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Review Article

Caesarean scar ectopic pregnancy: current concepts in diagnosis, classification and management – a comprehensive narrative review

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ABSTRACT

Caesarean scar ectopic pregnancy (CSEP) is defined as one in which implantation occurs within the myometrial scar of a previous caesarean section. Although uncommon, CSEP is associated with significant maternal morbidity and potentially life-threatening complications. Its incidence has increased substantially over the past two decades because of rising caesarean section rates and improvements in early pregnancy ultrasonography. Presentation of CSEP varies from asymptomatic cases to shock. The condition is associated with severe maternal morbidity, including massive haemorrhage, uterine rupture, placenta accreta spectrum disorders, disseminated intravascular coagulation, hysterectomy, and even maternal mortality if not diagnosed early. The main diagnostic modality for CSEP is transvaginal ultrasonography (TVS) with colour doppler imaging. Early recognition is crucial for timely intervention. Caesarean scar ectopic pregnancy is classified based on implantation pattern, direction of gestational growth, and myometrial thickness. Management remains controversial as there is no universally accepted treatment protocol. Treatment selection depends on hemodynamic status, gestational age, fetal viability, serum beta-human chorionic gonadotropin levels, myometrial thickness, and future fertility desires. This comprehensive narrative review summarizes the current literature on the epidemiology, etiopathogenesis, risk factors, classification, diagnosis, imaging findings, management options, complications, reproductive outcomes, and preventive strategies for caesarean scar ectopic pregnancy. Advances in early imaging and minimally invasive treatment strategies have improved outcomes substantially; however, standardized management guidelines remain lacking.

Keywords: Caesarean scar ectopic pregnancy, Placenta accreta spectrum, Methotrexate, Laparoscopy, Transvaginal ultrasonography with colour Doppler

INTRODUCTION

Caesarean scar ectopic pregnancy (CSEP) is a rare form of ectopic pregnancy in which the gestational sac implants within the myometrial defect of a previous caesarean section scar. It is considered one of the rarest forms of ectopic pregnancy. Delayed or missed diagnosis may result in catastrophic maternal complications. CSEP is frequently misdiagnosed as an incomplete abortion or cervical pregnancy, particularly in women presenting after failed medical termination of pregnancy. The current

caesarean rate, according to NFHS-5 in India, has increased to 21.5%, and this rate is more among urban areas when compared to rural areas. The private sector accounts for 47.5% of deliveries conducted by caesarean section.¹⁻⁵

CSEP represents a serious obstetric condition because of the high risk of severe haemorrhage, uterine rupture, disseminated intravascular coagulation, placenta accreta spectrum disorders, and hysterectomy. Historically, many cases were diagnosed only after catastrophic bleeding or

during surgical exploration. Currently, earlier diagnosis through high-resolution transvaginal ultrasonography has enabled fertility-preserving and minimally invasive treatment approaches.⁶

This review discusses the current understanding of CSEP, with emphasis on epidemiology, etiopathogenesis, diagnostic strategies, imaging findings, classification systems, management modalities, reproductive outcomes, and future research directions.

METHODS

A literature search was conducted using PubMed, Scopus, and Google scholar databases for articles published between 2000 and 2025 using keywords such as “caesarean scar pregnancy,” “CSEP,” “ectopic pregnancy,” “placenta accreta spectrum,” “methotrexate,” and “uterine artery embolization”. Relevant original articles, systematic reviews, meta-analyses, society guidelines, and case series published in English were included. Priority was given to recent systematic reviews, international society guidelines, and landmark studies addressing diagnosis and management strategies.

HISTORICAL BACKGROUND

Caesarean scar ectopic pregnancy was first reported by Larsen and Solomon in 1978 in a woman who presented with severe haemorrhage following attempted curettage, and they named it ‘pregnancy in uterine scar sacculus’, for which they performed laparotomy, and the findings of a gestational sac in the sacculus of the previous caesarean section confirmed.⁷ Initially, the condition was considered an exceptional rarity; however, increasing awareness and advances in ultrasonography have led to growing recognition worldwide.⁸ Historically, many cases were likely misdiagnosed as incomplete abortion or cervical ectopic pregnancy, resulting in inappropriate curettage and catastrophic haemorrhage.

