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Management of Cesarean Scar Ectopic Pregnancies

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Abstract:

Background: Cesarean scar ectopic pregnancy (CSEP) is a rare but potentially life-threatening form of ectopic gestation in which the embryo implants within the fibrous tissue of a previous cesarean delivery scar. Its incidence has risen in parallel with increasing global cesarean section rates and improved early ultrasound detection. CSEP carries significant risks, including uterine rupture, massive hemorrhage, abnormal placentation (e.g., placenta accreta spectrum), and loss of future fertility. Early diagnosis and appropriate management are critical to reducing maternal morbidity and preserving reproductive outcomes.

Keywords: Cesarean scar ectopic pregnancy; CSEP; ectopic gestation; early pregnancy complications; ultrasound diagnosis; methotrexate; uterine rupture; fertility preservation; placenta accreta spectrum.

Introduction:

Cesarean scar ectopic pregnancy (CSEP) represents an uncommon but clinically significant variation of ectopic implantation in which the gestational sac embeds within the myometrial defect of a previous cesarean delivery scar. Although it accounts for less than 1% of ectopic pregnancies, its incidence appears to be rising parallel to global cesarean delivery trends. Advances in high-resolution transvaginal ultrasonography have improved early detection, allowing for more accurate diagnosis before severe complications develop **(1).**

The condition is believed to result from blastocyst implantation into a microscopic tract or niche created by inadequate healing of the cesarean scar. Two types of CSEP are commonly described: Type 1 (endogenic), where the gestational sac grows toward the uterine cavity, and Type 2 (exogenic), where it progresses outward toward the serosal surface, increasing the risk of uterine rupture and massive hemorrhage **(2).** Clinical presentation is variable, ranging from mild vaginal bleeding to hemodynamic instability, though many cases are diagnosed incidentally during early pregnancy evaluation.

Several treatment approaches exist, including systemic or local methotrexate, ultrasound-guided aspiration, uterine artery embolization, and surgical removal via laparoscopy or laparotomy **(3).** The optimal management depends on gestational age, β-hCG level, fetal cardiac activity, hemodynamic stability, and future fertility desires. Early individualized management is crucial to preventing complications and preserving uterine integrity.

Due to the rarity of CSEP, there is no consensus regarding its management. Treatment options discussed here are mostly based on case reports and small case series. In general, there are expectant, medical and surgical options of treatment. Factors influencing the choice of treatment options include the type of the CSEP (Type I or II), hemodynamic stability, size of the pregnancy mass and gestational age, serum β hCG level, presence or absence of fetal cardiac activity, wish for future fertility, and availability of expertise (e.g. endoscopic surgery, interventional radiology) (**4).**

Expectant management

The expectant management is an option that can be taken with a patient who is asymptomatic and has a nonviable pregnancy, type 1 CSEP, and a decreasing or plateauing β hCG level.

Even though expectant management of CSEP has been described, the safety of continuing pregnancy is questionable. Caution must be exercised when choosing expectant management in cases of viable CSEP as it carries a significant risk of complications, including uterine rupture, severe hemorrhage and hysterectomy. In a systematic review of a total of 56 cases (including 44 cases with fetal cardiac activity) of CSEP managed expectantly, live births were achieved in 73% with a very high hysterectomy rate of 70% **(5).**

Women with viable CSEP and relatively favorable findings on imaging such as endogenic type, COS-2 on ultrasound and residual myometrial thickness of >5 mm on MRI may continue with the pregnancy if they have a strong desire to do so. Women need to understand that expectant management of a viable CSEP carries a significant risk of severe hemorrhage, uterine rupture, hysterectomy and severe invasive placentation. Expectant management can be considered in those with no fetal cardiac activity and with evidence of spontaneous resolution **(5).**

Medical management

Several recommendations have been made for selecting the healthiest patients as candidates for medical treatment. These include a pregnancy period that is less than 8 weeks, the absence of fetal cardiac activity, a patient who is hemodynamically stable, a β hCG level that is between 5000 and 12,000 mIU/mL, and a thickness of more than 2 millimeters between the myometrium and the bladder. Treatment with medicine can be administered either locally (intralesional) or systemically (intramuscularly), depending on the patient's preference.

Methotrexate

Methotrexate can be administered locally, systemically, or in combination with surgical management. Additional surgical or medical management should be considered if the CSEP does not resolve with the initial MTX treatment. (**6).**

Therapeutic regimens of MTX include single-dose, double- dose.

