ORIGINAL ARTICLE

Emergency postpartum hysterectomy: incidence, trends, indications, and complications

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Aim: The aim of this study was to investigate the incidence of, indications for, and risk factors associated with emergency postpartum hysterectomy.
Methods: Thirteen cases of emergency postpartum hysterectomy performed at Hachioji Medical Center of Tokyo Medical University (HMC) between January 1998 and February 2012 were evaluated retrospectively.
Results: Emergency postpartum hysterectomy was performed in 13 of 42,119 deliveries (0.31 per 1,000 deliveries). Uterine rupture was the most frequent indication (38.5%). Disseminated intravascular coagulopathy was the most frequent pre- and postoperative complication. It was evident that the incidence of emergency postpartum hysterectomy decreased upon introduction of active recombinant factor VII and uterine artery embolism in HMC (to 0.15 per 1,000 deliveries).
Conclusion: Emergency postpartum hysterectomy remains an effective procedure for managing postpartum hemorrhage. However, our findings suggest that new procedures can contribute to reducing the need for emergency postpartum hysterectomy.

Introduction

Massive postpartum hemorrhage (PPH) is one of the most life-threatening emergencies affecting healthy mothers without warning. It is a major cause of maternal mortality around the world with an incidence of 2–11%.[1–3] It is estimated that 99% of maternal deaths occur in Asia, Africa, and Latin America, and PPH is the cause of 1/4 to 1/3 of these deaths. The risk of maternal death from PPH is higher in developing countries (1:16 to 1:1,000 births) compared to developed countries (1:100,000 births in the United Kingdom and Japan).[4]

Emergency postpartum hysterectomy (EPH) is defined as hysterectomy performed within 24 hours of vaginal or cesarean delivery.[5–7] It is an uncommon procedure performed as a life-saving measure when PPH cannot be controlled by conservative approaches. It is considered "the last resort" for massive PPH ever since the first successful EPH was performed by Eduardo Porro in 1876.[8] Previous studies have reported the incidence of EPH to range from 0.2 to 5.4 per 1,000 deliveries,[9–11] and that the most common indications of EPH are uterine atony and uterine rupture.[12–14] More recent studies have reported the incidence of EPH to range from 0.24 to 0.78 per 1,000 deliveries,[15–17] with uterine atony remaining a common indication. Abnormal placental adherence is related to the increase in number of cesarean deliveries in recent years.[18–21] Although EPH is considered one of the major procedures for massive PPH, only one report has evaluated EPH in Japan.[22] In the present study, we estimated trends of procedures for PPH, including EPH, and examined the incidence of, indications for, and complications associated with EPH at our institution over a 13-year period.

Methods

Following Institutional Review Board (IRB) approval,

Table 1. General characteristics of EPH cases

Clinical and Demographic Characteristics	Mean ± SE (range), n (%)
N	13
Transported patients (n)	11 (84.6%)
Age (yrs)	31.15 ± 1.25 (23−42)
Parity (n)	1.15 ± 0.25 (0−3)
primiparous (n)	2 (15.4%)
multiparous (n)	11 (84.6%)
Previous cesarean delivery (n)	4 (30.8)
Operating time (minutes)	122.9 ± 7.07 (82−167)
Preoperative hemoglobin (g / dl)	8.03 ± 0.37 (6.2−10.2)
Estimated preoperative blood loss (ml)	2,908 ± 366.0 (1,560−5,480)
Intraoperative blood loss (ml)	1,168 ± 502.3 (40−7,120)
Need for transfusion	13 (100%)
Red cell concentrate	13 (100%)
Fresh frozen plasma	11 (84.6%)
Platelet concentrate	10 (76.9%)
Duration of hospital stay (days)	9.08 ± 1.76 (5−29)
Mode of delivery	
Vaginal delivery (n)	6 (46.2%)
Cesarean section (n)	3 (23.1%)
Vacuum extraction (n)	2 (15.4%)
Vaginal birth after cesarean section	2 (15.4%)
Method of hysterectomy	
Total hysterectomy (n)	5 (38.5%)
Supracervical hysterectomy (n)	8 (61.5%)
Additional procedures	
rFVIIa	2 (15.4%)

Clinical variables were presented as mean ± standard error (SE) and categorical variables as number and percent. rFVIIa, recombinant factor VII.

we conducted a retrospective analysis of all cases of EPH performed at Hachioji Medical Center of Tokyo Medical University (HMC) between January 1, 1998, and February 29, 2012. EPH was defined as hysterectomy performed for PPH unresponsive to other treatment within 24 hours of delivery.[5] All operations in this study were obstetrical hemorrhage emergencies judged to be life-threatening by obstetricians. EPH was carried out within the first 24 hours of the postpartum period.

