

Prophylactic trans-uterine embolization to reduce intraoperative blood loss for placenta percreta invading the urinary bladder

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Abstract

Reported herein is the case of a 35-year-old multipara woman diagnosed (on sonography) with total placenta previa that had ruptured through the myometrium of the uterus, invading the wall of the urinary bladder. In the 32nd week of gestation the patient underwent an emergency cesarean section due to profuse vaginal bleeding. Due to possible intraoperative massive bleeding during removal of the placenta it was decided to preserve the uterus and placenta temporarily. The patient underwent superselective trans-uterine embolization through the bilateral anterior branches of the hypogastric arteries, using gelfoam cubes and coils. Two days later cesarean hysterectomy was performed, and the placenta was successfully removed from the invaded urinary bladder. The whole procedure went smoothly and the estimated blood loss was only 1300 mL.

Key words: chorionic villi, placenta percreta, total placenta previa, *trans*-uterine embolization, uterine arteries.

Introduction

Total placenta previa percreta occurs when the placenta attaches abnormally to the uterine wall, with penetration of the chorionic villi throughout the entire myometrium. In rare conditions the placenta percreta invades the adjacent urinary bladder and can cause life-threatening hemorrhage during manual removal of the placenta. Currently the exact etiology of placenta previa is unknown. The risk factors include previous cesarean section, multiparity, older maternal age, multiple gestation and erythroblastosis fetalis. In 90% of cases cesarean hysterectomy performed for placenta percreta results in blood loss >3000 mL intraoperatively, requiring blood transfusion. For placentas invading the urinary bladder, blood loss ranged from 7000 mL to 17 000 mL.^{1,2} Without the help of preoperative prophylactic trans-uterine embolization (TUE) or other applicable methods, mortality rates of >15% have been reported in the older literature.^{1,3}

Case report

The patient, a 34-year-old woman (gravida 3, para 2) with two prior cesarean sections, was transferred from a local hospital due to abnormal placentation during a routine sonographic examination at 30 weeks of gestation. Ultrasonography showed that the placenta was extended from the anterior lower segment of uterus to the posterior wall. Thus the internal cervical os was completely covered. Color Doppler ultrasonography⁴ showed the central portion of the placenta with irregular shaped vascular sinuses, disrupting the hyper-echoic interface between the uterus and bladder, protruding to the bladder wall. The placental vessels were detected on the bladder side of the uterine bladder wall interface. Total placenta previa with placenta percreta was suggested (Fig. 1).

The patient was closely monitored until 32 weeks of gestation when two episodes of vaginal bleeding occurred, resulting in blood loss of approximately

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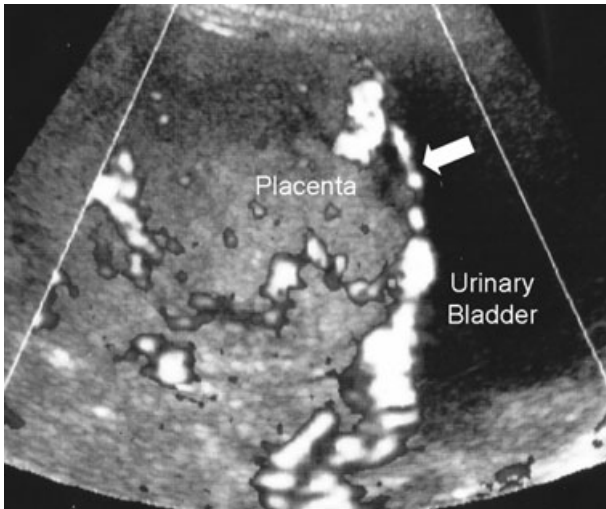


Figure 1 Color Doppler sonography shows dilated and chaotic pattern of vascularization arising from the placenta crossing to the bladder wall, highly suggestive of placental invasion of the bladder.

1000 mL. Cesarean delivery was indicated due to recurrent vaginal bleeding and persistent regular uterine contractions despite tocolytic treatment, but no hematuria was noted.

