Global Journal of Medical Research: E
Gynecology and Obstetrics
Volume 18 Issue 3 Version 1.0 Year 2018
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-4618 & Print ISSN: 0975-5888

Laparoscopic Resection Verses Transvaginal Resection in the Management of Exogenous Cesarean Scar Pregnancy

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Abstract- *Background:* Caesarean scar pregnancy (CSP) is a rare but potentially life-threatening complication for women of reproductive age with a previous caesarean birth the incidence of CSP has exponentially risen over the past two decades, due to an increasing rate of caesarean delivery. Because of the rarity of the condition, the majority of CSPs are case reports or small case series reported in the literature, and no universal treatment guidelines has been established yet.

Objective: To compare the safety and efficacy of laparoscopic resection and transvaginal resection as treatment options for cesarean scar pregnancy (CSP).

Methods: The clinical data of 19 patients diagnosed with exogenous CSP from January 2013 to June 2017 was reviewed.

Keywords: *exogenous caesarean scar pregnancy, laparoscopic resection, transvaginal resection.*

GJMR-E Classification: *NLMC Code: WJ 190*

Strictly as per the compliance and regulations of:

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Methods: The clinical data of 19 patients diagnosed with exogenous CSP from January 2013 to June 2017 was reviewed.

Setting: Tertiary hospital.

Results: Among these patients, 16 patients were treated with laparoscopic resection, 3 patients with transvaginal resection. All patients recovered fully without complications. Patients with excessive vaginal bleeding underwent emergency UAE treatment before laparoscopy. These two treatments had similar success rates (100% vs.100%), with no statistically significant difference in the intraoperative blood loss, duration of hospital stay, time for resolution of CSP mass, time for the return of menstruation, and time for normalization of serum beta HCG levels.

Conclusions: The accurate and timely diagnosis of CSP is vital. Laparoscopic resection and transvaginal resection of CSP are a safe and effective method of treatment, and both have comparable outcomes, high success rate, and fewer complications.

Keywords: exogenous caesarean scar pregnancy, laparoscopic resection, transvaginal resection.

I. Introduction

Caesarean scar pregnancy(CSP) or caesarean scar ectopic pregnancy is a rare but potentially life-threatening type of ectopic pregnancy where the gestational sac implants in a previous caesarean scar. The first case of CSP was described by Larsen and Solomon in 1978.[1] The incidence of CSP being reported over the past two decade has increased exponentially and is expected to rise due to the increasing rates of caesarean section (CS) being high as 40-50% and some hospitals up to 70%. [2] The Estimated incidence of CSP is 1:1800-1:2,226 in all Pregnancies, 0.45% in pregnancy after caesarean performed worldwide, improved diagnostic techniques and increased physician awareness. The frequency of CS worldwide is about 15%, but in China the rate is as delivery, and 6.1% in ectopic pregnancy after caesarean delivery.[3] Early and timely diagnosis is mandatory to prevent life-threatening complications like uterine rupture, massive haemorrhage or other serious consequences.

Vial et al. [4] classified CSP into two subtypes based on findings on transvaginal sonographic imaging. Endogenous CSP (CSP type I) is characterized by the implantation of the gestational sac at the cesarean-scar site followed by inward growth towards either the cervical isthmus space or the uterine cavity. Exogenous CSP (CSP type II) results from the deep implantation of the gestational sac into a cesarean scar defect with an outward growth that infiltrates the uterine myometrium creating a bulge from the uterine serosal layer.

Our study retrospectively analyzed the clinical data of 19 patients with exogenous CSP (type II CSP) treated in our hospital in the past five years. We analyzed and compared the outcomes, safety and efficacy of laparoscopic resection and transvaginal resection of exogenous CSP by evaluating the intraoperative blood loss, the time for serum beta-human chorionic gonadotropin (beta-HCG) to return to normal, duration of hospital stay, and resolution of the mass and return of menstruation.

