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Case Report

Laparoscopic management of cesarean scar pregnancy with isthmocele repair using Rahman's classification and surgical technique: a case report

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ABSTRACT

The global increase in caesarean section (CS) rates has resulted in a higher incidence of caesarean scar-related complications such as uterine niche, isthmocele, and caesarean scar pregnancy (CSP). Existing classification systems focus on when to operate rather than how to perform precise surgical repair. We present a case of a 32-year-old woman with a 5-week caesarean scar pregnancy associated with a large isthmocele, diagnosed by transvaginal ultrasound showing a 20×15 mm scar defect with a myometrial thickness of 2 mm. She underwent laparoscopic evacuation of the scar pregnancy followed by isthmocele repair based on Rahman's classification and surgical technique. Rahman's classification and surgical technique provide a structured approach that addresses both anatomical defects and abnormal mucosa. While this case shows a positive clinical outcome, more validation from deeper research is required before definitive conclusions on recurrence reduction or fertility outcomes can be drawn.

Keywords: Caesarean scar ectopic, Isthmocele, Rahman's technique, Uterine niche, Uterine scar defect

INTRODUCTION

The rate of caesarean deliveries has dramatically increased in most countries over the last decades, leading to an increase in complications following caesarean sections (CS). In India, the CS rate rose from 8.5% in 2005–06 to 17.2% in 2015–16, consistent with World Health Organisation (WHO) data showing global CS rates exceeding 30% in many regions.[1-3] This rise has contributed to an increase in CS-related complications such as uterine niche, isthmocele, and caesarean scar pregnancy. Deep uterine scar defects commonly result from suboptimal uterine closure techniques, while scientific literature guiding their repair remains limited.[4,5] These defects are frequently associated with chronic pelvic pain, abnormal uterine bleeding, and secondary infertility. Proposed risk factors include incorrect surgical technique, second-stage caesarean section, and patient-specific factors such as a retroflexed uterus, multiple CSs, high body mass index (BMI), and genetic predisposition.[6]

The terms "isthmocele" and "uterine niche," which are understood to refer to a pouch-like defect or detectable myometrial thinning at the anterior uterine isthmus at the site of a prior caesarean section due to discontinuity in uterine myometrium at the hysterotomy site as a result of defective wound healing, can be used interchangeably with each other in the current understanding of caesarean scar defects.[7,8]

A uterine niche is typically seen as indentation involving only the uterine myometrium, while an isthmocele is an outpouching that includes the entire thickness of the myometrium at the previous uterine scar. It appears as a hypoechoic area in the lower uterine segment, best visualized during the early follicular phase by transvaginal ultrasound, magnetic resonance imaging (MRI), hysteroscopy, or hysterosalpingography.[9,10]

Existing classifications provide limited operative guidance, especially in differentiating simple from

complex defects.[11] To address this gap, we developed Rahman's classification, which categorizes caesarean scar defects based on the circumferential involvement of the lower uterine isthmus. It distinguishes anterior defects, involving less than two-thirds of the isthmus circumference, from anterolateral defects that involve two-thirds or more and represent a more complex disruption. Rahman's surgical technique complements this classification by emphasizing complete mucosal excision, transillumination-assisted delineation of margins, and tailored reconstruction according to the defect type. These concepts are newly proposed by the authors and aim to provide a structured and reproducible approach to laparoscopic repair. Indications for surgery include symptomatic uterine niche or isthmocele, desire for future fertility, or patients planning for vaginal birth after caesarean (VBAC).

CASE REPORT

This case was managed at a referral center for advanced gynecological endoscopy centre. A 32-year-old woman (P1L1A1) presented with post-menstrual spotting, dysmenorrhea, and 2 months of amenorrhea. She had a history of a single lower segment caesarean section performed during the second stage of labor 3 years ago. Preoperative ultrasound revealed a lower uterine scar defect (20×15 mm) with a gestational sac corresponding to 5 weeks, located in the anterior lower uterine segment with an overlying myometrial thickness of 2 mm. The preoperative ultrasound image could not be retrieved from the institutional archive; yet the diagnostic findings reported here are based on the ultrasound performed during her initial evaluation. According to Rahman's classification, this patient had an anterolateral defect, as the circumferential involvement of the lower uterine isthmus was two-thirds or more. Given her symptoms and desire for future fertility, laparoscopic evacuation of the caesarean scar pregnancy with isthmocele repair was planned. Informed consent was obtained.

Surgical technique

The procedure began with hysteroscopic evaluation to determine the size, depth, and internal margins of the isthmocele. Laparoscopic entry was then performed, and the uterovesical peritoneal fold was dissected to mobilize the bladder downward, exposing the scar area clearly. The hysteroscope tip was subsequently positioned within the isthmocele to provide transillumination, which helped delineate the exact extent of the defect externally. Once the margins were identified, the scar defect was excised completely up to the level of the cervical canal using either cold scissors or a harmonic scalpel, ensuring thorough removal of all abnormal mucosal tissue. During reconstruction, the method of maintaining uterine canal patency depended on the defect type: for anterior defects, a Hegar's dilator was introduced into the cervical canal to preserve continuity, whereas for anterolateral defects, a Foley catheter was preferred to prevent canal narrowing. The uterine wall was then closed using double-layer unlocking sutures with barbed sutures to achieve a robust repair. In cases requiring Foley catheter support, the catheter was anchored to the external os using 2-0 Vicryl and trimmed to minimize discomfort. The catheter was designed to expel spontaneously within 40–45 days as the absorbable suture degraded. A follow-up hysteroscopy was performed at three months to confirm appropriate healing and restoration of uterine anatomy.

