How to identify and manage cesarean-scar pregnancy

One of the unforeseen consequences of our increasing reliance on cesarean delivery is gestation in the cesarean scar. Here, three experts offer a guide to its detection and management.

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Few ObGyn clinicians have faced a patient with a cesarean-scar pregnancy (CSP). Those few were confronted with a management dilemma. Continue the gestation, which would expose the mother to an elevated risk of heavy bleeding? Or terminate the pregnancy? And if termination is the patient's choice, what is the most effective method?

The literature contains more than 750 reports of CSP, ranging from a single sporadic case to a series of one to two dozen cases. It is impossible to make sense of the numerous treatments used in the past, which were "tested" on extremely small numbers of patients (sometimes as few as one). In this article, we formulate a management plan for the diagnosis and treatment of CSP based on an in-depth review of the published literature and our personal experience in treating more than four dozen patients with CSP.

We're all familiar with the "epidemic" of cesarean deliveries in this country, including late consequences of cesarean such as placenta previa and morbidly adherent placenta. One of the long-term consequences of cesarean delivery—the first-trimester CSP—is less well known and documented.

Our in-depth review of 751 CSP cases found no less than 30 published therapeutic approaches.[1] No consensus exists as to management guidelines. We have formulated this clinical guide, based on the literature and our experience managing CSP, for clinicians who encounter this dangerous form of pregnancy.[2]

Diagnosis requires transvaginal sonography

Transvaginal sonography (TVS) is thought to be the best and first-line diagnostic tool, with magnetic resonance imaging (MRI) reserved for cases in which there is a diagnostic problem.

In making a diagnosis, consider two main differential diagnoses:

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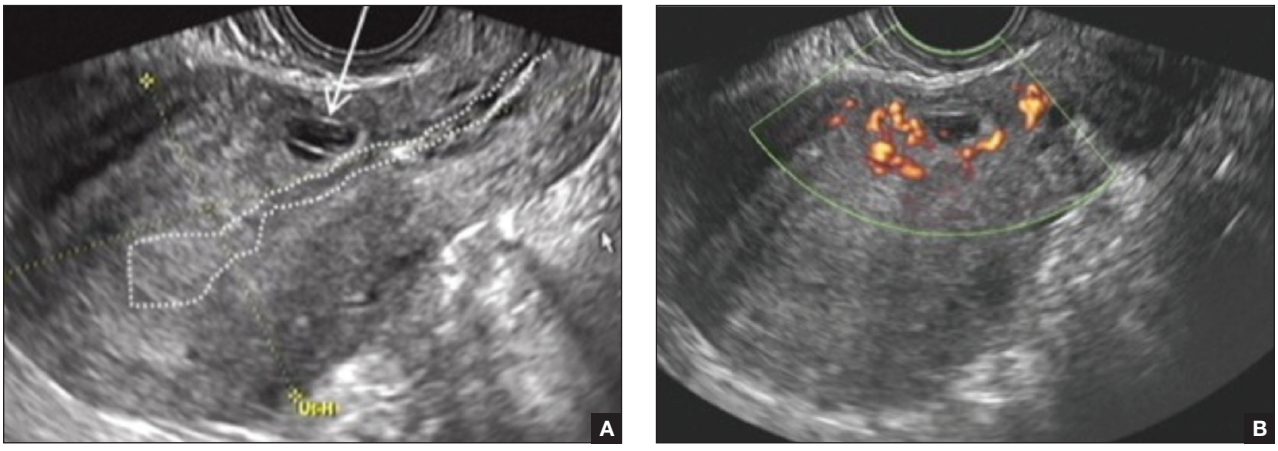
FIGURE 1 Cesarean-scar pregnancy at 6 weeks



Sagittal 2D transvaginal ultrasound images of a CSP at 6 weeks, 1 day. **A.** 2D gray-scale picture, with the empty uterine cavity and cervical canal within the dotted outline. The arrow points to the gestational sac. **B.** Power Doppler image of the rich vessel mesh surrounding the sac.

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The presence of a live cesarean-scar pregnancy requires immediate, decisive action to prevent further growth of the embryo or fetus

- **Cervical pregnancy**—This type of gestation is more likely to occur in women with no history of cesarean delivery
- **Spontaneous miscarriage in progress**—In a number of cases, the miscarriage happened to be caught on imaging as it passed the area where the CSP usually resides. Because there is no live embryo or fetus in spontaneous miscarriage, a heartbeat cannot be documented.