II. Materials and Methods

a) Patients

A retrospective comparative study was adopted. Between January 2013 and June 2017, 19 patients with exogenous CSP admitted at First Affiliated Hospital of Nanjing Medical University were enrolled in this study. The inclusion criteria were; (1)a history of cesarean delivery; (2) a history of amenorrhea and a positive urine pregnancy test; (3) a color Doppler transvaginal ultrasound indicating a Cesarean scar pregnancy based on the diagnostic criteria stipulated by Godwin et al.[5];*(i)*.Empty uterus and cervical canal; *(ii)*. Development of the gestational sac or fetal pole with or without cardiac activity or identification of a mixed-echo

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mass in the anterior part of the caesarean scar;(*iii).*Very thin myometrium(1-3mm) or an absence of healthy myometrium between the bladder wall and the sac/mass; and *(iv).*The gestational sac or mixed-echo mass being located toward either the cervicoisthmic space or the uterine cavity in CSP-I, or the infiltration of the gestational sac or mixed-echo mass into the myometrium and/or forming a bulge from the uterine serial layer in CSP-II; (*v*). High velocity with low impedance peritrophoblastic vascular flow clearly surrounding the sac in Doppler examination; (4) postoperative pathology report indicating implantation or the presence of chorionic villi in the myometrium; (5) Patient not a referral from a peripheral facility due to failed treatment for CSP.

This study was approved by the ethics committee of First Affiliated Hospital of Nanjing Medical University. All patients in this study were thoroughly informed of the potential risks and complication, benefits and curative effects of the surgeries and other alternatives and signed a written consent. The 16 patients were managed by laparoscopic resection of the CSP while 3 patients who declined laparoscopic surgery were managed by the transvaginal approach.

b) Preoperative Evaluation

Data collected from all patients included maternal age, presenting symptoms, gravidity, parity, gestational age based on last menstrual period (LMP) or Ultrasound dating, number of previous Caesarean deliveries, the time interval between the last caesarean delivery and current CSP, initial preoperative serum β-HCG, and transvaginal ultrasound findings (size of gestational sac/mass, relationship with anterior uterine myometrium, presence or absence of cardiac activity). Routine preoperative preparations were done, complete blood cell count, liver and renal function test, urinalysis, coagulation panel, and electrocardiography (ECG) were performed to rule out any contraindication for surgery. Vaginal cleaning was done a day before surgery.

c) Surgical Methods

i. *Laparoscopic resection*

The patients assumed a lithotomic position, under general anesthesia. The operation field was sterilized, CO2 pneumoperitoneum was created conventionally, a laparoscope was inserted to visualize the anterior wall of the uterus, the bladder, and for the presence of adhesion. Adhesiolysis was performed, the peritoneum between the bladder and the uterus was dissected, and the bladder pushed downwards appropriately, bilateral occlusion of ascending branches of uterine arteries was performed. Under laparoscopic monitoring the pregnancy mass was suctioned till it significantly reduced in volume, then the lesion and the scar tissue which is distinguishable from normal myometrium of the uterus was excised. The uterine defect was closed up in two layers using continuous sutures, and hemostatis was achieved. The uterine artery occlusion was the relieved to restore uterine blood flow. An abdominal drainage tube was left in situ. Hysteroscopy was then done to visualize the uterine cavity, the scar site and the patency of fallopian tube osmium. The operation was completed and patients reversed from anaesthesia.

ii. *Transvaginal resection*

Patients were placed in a lithotomic position then put under general anesthesia. The operation field was cleaned and draped. The bladder was emptied using a metal catheter. The vagina and cervix were exposed using a vaginal retractor. The anterior vaginal fornix was exposed by tenaculum attached to the upper lip of the cervix and pulled downwards. Normal saline was injected into the cervicovaginal space. The pressure from the injected solution separated the bladder and cervix. A transverse incision was made 2 cm above to the clamped site; the bladder was dissected and pushed away through the cervicovaginal gap till vesicoperitoneal fold, where the peritoneum was punctured and a vaginal retractor placed. A boggy area was detected by a probe and considered as a scar pregnancy lesion. A transverse incision was made at the cesarean section scar, where a bulge and purple bluish discoloration associated with pregnancy tissue could be visualized; sometime villi could be visualized as well. The scar tissue and the pregnancy tissues were removed using an ovum forceps through the incision, followed by suction to evacuate the uterine cavity. The incision was then closed in two layers by a continuous lock stitch under the guidance of the detecting probe. After examining the bladder to rule out any trauma during surgery, the peritoneum was sutured to ensure there was no active bleeding. Finally, the vaginal wall was closed by a continuous locking suture, 3 pieces of iodine gauzes were left in situ to be removed 24 hours later after the surgery. In both the laparoscopic or transvaginal groups, an indwelling urine catheter was put to monitor urine output and was removed 48 hours postoperatively.