During classical cesarean section a 2300-kg fetus was delivered with normal activity and gross appearance. Rupture of the placenta was confirmed at a low position, which was firmly clinging to the surface of the urinary bladder. The uterus and placenta were preserved and left *in situ*, and the abdominal wall was closed layer by layer. The total estimated blood loss was 900 mL. In order to prevent the possibility of post-partum hemorrhage, multidisciplinary management was considered. The patient was transferred to the radiological department and underwent emergency angiography. After the patient and her family understood the risk of severe bleeding from the retained placenta, they agreed to accept a treatment protocol to ensure a safe hysterectomy. Digital subtraction angiography was performed to selectively study the bilateral anterior divisions of the hypogastric arteries using 5-Fr catheters (J curve, Terumo). Angiography showed remarkable tortuous and dilated arteries supplying the placenta, which appeared to pulsate regularly (Fig. 2a). Although there was no evidence of active bleeding or focal extravasation of contrast medium, prophylactic selective arterial embolizations were performed to reduce the future cesarean hysterectomy planned 2 days later. Suspension of 2.0-mm³ gelfoam cubes

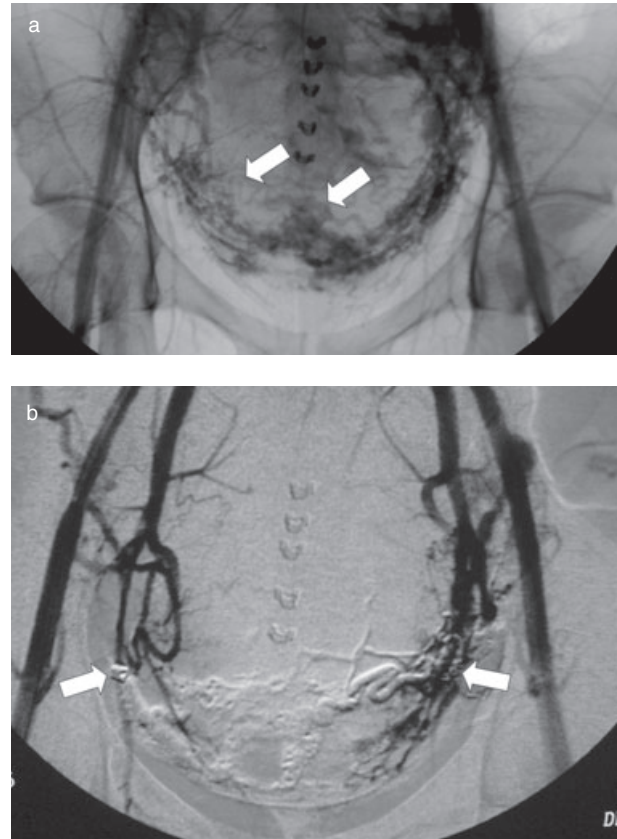


Figure 2 (a) Diagnostic angiography showing marked tortuosity and dilatation of uterine arteries (arrows), which mainly supply the placenta with regular pulsation. (b) Post-embolization digital subtraction angiography showing most of the branches of the uterine arteries supplying the placenta occluded by spring coils (arrows).

(Gelfoam, sterile sponge, Pharmacia & Upjohn) mixed with contrast medium were slowly instilled by super-selective catheterization to the lower branches of the right uterine artery. Even though many gelfoam cubes were instilled with a resulting slowdown of blood flow, there was still persistent pulsation. Five platinum coils (Vortx-35, Boston Scientific) were successively inserted into the inferior branch of the bilateral uterine arteries supplying the placenta. Subsequently a remarkable decrease in arterial flow pulsation was noted. The embolization was stopped after further gelfoam cube suspension was instilled to ensure more complete blockage of blood flow to the most distal placenta. A similar procedure was repeated on the left uterine arteries (Fig. 2b). The total TUE procedure time was approximately 50 min. The patient was transferred to

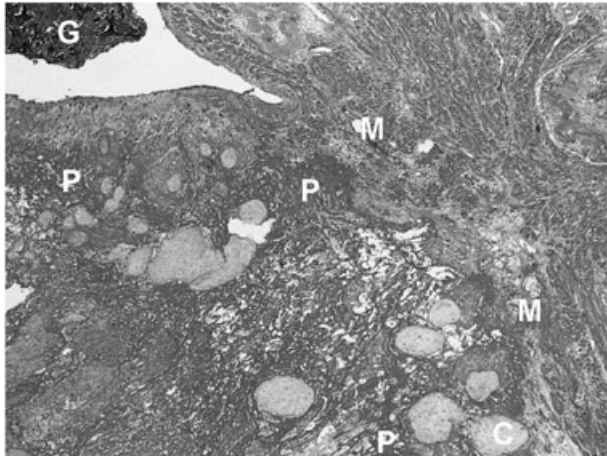


Figure 3 Microscopically, placenta acreta develops through the previous cesarean section site with degenerative chorionic villi directly involving the myometrium. (C, chorionic villi; G, gelfoam cube; M, myometrium; P, placenta).

the operating room shortly after for cesarean hysterectomy. Since the beginning of the TUE only a small amount of vaginal blood (<50 mL) was collected. In order to prevent massive hemorrhage during the possible partial cystectomy, a urologist was standing by to take over from the obstetrician if it was necessary.

