

Efficacy of computed tomography for the diagnosis of postpartum hemorrhage

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Summary

The authors evaluated the diagnosis of the cause of post-partum haemorrhage (PPH) by computed tomography (CT). They retrospectively transferred 15 patients with PPH from local clinics between January 2010 and December 2011. CT revealed diverse causes. Only two cases had no additional finding on CT. They found deep tearing extending to the lower uterine segment and uterine artery in two cases, whereas five cases were an arteriovenous malformation, and one case was a uterine pseudoaneurysm.

Key words: Postpartum hemorrhage; Computed tomography; X-ray computed.

Introduction

The incidence of maternal mortality due to postpartum hemorrhage (PPH) varies among countries. In developing countries, the incidence of maternal mortality is approximately one in 1,000 deliveries, whereas the incidence in developed countries is only about one in 100,000 deliveries [1]. This large difference in maternal mortality is attributed primarily to country-specific differences. Recommended procedures for managing PPH are well documented, including uterine artery embolization (UAE) and other methods, but no method for the diagnosis of PPH has been developed for obstetricians. The cause of PPH may be uterine atony, retained placenta tissue, genital tract trauma, or a coagulation defect [2]. However, except for a uterine rupture, the recommended method for diagnosis consists only of pelvic examination and inspection. Computed tomography (CT) is useful for diagnosing the bleeding focus, such as lower intestinal bleeding. The present authors evaluated PPH in patients transferred from local clinics and assessed the efficacy of CT for diagnosing PPH. CT is an assisting method to help with the diagnosis of obscure cases in PPH, particularly in patients who are not well known regarding course of labour and delivery as causes of PPH, transferred from local clinic to tertiary referral center obstetricians.

Materials and Methods

A retrospective medical records review was performed for patients diagnosed with PPH between January 2010 and December 2011. Data regarding the patients' major complaints, clinical and laboratory findings, and comorbidity were collected and analysed.

Fifteen patients with PPH had undergone CT in the emergency room, which signed an informed consent form. All 15 patients were referred from local private clinics to the present hospital, which is a tertiary referral center for such private clinics. Fifteen patients were vital signs were stable during performed CT.

Results

All referrals were based on PPH (ten PPH cases and five vulvovagina hematomas cases). The primary local clinics did not record the cause of PPH in the transfer notes. PPH was defined as ≥ 500 ml blood loss. The authors divided these cases into immediate (primary) PPH (occurring within 24 hours after delivery) and delayed (secondary) PPH (occurring between 24 hours after delivery and the sixth week of puerperium). Nine cases were immediate PPH and six cases were delayed PPH. The age of the mothers was 27~40 (median, 32) years. Gravity and parity both ranged from one to four (median, 1.6). Two patients had been performed repeat cesarean sections. No other medical illness was described. One patient had a history of ectopic pregnancy operation. All 15 cases were singleton gestations. Total transfusions of packed red blood cells and fresh-frozen plasma ranged from 2~15 and 0~6 (median, 7.4 and 2.9) pints, respectively. CT provided various diagnoses for PPH. Only two cases had no other specific finding on CT, indicating uterine atony. One case of uterine atony was improved by sulprostone and transfusions, and the other patient with uterine atony underwent a postpartum hysterectomy. In two cases, CT revealed deep tearing extending to the lower uterine segment and uterine artery, as well as the disappearance of one part of the isthmus por-

