



Review Article

Cesarean Scar Pregnancies: a Systematic Review of Treatment Options

Sarah Maheux-Lacroix, MD*, Fiona Li, Emmanuel Bujold, MD, MSc,
Erin Nesbitt-Hawes, BMed, Rebecca Deans, BMed, PhD, and Jason Abbott, BMed (Hons), PhD

From the School of Women's and Children's Health, UNSW, Sydney, Australia (Drs. Maheux-Lacroix, Deans, and Abbott; Ms. Li; and Ms. Nesbitt-Hawes), and Department of Obstetrics and Gynecology, CHU de Quebec, Université Laval, Laurier, Quebec, Canada (Dr. Bujold).

ABSTRACT The objective of this systematic review was to assess the efficacy and safety of treatment options of cesarean scar pregnancies (CSPs). We searched MEDLINE, Embase, and the Cochrane Library from inception to June 2016 as well as reference lists. We included English publications reporting treatment outcomes of at least 10 cases of CSPs. Two authors screened for eligibility, extracted data, and assessed the quality of the included studies. Treatment was considered successful if no subsequent intervention was required after the index treatment. Of the 1257 citations identified, 63 studies were eligible. The overall success rate of systemic methotrexate (MTX) and/or local injection of MTX or potassium chloride was 62%. Dilation and curettage (D&C) was associated with a 28% risk of hemorrhage that dropped to 4% when combined with uterine artery embolization (UAE). Hysteroscopic resection of CSP was unsuccessful in 12% of cases, and inadequate human chorionic gonadotropin decay was the primary indication for additional intervention. Laparoscopic, vaginal, and open excision and repair of the defect were associated with a high success rate ($\geq 96\%$) and a low risk of hemorrhage ($\leq 4\%$). Expectant management resulted in a 57% live birth rate, but 63% of women required hysterectomy because of placental implantation abnormalities or second trimester uterine rupture. Most studies were of low methodologic quality, and given the heterogeneity between the studies and groups, statistical comparison of treatment options was deemed inappropriate. In conclusion, the decision to allow the progression of CSPs exposes women to a high risk of life-threatening hemorrhage and hysterectomy. Medical treatment options alone are often insufficient. D&C is a reasonable option in well-selected women or when combined with UAE. The potential benefits of excision and repair of scar defect on further pregnancy outcomes need to be further assessed. *Journal of Minimally Invasive Gynecology* (2017) ■, ■–■ © 2017 AAGL. All rights reserved.

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Because of the increase in cesarean deliveries, cesarean scar pregnancies (CSPs) have become increasingly common in the last decades [1]. They occur in 1 in 500 pregnancies among women who previously underwent cesarean delivery and account for 4% of ectopic pregnancies [2]. CSPs are caused by the migration of the blastocyst into the

myometrium though a defect of the cesarean scar [3]. They are usually diagnosed on transvaginal ultrasound by visualizing the gestational sac in the myometrium at the scar site surrounded by color Doppler flow with little or no separation from the bladder and occasionally an outward bulge of the sac in the scar [4]. Two different types of CSPs are described depending on the depth of the implantation with type 1 progressing toward the uterine cavity and type 2 progressing toward the bladder [5].

One quarter of women are asymptomatic at the time of diagnosis; the remaining present with symptoms of bleeding and/or pain [6]. If treatment is delayed, CSP can evolve into placenta accreta or uterine rupture [4]. Given the deep implantation of CSP into the fibrous scar tissue of the lower uterine segment, treatment is challenging and may fail or cause hemorrhage and require hysterectomy [1]. Many

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The study protocol was registered with Prospero (#CRD42016046493).

Corresponding author: Sarah Maheux-Lacroix, MD, Royal Hospital for Women, University of New South Wales, Barker St, Randwick, 2031, NSW, Australia.

E-mail: sarah.maheux.lacroix@gmail.com

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treatment options have been proposed, but their effectiveness is difficult to evaluate in a well-designed study given the rarity of this condition. Our objective is to assess the efficacy and safety of management options for CSP by systematically reviewing the literature.

Material and Methods

Eligibility Criteria, Information Sources, and Search Strategy

We conducted a systematic review of original studies reporting treatment outcomes of CSP using a protocol registered with Prospero (#CRD42016046493). We searched MEDLINE, Embase, and the Cochrane Library from their inception to June 2016. Search terms included *cesarean section* and *ectopic pregnancy*. The search strategy was revised by a health care librarian and is presented in [Figure 1](#). We also looked at the reference lists of the included studies to identify additional eligible reports.