During the cesarean hysterectomy the lower segment of the total placenta previa (approximately 5.0 cm × 4.0 cm) protruded directly into the urinary bladder. Remarkable arterial occlusion and initial necrotic change was grossly apparent on the attached side of the protruding placenta; fine and complete dissection of the placenta from the wall of urinary bladder was carefully performed. The whole urinary bladder was preserved but a very small part of the attached placenta remained embedded in the bladder wall.

The placenta also slightly adhered to the left adnexa and was cleanly removed along with the uterus. The total blood loss was 1300 mL. It was determined by measuring the volume of suctioned fresh blood and blood clots, as well as the weight of blood soaked surgical pads and gauzes. There was no further vaginal bleeding after treatment and the patient's vital signs were stable.

Macroscopic and microscopic examination of the specimen showed that placental chorionic villi invaded through the uterine myometrium via the previous cesarean scar (Fig. 3). There were foci of ischemic infarctions and only a scant amount of blood

clotting, due to the distal arterial occlusion created by TUE in the placenta. Similar findings were not noted in the uterus.

Discussion

The diagnosis of placenta previa is usually made on routine ultrasonography in the third trimester. If the placental location is still abnormal at 32–34 weeks, natural resolution by term delivery is uncommon. Cesarean section is usually unavoidable whenever profuse vaginal bleeding occurs. If the placenta invades the urinary bladder or adnexa, bleeding can be profuse and surgery may be at risk due to potentially massive intraoperative blood loss. Before cesarean hysterectomy, ligation of the hypogastric arteries is traditionally performed to reduce pulse pressure to the uterus. The procedure is successful only in <50% of all attempted cases.^{5,6} This percentage is even much lower in the case of placental invasion of the urinary bladder. In the literature some methods such as full-thickness suturing of the placental site of bleeding, perioperative prophylactic transarterial hypogastric artery balloon occlusion, and prophylactic TUE have been applied. Among these, perioperative prophylactic transarterial hypogastric artery balloon occlusion is a temporary and lesser invasive interventional procedure, which can be applied successfully in some cases. However, its advantages are limited by the inaccessibility of small-caliber arteries and inability to tamponade excessive collateral circulation. This method also reports a 7% complication rate, including pelvic infection, ischemic phenomena such as bladder gangrene, post-embolization syndrome, fever and pain from tissue necrosis or vascular thrombosis.⁷ Prophylactic selective embolization of the hypogastric or uterine arteries by gelatin cubes is a temporary occlusive treatment. This short-term effect may last from 10 to 30 days. It rarely results in prolonged ischemia to pelvic organs because of development of collateral circulation from branches of the common iliac arteries.⁸ Normal pregnancies after this procedure are reported.^{9,10} In recent years TUE has been commended due to its low complication rate. Nonetheless, infection is still possible as compared to the non-standard procedure, and post-embolization necrosis or infarct tissue is susceptible to infection. Sepsis must be suspected when fever persists beyond 24–48 h and probably indicates spread of bacteria from the infected uterus to the bloodstream. We suggest that preventive or therapeutic antibiotics should be provided to the patient accordingly. Post-embolization

discomfort, such as diffuse abdominal pain and nausea, can be relieved successfully by i.v. narcotics. According to the authors' experience TUE by gelfoam cubes alone did not completely occlude the blood flow to the postpartum uterus and the retained placenta, as evidenced by heavy pulsatile arterial blood supply and immediate collateral vessel formation. Successive embolizations with gelfoam cubes and spring coils appeared to have better results, although future fertility was lost. Conservation of the uterus with combined treatment of TUE and methotrexate was not proposed in the present case because the patient expressed a firm desire to have no more children and of non-compliance of frequent follow up for the possible side-effects.^{11,12} The technique of endovascular embolization has the advantage over balloon occlusion, promising more distal arterial occlusion. It could also effectively suppress the recanalization of placenta within a short period. We chose this method for the present patient because cesarean total hysterectomy is still the classic and most successful treatment for total placenta previa. Although the patient received treatment at a relatively early gestational age (32nd week) for minor invasion of the urinary bladder, it is undeniable that prophylactic TUE played an important role in preventing potentially catastrophic intraoperative blood loss.

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