Components of diagnosis by TVS

Accurate identification of CSP depends on the following sonographic criteria:

- empty uterine cavity and cervical canal (**FIGURE 1A**)
- close proximity of the gestational sac and the placenta to the anterior uterine surface within the scar or niche of the previous cesarean delivery (**FIGURES 1B, 2A, AND 2B**)
- color flow signals between the posterior bladder wall and the gestation within the placenta (**FIGURES 1B, 2B, AND 3B,** page 22)
- abundant blood flow around the gestational sac, at times morphing into an arteriovenous malformation with a high peak systolic velocity blood flow demonstrable on pulsed Doppler.

Our analysis of 751 cases of CSP found that almost a third—30%—were misdiagnosed, contributing to a large number of treatment complications. Most of these complications could have been avoided if diagnosis had been early and correct. The earlier the diagnosis, the better the outcome seemed to be. This was true even when treatment modalities with slightly higher complication rates were used in very early gestation.

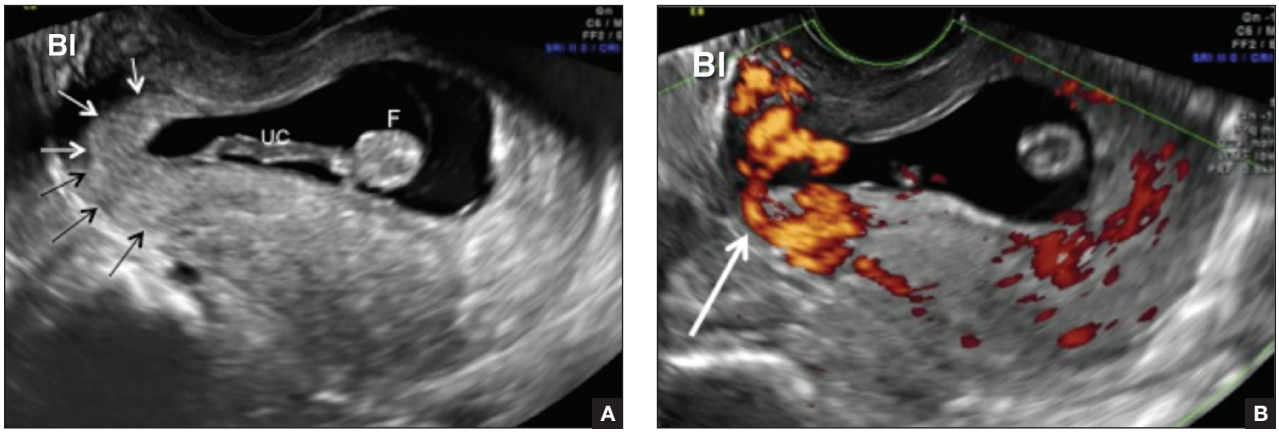
Thorough counseling of the patient is paramount

Once a diagnosis of CSP has been established, the patient should be counseled about her options. The presence of a live CSP requires immediate and decisive action to prevent further growth of the embryo or fetus. Literature from the past decade, particularly from the past several years, makes evidence-based counseling possible.

In general, treatment should be individualized, based on the patient's age, number of previous cesarean deliveries, number of children, and the expertise of the clinicians managing her care. Options include:

- termination of the pregnancy
- continuation of the pregnancy with the possibility of delivering a live offspring, provided the patient understands that a morbidly adherent placenta may occur, often necessitating emergency hysterectomy.[3,4]

FIGURE 2 Cesarean-scar pregnancy at 9 weeks



Sagittal 2D transvaginal ultrasound images of a CSP at 9 weeks, 2 days in a retroverted uterus. **A.** The 2D gray-scale picture concentrates on the tiny placenta (black and white arrows) embedded in the niche left by the previous cesarean delivery. The umbilical cord (UC) has an almost central placental insertion. The sac is already gravitating toward the uterine cavity (Bl = bladder; F = fetus). **B.** Power Doppler image of the placental insertion reveals the abundant blood vessels (arrow) beneath the bladder (Bl).