Medical records of patients who underwent EPH at HMC were evaluated retrospectively. Medical information for those who were transported from affiliated clinics following cesarean or vaginal delivery for PPH was collected manually from patient records at their respective clinics. Maternal characteristics, including maternal age, parity, previous cesarean section (CS), and mode of delivery were obtained. Information pertaining to indications for EPH, type of hysterectomy, operating time, estimated preoperative blood loss, intraoperative blood loss, preoperative hemoglobin values (Hb), pre- and postoperative complications, need for transfusion, and postoperative hospitalization

Table 2. Indications for emergent postpartum hysterectomy

Indication	N (%)	Transported patients
Placenta accreta	2 (15.4)	1
With previa	1	0
Uterine atony only	4 (30.8)	4
Uterine rupture	5 (38.5)	5
With birth canal trauma	2	2
With broad ligament hematoma	2	2
With uterine artery laceration	1	1
Placental abruption	2 (15.4)	1

days were collected from medical records. Evidence of intraoperative complications and the occurrence of surgical mishaps were obtained from operation records. The study population was subdivided into two periods of three years (1998−2000, 2001−2003) and two periods of four years (2004−2007, 2008−2012) to determine changes in EPH variables during different periods.

Disseminated intravascular coagulopathy (DIC) was

Table 3. Trends of indications for EPH from 1998 to 2012

	Number of cases per period			
	1998−2000 ($n = 3$)	2001−2003 ($n = 4$)	2004−2007 ($n = 4$)	2008−2012 ($n = 2$)
Placenta accreta	0	0	1	1
Uterine atony	1	2	1	0
Uterine rupture	1	2	1	1
Placental abruption	1	0	1	0
Total number of deliveries	8,714	8,603	11,535	13,267
Incidence per 1,000 births	0.34	0.46	0.35	0.15

diagnosed by obstetrical DIC score.[23,24] Operative notes and pathology reports of the uterus and placenta were used to determine the final indication for the procedure. Blood transfusion with red cell concentrate (RCC), fresh frozen plasma (FFP), or platelet concentrate (PC) was performed at the discretion of the attending physician.

Statistical analysis was performed using Graph Pad Prism 5 (Graph Pad Software Inc. CA, USA). Clinical variables were presented as mean ± standard error (SE) and categorical variables as number and percent.

Results

Over the 14-year period between January 1998 and February 2012, 42,119 women delivered at HMC and its affiliated clinics. Among them, 13 women underwent EPH (0.031%), at an incidence of 0.31 per 1,000 deliveries. There were no maternal deaths related to EPH, and all infants survived.

Table 1 shows the clinical and demographic characteristics of the study population. Among 13 patients with EPH, 11 (84.6%) were transported from affiliated clinics. The mean age of EPH patients was 31.15 ± 1.25 years (range, 23−42), and mean parity was 1.15 ± 0.25 times (0−3), which included two primiparous (15.4%) and 11 multiparous (84.6%) women.

Mean estimated preoperative blood loss was 2,908 ± 366.0 ml (1,560−5,480), and mean preoperative hemoglobin was 9.08 ± 1.76 (5−29). Mean intraoperative blood loss was 1,168 ± 502.3 ml (40−7,120). There were eight abdominal total hysterectomies (61.5%) and five supracervical hysterectomies (38.5%). Abdominal total hysterectomies were performed in all five patients with uterine rupture and the two patients with placenta accreta. Three of the four patients with uterine atony underwent supracervical hysterectomy. Mean operating time was 122.9 ± 7.07 minutes (82−167), and mean duration of hospital stay was 9.08 ± 1.76 days (5−29). Mode of delivery was normal vaginal delivery in six patients (46.2%), cesarean delivery in three (23.1%), vaginal birth after cesarean section (VBAC) in two (15.4%), and vacuum extraction in two (15.4%).

Table 4. Pre- and postoperative complications of EPH patients

Complications	Number of patients (%) ($n = 13$)
DIC	
preoperative	10 (76.9)
postoperative	11 (84.6)
Postoperative fever	5 (38.5)
Ureteral injury	1 (7.7)
Postoperative depression	2 (15.4)
Surgical re-exploration	1 (7.7)

DIC, disseminated intravascular coagulopathy.

Table 2 shows indications for EPH. The leading indication was uterine rupture (38.5%), followed by uterine atony (30.8%). Uterine rupture cases included two patients with uterine scar laceration from previous CS during VBAC, two with uterine injury caused by forcible fundal pressure, and one with lower segment uterine rupture with cervical laceration.

When dividing the study period into four groups of three or four years each (1998−2000, 2001−2003, 2004−2007 and 2008−2012), there was a notable decrease in the incidence of EPH in 2008−2012 (i.e., from 0.34−0.46 to 0.15 per 1,000 deliveries; Table 3).

Table 4 shows antenatal and postoperative complications in EPH patients. DIC was the most frequent postoperative complication (84.6%). Eight of 11 women with postoperative DIC also had DIC before EPH. After DIC, febrile morbidity was the next most frequent complication. Additional complications included depression in two patients and ureter injury in one. Surgical re-exploration was performed in one patient. Additional procedures were required in two patients. In both patients, activated recombinant factor VII (rFVIIa) was administered for persistent postoperative hemorrhage caused by DIC.

