Incidence and outcomes of cases of caesarean scar ectopic pregnancy in a tertiary referral centre

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Background. Caesarean scar ectopic pregnancy (CSEP) is a rare condition in which the implantation of the gestational sac takes place within the uterine scar of a previous caesarean section (CS). As a result, the gestation of a CSEP is located within the area surrounded by the myometrium and fibromuscular tissue of the scar.[1,2] The pathogenesis has not been delineated. However, the prominent theory is that impaired wound healing after previous trauma, such as after CS or myomectomy, creates a myometrial defect and a subsequent scar at which the blastocyst implants.[3,4]

Caesarean scar ectopic pregnancy (CSEP) is a rare condition in which the implantation of the gestational sac takes place within the uterine scar of a previous caesarean section (CS). As a result, the risk of placenta accrete or uterine rupture is increased.

Objective. To investigate four treatment methods, based on each patient’s clinical presentation, gestational age of the pregnancy and haemodynamic stability, for the management of CSEP.

Methods. CSEP cases (N=30) were diagnosed by ultrasound at the Shatby Maternity University Hospital, Egypt. Various treatment modalities, based on gestational age, were employed to treat the patients. Treatments included suction curettage (n=12), embryo reduction with local methotrexate injection (n=12), laparoscopic excision (n=3) and excision through laparotomy (n=3). Serum levels of beta-human chorionic gonadotrophin (β-hCG) were measured at diagnosis and weekly following treatment until the levels returned to non-pregnant values.

Results. There was a significant positive correlation between gestational age in weeks and the CSEP management strategy employed. β-hCG levels decreased from before treatment to the end of the follow-up period 3 weeks later. No cases required a hysterectomy, and no maternal complications were reported in this study.

Conclusion. The appropriate CSEP management strategy varies according to gestational age. Suction and embryo reduction with local methotrexate injection offers an effective, safe and minimally invasive surgical treatment to remove ectopic pregnancy tissue. Closely monitored follow-up of patients, including serial measurement of β-hCG levels and ultrasonographic examinations, is recommended after CSEP management.

Laparoscopic hysterotomy with wedge resection of the CSEP and previous scar has been reported in several studies. This approach has been recommended for patients with CSEP growing toward the bladder or abdominal wall.\cite{14,13} The trophoblastic mass plays an important role in defining the risk of conversion from medical to surgical treatment.\cite{14} Surgical treatment, including ultrasonography-guided evacuation,\cite{14} is considered as a rapid and successful resolution of CSEP.\cite{14}

**Objective**

To investigate four methods of treating cases diagnosed with CSEP at a tertiary referral center in Alexandria, Egypt.

**Methods**

This study was approved by the ethics committee of the Faculty of Medicine, University of Alexandria (ref. no. 00012098) and conducted at the Shatby Maternity University Hospital, Egypt. The study cohort comprised 30 women diagnosed with CSEP, based on a transvaginal ultrasound (GE Voluson P8 Ultrasound), between May 2016 and April 2019. Ultrasoundographic criteria for CSEP diagnosis were:\cite{16}

(i) empty uterine cavity, with clearly demonstrated endometrium;  
(ii) a clearly visible empty cervical canal, without contact with the gestational sac; and  
(iii) presence of the gestation sac with (or without) a fetal pole with (or without) fetal cardiac activity (depending on the gestational age) in the anterior part of the uterine isthmus.

Patients were informed about emergency conditions, including excessive bleeding and severe pain, and were monitored as outpatients following treatment.

Different CSEP treatment modalities, according to gestational age, were used in this study. Briefly, cases presenting before 6 weeks' gestation were treated using suction curettage under ultrasonographic guidance, while those presenting after 6 - 8 weeks' gestation were treated using suction curettage or embryo reduction and local methotrexate injection, according to the patient's choice after counselling and explaining the two different methods of treatment. Cases presenting with an acute abdomen, moderate or severe vaginal bleeding and severe pain, and those patients treated by laparotomy showed signs of peritoneal irritation, with a maternal heart rate above 120 beats per minute, and ultrasonographic evidence of moderate peritoneal collection.