Management approaches

Most treatment regimens and combinations thereof can be classified as one of the following:

- **Surgical**—requiring general anesthesia and either laparotomy with excision or hysterectomy, or laparoscopic or hysteroscopic excision followed by dilation and curettage (D&C).
- **Minimally invasive**—involving local injection of methotrexate or potassium chloride or systemic intervention, involving a major procedure such as uterine artery embolization in combination with a less complicated one: intramuscular injection of methotrexate in a single or a multidose regimen.

A variety of simultaneous as well as sequential combination treatments also were used. More recently, an ingenious adjunct to treatment is gaining attention: insertion and inflation of a Foley balloon catheter to prevent or tamponade bleeding.

A large number of treatments described in the literature—and their different combinations—have been reported as relatively small case series. Gynecologic surgeons generally perform D&C, laparoscopy, and hysteroscopy or laparotomy as the first-line approach. Obstetricians, radiologists, and in vitro fertilization specialists usually prefer systemic, parenteral administration of methotrexate or ultrasound-guided local methotrexate (or potassium chloride) as an injection into the gestational sac. On occasion, the help of an interventional radiologist was requested to embolize the area of the CSP through the uterine arteries.

Potential complications

In our analysis of 751 cases of CSP, we used a rigorous definition of complication, which included an immediate or delayed need for a secondary treatment for blood loss exceeding 200 mL or requiring blood transfusion. If general anesthesia or major surgery was required, we classified that need as a complication.

Utilizing these criteria, we observed an overall complication rate of 44.1% (331 of 751 cases).[1]

Complications occurred most often when the following treatment modalities were used alone:

- single systemic dose of methotrexate
- D&C
- uterine artery embolization.

Of the 751 cases reviewed, 21.8% resulted in major surgery or interventional radiology procedures (primary or emergency). The total planned primary (nonemergency)

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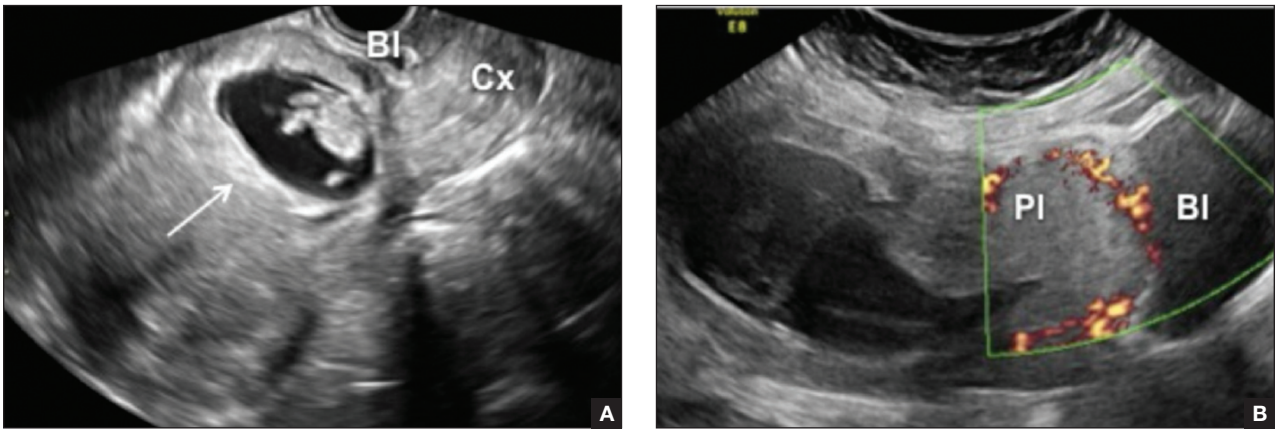
- **D&C**
- **uterine artery embolization**

FIGURE 3 A progressing gestation



A. At 10 weeks, 2 days, the sac (arrow) remains in the lower uterine segment, below the bladder (Bl) and above the internal os of the cervix (Cx). **B.** Power Doppler scan of the same pregnancy at 12 weeks, 1 day. The placenta (Pl) clearly has invaded to the level of the bladder line (Bl). The bulk of the sac is now mostly in the uterine cavity.