Discussion

EPH is a life-saving procedure, particularly in cases of

Table 5. Obstetrical hemorrhage cases (≥ 2,500 ml) in 1998−2007

Cause of hemorrhage	N	Transported patients
Placenta accreta	2	1
With previa	1	0
Uterine atony only	8	5
Birth canal trauma only	3	3
Uterine rupture	5	5
With birth canal trauma	2	2
With broad ligament hematoma	2	2
With uterine artery laceration	1	1
Placental abruption	4	1

Table 6. Obstetrical hemorrhage cases (≥ 2,500 ml) in 2008−2012

Cause of hemorrhage	Number	Procedure
Uterine atony	9	Atonic agent only 6 UAE 2 rFVIIa 1
Placenta accreta	2	UAE 1
Cervical laceration	1	Surgical suture

UAE, uterine artery embolism; rFVIIa, recombinant factor VII.

persistent obstetrical hemorrhage after delivery. This procedure has been advocated by obstetricians for over 100 years.[8,25] In fact, prior to the first successful EPH procedure by Porro, maternal mortality following classic CS was nearly 100%.[26] Porro's procedure subsequently decreased the mortality rate to 58%,[27] and this procedure culminated in modern-day EPH as the result of modifications made by many obstetricians. From 2000 onward, the incidence of EPH has been reported to range from 0.6 to 1.4, which is similar to the incidence in 1980−1990.[7,12−14,22,26,28] The incidence of EPH at our institution between 1998 and 2012 was 0.31 per 1,000 births, which is lower than any of those reported in previous publications for that period.

Table 5 shows the number of massive hemorrhage (≥ 2,500 ml) cases in 1998−2007 at HMC. The occurrence rate of massive PPH was 0.076% during this period. This rate did not significantly differ from that in 1998−2000 (0.090%, Table 3). On the other hand, the incidence of EPH was 0.31 in 1998−2007 and 0.15 in 2008−2012. Comparing both periods, it is clear that the incidence of EPH decreased substantially in 2008−2012, despite no remarkable changes in the occurrence rate of massive PPH.

The rate of peripartum hysterectomy (not limited to emergent cases) increased from 1994 to 2007 in the United States. Bateman et al. indicated that this increase could be attributed to the rising rate of CS.[29] We considered that this tendency in our institution is related to the appearance of new procedures for PPH.

In recent guidelines for PPH management, various hemostatic procedures are recommended, including uterine artery embolism (UAE), a new balloon technique, and powerful hemostatic agents like rFVIIa.[30.31] In 2006, we began using rFVIIa for persistent obstetrical DIC.[32] Moreover, UAE became available outside office hours at HMC since August 2007. These new approaches to PPH have enabled us to reduce the need for EPH. Table 6 shows the number of massive PPH (≥ 2,500 ml) cases in

2008−2012 at HMC. In these cases, UAE was performed in two patients with uterine atony and one with placenta accreta. rFVIIa was used in one patient with uterine atony, because conservative approaches (administration of atonic agents and uterine massage) had no effect on massive PPH. If rFVIIa or UAE was not used or available, EPH would have been the likely choice. rFVIIa was originally developed to treat hemophilia patients with factor VIII and IX inhibitors.[33] Given its powerful hemostatic effect, rFVIIa is often used for life-threatening hemorrhage cases in various clinical settings,[34−36] as well as for obstetrical emergencies involving massive hemorrhage.[37−39] UAE is a well-recognized alternative treatment for PPH with a high success rate after failure of or in conjunction with local and medical treatment.[40,41] These procedures were especially effective against uterine atony in the present study. However, even these procedures may not be effective in uterine rupture cases complicated with severe pelvic organ trauma, including uterine artery laceration, broad ligament hematoma, and birth canal trauma. In our series, 80% of patients with uterine rupture had severe complications in the pelvic organs. In such cases, PPH might not be controllable through the repair of only pelvic organs.

DIC was one of the reasons for performing EPH. According to some reports, DIC is a risk factor for EPH.[17,22] Other risk factors include parity (i.e., multiparous), previous CS, history of curettage, or prenatal use of tocolytic agents.[7,15,22,28] Multiparity was observed in 84.6% of EPH cases in the present study, although some patients had other risk factors as well (Table 1). Among our study population, 76.9% of EPH cases had preoperative DIC. This high rate of DIC is associated with the fact that 84.6% of EPH patients were transported from affiliated clinics. HMC is a tertiary medical center and a community teaching hospital located at the west end of Tokyo. It takes at least 40 minutes from the decision to transport a patient to arrival at HMC, even from the nearest clinic. Obstetrical DIC develops rapidly during transport. As Yamamoto et al. suggested, private physicians must make rapid decisions

regarding maternal transport.[22]

Temporary hemostasis prior to maternal transport may improve prognosis by slowing the progress of obstetrical DIC. Simple techniques to manage massive PPH that can be conducted even at private clinics have been reported, such as use of the Bakri balloon, BT-Cath balloon, or EBB balloon.[31]

In this study, we reported the incidence of, indications for, and complications associated with EPH at our institution. We also evaluated trends relating to EPH. Recent advances in massive PPH management have contributed to a reduction in the incidence of EPH. Moreover, temporary hemostatic measures may improve prognosis by slowing the progress of DIC.

Conflict of interest

None.

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