Successful treatment was regarded as a patient fully recovered, a steady decline in vaginal bleeding, serum beta HCG levels returning down to normal, the disappearance of the CSP mass, no severe complications, uterus preserved, and no need for additional treatment. Intraoperative blood loss, length of hospital stay, serum beta-HCG levels, and postoperative complication were recorded.

iii. *Follow up*

Patients were discharged based on the following criteria: no chief complaint, no fever, the vaginal bleeding stopped or decreased to less than normal menstrual bleeding, normal or steadily decline of beta HCG level, no CSP mass on transvaginal

ultrasound or the size of mass decreased. After discharge from the hospital, all patients were followed up every week for 3 to 6 months. Serial measurements of serum beta HCG was done every week till normal. The first return of the menstrual cycle was recorded. Transvaginal ultrasound screening was carried out to determine if there were residual pregnant tissues within the uterine scar tissues every two weeks.

The patients were advised to take on a suitable method of contraception for at least one year.

iv. *Statistical Methods*

We used SPSS 24.0 software for statistical analysis of the data. All data are represented as mean ±standard deviation (SD). The independent sample t-test was used for intergroup comparison. A p value ($P<0.05$) was considered statistically significant.

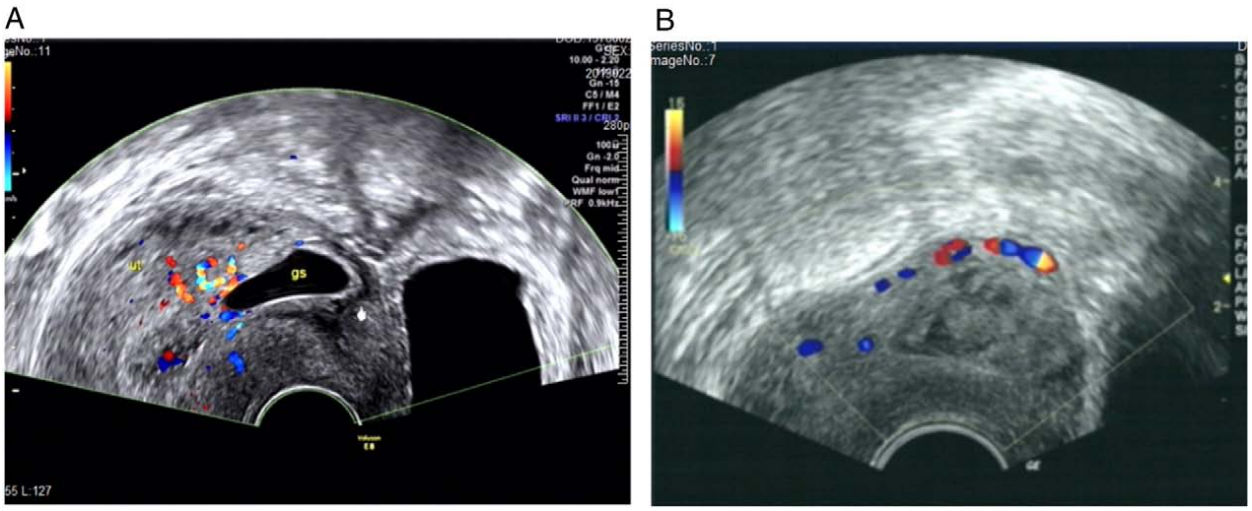

Fig. 1: Transvaginal ultrasonography images. (a) A 34-year-old woman with endogenous cesarean scar pregnancy t; a gestational sac is implanted at the site of a previous cesarean scar. (b) A 28-year-old woman with exogenous cesarean scar pregnancy type; the gestational sac implanted into a previous cesarean scar defect with outward growth that has infiltrated into the myometrium and bulges from the uterine serial surface.