EPIDEMIOLOGY

The exact incidence of CSEP is difficult to determine because of underdiagnosis and variation in diagnostic criteria. Current literature estimates the incidence to be approximately 1 in 1,800 to 1 in 2,200 pregnancies and nearly 6% of ectopic pregnancies in women with previous caesarean delivery.⁹

Women with multiple prior caesarean sections appear to have a higher risk, although CSEP may occur even after a single caesarean delivery. The number of previous caesarean deliveries does not affect the incidence of CSEP.^{10,11} Other risk factors for CSEP are caesarean delivery during the second stage of labour, retroflexed uterus, gestational diabetes, increased maternal body mass index (BMI), perioperative fever, infection and myomectomy.¹²

The incidence may still be underestimated because asymptomatic cases can remain undetected or may be misdiagnosed during spontaneous miscarriage. Increased utilisation of fertility treatments and delayed childbearing have also contributed to increasing prevalence.

Geographical variation in incidence correlates strongly with caesarean section rates. Countries with rapidly increasing institutional delivery and operative birth rates have reported higher frequencies of CSEP.

ETIOPATHOGENESIS

The exact pathogenesis of CSEP remains incompletely understood. The most widely accepted mechanism involves implantation of the blastocyst into a microscopic tract or dehiscence area within the previous caesarean scar. Deficient healing of the uterine scar may create microscopic tracts through which trophoblastic tissue invades deeply into the myometrium. Infection, hematoma formation, and poor vascularisation may contribute to scar defects. Defective decidualization and impaired vascularisation within the scar may facilitate abnormal implantation. The trophoblastic tissue invades deeply into the myometrium due to an absent or deficient decidua basalis at the scar site. Increasing evidence suggests that abnormal trophoblastic invasion at the scar site forms the pathological basis linking CSEP with placenta accreta spectrum disorders.

CAESAREAN SCAR ECTOPIC PREGNANCY AND PLACENTA ACCRETA SPECTRUM

Increasing evidence suggests that CSEP and placenta accreta spectrum (PAS) disorders may represent different manifestations along the same pathological continuum. Both conditions are characterised by abnormal trophoblastic invasion through a deficient decidua basalis at the site of a previous uterine scar. Untreated or continuing CSEP may progress into second- or third-trimester PAS disorders, including placenta accreta, increta, and percreta. Such pregnancies are associated with markedly increased risks of massive haemorrhage, uterine rupture, preterm delivery, hysterectomy, maternal morbidity, and maternal mortality.

The relationship between CSEP and PAS highlights the importance of early diagnosis and timely intervention. Recognition of CSEP during the first trimester provides a critical opportunity to prevent severe PAS-related complications later in pregnancy.

CLASSIFICATION

CSEP is commonly classified into two types based on the direction of gestational growth. Type 1 (endogenic) pregnancies grow towards the uterine cavity and may occasionally progress into the second or third trimester, although they remain associated with a high risk of PAS disorders and severe haemorrhage. Type 2 (exogenic)

pregnancies invade deeply into the scar and grow outward toward the bladder and abdominal cavity. These pregnancies are associated with a significantly higher risk of early uterine rupture and catastrophic haemorrhage.

More recent classification systems additionally incorporate residual myometrial thickness, implantation depth, and crossover sign assessment. Table 1 shows the characteristic features of type 1 and 2 caesarean scar ectopic pregnancies.

CLINICAL PRESENTATION

Clinical presentation varies widely, ranging from asymptomatic in 37-40% of cases to hemodynamic instability.^{13,14} Common symptoms include heavy vaginal bleeding, spotting, pelvic pain and cramping without associated vaginal bleeding or discharge.¹⁵ Painless vaginal bleeding is the most common symptom. Women may present for the first time in an emergency with hemodynamic instability and shock, which necessitate emergency laparotomy and massive blood transfusions. The degree of symptoms does not necessarily correlate with severity.

Therefore, a high index of suspicion is essential in women with prior caesarean delivery presenting with early pregnancy bleeding. Early diagnosis and conservative management will lead to an overall reduction in morbidity and mortality of women.

DIAGNOSTIC APPROACH

A high index of suspicion is essential for diagnosis, especially in women with previous caesarean delivery presenting with early pregnancy bleeding or pain.

A systematic review and meta-analysis of 724 women have shown the importance of early diagnosis for composite adverse outcomes. Those CSEPs diagnosed before or at 9 weeks had an adverse outcome in 5.9% of cases, compared with those diagnosed at more than 9 weeks, who had an adverse outcome in 32.4% of cases.¹⁶ Hence, early diagnosis is critical for preventing morbidity and preserving fertility.

TVS with colour doppler is the diagnostic modality of choice. It is important to record sonographic findings, including gestational sac size, vascularity, location of pregnancy in relation to the uterine cavity and serosa. According to its location, CSEP can be classified as, CSEP in which the largest part of the gestational sac protrudes towards the uterine cavity, CSEP in which the largest part is embedded in the myometrium but does not cross the serosal contour, CSEP in which the gestational sac is partially located beyond the outer contour of the cervix or uterus.¹⁷

Sonographic criteria include an empty uterine cavity, empty cervical canal, a gestational sac or solid mass of

trophoblast located in the anterior part at the level of the internal os at the site of a previous lower uterine segment caesarean scar, thin or absent myometrium between the gestational sac and bladder and increased vascularity around the gestational sac.¹² Three-dimensional USG and MRI also play a diagnostic role in CSEP, but not as the first line of modality.

