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ORIGINAL ARTICLE

Transcatheter arterial embolization as first-line rescue in intractable primary postpartum hemorrhage: Assessment, outcome, and subsequent fertility

Hsin-Hsin Cheng [a], Leo Leung-Chit Tsang [b], Te-Yao Hsu [a], Chia-Te Kung [c], Chia-Yu Ou [a], Ching-Di Chang [b], Ching-Chang Tsai [a], Yu-Fan Cheng [b,*], Fu-Tsai Kung [a,*]

[a] *Department of Obstetrics and Gynecology, Kaohsiung Chang Gung Memorial Hospital and Chang Gung University College of Medicine, Kaohsiung, Taiwan*
[b] *Department of Diagnostic Radiology, Kaohsiung Chang Gung Memorial Hospital and Chang Gung University College of Medicine, Kaohsiung, Taiwan*
[c] *Department of Emergency Medicine, Kaohsiung Chang Gung Memorial Hospital and Chang Gung University College of Medicine, Kaohsiung, Taiwan*

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KEYWORDS
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Background/purpose: To assess the risk factors for intractable and controllable postpartum hemorrhage (PPH) and to evaluate the safety, efficacy, and outcome of transcatheter arterial embolization (TAE).
Methods: An emergency PPH rescue system including the 24-hour-available TAE was established in 2004. TAE with gelatine sponge particles placed on bilateral uterine or internal iliac arteries served as the first-line treatment for intractable PPH. Delivery methods, parity, causes of bleeding, clinical vital signs, coagulopathy, success rate, resumption of menstruation, and subsequent pregnancy outcome after TAE were recorded.
Results: From the years 2005 to 2013, 301 women experienced PPH, of whom 178 had controllable PPH and 123 intractable PPH. Tachycardia and disseminated intravascular coagulation were significant risk factors for intractable PPH. All of the women with intractable PPH underwent TAE, and 89 (72.3%) were transferred by ground transport to receive treatment in this system. The mean travel distance was 15 km ± 12.5 km. The mean time of order to angiography room was 24.9 minutes ± 14.2 minutes. The mean blood loss before TAE was 2247 mL ± 1482 mL (range, 900–11,110 mL). The first TAE successfully controlled bleeding

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* Corresponding authors. Department of Diagnostic Radiology, Kaohsiung Chang Gung Memorial Hospital, 123, Ta-Pei Road, Niao Sung District, Kaohsiung, 833, Taiwan (Y.-F. Cheng); Department of Obstetrics and Gynecology, Kaohsiung Chang Gung Memorial Hospital, 123, Ta-Pei Road, Niao Sung District, Kaohsiung, 833, Taiwan (F.-T. Kung).
E-mail addresses: cheng.yufan@msa.hinet.net (Y.-F. Cheng), ftkung@cgmh.org.tw (F.-T. Kung).

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in 118 of the 123 (95.9%) women with intractable PPH. Of the 70 women with complete follow-up, 69 (98.6%) recovered menstruation. Twenty-three women tried to get pregnant and 19 (82.6%) of them succeeded, giving birth to 12 full-term live infants.
Conclusion: TAE was safe and effective in treating intractable primary PPH with a high success rate and preservation of menstruation and fertility.

Introduction

Maternal morbidity and mortality have declined in recent years due to advances in medicine and medical techniques.[1] However, obstetric hemorrhage remains one of the top three causes of death among women.[2] Postpartum hemorrhage (PPH) is a serious complication, accounting for 25% of pregnancy-related deaths.[3] PPH occurs after about 4% of vaginal deliveries and 6% of caesarean deliveries.[3] PPH is usually unpredictable, with the progression of bleeding being fast, urgent, and life-threatening. The most frequent cause of PPH is uterine atony.[4] Several methods are available to manage PPH including the administration of uterotonic medications such as oxytocin, misoprostol, prostaglandin F2α, and ergot alkaloids. If medical treatment fails, further aggressive interventions should be applied. Interventions include balloon tamponade of the uterine cavity, uterine artery embolization, uterine compression sutures (B-Lynch technique), clamping of the uterine vessels, ligation of the internal iliac arteries, and hysterectomy.[3]

Most of these aggressive interventions require an experienced obstetrician and general anaesthesia. Loss of fertility is a big regret for patients who undergo life-saving hysterectomy to control intractable PPH. In Taiwan, the service of delivering babies is open to all gynecologists and obstetricians. They can choose to offer this service in their own clinics, which are composed of only gynecologists, obstetricians, and rotating anesthesiologists. Due to the scale of the settings, they always lack sound back-up teams, medication, and blood products. Encountering intractable PPH can be a disaster for them.

Transcatheter arterial embolization (TAE) was first used to treat uncontrollable PPH in 1979 and is recommended as a technique prior to surgery due to its efficacy and safety.[5] TAE can be performed quickly, with only local anesthesia, to control obstetrical hemorrhages.[6,7] It can reduce the pressure for the doctors treating congestion uterus and overwhelming bleeding. However, TAE is not considered routine and tends to serve as a second-line treatment to control intractable bleeding. For this reason, a large case series to prove the benefit and outcome of TAE for PPH does not exist. To improve the outcome of women suffering from intractable PPH, we tried to set up the idea of making TAE a first-line rescue approach.

The aim of this study was to assess the risk factors for intractable and controllable PPH and to evaluate the efficacy outcomes and subsequent fertility after TAE treatment in women with intractable PPH.

Patients and methods

In 2004, an emergency 24-hour transfer system including specialists in emergency medicine, obstetrics and gynecology, and radiology was established in southern Taiwan at a tertiary medical center. The TAE team including two doctors, one technician, and one nurse was asked to be on-call after routine work and to be ready to perform TAE within 30 minutes. An official announcement was sent encouraging all member practitioners with delivery services to transfer emergency patients. The geographical area included about 7 million people and 850–950 obstetrician/gynecologists. Primary PPH was defined as PPH within the first 24 hours after delivery. Patients with amniotic fluid embolism ($n = 10$), hemolysis, elevated liver enzymes, and low platelet count ($n = 5$), or acute fatty liver ($n = 2$) were excluded by retrospective review of individual prenatal history and clinical course. Embolization was still performed if necessary. The study was approved by the Institutional Review Board of the hospital. Informed consent of this invasive procedure was signed before TAE.

Initial management

On receiving a call, the on-duty obstetrician evaluated the patient by taking a history and then informed the radiologists to stand by if intractable PPH was favored. Patients difficult to evaluate over the phone were evaluated on arrival using a set protocol (Fig. 1) rather than rushing the patients to TAE. The same protocol was used to evaluate women already in our hospital suspected of having PPH. Upon arrival at the hospital, they would be treated as first priority. Emergency medical staff stablized the vital signs, while obstetricians palpated the uterus to check for contractions, examined the pelvis, evaluated the vaginal canal, and massaged the uterus. Abdominal ultrasonography was performed to rule out any retained placental tissue. Oxytocin was infused intravenously, followed by methylergonovine in patients with no history of hypertension and a misoprostol suppository was inserted into the patient's rectum. Controllable PPH was defined as reduced bleeding at this stage. Blood products, including whole blood, packed red blood cells, fresh frozen plasma, platelets, or cryoprecipitate were administered based on vital signs, estimated blood loss, and laboratory data.

Advanced management with TAE

Intractable PPH was defined as bleeding that persisted after failure of the above conservative methods. TAE was

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