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MATERNAL-FETAL MEDICINE

Emergency peripartum hysterectomy: 2-year experiences in non-tertiary center

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Abstract
Purpose The aim of this study was to evaluate risk factors, indications and materno-fetal outcomes for emergency peripartum hysterectomy
Methods Retrospective evaluation was made of 23 cases. Maternal and neonatal outcomes, need for referral to the tertiary center and related complications were compared to those at the initial diagnosis for surgery, location of delivery, type of surgery and the admission diagnosis. The risk factors associated with emergency peripartum hysterectomy were also investigated. Significance was evaluated at p values of <0.01 and <0.05.
Results There was a correlation between peripartum hysterectomy and uterine atony or uterine rupture ($p < 0.01$). The referral rates of patients with home delivery were significantly higher than those of patients who delivered in hospital ($p = 0.02$) but no significant difference was observed in the neonatal outcomes ($p = 0.38$). There was no significant difference in the rates of maternal complications between home and hospital delivery ($p = 0.068$). According to the indication for surgery, no significant difference was observed between the rates of referral to the tertiary center, maternal outcomes, complications, or need for maternal intensive care ($p > 0.05$). However, a highly significant difference was observed between the neonatal outcomes ($p = 0.001$).
Conclusion The results of this study showed the most important risk factors associated with peripartum hysterectomy to be uterine atony, grand multiparity, and uterine rupture. Maternal intensive care, maternal death, neonatal death, or neonatal intensive care were associated with home delivery or delayed presentation at hospital.

Keywords Hysterectomy · Multiparity · Uterine atony · Uterine rupture

Introduction

Peripartum hysterectomy is typically a life-saving procedure that is used in cases of severe postpartum bleeding that are unresponsive to more conservative treatments (e.g., during cesarean section or within the first 24 h after vaginal delivery). However, it is also associated with severe maternal morbidity and mortality [1]. The risk factors that are associated with adverse outcomes after peripartum hysterectomy include age, cesarean section, multiple pregnancy, labor induction, instrumental delivery, placenta previa, placenta accreta, and uterine atony [1, 2]. The incidence of peripartum hysterectomy has been reported as 0.13–5.38 per 1000 deliveries [3]. Although the most common indications for peripartum hysterectomy in undeveloped or less-developed countries are uterine atony and uterine rupture, the most common indications in developed countries are placental invasion anomalies, which are parallel with the increasing incidence of cesarean section [3–7].

In this study, a retrospective evaluation was made of cases of peripartum hysterectomy performed in the

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Maternity Hospital of the Batman province of Turkey between 2011 and 2013. This hospital does not contain a tertiary center and is located in a relatively rural southeastern part of Turkey.

Materials and methods

Retrospective evaluation was made of the outcomes of 23 cases, to whom emergency peripartum hysterectomy was performed for various indications at Batman Maternity Hospital between 2011 and 2013. Age, gravida, parity, admission diagnosis, location of delivery, additional surgery and its indication, duration of hospitalization, reason for referral to a tertiary center, maternal complications, neonatal outcomes, and transfusion rates were all evaluated. Neonatal outcomes were evaluated as good, death, or the need for intensive care, while maternal outcomes were classified as good or death. The need for maternal intensive care and related complications were also classified. These parameters were compared to those at the initial diagnosis for surgery, location of delivery, and the admission diagnosis. We also investigated the risk factors associated with emergency peripartum hysterectomy, as well as the correlation between complications, maternal and fetal outcomes, first admission diagnosis, surgery indications, type of surgery, and place of birth.

NCSS (Number Cruncher Statistical System) 2007 and PASS (Power Analysis and Sample Size) 2008 Statistical Software (Utah, USA) programs were used for statistical analysis. The Pearson's Chi square test was used to evaluate the rates of cesarean section between years and correlation between peripartum hysterectomy and age and gravida.

The Fisher-Freeman-Halton test and the Fisher exact test were used to evaluate the correlation between place of birth and outcomes. The Fisher-Freeman-Halton test was used to evaluate the correlation between the surgery indications and outcomes, the correlation between the type of surgery and outcomes and association between initial diagnosis and peripartum hysterectomy. Significance was evaluated at p values of <0.01 and <0.05.

Results

The incidence of cesarean section increased markedly between 2011 and 2013 in our hospital ($p < 0.01$) (Table 1). Although peripartum hysterectomy and age were not correlated ($p > 0.05$), a correlation existed between multiparity (>4) and uterine rupture or uterine atony (both, $p < 0.01$) (Table 2). The demographic characteristics of the 23 cases are listed in Table 3. The initial diagnosis on admission to the hospital were term pregnancy with labor pain ($n = 12$, 52.2 %), recurrent cesarean with pain ($n = 3$, 13.0 %), home delivery with vaginal bleeding ($n = 3$, 13.0 %), fetal exitus ($n = 2$, 8.6 %), vaginal bleeding at 32 weeks' gestation ($n = 1$, 4.3 %), previous cesarean with pain ($n = 1$, 4.3 %), and recurrent cesarean with placenta accreta ($n = 1$, 4.3 %).

