

Effectiveness of embolization of the internal iliac or uterine arteries in the treatment of massive obstetrical and gynecological hemorrhages

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Abstract. – OBJECTIVE: This study evaluated the effectiveness of embolization of internal iliac artery or uterine artery in the treatment of massive obstetrical and gynecological hemorrhages, including postpartum hemorrhages.

PATIENTS AND METHODS: A total of 21 patients with massive obstetrical and/or gynecological hemorrhages underwent the modified Seldinger procedure. The catheter was inserted into the femoral artery on one side. Then, internal iliac artery angiography was performed to identify lesions in the areas supplied by internal iliac artery, and the bleeding site. Gelatin sponge particles were injected to embolize the bleeding artery. A second angiography was performed to determine whether embolization was successful.

RESULTS: Clinical success was achieved in 20 patients after a single embolization procedure. Hysterectomy was performed in one woman with pernicious placenta previa due to persistent massive bleeding 24 hours after the removal of uterine packing. In the remaining 20 patients, the uterus was preserved. All 21 patients were cured and discharged.

CONCLUSIONS: Embolization of internal iliac artery or uterine artery is an effective method to treat massive obstetrical and gynecological hemorrhages, including postpartum hemorrhages, and provides a new option to preserve the uterus.

Key Words:

Postpartum hemorrhage, Artery embolization, Uterus preservation.

agent is injected into the vessels of the affected area through a catheter to prevent blood flow to the affected area and thereby stop the bleeding. Since 1996, we have successfully utilized this technique in our hospital to treat massive obstetrical and gynecological hemorrhages, which were refractory to conservative treatments. Here, we provide a summary of our case load.

Patients and Methods

Patients

We analyzed the data of 21 women with massive obstetrical and gynecological hemorrhages who were treated in our department from January 2007 to December 2012. The women's age ranged from 23 to 40 years ([mean $\pm$ SD] 30.2 ± 3.8 years). Fifteen patients were admitted from the Obstetrics Department. Their children were delivered on 29-41 gestational weeks (37 ± 3.2 weeks) by caesarean section ($n = 9$) or vaginal birth ($n = 6$). Six patients were from the Gynecology Department: five of them had caesarean scar pregnancy and one underwent termination of mid-trimester pregnancy. The bleeding occurred within 24 hours after the labor in 16 patients and after 10 days in 1 patient. The causes of bleeding included placenta-related factors ($n = 9$), uterine atony ($n = 5$), soft birth canal laceration and hematoma ($n = 1$), and uterine artery pseudoaneurysm after caesarean section ($n = 1$). After bleeding, therapeutic measures included the use of uterine contraction agent, uterus massage, and oppression and suturing of the bleeding site. Intrauterine packing with gauze was applied in women who had received caesarean section after which the bleeding did not stop. Blood loss was defined as the amount of blood lost between the delivery of the placenta and interventional surgery, and ranged from 1000 to 1500 ml in 5

Introduction

It is estimated that about 3% to 5% of women develop postpartum hemorrhages¹; this severe perinatal complication is the leading cause of perinatal deaths². Since the first introduction³, transcatheter arterial embolization quickly became standard interventional treatment for postpartum hemorrhages. In this procedure, embolic

patients and 1500-3000 ml in 14 patients, and was 3500 ml in one and 5000 ml in another patient. Eleven patients developed hemorrhagic shock; this was accompanied by disseminated intravascular coagulation in 5 patients.

Therapeutic Measures

After active anti-shock treatment and correction of coagulation disorders, patients were placed in a supine position and placed under ECG monitoring. Disinfection and draping of the right inguinal area was performed as per standard procedures. After local anesthesia with lidocaine, a femoral artery puncture was performed using Seldinger procedure with the goal to place the 5-6 F catheter sheath, through which uterus catheter was inserted. Angioplasty of right iliac and uterus arteries was performed under the guidance of digital subtraction angiography using a non-ionic contrast medium (Omnipaque). After bleeding sites were identified, embolization of either internal iliac artery or uterine artery was conducted. Embolization site was defined based on the patients' specific conditions. For embolization, medium-acting gelatin sponge particles (2 × 2 mm) were used to embolize bleeding arteries. The success was confirmed by digital subtraction angiography. Using the same method, either internal iliac artery or uterine artery on the opposite side was also embolized. After withdrawal of the catheter, compression bandaging was applied for 24 hours followed by bag compression for 6 hours. After the surgery, antibiotics were routinely applied to prevent infection.

Results

Angiographic Findings

On the angiography, intrapelvic spillage or accumulation of the contrast medium was seen in all 21 patients. Uterine arteries were thicker and more twisted than normally, and anomalous vascular courses were present.