III. Results

From January 2013 to June 2017, 19 patients diagnosed with exogenous CSP were managed in our gynecology ward. During the same period, 212 cases of Endogenous CSP were admitted in our hospital. The clinical characteristics of the patients according to the type of surgery are provided in Table 1. All the patients had a history of low-segment cesarean deliveries, and their ages ranged from 22-44years (33.05±6.20years) .3 patients had a history of 2 Cesarean deliveries while the rest of the 16 had one prior cesarean delivery. The preoperative serum beta HCG level was 710–156,452 IU/L. The interval between the last caesarean delivery and current CSP was 5.94±4.03 years (0.7-22years), 6 cases had a fetal cardiac activity present on ultrasound. The thickness of the myometrium from the serosa to the gestational sac, as measured on ultrasound was 1.0mm-5.0mm, and the largest diameter ranged from 10mm-40mm

Of the 19 patients with an exogenous CSP, 3 received Transvaginal resection of the CSP with the operation completed successfully. For the other 16 patients, we conducted laparoscopic resection, 4 patients received bilateral uterine artery remobilization before surgery due to a large amount of vaginal bleeding on admission. All were successful, and none of them required secondary treatment.

The postoperative Transvaginal color Doppler ultrasound reexaminations did not reveal any significant mass at the uterine isthmus. For both groups the intraoperative blood loss, the duration of hospital stay, the time for the serum beta HCG to return to normal, time for complete resolution of CSP mass and resumption of menstruation between the two groups showed no statistically significant difference ($P>0.05$). (Table 2). The pathological report of the lesion tissues taken from the 19 patients revealed chorionic villi in the myometrium, consistent with the preoperative diagnosis of CSP. The success rate in both groups was 100% with no postoperative complication.

Table 1: Clinical characteristics of patients with cesarean scar pregnancy at baseline [χ]

Characteristics	laparoscopic group	Transvaginal group	P value [ɣ]
Maternal age (years)	33.23±5.07	33.03±5.00	0.993
Gravidity	4.01±1.5	4.10±1.48	0.509
Abortion	1.74±1.38	1.90± 1.40	0.387
Gestational age (days)	49.25±5.59	44.67±6.11	0.2149
Number of previous cesarean deliveries			
1	13	3	
2	3	0	
Time interval between previous CS and present CSP (years)	5.92±3.71	6.33±4.23	0.467
Initial level of serum β-HCG (IU/L)	44995±41966	43211±42751	0.389
Largest diameter of CSP mass (mm)	27.87±13.76	29.01±14.09	0.285

Abbreviations: CSP, cesarean scar pregnancy; CS, cesarean sections; β-HCG, beta human chorionic gonadotropin..
[χ] Data presented as mean ± SD (range) or number (percentage) unless indicated otherwise
[ɣ] Student t test

Table 2: Patients outcome after treatment[χ]

Variable	LAP group (n=16)	TV group (n=3)	P value[ɣ]
Intraoperative blood loss (ml)	159.38±155.54	76.67±40.41	0.3829
Percentage decline of β-HCG in 24 hrs after treatment	85.04±11.21	82.47±21.27 %	0.3379
Duration of hospital stay (days)	9.56±2.83	7.67±1.15	0.2274
Time for resolution of CSP mass (days)	24.50±1.32	24.00± 1.00	0.5440
Time for normalization of serum β-HCG (days)	19.25 ±1.34	17.33.±3.06	0.085
Time for resumption of menstruation (days)	24.76±1.87	25.56±1.52	0.4971
Success rate of treatment (%)	100%	100%	

Abbreviations: CSP, cesarean scar pregnancy; β-HCG, beta human chorionic gonadotropin.
[χ] Data is given as mean ± SD (range) or percentage unless indicated otherwise
[ɣ] Student t test

IV. Discussion

In 1978, Larsen and Solomon first reported one case of scar pregnancy and proposed the concept of scar pregnancy after caesarean section. [1]Until 2001, there were 19 cases of scar pregnancy reported in 2 case reports and by 2011 the number of cases described in the literature was 751, showing a rapid increase in the incidence of this type of pregnancy which can be attributed to the increasing number of caesarean deliveries being done, improved diagnostic tools and increased physician knowledge and awareness of the condition. [6]. Due to the relatively lower incidence, there has been no universal standard method of treatment of CSP. Classification using ultrasonography provided the basis for the management of patients.