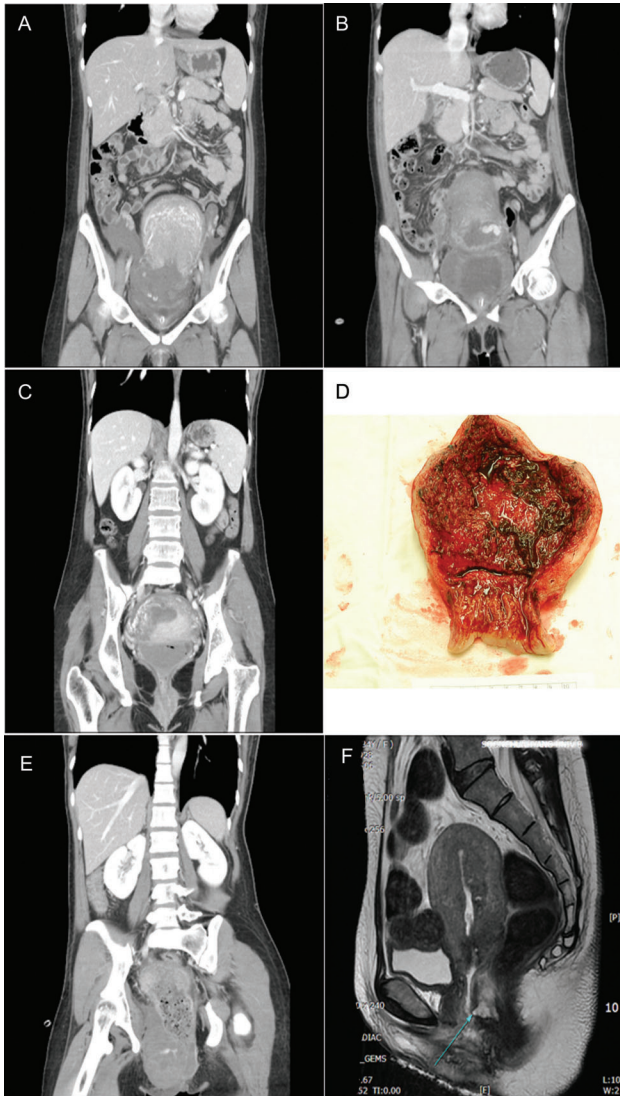


Figure 1. — (A) The right anterior portion of the uterine cervix is disrupted and a hemoperitoneum is found. (B) Active contrast leakage into the endometrial cavity outside the uterus indicates uterine arteriovenous malformations. (C) Computed tomography scan showing an oval pseudoaneurysm with a large active bleeding focus vessel and hematoma. (D) Large tortuous vessels and an oval defect are observed in the uterus. Uterine artery embolisation was performed in one patient with an active bleeding focus in a vulvovagina hematoma. (E) The right perineum has heterogeneous high density, with active dye extravasation from the vessel. (F) Vaginal laceration in the 5' direction with a loculated hematoma abutting the left levator ani muscle.

tion of the uterus and hemoperitoneum (Figure 1A). These two patients underwent a postpartum hysterectomy. A broad ligament hematoma from the uterine artery and a hemoperitoneum were found during the operation. If the authors had not verified this by CT, they might have presumed only a simple deep cervical laceration, but the uterus had almost

ruptured from the cervix to the lower uterine segment intraperitoneum. Five cases were uterine arteriovenous malformations (UAVMs; Figure 1B), and six cases were delayed PPH (occurring from two days to one month after delivery). Two patients were misdiagnosed with a retained placenta in local clinics; thus, dilation and curettage were performed. Four patients underwent UAE, and one patient underwent a subtotal hysterectomy because the radiologist could not perform a UAE. In one case, CT revealed an oval pseudoaneurysm with a large active bleeding focus vessel (Figure 1C); thus, this patient underwent a postpartum hysterectomy. She had developed PPH five years previously, at her first delivery, and received transfusions. Large tortuous vessels were present in the uterus (Figure 1D). Five patients were transferred for vulvar hematomas, but CT findings revealed two retroperitoneal hematomas, one hematoma, and two actively bleeding vessels. The authors packed the vaginas of four patients with gauze for 24 hours. UAE was conducted in one patient who had an active bleeding focus in the vulva (Figure 1E). They re-evaluated this case with magnetic resonance imaging (MRI), which revealed a hematoma extending to the levator ani muscle (Figure 1F). One day after gauze packing, antibiotics were administered daily to all patients, with no other intervention. All 15 patients were followed-up one week and one month after admission, and no other complication was found. The study was approved by the Institutional Review Board of Soonchunhyang University Bucheon Hospital. (SCHBC-IRB 2012-20)