When using a double dose regimen, MXT is often provided on days 1 and 4, and the serum level

of β hCG is assessed on days 4–7 of the regimen. If the value drops by less than 15%, the third dose ought to be provided, and its effectiveness is evaluated on the eleventh day. A fourth dose may also be ordered if it is deemed necessary, and surgery may be suggested in the event that there is no response. **(6).**

When using a multi-dose regimen, methotrexate injections of up to four doses (1 mg/kg of muscular bodyweight) are given every other day in order to induce a fall of 15% or more in the concentration of β hCG. The level of the hormone should be tested on days 1, 3, 5, and 7 of the treatment. **(7).**

Local MTX injection, this can be done under ultrasound guidance (transabdominal or transvaginal), or direct vision through laparoscopy or hysteroscopy **(7).**

Numerous side effects, such as baldness, pneumonitis, bone marrow suppression, and stomatitis, have been described as being caused by this medication. Cirrhosis and hepatic fibrosis can occur in severe cases as a result of the accumulation of MTX by products in the liver, adipose tissue, and erythrocytes. **(4).**

The need for further intervention is common when using any of the MTX protocols. Some factors that appear to increase the chance of success for local MTX include greater than 2-mm myometrial thickness between pregnancy and the bladder and a lower β hCG level. The actual threshold of β hCG has not been determined, and a wide range from less than 5000 to 100,000 mIU/mL has been reported **(6).**

Surgical treatment

- **Suction curettage**

By definition, the gestational mass in a CSEP is not actually within the uterine cavity. Therefore, not only the trophoblastic tissue is inaccessible by the curettage but also such attempts can potentially rupture the uterine scar leading to severe hemorrhage and causing more harm (**8).**

A recently published meta-analysis suggested favorable outcomes (less blood loss, lower incidence of adverse events and shorter duration of hospital stay) following high-intensity focused ultrasound compared to uterine artery embolization before uterine curettage **(5).**

In a case control study, advanced gestational age, higher serum β hCG level, bigger gestational sac diameter, thinner myometrial layer and significant peri trophoblastic perfusion were associated with excessive intra-operative hemorrhage (≥200 ml) during suction evacuation of CSEP (**4).**

- **Hysteroscopy**

Hysteroscopy has been utilized to remove CSEP either alone or with adjuvant medical therapy. Many variations of this method have been reviewed in several studies, including hysteroscopic removal of tissue, aspiration of gestational sac after medication, and injection of MTX or ethanol

into the gestational sac (**9).**

some suggest that hysteroscopic removal is best indicated in individuals with type I CSEP. Unfortunately, many of the systematic reviews failed to describe hysteroscopic technique that was utilized making it difficult to provide best practice recommendations. Hysteroscopic resection of the cesarean scar ectopic pregnancy with or without removal of the scar has had a variable rate of success, and multiple reviews reported the requirement for additional procedures, including hysterectomy **(8)**.

Higher success with hysteroscopic removal appears to be associated with lower gravidity/parity, fewer prior cesarean deliveries, and earlier gestational age at time of procedure. An American Society for Reproductive Medicine review in 2016 on various methodologies for CSEP elimination reported that hysteroscopy could be used to remove the CSEP via direct visualization or ultrasound assistance **(10).**

They described a technique by careful dissection of the CSEP from the uterine wall using electrosurgery that had a high success rate and an extremely low complication rate. They suggested that the method delineated in their review should be considered a safe and effective method for CSEP termination. Although complications from hysteroscopy are rare, they are more likely with any complex hysteroscopic procedure including myomectomy and septum removal. Complications include fluid overload, electrolyte imbalances, perforation, infection, and hospital admission. Although reported to be uncommon, these need to be addressed when counseling patients **(7).**

- **Laparotomy**

There are very few data on laparotomy as a first choice for the treatment of CSEP. Proponents suggest that an abdominal, or open, technique enables direct visualization of the lower uterine segment with the cesarean delivery scar and implanted gestational sac. This approach may be better when the myometrium between the CSEP and the bladder is greater than 2 mm. The abdominal approach can be utilized when performing a myometrial wedge excision or complete hysterectomy **(9).**

Overall, this has a high success with a low complication rate. Removal of the gestational sac via open technique, or abdominal hysterectomy, generally is not deemed first line treatment because of the potential morbidity and invasive nature of this method. The ACOG's Committee Opinion states that an abdominal approach to gynecologic surgery has a longer duration of hospital stay, operating time, bladder/ureter injuries, intraoperative blood loss, wound complications, and slower return to normal activity. As such, minimally invasive surgical techniques should be considered as a first line if the surgeon is adequately trained, and an open approach should be avoided for CSEP management if possible **(4).**

♦ Laparoscopy

A laparoscopic hysterotomy with wedge resection of the CSEP and previous scar has been reported in several studies. It has been recommended by some that this approach was best suited in individuals with type 2 CSEP (growing toward the bladder/abdominal wall) **(8).**

Two different systematic reviews reported a 97% success rate with faster resolution of β hCG and no complications. In addition, other long- term outcomes, including a higher rate of subsequent pregnancies and a reduction of CSEP recurrence, have been reported (data compiled for hysterotomies performed via laparotomy, laparoscopy, or transvaginal approach) **(7).**

Other considerations should be given to temporarily occluding blood supply to the uterus. This has the potential to decrease blood loss, enable complete resection of the CSEP, and prevent future complications such as pregnancy loss that can be seen with uterine artery embolization (UAE). As this approach allows for direct visualization of the pregnancy and removal of the scar and is minimally invasive, it has been encouraged as one of the primary approaches for CSEP management **(9).**

