Imaging Evaluation of Maternal Complications Associated with Repeat Cesarean Deliveries

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KEYWORDS

• Cesarean delivery • Cesarean complications • Repeat cesarean • Uterine rupture • Scar pregnancy • Uterine dehiscence • Scar niche

KEY POINTS

- The rate of cesarean deliveries continues to rise, while the rate of vaginal delivery after cesarean birth continues to decline.
- Many women now tend to undergo multiple CDs, and therefore the associated chronic maternal morbidities are of growing concern.
- Accurate diagnosis of these conditions is crucial for maternal and fetal well-being.
- Many of these complications are diagnosed by imaging, and radiologists should be aware of the type and imaging appearances of these conditions.

INTRODUCTION

The rate of cesarean deliveries (CDs) in the United States has been steadily increasing. According to National Vital Statistics Data, cesarean rates increased by 60% from 1996 to 2009, and have been steadily holding at approximately 32% of all deliveries since 2010. In 2012, approximately 1.3 million births were via CD.[1]

The increased CD rate is thought to be a result of several factors, including the relatively safety of the procedure, reduced rate of breech vaginal deliveries, increased maternal obesity, increased maternal age, unwillingness of obstetricians and women to attempt vaginal labor trials after CDs, increased rates of labor induction, and medical-legal issues.[2] More than 90% of women with a prior cesarean choose to have a repeat CD. After 2 cesareans, most women are only offered a repeat CD.[3]

Most women with a history of a previous CD are counseled for complications associated with vaginal delivery, particularly risk of uterine rupture. Multiple repeat CDs also are associated with several short-term and long-term maternal and perinatal morbidities (**Table 1**), which are less often discussed with the patient at the time

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Table 1
Increased maternal and fetal complications associated with repeated cesarean deliveries

Acute Maternal Complications	Chronic Maternal Complications	Fetal Complications
Placentation abnormalities	Chronic pelvic pain	Placentation abnormalities
Uterine rupture or dehiscence	Chronic incision site pain	Still birth
Uterine atony	Cesarean scar dehiscence	Preterm birth
Excessive bleeding	Dysmenorrhea	Intrauterine growth restriction
Bladder/bowel/urethral injury	Abnormal vaginal bleeding	Small for gestation fetus
Postoperative ileus/bowel obstruction	Pelvic adhesions/scar niche	Increased need for neonatal resuscitation
Postoperative infections	Endometriosis	
Increased intensive care unit/ hospital stay	Uterine synechiae	
	Ectopic pregnancy	
	Reduced future fertility	

of delivery planning.[4] Silver and colleagues,[5] in their review of a 30,132-patient cohort with CDs, found no absolute threshold number of CD after which future pregnancies should be avoided. However, they noted a significantly increased rate of several serious postsurgical morbidities, including the need for the need for cystotomy, hysterectomy, and intensive care unit admissions.

In this article, we review the utility of ultrasound, computed tomography (CT), and magnetic resonance imaging (MRI) in imaging of various complications associated with multiple CDs, and will briefly touch on treatment options.

IMAGING TECHNIQUES

Imaging can assist in diagnosis of both acute and chronic complications of CD. The choice of imaging modality usually depends on the type and acuity of symptoms, severity of symptoms, and the anatomic site of interest. Symptoms, including heavy bleeding, fever, and other clinical signs of postoperative infection, prompt an investigation via imaging. Ultrasound is usually the first imaging modality of choice; however, CT is used relatively liberally after ultrasound for evaluation of common and/or serious postoperative complications. MRI may be used as a problem-solving tool.

POST-CESAREAN COMPLICATIONS

Uterine Dehiscence and Rupture

Uterine dehiscence refers to disruption of the myometrium at the hysterotomy site with an intact serosal layer. Disruption or tear in the myometrium, which extends through the serosa, is defined as uterine rupture.[6] The reported incidence of a myometrial cesarean scar defect is between 1.9% and 3.8%.[7]

Women with more than one previous CD, and those attempting vaginal birth after CD, are at increased risk of uterine dehiscence and rupture. The risk of rupture is lower with a Pfannenstiel incision, at 0.2% to 1.5%. With vertical or T-shaped incisions, the risk rises to approximately 4% to 9%.[8]

Several investigators have attempted to evaluate the integrity and thickness of the cesarean scar and the lower uterine segment by 2-dimensional and 3-dimensional (3D) ultrasound, so as to predict possible obstetric complications of future pregnancies.[9] No conclusive data are yet available to our knowledge; however, Vikhareva Osser and Valentin,[10] in a recent study, suggested an association between large defects in the cesarean scar after CD detected on transvaginal ultrasound in nonpregnant women, and uterine dehiscence or rupture in subsequent pregnancy. Gizzo and colleagues[11] suggest a significant difference in the lower uterine segment size and myometrial thickness between women with multiple CDs and those without. Some investigators suggest a critical cutoff thickness of 2.5 mm or thicker for the lower uterine segment, for those women choosing to attempt a vaginal delivery after CD.[12]

In most nonpregnant women, cesarean scar dehiscence is asymptomatic, but may occasionally cause symptoms such as dysmenorrhea,