CEOG Clinical and Experimental Obstetrics & Gynecology

Preliminary experience in uterine artery embolization for second trimester pregnancy induced labor with complete placenta previa, placenta implantation, and pernicious placenta previa

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Summary

Objective: To explore the application of uterine artery embolization (UAE) in complete placenta previa, placenta implantation, and pernicious placenta previa during second trimester pregnancy induced labor. *Materials and Methods:* From April 2013 to April 2014, the present hospital admitted 12 cases of second-trimester complete placenta previa, placenta implantation, and pernicious placenta previa. Six of 12 cases at first were given UAE before cesarean section or labor induction. The other six cases, which were introduced into the present hospital after a failed embolization, underwent UAE, followed by hysteroscopy or curettage or laparotomy. *Result:* None of the 12 patients underwent hysterectomy. The average blood loss of six patients with UAE was 383 ml and the average hospitalization was 8.66 days. While the remaining six patients without embolization in advance experienced 1,533 ml mean blood loss and 18 days in average stay. Among 12 patients, seven reported abdominal pain following embolization, four had a fever, and two had nausea and vomiting. Nine patients were followed-up and the menstrual cycles of seven returned to normal in one+ month, one in two+ months, and one suffered amenorrhea. Among the same nine patients, six menstruated regularly, two had menstrual disorders, and one had amenorrhea. No serious short- and long-term complications were observed. *Conclusion:* UAE is the safe method to avoid serious bleeding due to complete placenta previa, placenta implantation, and pernicious placenta previa with second-trimester pregnancy termination.

Key words: Uterine artery embolization (UAE); Complete placenta previa; Placenta implantation; Pernicious placenta previa; Second trimester pregnancy induced labor.

Introduction

Placenta previa is a leading cause of obstetric hemorrhage. It affects approximately 5-7% of mid-pregnancy [1-2]. Mid-pregnancy with placenta previa requires termination and due to pathological factors is prone to postpartum hemorrhage (PPH). As a result, cesarean section is a common choice in many medical centers to terminate pregnancy in second-trimester complete placenta previa [3]. Placenta previa is itself a risk factor of placenta implantation, which more likely leads to PPH and induction failure [4].

One goal of obstetricians is to reduce the incidence of PPH by non-surgical methods. Uterine artery embolization (UAE) has been applied in the clinic for more than 20 years. It is minimally invasive, obviously therapeutic, and easily accepted by patients. Undoubtedly, it appears as a new treatment for the patients with placenta previa and placenta implantation to terminate pregnancy.

This study gathered all the mid-trimester pregnancy with placenta previa and placenta implantation between April 2013 and April 2014 in the present hospital, aiming to analyze and evaluate the clinical efficacy, side effects, and late complications related to UAE.

Materials and Methods

First clinical data:12 cases of second-trimester complete placenta previa, placenta implantation, and pernicious placenta previa were enrolled in this hospital, between April 2013 and April 2014. Considering these pregnant women, the mean age was 30.2 years, average weight was 57.42 kg, and average gestational age was 20.67 weeks. Only one case was in first pregnancy, while the remaining had multiple miscarriages and repeated cesarean section. Among the 12 cases, three were complete placenta previa only, five were placenta implantation only, and two were both. Meanwhile, one in 12 patients was pernicious placenta previa and one was pernicious placenta previa with placenta implantation.

Diagnostic criteria included: 1) complete placenta previa: B ultrasonic showing cervix completely covered; 2) placenta implantation: three characteristics of ultrasound as follows: i) placental thickening; ii) placental lacunae appeared; iii) myometrium of lower uterine segment was thin in the area of low-lying gestational sacs. Visualization of lacunae, especially was of most diagnostic significance. Meanwhile, more than two characteristics included, combined with ultrasound images after induced labor could increase the positive predictive value [5]; 3) pernicious placenta previa: a history of cesarean section, pregnancy in which the placenta was abnormally attached to the uterine scar [6].