The exact etiology of CSP is unknown but it has been suggested that a shortage of blood supply at a low uterine segment after cesarean delivery may result in insufficient fibrosis and repair hence forming uterine scar dehiscence or small-scar defects and later CSPs.[7] Such defects can also develop from the trauma of other uterine surgery for such as curettage, myomectomy, metroplasty, hysteroscopy and even manual removal of placenta. [8,9] Better suturing techniques of the cesarean incision may help prevent CSP.

CSP can occur in any woman of child bearing age with a previous caesarean delivery. The age reported in literature ranges between 20-45 years old, and the gestational age at presentation is 5-16 weeks. [3,9] In this study the age of the 19 patients was 22-44years old, and the gestational age was 4-14 weeks, which is consistent with literature. No positive correlation between the number of Caesarean sections and the risk of CSP has been shown. Rotas et al reviewed 112 cases of which 52% had a history of one CS, 36% had a history of 2 CS, 12% had 3 or more previous CS, suggesting that the number of previous is not related to the risk of CSP. [10] Our study found 16 patients (84.2%) had a history of 1 CS and 3 patients (15.8%) had 2 previous CS.

CSP often presents with symptoms of irregular vaginal bleeding and /or abdominal pain or discomfort, but a few are asymptomatic and CSP is found incidentally on routine first trimester Ultrasound. A number of cases are misdiagnosed as a spontaneous abortion of an intrauterine pregnancy, or after medical abortion or curettage done for abnormal vaginal bleeding. In this study all patients had a history of amenorrhea, no cases were misdiagnosed, 52.6% of

patients presented with irregular vaginal bleeding, 15.7% with both vaginal bleeding and abdominal pain, and 31.5% were asymptomatic. Routine transvaginal ultrasonography is therefore recommended in early pregnancy for patients who have previously undergone a cesarean delivery to rule out CSP.

The Transvaginal ultrasonography is the standard first line diagnostic tool with a diagnostic accuracy as high as 86.4% reported combined with detailed patient history. [10] The Ultrasound diagnosis criteria for endogenous CSP proposed includes an empty uterine cavity, empty cervical canal,, gestational sac seen at either the uterine isthmus or the anterior uterine wall, and myometrial tissue depression detected between the gestational sac and bladder wall. [4,5] Magnetic resonance imaging(MRI), hysteroscopy, or laparoscopy can be considered when ultrasound imaging is inconclusive or equivocal in order to reduce the misdiagnosis rate. It is notable that MRI is a costly diagnostic technique and that this must often be taken into account in clinical environment. Ultrasonography has the advantages of being non-invasive, simple, and cheap. [11,12,13] The pathological examination done in this study confirmed the accuracy of using ultrasonography for diagnosis.

Expectant management is not recommended as it is associated with poor outcome including hysterectomy.[14]The currently available therapeutic options reported in the literature include medical therapy such as injecting embyrocides(such as kalium chloratum) into the gestational sac, and systematic or local administration of methotrexate (MTX), uterine artery embolization (UAE), hysteroscopic resection, laparotomic resection, laparoscopic resection or more recently transvaginal resection.[6] Treatment should be individualized for every case of CSP after adequate preoperative assessment based on the gestational age, viability of fetus, myometrial defects, and presenting symptoms and physicians experience.