As an indicator of ectopic pregnancy, β-hCG serum levels were quantified at diagnosis, and then again at outpatient follow-ups 1 and 3 weeks after CSEP treatment (Table 3). The mean baseline level of β-hCG decreased significantly 1 week after treatment. The mean (SD) β-hCG levels decreased to 2.32 (1.48) mIU/mL 3 weeks after treatment. Overall, there was a significant positive correlation between β-hCG levels for the four management strategies, following treatment.

The use of suction and embryo reduction with local methotrexate injection offers an effective, safe and minimally invasive surgical treatment to remove ectopic pregnancy tissue (Fig. 2). CSEP management by suction curettage was observed to result in the slowest reduction of β-hCG serum levels within the first week following treatment.

**Discussion**

Since the first reported case in 1978,\cite{14} an increasing number of CSEP cases have been reported, and this is thought to be correlated with an increased rate of caesarean deliveries.\cite{19} Harb et al.\cite{15}

<table>
<thead>
<tr>
<th>Table 1. Number of previous CS in the studied women</th>
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<tbody>
<tr>
<td>Previous CS</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
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</table>

**Results**

In this study, CSEP cases \((N=30)\) were diagnosed by transvaginal ultrasound (Fig. 1). The number of previous CS within this cohort ranged from 1 - 5, with a mean of 2.5 previous CS, and the majority (40%) of the women had previously had 3 CS (Table 1). The number of years since last delivery in these patients ranged from 1 - 7, with a mean (SD) of 2.8 (1.42) years. The women had a mean (SD) gestational age at diagnosis of 7.01 (1.13) weeks, and this determined the respective management strategies (Table 2). Haemodynamically stable patients were treated by suction curettage \((n=12)\) for those diagnosed at a gestational age of <8 weeks, while embryo reduction and local methotrexate injection were used to treat patients \((n=12)\) diagnosed at a gestational age of ≥6 weeks. Patients diagnosed at a gestational age of ≥8 weeks were managed by either laparoscopic excision \((n=3)\) or laparotomy \((n=3)\). Patients treated by laparoscopy presented with abdominal pain and signs of peritoneal irritation and were haemodynamically stable. Those patients treated by laparotomy showed signs of peritoneal irritation, with a maternal heart rate above 120 beats per minute, and ultrasonographic evidence of moderate peritoneal collection.

**Fig. 1. Ultrasonogram, 2D (left) and 3D (right), of one case from the study cohort who was diagnosed at a gestational age of 6 weeks, before treatment.**
estimated the incidence of CSEP across 86 early pregnancies from 2013 to 2015 to be 1.5 per 10 000 pregnancies in the UK. In contrast, Shatby Maternity University Hospital has a high incidence of CSEP as a proportion of all ectopic pregnancies. The estimated incidence at Shatby Maternity University Hospital is 1 per 2 100 pregnancies, and 10 per 100 ectopic pregnancies. The elevated CSEP frequency may be attributed to a high (~52% in 2014) and increasing CS rate in Egypt.[20] Furthermore, Shatby Maternity University Hospital is a tertiary referral hospital, for an area with a population of 15 million, and most tubal ectopic pregnancies are managed in secondary referral hospitals.

Maymon et al.[21] and Jurkovic et al.[16] reported that 50 and 72%, respectively, of CSEP patients within their studies had previously undergone multiple CS. Poor healing after two or more CS could contribute to the elevated risk of CSEP. In the current study, 86.7% of patients had previously had two or more CS. A wide variation in the median interval between the last caesarean delivery and CSEP, from 2 months to 17 years, has been previously reported, and this suggests that the risk of CSEP is not reduced by increased duration since last caesarean delivery.[21]

In the present study, only 20% of the patients presented with symptoms of lower abdominal pain and vaginal bleeding. This is in agreement with previous studies in which the majority of patients were asymptomatic and diagnosed incidentally while having an early pregnancy ultrasound.[14,15]

In the current study, the CSEP management strategy was planned according to gestational age in weeks. All 5 cases presenting before 6 weeks’ gestation were treated by ultrasound-guided suction curettage. A further 17 cases presented between 6 and 8 weeks’ gestation, and these were managed according to the patient’s choice after counselling. Briefly, 10 patients were treated by embryo reduction and local methotrexate injection, and 7 were treated by ultrasound-guided suction curettage. Eight cases presented after 8 weeks’ gestation, and 2 of these cases were treated by embryo reduction and local methotrexate injection, while 6 cases were treated either by laparoscopy or laparotomy due to signs of disturbed pregnancy.