DIFFERENTIAL DIAGNOSIS

Important differential diagnoses include cervical ectopic pregnancy, low intrauterine pregnancy and placenta accreta spectrum as depicted in Table 2. Correct differentiation is essential because inappropriate curettage may result in catastrophic haemorrhage.

Serum beta-human chorionic gonadotropin (beta-hCG) levels are useful for diagnosis and follow-up but are not diagnostic. Serial beta-hCG monitoring is important during conservative management. Conservative management is usually reserved for patients who are not willing for surgery after discussing about the need for emergency surgery.

Baseline investigations should include complete blood count, blood group and cross match, kidney and liver function tests and coagulation profile.

MANAGEMENT

Management of CSEP remains challenging because no universally accepted treatment algorithm currently exists. The goal of management should be the prevention of ongoing haemorrhage, removal of tissue and conservative fertility-sparing surgery. Management should be individualised according to hemodynamic stability, gestational age, serum beta-hCG level, desire for future fertility and expertise of the surgeon. No single treatment modality is universally superior to others.

EXPECTANT MANAGEMENT

Expectant management is generally discouraged because of the high risk of severe maternal morbidity and mortality, so guidelines clearly opine against expectant management. Continuation of pregnancy may lead to uterine rupture, massive haemorrhage, PAS disorders, hysterectomy and mortality. The patient should be counselled about the gravity of the situation of CSEP, and if the patient refuses termination of pregnancy, then expectant management under close follow-up till term will be done, as seen in the study by Kutlesic et al. The patient should be referred to a higher institute with facilities of 24×7 OT services and blood bank.^{18,19} Studies have shown 100% complication and failure rate in expectant management.²⁰

MEDICAL MANAGEMENT

Medical management is usually reserved for haemodynamically stable patients with early gestational

age, absent fetal cardiac activity, low serum beta-hCG levels, and relatively small gestational sacs (generally <7 weeks of gestation). The most commonly used medical agent is methotrexate (MTX), which may be administered systemically or locally. Medical management can be given in the form of systemic methotrexate and local injection of methotrexate. Local injection of methotrexate into the gestational sac under ultrasound guidance achieves high local drug concentration with fewer systemic adverse effects. Systemic methotrexate has shown a success percentage of 33.3%, and local intra-gestational sac methotrexate has a success percentage of 75%.^{20,21}

Other locally injected agents include potassium chloride (KCl) and hyperosmolar glucose, particularly in pregnancies with fetal cardiac activity. Combined medical approaches may further improve treatment outcomes in selected cases.

SURGICAL MANAGEMENT

Surgical management provides immediate resolution and is increasingly preferred because of higher success rates, shorter recovery periods, and lower treatment failure rates. Minimally invasive surgical approaches are favoured whenever feasible. Laparoscopic excision with scar repair is increasingly preferred for exogenous CSEP and cases with thin residual myometrium. Advantages include reduced postoperative morbidity, shorter hospital stay, and

simultaneous repair of the scar defect, which may reduce recurrence risk in future pregnancies. Hysteroscopy permits direct visualisation of the gestational tissue, precise resection of trophoblastic tissue, and coagulation of bleeding vessels. It is particularly useful in endogenous CSEP, where the pregnancy grows toward the uterine cavity. This technique is particularly useful for endogenous CSEP. USG-guided uterine evacuation can be done. Real-time ultrasonographic guidance reduces the risk of uterine perforation and haemorrhage. Laparotomy may be necessary in hemodynamic instability, uterine rupture, massive haemorrhage, and advanced gestation and failed minimally invasive procedures. Emergency hysterectomy may be life-saving in cases of uncontrolled haemorrhage or extensive placental invasion.

UTERINE ARTERY EMBOLISATION

Uterine artery embolization (UAE) is increasingly used as an adjunctive therapy. UAE may be combined with methotrexate, curettage, hysteroscopy and laparoscopy. Blind dilatation and curettage should be avoided as a standalone treatment because it is associated with a substantial risk of catastrophic haemorrhage and incomplete removal of trophoblastic tissue.²² Multimodal approaches incorporating UAE have demonstrated improved haemostatic control and reduced complication rates in selected patients.

Table 1: Classification of caesarean scar ectopic pregnancy based on direction of gestational growth.