Surgical excision of CSP has the highest cure rate, and is not only effective in termination of pregnancy but also allows repair of scar defects while avoiding risk of hysterectomy caused by complications such as massive bleeding and uterine perforation during curettage and preserve fertility of the patient so as to avoid occurrence of repeat CSP. [15,16,} The gestational sac that grows toward the urinary bladder (exogenous CSP) has a higher risk for massive hemorrhage than the gestational sac that grows toward the uterine cavity (endogenous CSP). So for most patients in which the gestational sac grew toward the urinary bladder in most literature reports underwent surgical excision. Since the first report in 1978, laparotomy, laparoscopy, hysteroscopy or transvaginal excision of CSP and repair of the uterine defect have been reported successfully. After resection of CSP and repair of the scar through laparotomy, the serum beta HCG can be return to normal in 1-3 weeks after operation and it can reduce risk of uterus rupture and recurrence of CSP. However, laparotomy is associated with larger surgical wounds, long hospital stay and more postoperative pain and adhesion formation. It is usually used in emergencies in patients with unstable hemodynamic and actively bleeding.[3]

In recent years, with the development and improvement of minimally invasive technology, more physicians in China and abroad are using laparoscopic and transvaginal techniques in the treatment of CSP. Minimally invasive surgery has well established advantages of a smaller surgical wound, less postoperative pain, a shorter hospital stay, quicker recovery, and better aesthetic results.[16,17]

Since 2012, our hospital has taken the lead in exploring laparoscopy and transvaginal surgery in the province, 16 cases successfully treated with laparoscopy and 3 cases with transvaginal approach, the operations were smooth and intraoperative blood loss was minimal (159.38±155.54 and 76.67±40.41 respectively) and there were no postoperative complications. After the operation, the serum beta HCG decrease was satisfactory, minimal or no pregnancy tissue remained, and the results were satisfactory. However, laparoscopic surgery is expensive and is highly demanding for surgeons .Our experience is that:1.We should know the indications for operation: CSP patients with transvaginal colour Doppler ultrasound findings sgowing no gestational sac in the uterine cavity but the CSP mass bulging externally at the anterior wall of the lower uterine segment <5mm from serous layer and the echo of the gestational sac in the anterior wall of the lower segment of uterus is rich in blood flow signals ; 2. Avoid instrumental manipulation of the uterine cavity before operation, so as to reduce massive bleeding caused by instrumentation; 3. Temporarily occluding the blood flow of both uterine arteries, so as to reduce blood supply to the lesion and hence reducing massive bleeding during the operation.

Some studies have used mifepristone administered preoperatively in order to reduce intraoperative blood loss and enhance apoptosis and necrosis of the trophocytes or intraoperative local injection of oxytocin or injection of vasopressin with satisfactory results.[15,16] ; 4. Open the vesico-uterine peritoneal fold, push the bladder downwards to avoid both bladder injury during the surgical procedure and subsequent difficulties when suturing the uterine incision. Under laparoscopic monitoring, suction the pregnancy mass till it has significantly reduced in volume, then the lesion and the scar tissue which is clearly distinguishable from normal myometrium of uterus is excised; 5. The uterus should be sutured in two layers so as to prevent recurrence of CSP and preserve reproductive function; 6. After resection and repair of scar lesions, the uterine artery occlusion is relieved,

uterine blood flow is restored, and uterine function preserved.

Transvaginal approach is relatively simple in experienced hands .However there are limitation in gestation age, amount of bleeding, gestational sac location, difficulty in cervical exposure and a small operation field.[17].Our experience is; 1. The gestational age <90days, the gestational sac diameter<5cm, <5mm from the serosal layer, the position of the gestational sac is low and the cervix is easily exposed; 2. Intraoperative injection of oxytocin into the cervix helps reduce bleeding during the operation: 3. Normal saline is injected into the cervico-vaginal gap, the pressure from the injected normal saline fully separates the bladder and cervix; 5. The incision is closed by a continuous locking stitch under the guidance of the detecting probe, carefully repairing the anterior wall of the uterus, to avoid scar incision diverticulum and small sinus formation.

Our study was limited by the sample size and the lack of multicenter data, and lack of follow up on future reproductive outcomes. In the future, we will conduct a prospective, randomized, controlled study with more patients to make up for these deficiencies.