♦ Colpotomy

A transvaginal approach to CSEP utilizes similar technical aspects as a vaginal hysterectomy, where an anterior colpotomy incision is made to access the CSEP with subsequent removal and repair of the previous scar. However, this approach appears to be utilized the least when compared with hysterotomy via laparoscopy or laparotomy. Overall, the morbidity associated with the transvaginal approach has been demonstrated to be minimal with success rates greater than 90% **(5).**

A small RCT also showed a faster resolution of β hCG when compared with UAE or hysteroscopic removal + MTX. Pooling data from many studies supports the use of a transvaginal hysterotomy for stable patients who desire future fertility **(10).**

A transvaginal approach for CSEP has similar surgical risks to other approaches, including infection, bleeding, and damage to surrounding structures. However, there are minimal data comparing this vaginal approach to laparoscopic or abdominal approaches for CSEP. One concern that has been raised to this approach is incomplete visualization of the CSEP and the previous hysterotomy scar with the potential for persistent embryonic tissue **(7).**

Combination Approaches

Many studies report MTX administered in combination with other interventions including UAE, hysteroscopic or laparoscopic removal of the ectopic, suction curettage, and needle aspiration. This combined approach appears to have greater success with less morbid sequelae than MTX alone. The success rates for MTX + UAE, MTX + hysteroscopic or laparoscopic excision, and MTX + needle aspiration are greater than 80%., Complications, including hemorrhage, need for blood

transfusion, hysterectomy, or laparotomy, have been reported in all of these treatment protocols (**4).**

Methotrexate with or without D&C or suction curettage appears to have the most conflicting results when compared with MTX alone. Some research has failed to show any differences between the two. However, an RCT revealed that UAE + curettage had fewer adverse events compared with those who had MTX + curettage, including blood loss **(5).**

Reports suggest that success was further enhanced with the use of hysteroscopy. Although these studies had several limitations, including lack of randomization, an isolated patient population, and failure to assess future fertility, UAE in combination with other surgical methods has been advocated strongly in individuals who do not desire future fertility (**7).**

Hysteroscopic resection in combination with other methods has been described including UAE, D&C, and adjuvant MTX with variable levels of success to accelerate the resolution of the gestational sac. The combination of UAE, D&C, and hysteroscopy has a higher success and lower complication rate compared with hysteroscopy alone (**8).**

However, the addition of MTX did not seem to increase success overall but did have a marginally higher hemorrhage rate. Although the combination of hysteroscopy with another surgical method has a better outcome than hysteroscopy alone, these methods should be compared by an RCT in order to determine their overall effectiveness and safety profile (**9).**

Uterine artery embolization

Uterine artery embolization in combination with other treatment modalities such as MTX, dilatation and curettage or hysteroscopic resection has been used to treat CSEP. Catheterization of the uterine arteries is carried out through a transfemoral approach under local anesthesia. If embolization is combined with a dose of MTX it is split between the two uterine arteries and infused via the arterial catheter. Finally, both uterine arteries are embolized with gelatin sponge particles or polyvinyl alcohol (**7).**

In a systematic review, UAE combined with D&C was highly effective with only 6.4% of cases needed additional treatment and severe complications (hemorrhage, hysterectomy) occurred in 3.4% of cases. A combination of UAE, D&C and hysteroscopy also resulted in a high success rate of 95.4% and a very low complication rate of 1.2% (**4).**

In women treated with a combination of UAE, D&C and MTX, additional treatment was needed in 31.4% because of treatment failure and hysterectomy rate was 2.8%. In comparison, between one-fourth to one-third of patients treated primarily with MTX required additional treatment (**7).**

Post-treatment follow-up

Close follow up is essential to confirm complete resolution of the CSEP. Patients need serial serum

β hCG measurements and pelvic ultrasound until the β hCG level is undetectable, and the pregnancy mass disappears, which may take several weeks (**8).**

In general, post treatment weekly measurement of serum β hCG is required to confirm resolution. Patients who have undergone hysterectomy do not require β hCG monitoring. Serial transvaginal colour flow Doppler is useful for monitoring the response to medical treatment (**10).**

It is worth to note that uterine rupture and severe maternal hemorrhage can occur despite a satisfactory drop in serum β hCG levels. Continuation of fetal cardiac activity or growth of the sac with rising serum β hCG concentration indicates failure of medical treatment (**4).**

Counseling considerations

Counseling patients with a CSEP poses significant challenges due to associated morbidities, desire for future fertility, and most importantly, by a lack of consensus on treatment approach. It is recommended that patients terminate the CSEP soon after diagnosis to prevent uterine rupture, placentation abnormalities, invasion into surrounding organs, and hemorrhage associated with continuing the pregnancy **(5).**

Other significant complications include disseminated intravascular coagulopathy, hypovolemic shock, and death. For those who desire to pursue expectant management, there is a high likelihood of cesarean hysterectomy, and an elective early cesarean hysterectomy may be advised. Patients have to be chosen carefully for this management option because compliance is critical as close surveillance is needed until complete resolution of the pregnancy is confirmed **(4).**

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