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A single injection of systemic methotrexate carried a complication rate of 64.6%, mostly because it required a second treatment

interventions performed were 66 (8.7%), which included 3 hysterectomies, 14 laparotomies, and 49 uterine artery embolizations or ligations. There were 98 (13.0%) emergency interventions, which included 36 hysterectomies, 40 laparotomies, and 22 uterine artery embolizations or ligations.[1]

Nine treatments and their complications

1. Systemic, single-dose methotrexate

The usual protocols were 1 mg/kg of body weight or 50 mg/m^2 of body surface area. This treatment was associated with a complication rate of 64.6%, mostly because it required a second treatment when the fetal heart beat did not cease after several days.[1]

We speculate that the high failure rate with this treatment may be caused by its slow action and questionable ability to stop cardiac activity and placental expansion. The expected result can take days, and all the while the gestational sac, the embryo or fetus, and its vascularity are growing. Secondary treatment has to address a larger gestation with more abundant vascularization.

2. Systemic, multidose, sequential methotrexate

In this regimen, the amounts of methotrexate injected are similar to the dose for the single-dose regimen. Two to three intramuscular injections (1 mg/kg of body weight or 50 mg/mm^2 of surface area) are given at an interval of 2 or 3 days over the course of a week. Be aware of the cumulative adverse effects of this drug on the liver and bone marrow—and the fact that even multidose treatment can fail.[1]

We found it impossible to assess the complication rate associated with this approach because it was often used in conjunction with another "first-line" treatment or after it. However, it is clear that methotrexate can be combined with other, mostly nonsurgical treatments.

3. Suction aspiration or D&C, alone or in combination

This option requires general anesthesia. The 305 cases involving this treatment had a mean complication rate of about 62% (range, 29%–86%).[1] This approach caused the greatest number of bleeding complications, necessitating a third-line treatment that almost always was surgical.

At delivery or the time of spontaneous abortion, the multilayered myometrial grid in the uterine body is able to contain bleeding vessels after placental separation. However, in CSP, the exposed vessels in the

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cervical scar tissue bleed because there is no muscle grid to contract and contain the profuse bleeding.

If you choose D&C or aspiration, have blood products available and a Foley balloon catheter handy! In several reports, a Foley balloon catheter was used as backup after significant bleeding occurred following curettage.[5,6]

In one of the series involving 45 cases treated by methotrexate followed by suction curettage, mean blood loss was significant at 707 mL (standard deviation, 642 mL; range, 100–2,000 mL), and treatment failed in three patients despite insertion of a Foley balloon catheter.

4. Uterine artery embolization, alone or in combination

This treatment requires general anesthesia. The complication rate was 47% among the 64 cases described in the literature.[1] Uterine artery embolization appeared to work better when it was combined with other noninvasive treatments. It probably is not the best first-line treatment because the delay between treatment and effect allows the gestation to grow and vascularity to increase. And if uterine artery embolization fails, the clinician must contend with a larger gestation.

5. Excision by laparotomy, alone or in combination with hysteroscopy

General anesthesia is required. Of the 18 cases described in the literature, only five complications were reported—and only when used in an emergency situation.[1]

6. Laparoscopic excision

Again, general anesthesia is required. Fifteen of the 49 cases (30.6%) described in the literature involved complications, but only one of five cases (20%) experienced complications if hysteroscopy and laparoscopy were combined. Small numbers may not allow meaningful evaluation of the latter approach.[1]

7. Operative hysteroscopy, alone or in combination

General anesthesia is required. The overall complication rate for 108 cases was 13.8%. However, if hysteroscopy was combined with transabdominal ultrasound guidance (as it was in nine cases), no complications were noted. If hysteroscopy was combined with mifepristone, the complication rate was 17%.[1] It appears that, when it is performed by an experienced clinician with ultrasound guidance, hysteroscopy may be a reasonable operative solution to CSP.

8. Intragestational-sac injection of methotrexate or potassium chloride, with ultrasound guidance

No anesthesia is required. This approach (**FIGURE 4**) had the fewest and least-involved complications. Of 83 cases, only 9 (10.8%) involved complications.

Cases performed with transabdominal sonography guidance had a slighter higher complication rate (15%) than those using TVS guidance.[1]

Because local injections are performed without general anesthesia and provide a final treatment by stopping heart activity, they appear to be the most effective intervention and may be especially useful when future fertility is desired.