Treatment methods

Embolization: the femoral artery, accessed by a needle puncture under a Roberts guiding catheter was then used and placed

Revised manuscript accepted for publication August 4, 2015

into the uterine artery under X-ray guidance via the puncture site. Once at the level of the uterine artery, a super selective angiogram was performed to confirm placement of the catheter, followed by perfusion of 30-40 mg methotrexate (MTX) through the catheter and UAE with gelatin sponge particles, approximately 500-1000 microns in diameter, which would preferentially block blood flow to the vascular uterine fibroids. This was performed bilaterally from the initial puncture site.

One of 12 patients, due to heavy bleeding, had applied one abdominal aorta balloon block and one case achieved embolization to terminals of many internal Iliac arteries branches. Six of 12 patients at first underwent UAE before caesarean section or labor induction (three cases had induced labor successfully, the other three had induced labor failure and underwent subsequent cesarean delivery). Five cases, which were admitted to this hospital after a failed induced labor, underwent UAE, followed by hysteroscopy or curettage or laparotomy; one case had uterine arteriovenous fistula after the failed induced labor in another institution and the embolization was performed again associated with abdominal aorta balloon block, following hysteroscopic treatment.

Data analysis

The clinical curative effect, blood loss, hospital stay, and menstrual recovery of patients, as well as adverse effects and late complications of embolization were statistically assessed.

Results

Uterine artery angiography

The authors identified 12 patients undergoing second-trimester termination of pregnancy. Of these, three had complete placenta previa only, five had placenta implantation only, and two had both. Meanwhile, one of 12 patients had pernicious placenta previa and one had pernicious placenta previa with placenta implantation. Table 1 lists the patient characteristics and their associated symptoms .

Nine cases showed bilateral uterine arteries that were markedly dilated and tortuous and obvious staining were also observed (Figure 1). One case appeared with many branches that were contributors to the blood supply (Figure 2). One case displayed the abdominal aorta balloon block that undoubtedly contributed to reduce bleeding (Figure 3).

Table 1. — *Patient characteristics and associated symptoms.*

Case	Age	G	P	GA (weeks)	Complete placenta previa	Placenta implantation	Pernicious placenta previa
1	24	3	0	15+2	–	+	–
2	23	2	0	After induced labor	–	+	–
3	36	5	1	19+4	+	+	–
4	25	4	0	After induced labor	–	+	–
5	29	1	0	24	+	–	–
6	36	5	2	18+3	–	+	+
7	39	4	2	17+1	–	–	+
8	38	6	2	20	+	–	–
9	38	4	2	27+5	+	+	–
10	25	4	4	After induced labor	–	+	–
11	23	2	0	After induced labor	–	+	–
12	27	2	1	18+4	+	–	–

Clinical follow-up

None of the 12 patients underwent hysterectomy; the average blood loss of six patients with UAE was 383 ml and the average hospitalization was 8.66 days.While the remaining six patients without embolization in advance had 1,533 ml mean blood loss and 18 days in average stay.

Figure 1. — Superselective uterine artery angiogram shows enlarged and tortuous vessels.

Figure 2. — One case with pernicious placenta previa demonstrates filling of branches of uterine artery because of heavy bleeding and hypervascularity in the uterine bed.

Figure 3. — Abdominal aorta balloon block in the operation of one case with placenta implantation.

Adverse effects and complications

Among 12 cases, seven patients reported abdominal pain following embolization, four cases had a fever, and two cases had nausea and vomiting. Nine patients were followed-up and the menstrual cycles of seven returned to normal in one+ months, one in two+ months, and one case suffered from amenorrhea. No serious short- and long-term complications were observed.

Discussion

Despite the advances in medicine and surgery, second trimester pregnancy induced labor with placenta previa continues to be a leading cause of PPH and induction failure [3-4]. Therefore, subsequent improvements to reduce PPH and increase induction success are considered of vital significance.

Regarding complete placenta previa or partial placenta previa, induced abortion by rivanol or mifepristone combined misoprostol [7] or gemeprost [8] remains the most frequently used option for termination pregnancy. Risks of heavy bleeding and amniotic fluid embolism, however, arise by this method. Furthermore, avoiding pregnancy in two years is unacceptable for those who are childless. Follow this assumption, non-surgical treatment should be seriously taken into consideration.