Feature	Type 1 (endogenic)	Type 2 (exogenic)
Direction of growth of the gestational sac	Grows towards the uterine cavity	Grows outwards towards the bladder and abdominal cavity
Outcome	Can continue into the second or third trimester	Life-threatening complications like uterine rupture during early pregnancy
Presentation	Usually, asymptomatic	Present with shock and bleeding
Obstetric outcome	Can be carried up to term and have a live birth	Early pregnancy presentation, so hysterotomy/hysterectomy may be needed.
Associated complications	High risk of placenta accreta spectrum and severe haemorrhage	High risk of rupture of the uterus and life-threatening bleeding in early pregnancy

Table 2: Differential diagnosis of caesarean scar ectopic pregnancy.

Type of pregnancy	CSEP	Cervical pregnancy	Low IU pregnancy	Incomplete abortion	PAS
Definition	Implantation within the myometrial defect of the previous scar	Implantation within the endocervical canal	The implanted gestation sac is located low in the uterine cavity	Retained products of conception after partial expulsion	Abnormal placental adherence/invasion into the myometrium
Gestation-al age at diagnosis	Early pregnancy	Early pregnancy	Early pregnancy	Early pregnancy	Usually, the second or third trimester
Risk factors	Previous caesarean, uterine surgery or ART	Repeated D and C	No specific risk factor	Prior miscarriage or abortion	Previous caesarean, repeated D and C, and myomectomy
Presenting complaints	Vaginal bleeding with or without pain	Painless vaginal bleeding	Mild spotting or asymptomatic	Bleeding with cramping pain	APH, PPH and retained placenta

Continued.

Type of pregnancy	CSEP	Cervical pregnancy	Low IU pregnancy	Incomplete abortion	PAS
H/O caesarean	Yes	May or may not be	May or may not be	May or may not be	Yes
TVS findings	Gestational sac in LUS at the site of the previous caesarean scar	A gestational sac is within the cervix, giving a barrel-shaped cervix. The sliding sign is absent	The gestational sac is seen above the internal os. The internal os is closed	Gestational sac /or products of conception in LUS and cervical canal, and the os is open. A sliding sign is present	Loss of retroplacental hypoechoic zone, myometrial thinning, abnormal placental lacunae, bladder wall interruption and placental bulge
Role of MRI	In diagnostic uncertainty	Not needed	Not needed	Not needed	Role in the case of an inconclusive finding on TVS
Main complications	Uterus rupture, massive haemorrhage	Massive haemorrhage	Usually, no complications	Haemorrhage and infections	Massive haemorrhage and need for hysterectomy
Treatment	Multimodal approach	Methotrexate, UAE, surgery	Routine antenatal care	Suction and evacuation	Hysterectomy may be needed
Effect on future fertility	Depending on the mode of treatment	Usually preserved	Normal	Usually preserved	Depending on the treatment used

FOLLOW-UP AND FUTURE REPRODUCTIVE OUTCOMES

Close follow-up with serial beta-hCG monitoring and transvaginal ultrasonography is essential until complete resolution is achieved. Women with previous CSEP remain at increased risk for recurrent CSEP, placenta accreta spectrum disorders, miscarriage, preterm birth, and uterine rupture in subsequent pregnancies. Reported recurrence rates range from 20.5% to 34.3%.^{23,24} Therefore, early first-trimester transvaginal ultrasonography is strongly recommended in all future pregnancies following CSEP.

Guidelines still do not have a clear-cut recommendation for performing a routine ultrasound in women with a history of previous caesarean, and the use of TVS should be limited only for indications like bleeding p/v or abdominal pain. High suspicion and awareness on the part of the clinician can make a big difference in the management of CSEP.

Future reproductive outcomes vary according to treatment modality and severity of disease. Subsequent risks include recurrent CSEP, placenta accreta spectrum, miscarriage, preterm birth and uterine rupture.

CONCLUSION

Caesarean scar ectopic pregnancy is an increasingly important obstetric condition associated with significant maternal morbidity. Early diagnosis using transvaginal ultrasonography is essential for preventing catastrophic complications and enabling fertility-preserving

management. Management of CSEP remains complex and should be individualised according to haemodynamic stability, gestational age, serum beta-hCG levels, fetal viability, residual myometrial thickness, and future fertility desires. Current treatment options include medical therapy, minimally invasive surgery, uterine artery embolization, and multimodal approaches.

Increasing clinician awareness, prompt diagnosis, multidisciplinary management, and timely referral to tertiary care centres remain essential for improving maternal outcomes and preserving reproductive potential. Further large-scale prospective studies and development of evidence-based management guidelines are necessary to optimise treatment strategies and long-term reproductive outcomes in women with CSEP.

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