9. Use of a Foley balloon catheter

Inserting a Foley balloon catheter and inflating it at the site of the CSP is an ingenious,

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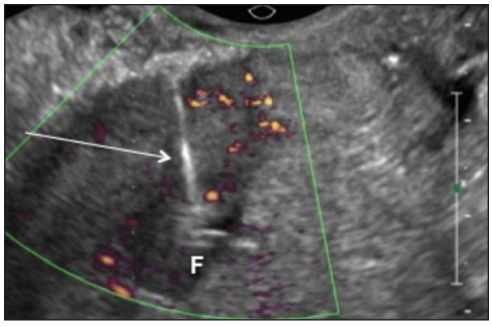
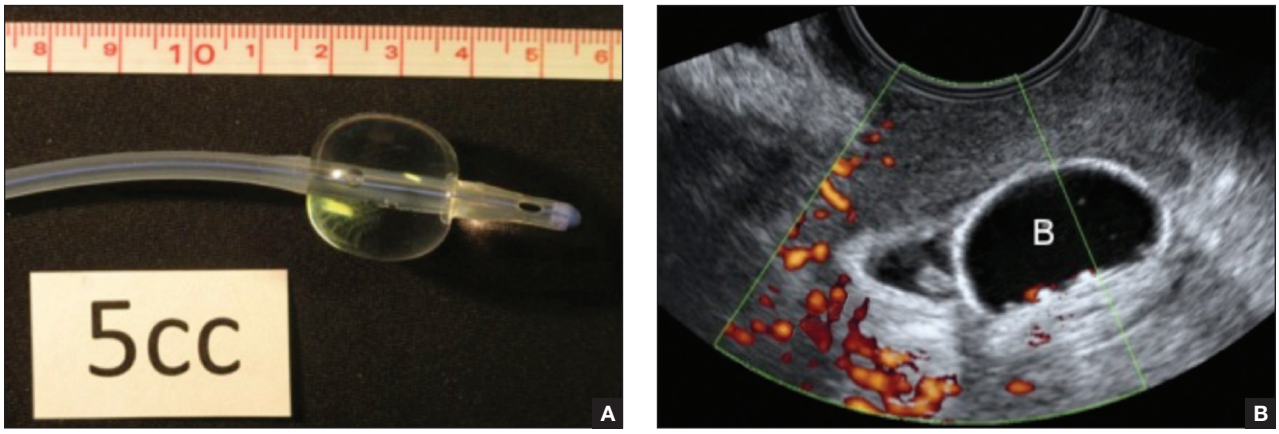
FIGURE 4 Ultrasound-guided injection



Transvaginal, real-time, ultrasound-guided intragestational-sac injection of methotrexate in a live CSP at 6 weeks, 4 days. The arrow points to the needle in place. (F = fetus.)

FIGURE 5 Foley balloon catheter



A. The catheter with the balloon inflated with 5 mL of saline. **B.** Transvaginal power Doppler image of the inflated balloon (B) in a case of a CSP at 6 weeks, 4 days, after injection of methotrexate.

relatively new approach.[1,2,5–7] The catheters come with balloons of different capacity (**FIGURE 5A**). They can be used alone (usually in gestations of 5–7 weeks) in the hope of stopping the evolution of the pregnancy by placing pressure on a small gestational sac. Even so, this approach is almost always used in a planned fashion in conjunction with another treatment or as backup if bleeding occurs.

Our impression of the value of the balloon catheters is positive. We suggest the French-12 size 10-mL silicone balloon catheter (prices range from $2 to $20), although we used a French-14 catheter with a 30-mL balloon successfully in a case of an 8-week CSP.

Insert the catheter using real-time transabdominal sonographic guidance when the patient has a comfortably full bladder. One also can switch to TVS guidance to allow for more precise placement and assess the pressure, avoiding overinflation of the balloon (**FIGURE 5B**).

There is no information in the literature about how long such a catheter should be kept in place. In our experience, 24 to 48 hours is the preferred duration, with the outer end of the catheter fastened to the patient's thigh. We also provide antibiotic coverage and reevaluate the effect in 2 days or as needed. General anesthesia is not required.