V. Conclusion

For patients with CSP is early, timely, and clear diagnosis is key, and individualized treatment that should be implemented in accordance with the gestational age, hemodynamic stability of the patient, serum beta HCG levels, and ultrasound and MRI findings. Laparoscopic resection and transvaginal resection are the most reasonable approach for managing exogenous CSP because of the deep implantation of the mass into the myometrium and very thin myometrium between the gestational sac and the bladder, hence high risk of rupture with other treatment modalities. They both have a comparable high success rate, thorough lesion clearance, fewer complications, and a shorter time to beta HCG levels returning to normal. However, both require accumulated patient experiences and surgical techniques are necessary before broad application.

Acknowledgements
The author accepted no funding for the study.

Conflict of interest
None.

References Références Referencias

1. Larsen JV, Solomon MH. (1978). Pregnancy in a uterine scar sacculus-an unusual cause of postabortal haemorrhage. A case report. S Afr Med J, 53: 142-3.
2. Litwicka K, Greco E. (2013) Caesarean scar pregnancy: a review of management options. Curr Opin Obstet Gynecol, 25: 456-461.
3. Timor-Tritsch IE, Monteagudo A, Santos R, Tsymbal T, Pineda G, Arslan AA. (2012). The diagnosis, treatment, and follow-up of cesarean scar pregnancy. AJOG 207:44.e1e44.e13
4. Vial Y, Petignat P, Hohlfeld P. (2000). Pregnancy in a cesarean scar. Ultrasound Obstet Gynecol, 16: 592-3.
5. Godin PA, Bassil S, Donnez J. (1997). An ectopic pregnancy developing in a previous caesarian section scar. Fertil Steril, 67: 398–400.
6. Timor-Tritsch IE, Monteagudo A. (2012) Unforeseen consequences of the increasing rate of cesarean deliveries: early placenta accreta and cesarean scar pregnancy. A review. Am J Obstet Gynecol. 207(1):14-29.
7. Jurkovic, D., Hillaby, K., Woelfer, B., Lawrence, A., Salim, R., and Elson, C.J. First-trimester diagnosis and management of pregnancies implanted into the lower uterine segment Cesarean section scar. Ultrasound Obstet Gynecol. 2003; 21: 220–7
8. Fait G, Goyert G, Sundareson A, Pickens A Jr. Intramural pregnancy with fetal survival: case history and discussion of etiologic factors. Obstet Gynecol 1987; 70: 472–4.
9. Seow K-M, Huang L-W, Lin YH, Yan-Sheng Lin M, Tsai Y-L, Hwang J-L. Caesarean scar pregnancy: issues in management. Ultrasound Obstet Gynecol 2004; 23: 247–53.
10. Rotas MA, Haberman S, Levgur M. Cesarean scar ectopic pregnancies: etiology, diagnosis, and management. ObstetGynecol 2006; 107: 1373e81.
11. Smith A, Maxwell D, Ash A. Sonographic diagnosis of caesarean scar pregnancy at 16 weeks. J Clin Ultrasound (in press).
12. Hwu Y-M, Hsu C-Y, Yang H-Y. Conservative treatment of caesarean scar pregnancy with transvaginal needle aspiration of the embryo. *BJOG* 2005; 112: 841–2.
13. Wang C-J, Chao A-S, Yuen L-T, Wang C-W, Soong Y-K, Lee C-L. Endoscopic management of cesarean scar pregnancy. *Fertil Steril* 2006; 85: 494–7.
14. Herman A, Weinraub Z, Avrech O, Maymon R, Ron-El R, Bukovsky Y. Follow up and outcome of isthmic pregnancy located in a previous caesarean section scar. *Br J Obstet Gynaecol* 1995; 102: 839–41
15. Wang G, Liu X, Bi F, Yin L, Sa R, Wang D, Yang Q. Evaluation of the efficacy of laparoscopic resection for the management of exogenous cesarean scar pregnancy. Fertil Steril. 2014 May; 101(5): 1501-7.
16. Fuchs N, Manoucheri E, Verbaan M, Einarsson JI. Laparoscopic management of extrauterine pregnancy in caesarean section scar: description of a surgical technique and review of the literature. BJOG 2015; 122: 137–142.

17. Zhang, H., Shi, J., Yang, Y. et al, Transvaginal surgical management of cesarean scar pregnancy II (CSP-II): an analysis of 25 cases. *Med Sci Monit*. 2015; 21: 3320–3326.