In the current study, mean (SD) serum β-hCG levels decreased significantly over the course of the 3-week period following treatment, to 2.32 (1.48) mIU/mL. The slowest reduction in β-hCG levels was observed for the suction management group, possibly due to incomplete removal of trophoblastic tissue from the uterus during suction evacuation, as compared with the patients treated by embryo reduction with local methotrexate injection. This could be complemented by a dose of methotrexate if β-hCG levels continue to persist. β-hCG levels decreased rapidly in both the laparotomy and laparoscopic treatment groups. These findings are in agreement with previous studies that reported successful CSEP treatment outcomes associated with a >15% decline in β-hCG levels within a week, and reaching undetectable levels a month after treatment.[22] He et al.[23] in a study of 6 patients following successful vaginal treatment for CSEP, reported that serum β-hCG levels reached undetectable levels after 1 month of treatment.

**Conclusion**

CSEP is an important phenomenon in modern obstetrics. Early diagnosis enables the use of minimally invasive methods of

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**Table 2. The CSEP management strategy according to gestational age**

<table>
<thead>
<tr>
<th>GA (weeks)</th>
<th>Suction evacuation (N=12), n (%)</th>
<th>Embryo reduction and local methotrexate injection (N=12), n (%)</th>
<th>Laparotomy (N=3), n (%)</th>
<th>Laparoscopic excision (N=3), n (%)</th>
<th>χ²</th>
<th>MCp</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;6</td>
<td>5 (41.7)</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>22.279*</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>6 - 8</td>
<td>7 (58.3)</td>
<td>10 (83.3)</td>
<td>n/a</td>
<td>n/a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;8</td>
<td>n/a</td>
<td>2 (16.7)</td>
<td>3 (100)</td>
<td>3 (100)</td>
<td></td>
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CSEP = caesarean scar ectopic pregnancy; GA = gestational age; MCp = multiple comparison p-value; n/a = not available. *p<0.05.

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**Table 3. The mean β-hCG levels pre and post treatment for the respective management strategies**

<table>
<thead>
<tr>
<th>Management strategy</th>
<th>β-hCG levels (mIU/mL)</th>
<th>Post-treatment (n=16), mean (SD)</th>
<th>1 week (n=20), mean (SD)</th>
<th>3 week (n=16), mean (SD)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suction curettage (n=12)</td>
<td>15 183 (15 417.2)</td>
<td>5 758 (5 438)</td>
<td>3 (2)</td>
<td>0.0001*</td>
<td></td>
</tr>
<tr>
<td>Embryo reduction and local methotrexate injection (n=12)</td>
<td>20 836 (11 208)</td>
<td>4 197 (4 667)</td>
<td>2 (1)</td>
<td>0.0001*</td>
<td></td>
</tr>
<tr>
<td>Laparoscopic excision (n=3)</td>
<td>20 206 (8 135.0)</td>
<td>3 123 (2 502)</td>
<td>4 (1)</td>
<td>0.001*</td>
<td></td>
</tr>
<tr>
<td>Laparotomy (n=3)</td>
<td>27 970 (7 938.3)</td>
<td>1 660 (1 027)</td>
<td>3 (1)</td>
<td>0.001*</td>
<td></td>
</tr>
</tbody>
</table>

β-hCG = beta-human chorionic gonadotrophin; SD = standard deviation. *p<0.05.
treatment. Embryo reduction plus local methotrexate injection appears to offer an effective and minimally invasive surgical treatment option to remove ectopic pregnancy tissue until 8 weeks’ gestation, while more invasive methods are needed after 8 weeks of gestation. Given the risk of remote complications and a potential need for additional treatment modalities, follow-up with serial measurement of quantitative β-hCG levels and serial ultrasonographic examinations are recommended.

Declaration. None.

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Conflicts of interest. None.


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