Discussion

The patient's transfer notes revealed only that the cases were PPH and vulvovagina hematomas; thus, the authors could not evaluate accurately the cases from the time of arrival in the emergency room. They conducted CT, which yielded diverse diagnoses. CT provided the information required to conduct an emergency operation, UAE, or conservative management. They found three interesting new findings based on the CT scans. First, CT images are important to inform the physician about the characteristics and extent of the hematoma or bleeding focus. Second, delayed PPH could be a UAVMs or pseudoaneurysm, so a careful evaluation is recommended to determine the cause. Postpartum endometrium curettage should not be performed first, as the curettage could aggravate the bleeding. Two patients in this sample were misdiagnosed with a retained placenta at local clinics. Third, obstetricians should conduct a pelvic examination and fundal compression of the uterus after a vaginal delivery. The authors found a simple cervical laceration in one case, but CT revealed deep tearing extending to the lower uterine segment and uterine artery. A vulvovagina hematoma or deep cervical laceration or uterovaginal tearing is not a simple vaginal or cervical laceration. They recommend that these findings be called a

uterine rupture. Cases of deep vaginal and cervical laceration should not be examined digitally, but by adequate exposure and visual inspection with right-angled vaginal retractors [2]. Obstetricians cannot identify the exact focus of bleeding from deep vaginal and cervical lacerations by visual inspection alone. Thus, the present authors recommend designating these deep lacerations as uterine ruptures and conducting a CT scan first to help determine the best management option. The pathological anatomy of a uterine rupture most often involves the lower uterine segment, with lacerations extending upwards into the body of the uterus and downwards through the cervix into the vagina [2]. Thus, the present authors recommend that deep cervical and vaginal lacerations or tearing be called a uterine rupture. PPH is a most important topic for obstetricians. Delayed PPH, which occurs more than 24 hours after delivery, is related mainly to retained placental or infectious products [3]. However, the present cases were all UAVMs, with the exception of one uterine pseudoaneurysm. The local private clinic aggravated the PPH by performing a postpartum endometrial curettage and misdiagnosing the patient with retained placental products. The present authors have published the presenting features of UAVMs, but local private clinics may misdiagnose UAVMs as an incomplete abortion or dysfunctional uterine bleeding [4]. Imaging to monitor obstetric complications has focused on endometritis and retained products of conception [5]. Ultrasonography has been used to assist in diagnosis, but no imaging finding specific to PPH has been reported [6]. CT images can show active bleeding by intravenous contrast extravasation [7]. Thus, CT is recommended for alternative genital hematoma diagnoses such as the present [7]. A vulvovagina hematoma is not simple hematoma and should be classified as vulvar, vulvovaginal, paravaginal or supravaginal. [7] A large vulvovagina hematoma extends into the paravesical, pararectal, or presacral spaces [7]. CT and MRI are keys in recognising the spread of a hematoma [7]. Uterine cervix lacerations may lead to inferior pudendal, vaginal, or uterine vessel injuries [7]. These findings indicate that patients with uncontrolled increasing vulvovagina hematoma and deep cervical lacerations should undergo a CT to determine the active bleeding focus. CT angiography findings have shown 93% accuracy for identifying the cause of lower intestinal bleeding [8]. CT is useful for detecting or localising an active PPH before angiography [7]. This procedure does not provide a CT-based diagnosis, but

is an alternative to angiography for detecting PPH before UAE [7].

In conclusion, the present data are derived from a simple case series; a randomized controlled trial is necessary to confirm the efficacy of CT for aiding in the diagnosis of PPH. CT can assist in making the diagnosis where it is obscure. Certainly it might be difficult to perform CT in a patient with massive postpartum hemorrhage on to the floor with unstable vital signs. Therefore, the authors have not recommended the serious cases.

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