Postoperative recovery was smooth. The patient reported complete resolution of abnormal bleeding, no pelvic pain, and normalization of menstrual cycles. Follow-up imaging confirmed restored myometrial thickness and absence of recurrent niche.

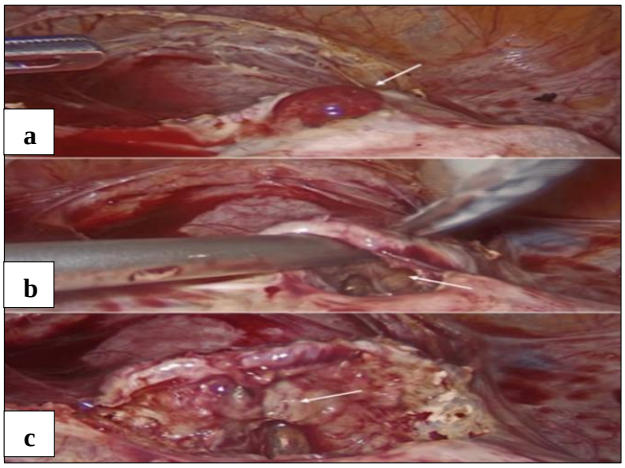

Figure 1: Laparoscopic repair of isthmocele, (a) caesarean scar ectopic pregnancy projecting through the isthmocele, (b) thinned uterine myometrium forming the isthmocele pouch, and (c) complete excision of the defect, including the mucosal lining and lateral extensions of the isthmocel.

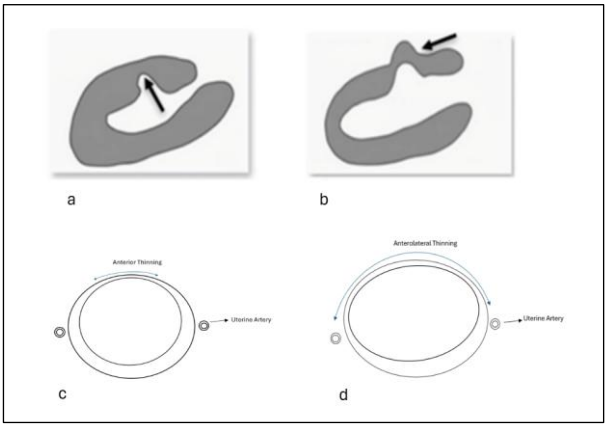

Figure 2: Uterine scar defect types and measurement, (a and b) schematic representation of the uterine scar defects (uterine niche and isthmocele), and (c and d) measurement of niche width (blue line) in the transverse plane for different morphologies.

DISCUSSION

The global increase in caesarean deliveries has led to a corresponding rise in associated complications, such as uterine scar defects.[13,14] Uterine scar defects often result from suboptimal uterine closure techniques. Despite the rising incidence, scientific literature on the repair of such defects remains limited. Uterine scar defects, such as isthmocele or uterine niche, are typically characterized by a pouch-like defect or myometrial thinning at the anterior uterine isthmus, occurring at the site of a prior caesarean section due to defective wound healing.[14]

The concept of caesarean scar defects dates back to 1975, when Stewart et al first noted the potential for preserving the uterus by excising the lower segment and suggested preoperative hysterography or pelvic arteriography for identification.[15] In 1995, Morris provided the first detailed description of this condition, and in 2003, Nezhat et al performed the first laparoscopic treatment.[16,17] These developments have been crucial in shaping current understanding and management strategies for caesarean scar defects. In this case, the presence of a caesarean scar pregnancy with a large symptomatic isthmocele necessitated a laparoscopic approach. Laparoscopic repair allows direct visualization, precise excision of abnormal mucosa, accurate restoration of myometrial integrity, and improved anatomic correction.

Rahman's classification provides an operative framework that helps surgeons anticipate the complexity of a caesarean scar defect based on the circumferential involvement of the lower uterine isthmus. Anterior defects (Figure 2c) involve less than two-thirds of the isthmus circumference and typically present with more localized disruption, whereas anterolateral defects (Figure 2d) involve two-thirds or more of the circumference and are associated with broader myometrial deficiency. This distinction was relevant in the present case, as it guided the extent of excision and influenced the choice of reconstructive technique. The schematic representation of these defect types, along with the method for assessing defect width in the transverse plane, is shown in Figures 1a and b.

Rationale for Rahman's classification and technique

Rahman's classification distinguishes simple anterior defects from more complex anterolateral defects based on the degree of circumferential involvement of the lower uterine isthmus. This distinction is relevant during surgery because it helps predict the extent of myometrial disruption and guides the choice of reconstructive method. The technique emphasizes the use of clear intraoperative landmarks with transillumination to improve precision, along with complete removal of abnormal mucosa an aspect often under-described in existing literature. Standardized reconstruction is also central to this approach, aiming to promote uniform healing and reduce irregular scar formation. Together, the classification and technique offer a structured and reproducible method for correcting caesarean scar defects.

CONCLUSION

We propose that laparoscopic isthmocele repair based on Rahman's classification and technique may help achieve symptomatic improvement and anatomical restoration. The potential benefits of this structured technique include standardized excision and reconstruction. However, further prospective trials are required to validate clinical outcomes and assess long-term gynecological and obstetrical results.

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