Effectiveness of Embolization

Embolization was completed within 40-65 min in all 21 patients. After the surgery, vaginal bleeding was substantially decreased, and rise in blood pressure was observed in patients in shock. Hysterectomy was urgently performed in one woman with pernicious placenta previa because of recurrent massive bleeding that occurred 24 hours after the removal of uterine packing. In this

patient, postoperative pathology confirmed the presence of placenta implantation. A second embolization was performed in one patient with Caesarean scar pregnancy who developed bleeding 23 days after the surgery. The bleeding was successfully stopped, and pathology indicated the presence of hydatidiform mole at the site of the Caesarean section scar. After embolization, the bleeding was cured in all patients. As stated above, hysterectomy had to be carried out in only one woman.

The follow-up lasted for 3 months to 5 years. During the follow-up, utera regained normal function in 20 women, with no abnormal vaginal bleedings observed. Normal changes in menstruation occurred gradually over time.

Complications

Fifteen of 21 patients did not observe any discomfort after the surgery. Six patients experienced mild hip pain, which spontaneously resolved without treatment within three days after the procedure. Two patients had varying degrees of hip pain, which disappeared 7 days after symptomatic treatment. Four patients experienced fever of < 38.5°C. No severe complication occurred.

Discussion

The main causes of postpartum hemorrhage include uterine atony after childbirth, placenta adhesion, soft birth canal laceration, and coagulation dysfunction. The hemorrhage can be treated by uterus massage, oxytocin, curettage, suturing of the birth canal laceration, correction of the coagulation dysfunction, blood transfusion, rehydration, and other methods. If the above measures are unsuccessful, an intrauterine gauze packing can be applied. If massive hemorrhaging persists, ligation of the ascending branch of uterine artery or internal iliac artery, and/or hysterectomy may be applied. More specifically, ligation of the ascending branch of uterine artery is applicable in women with bleeding due to poor uterus contraction. However, is not usable in hemorrhages caused by placenta praevia or low-lying lower uterine segment¹. The relapse rate can be high after ligation of the internal iliac artery due to a rapid establishment of collateral circulation. The operation is difficult to perform and is often associated with high risk and large trauma. Therefore, ligation of the internal iliac artery is

rarely applied³. Hysterectomy is the most effective method to stop postpartum hemorrhages. However, the uterus, besides the reproductive, also has an endocrine function. Further, about half of the blood supply of the ovary is provided through the ovarian branch of the uterine artery. The removal of the uterus inevitably affects the ovarian endocrine function, with negative consequences for women's physical and mental health⁴. Therefore, hysterectomy is not considered a treatment of choice. In patients with refractory obstetrical and gynecological massive hemorrhages, bleedings that persist after conservative therapy can be life-threatening.

Patients with postpartum hemorrhages can be examined using digital subtraction angiography, and arterial embolization can be utilized if residues of placenta and uterine subinvolution are excluded. This interventional technique provides the following advantages for the treatment of postpartum hemorrhages: a) it can accurately and rapidly stop bleeding; b) it can preserve the reproductive function of the patient; c) it causes only small trauma and little loss of blood; and d) only local anesthesia is required. As this technique helps to avoid hysterectomy, it should be the treatment of choice in qualified hospitals. The internal iliac artery has rich collateral circulation and arterial anastomoses. Along with embolization of the main trunk of internal iliac artery or uterine artery, only small arteries and arterioles are embolized, while the capillary bed is not affected. Therefore, pelvic organs (e.g., uterus and bladder) will receive sufficient blood supplies via the communication arteries and will not become necrotic⁵. Fresh gelatin sponge particles are resorbable medium-acting embolic agents, which can be absorbed by vessels for 2-3 weeks after the embolization, achieving vessel recanalization. In addition, gelatin sponge particles only embolize peripheral arteries, and do not embolize precapillary arteries or capillary bed. This ensures the patency of the collateral circulation of the plane of the capillaries/arterioles, making sure that the uterus receives some blood supply. Therefore, this technique does not cause necrosis of pelvic organs or affect blood supply of uterus and bladder, and does not cause endocrine dis-

ruption or reproductive impairment⁶. The procedure requires only small incisions, is quick and, therefore, less painful. By preserving patient's uterus, quality of life is improved, and secondary mental or physical injury prevented.

In recent years, "minimally invasive" procedures became an increasingly popular concept in surgery. These novel interventional procedures are characterized by smaller trauma, less pain, lower risk, faster recovery, higher effectiveness, preservation of fertility, and thus achieve better effectiveness.

Conclusions

The incidence of postpartum hemorrhages is gradually increasing in parallel with the increase in the number of Caesarean sections. Thus, a more frequent use of these minimally invasive interventional procedures is to be expected.

Conflict of Interest

The Authors declare that there are no conflicts of interest.

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