Given the large number of eligible publications, we restricted our selection criteria to studies published in English and reporting at least 10 cases of CSPs. Reports were excluded if outcomes were insufficiently detailed or not reported by treatment modality. We considered all study designs including case series, comparative studies, and randomized controlled trials (RCTs). Being a systematic review, this study did not require ethics approval.

Fig. 1

MEDLINE search strategy.

Search
#1 "Cesarean scar pregnancy" [tiab] OR "Cesarean scar pregnancies" [tiab] OR "Cesarean scar implantation"[tiab] OR "Cesarean scar implantations"[tiab] OR "Caesarean scar pregnancy" [tiab] OR "Caesarean scar pregnancies" [tiab] OR "Caesarean scar implantation"[tiab] OR "Caesarean scar implantations"[tiab]
#2 "Pregnancy" [Mesh] OR "Pregnancy, Ectopic" [Mesh] OR "Ectopic Pregnancies" [tiab] OR "Pregnancies, Ectopic" [tiab] OR "Extrauterine Pregnancies" [tiab] OR "Extrauterine Pregnancy" [tiab] OR "Ectopic Pregnancy" [tiab]
#3 "Cesarean Section" [Mesh] OR "Cesarean Section" [tiab] OR "Cesarean Sections" [tiab] OR "Delivery, Abdominal" [tiab] OR "Abdominal Deliveries" [tiab] OR "Deliveries, Abdominal" [tiab] OR "Caesarean Section" [tiab] OR "Caesarean Sections" [tiab] OR "Abdominal Delivery" [tiab] OR "C-Section" [tiab] OR "C Section" [tiab] OR "C-Sections" [tiab] OR "Postcesarean Section" [tiab]
#4 "Animals" [Mesh] NOT "Humans" [Mesh]
#5 #1 OR (#2 AND #3) NOT #4

Study Selection

Study eligibility was assessed independently by 2 reviewers screening titles, abstracts, and full-text publications when required. If disagreements were not resolved by a consensus, a third reviewer was consulted.

Data Extraction, Risk of Bias, and Analyses

Data abstraction of the included studies was performed using a standardized data abstraction form, and another assessor subsequently reviewed all data entries. Site, dates, and treatment modalities of each included studies were compared to identify and exclude duplicate records of cases. The following information was extracted from each study: design, characteristics of women at presentation, first management attempted, success of treatment, reason of failure, occurrence of hemorrhage after the onset of treatment, occurrence of hysterectomy, time for human chorionic gonadotropin (hCG) resolution, and outcomes of subsequent pregnancies. The management was considered successful if no further treatment was required until the complete resolution of the CSP. We did not consider repeat administration of methotrexate (MTX) as a failure of systemic therapy. We considered hemorrhage if reported as such by authors or if a bleeding of 500 mL or more was reported. The methodologic quality of the included studies was assessed by 2 reviewers using the Effective Public Health Practice Project Quality Assessment Tool [7]. Data were pooled in frequencies, proportions, and means using SAS 9.3 (SAS Institute, Inc, Cary, NC). Statistical comparison of different treatment modalities was deemed inappropriate given the heterogeneity in the way results were reported and between subgroup populations.

Results

Of the 1257 citations identified, 63 studies were eligible, representing 3127 cases of CSPs ([Fig. 2](#)). Studies were published between 2004 and 2016 and included 4 RCTs, 17 comparative studies, and 42 case series. The majority of publications (85%) were from China. Design issues resulted in all studies being graded as either moderate (6%) or weak quality (94%). The characteristics of the included studies are summarized in [Table 1](#).

Women presented at a mean age of 33 ± 4.8 years and a gestational age of 8 ± 3.0 weeks. Most women (80%) had a history of only 1 previous cesarean delivery, and the mean scar thickness was 3.1 ± 1.9 mm. The type of CSP was specified in 13 studies with 66% type 1 CSPs and 34% type II.

Medical Management

Medical management of CSPs was studied in 3 of the 4 RCTs and included systemic injection of MTX; injection of MTX and/or potassium chloride (KCl) in the gestational sac; and, less commonly, oral mifepristone. Medical therapy

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