Since its introduction as a treatment for PPH in 1979, UAE has been shown to be associated with high technical success rates and good clinical outcomes for the treatment of primary and secondary PPH. In recent years, UAE has been widely used in endometriomas, complete placenta previa, placenta implantation, scar pregnancy, and so on [9].

Current studies in the literature focus on the treatment of UAE for late pregnancy with placental abnormality and PPH, but there is lack of application and research on second trimester pregnancy induced labor with placental abnormality. This study analyzed and reviewed those patients, with the intention to assist in developing new therapeutic approaches.

The present authors treated all 12 cases enrolled between April 2013 and April 2014, with second trimester complete placenta previa, placenta implantation, and pernicious placenta previa by UAE. None of the 12 patients underwent hysterectomy and the average blood loss of six patients with UAE was 383 ml and the average hospitalization was 8.66 days. These results demonstrated that UAE performed in advance could reduce bleeding and hospital stay, also for patients with complete placenta previa and placenta implantation. Although there are higher expenses with UAE, total cost has not increased due to reduced blood transfusion and hospital stay.

Adverse effects that have been reported include abdominal pain, infection, fever, vomiting and so on, and the recent complications are mainly deep vein thrombosis and pulmonary embolism. Long-term complications mainly involve bladder vagina fistula, endometrial atrophy, and amenorrhea. Toor *et al.* treated 54 patients that underwent UAE due to different reasons and there were no reported deaths, as well as a low rate of major complications [10]. Among 12 cases in the present research, seven patients reported abdominal pain following embolization, four had a fever, and two had nausea and vomiting. Meanwhile, late follow-up of nine cases revealed that the menstrual cycles of seven returned to normal in one+ months, one in two+ months, and one case suffered from amenorrhea. The present results were consistent with most researches, supporting that UAE is an alternative to hysterectomy, which is safe and effective.

In terms of the impact of UAE on menstruation and fertility, Woźniakowska *et al.* believed that embolization might cause amenorrhea and higher FSH level, leading to premature birth, which is more likely to occur in women over the age of 45 [11]. Embolization, hence, is considered to be more suited to the patients without fertility requirements, refusing surgery or desirous of maintaining their uterus. However, Hardeman *et al.* had also prompted that UAE did not alter subsequent fertility [12]. Nine patients in the present study underwent follow-up after UAE and menstrual recovery has been mentioned above. However, no sufficient data and complete reassurance can be provided for the relation between potential risks of UAE and subsequent fertility, which deserves to be explored by further studies with higher statistical power.

Pernicious placenta previa refers to a placenta that overlies uterine scar after previous cesarean section. It is often associated with unfavorable outcomes, such as placenta accreta, unmanageable severe hemorrhage, whose mortality could reach 10%. To circumvent this situation, a few preventive simple surgical options have been discussed, such as the application of ascending uterine artery suture, placenta accrete location, and wedge resection [13]. In recent years, many scholars devoted themselves to new treatments exploration avoiding losing fertility and normal menstruation for the women of reproductive age. Two cases with pernicious placenta previa in this present study underwent UAE in advance, followed by cesarean section and both patients achieved satisfactory results.Therefore, UAE appears to have an overall patient satisfaction rate and can be a potential therapeutic tool for pernicious placenta previa.

Overall, the present authors have not identified more findings to better explain UAE technique due to the limitations of case numbers and research time. The results of this study are nevertheless extremely encouraging, and are generally concordant with the findings by former researches discussed above. This wealth of evidence indicates the potential implementation of UAE in complete placenta previa, placenta implantation, and in pernicious placenta previa during second trimester pregnancy induced labor. It is assuring that blood product requirements after UAE are low and the sur-

gical risks and absolute loss of fertility associated with hysterectomy were avoided. UAE undoubtedly represents a promising new method of treating such kinds of cases.

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