Key takeaways

Is there any single and effective treatment protocol? Probably not. Our management approach is presented as an algorithm (**FIGURE 6,** page 28). We also offer the following guidelines:

- **Do not confuse CSP with ectopic pregnancy.** Such nomenclature has caused some referring physicians to simply use methotrexate protocols developed on "garden variety" tubal ectopic pregnancies, which not only failed but yielded disastrous results.
- **Early diagnosis matters.** TVS is the most effective and preferred diagnostic tool. Delay in the diagnosis delays treatment, increasing the possibility of complications.
- **Cervical pregnancy is rare.** In a patient who has had a cesarean delivery, a low chorionic sac is almost always a CSP.
- **A key first step:** Determine whether heart activity is present, and avoid methotrexate if no heart activity is observed.
- **Counsel the patient.** If heart activity is documented, provide evidence-based counseling about the patient's options.
- **Act fast.** If continuation of the pregnancy is not desired, provide a reliable treatment that stops the embryonic or fetal heart beat without delay. Early treatment minimizes complications.

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A cesarean-scar pregnancy is an entity distinct from ectopic pregnancy. Do not confuse the terminology or treatment.

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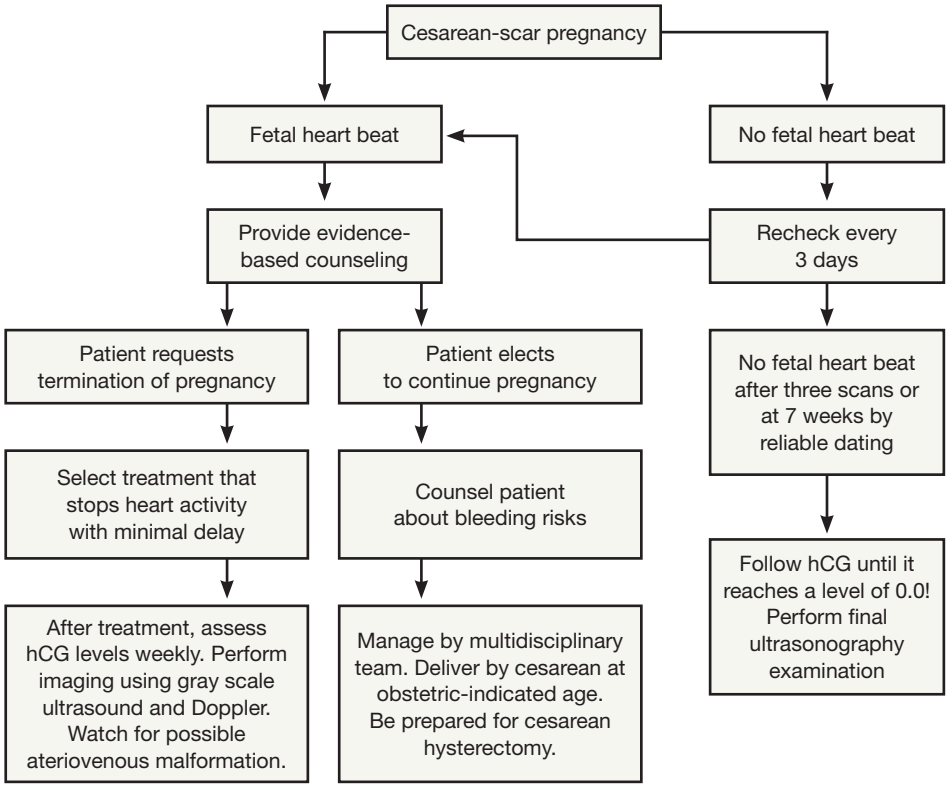
FIGURE 6 Suggested management of a cesarean-scar pregnancy



Abbreviation: hCG, human chorionic gonadotropin.

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Combination treatments may provide the best results in the termination of a cesarean-scar pregnancy

- **Avoid single treatments unlikely to be effective,** including D&C, suction curettage, single-dose intramuscular methotrexate, and uterine artery embolization applied alone.
- **Keep a catheter at hand.** Foley balloon tamponade to prevent or treat bleeding is a useful adjunct to have within easy reach.
- **Consider combination treatments,** as they may provide the best results.
- **Fully inform the patient** of the risks of pregnancy continuation. If a patient elects to continue the pregnancy, schedule an additional counseling session in which a more detailed overview of the anticipated clinical road is thoroughly explained.

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