also to alterations in uterine structure and function caused by the surgery itself [13].

Overall, the findings from the current study reinforce existing evidence that postmenstrual spotting is a hallmark symptom of CSD, warranting careful evaluation of such patients for possible scar defects. Recognizing this association is critical for guiding appropriate diagnostic and therapeutic strategies, while avoiding unnecessary interventions.

The primary strength of this study is its prospective design and use of standardized transvaginal sonography (TVS) conducted by a single trained and calibrated investigator, which reduces interobserver bias and guarantees diagnostic consistency. Nonetheless, the study's constrained sample size, shorter duration, and single-center setting may limit the generalizability of the results. The dependence on transvaginal sonography (TVS) without supplementary imaging techniques like saline contrast sonohysterography (SHG) or MRI may have resulted in an underappraisal of subtle or minor abnormalities. Subsequent research must encompass large, multicentric investigations employing modern imaging modalities and extended follow-up to corroborate these findings and evaluate the clinical effects of diverse therapeutic strategies.

Conclusion

The study found a clear association between multiple caesarean deliveries and CSD, as well as between CSD and postmenstrual spotting in women with abnormal uterine bleeding. Age, parity, and interval since the last LSCS showed no significant link. These results highlight the need to evaluate women with postmenstrual bleeding and multiple caesarean histories for possible CSD to enable early diagnosis and targeted management.

Author Contributions

Dr. Guduri Amulya: Conceptualized and designed the study, supervised data collection, and drafted the initial manuscript.

Dr. Guduri Amulya, Dr. Onimi Syamala: Assisted in data acquisition, performed data analysis, and contributed for interpretation of results, provided critical revisions, verified statistical findings, and approved the final version of the manuscript for submission.

All authors reviewed and approved the final manuscript and agree to be accountable for all aspects of the work

Conflict of Interest

The authors declare no conflict of interest related to this study.

Funding source

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Acknowledgements

The authors acknowledge the guidance and encouragement provided by GIMSR.

References

1. Xu XJ, Jia JX, Sang ZQ, Li L. Association of caesarean scar defect with risk of abnormal uterine bleeding: results from meta-analysis. BMC Women's Health. 2024 Jul;24(1):432.
2. Abhishek S, Shreevijay B, Sona M, Kulkarni S. Abnormal uterine bleeding in a woman with caesarean scar defect (isthmocele): a case report. International Journal of Otorhinolaryngology and Head and Neck Surgery. 2022;8:1608-1611.
3. Bulbul S, Kumari R. Association of cesarean scar defect with abnormal uterine bleeding: the results of a prospective study. International Journal of Pharmaceutical and Clinical Research. 2024;16(11):318-321.
4. Tang X, Wang J, Du Y, Xie M, Zhang H, Xu H, Hua K. Caesarean scar defect: risk factors and comparison of evaluation efficacy between transvaginal sonography and magnetic resonance imaging. European Journal of Obstetrics & Gynecology and Reproductive Biology. 2019 Nov 1;242:1-6.
5. Morris H. Surgical pathology of the lower uterine segment caesarean section scar: is the scar a source of clinical symptoms? International Journal of Gynecological Pathology. 1995;14:16-20.
6. Bij de Vaate AJ, Brölmann HA, van der Voet LF, van der Slikke JW, Veersema S, Huirne JA. Ultrasound evaluation of the cesarean scar: relation between a niche and postmenstrual spotting. Ultrasound in Obstetrics & Gynecology. 2011;37(1):93-99.
7. Bromley B, Pitcher BL, Klapholz H, Lichter E, Benacerraf BR. Sonographic appearance of uterine scar dehiscence. International Journal of Gynecology & Obstetrics. 1995;51(Suppl 3):S3-S6.
8. Ofili-Yebovi D, Ben Nagi J, Sawyer E, Yazbek J, Lee C, Gonzalez J, Jurkovic D. Deficient low-segment cesarean section scars: prevalence and risk factors. Ultrasound in Obstetrics & Gynecology. 2008;31:72-77.
9. Tahara M, Shimizu T, Shimoura H. Preliminary report of treatment with oral contraceptive pills for intermenstrual vaginal bleeding secondary to a cesarean section scar. Fertility and Sterility. 2006;86:477-479.
10. Wang CJ, Huang HJ, Chao AS, *et al*. Cesarean scar defect: correlation between cesarean section number, defect depth,

and postmenstrual spotting. Taiwanese Journal of Obstetrics & Gynecology. 2011;50(4):512-516.
11. Antila RM, Mäenpää JU, Huhtala HS, Tomás EI, Staff SM. Association of cesarean scar defect with abnormal uterine bleeding: the results of a prospective study. European Journal of Obstetrics & Gynecology and Reproductive Biology. 2020;244:134-140.
12. Van der Voet LF, Vervoort AJ, Hehenkamp WJ, Thurkow AL, van Kesteren PJ, Huirne JA. Postmenstrual spotting and cesarean section scar defect (isthmocele) in relation to quality of life and sexual activity. Ultrasound in Obstetrics & Gynecology. 2014;43(4):461-465.
13. Juhasz G, Gyamfi C, Gyamfi-Bannerman C. Correlation between cesarean scar defect and abnormal uterine bleeding. Journal of Obstetrics and Gynaecology. 2016;36(6):737-741.

How to Cite This Article
Amulya G, Syamala O. Association of caesarean scar defects in abnormal uterine bleeding: A clinical study. International Journal of Clinical Obstetrics and Gynaecology. 2025;9(6):132-136.