The following surgical procedures were conducted peripartum: total abdominal hysterectomy (TAH) ($n = 12$, 52.2 %), subtotal hysterectomy ($n = 3$, 13.0 %), TAH+ unilateral salpingo-oophorectomy ($n = 3$, 13.0 %), hypogastric artery ligation + TAH ($n = 3$, 13.05 %), primary repair + hypogastric artery ligation ($n =$, 4.3 %) and subtotal hysterectomy + unilateral salpingo-oophorectomy ($n = 1$, 4.3 %). Bleeding was observed in 21.7 % of the cases ($n = 5$), and additional surgery was performed in each of these cases postpartum (TAH: 1 case, evacuation of hematoma: 4 cases). No complications were observed in ($n = 10$) 43.5 % of the cases, while complications were observed in ($n = 13$) 56.5 % of the cases. A total of 16 complications which were observed in these cases included urinary bladder injury ($n = 4$), ureteral injury ($n = 1$), DIC ($n = 7$), multiorgan failure ($n = 1$) in a DIC case, obturator nerve injury ($n = 1$) in a DIC case, intra-abdominal collection ($n = 1$), and retroperitoneal hematoma ($n = 1$) in a DIC case. Seven cases (30.4 %) were referred to another tertiary center. The duration of hospital stay ranged from 3 to 30 days, and the mean duration was 8.86 ± 9.65 days. TAH was performed for 19 patients, which included all 4 cases of urinary bladder injuries and a ureteral injury. Hypogastric artery ligation was performed in 1 case with DIC where obturator nerve injury was observed. In the evaluation of patients who developed DIC, it was observed that 2 patients (28.57 %) presented with intra-uterine fetal death, 2 patients (28.57 %) with home delivery presented with vaginal bleeding, 2 patients (28.57 %) presented at term with labor pains, and 1 patient (14.28 %) presented with vaginal bleeding at 32 weeks gestation.

As the patients were classified according to home and hospital delivery, the referral rates of patients who had delivered at home were significantly higher than those of patients who had delivered in the hospital ($p = 0.020$). All three patients who delivered at home were also referred to the tertiary center, but no significant difference was observed in the neonatal outcomes ($p = 0.383$). There was no significant difference in the rates of maternal complications between home and hospital delivery ($p = 0.068$). Maternal complications were observed in all 3 cases of home delivery, compared to in 35.0 % of cases that delivered at the hospital. Similarly, there was no significant difference in the rates of maternal intensive care referral ($p = 0.067$). However, maternal intensive care was needed in 66.7 % of home delivery cases, compared to in 10.0 % of hospital

Table 1 Incidence of cesarean sections between 2011 and 2013

	Year of hospitalization			Total	*p* value
	2011 ($n = 5.870$) *n* (%)	2012 ($n = 6.019$) *n* (%)	2013 ($n = 6.523$) *n* (%)		
Route of delivery					
Vaginal	4358 (74.3 %)	4267 (70.9 %)	4523 (69.4 %)	13.148	0.001*
Cesarean section	1512 (25.7 %)	1752 (29.1 %)	2000 (30.6 %)	5.264	
Total	5.870	6.019	6.523	18.412	

* Pearson's Chi square test, $p < 0.01$

Table 2 Risk factors associated with peripartum hysterectomy (PH)

	PH *n* (%)	Non-PH *n* (%)	Total	*p* value
Age (years)				
18–25	3 (13.0 %)	5.809 (31.6 %)	5.812	0.112[a]
26–35	12 (52.2 %)	8.533 (46.4 %)	8.545	
36–45	8 (34.8 %)	4.047 (22.0 %)	4.055	
Total	23	18.389	18.412	
Gravida				
Primigravid	2 (8.7 %)	6.204 (33.7 %)	6.206	0.003[a]**
<4	5 (21.7 %)	5.450 (29.6 %)	5.455	
≥4	16 (69.6 %)	6.735 (36.6 %)	6.751	
Total	23	18.389	18.412	
Diagnosis				
Placenta previa accreta	2 (8.7 %)	974 (44.1 %)	976	0.001[b]**
Ablation	3 (13.0 %)	154 (7.0 %)	157	
Atony	11 (47.8 %)	901 (40.8 %)	912	
Rupture	7 (30.4 %)	182 (8.2 %)	189	
Total	23	2.211	2.234	

** $p < 0.01$

[a] Pearson's Chi square test

[b] Fisher-Freeman-Halton test

Table 3 Distribution of descriptive characteristics

	Min–Max	Mean ± SD	Median
Age (years)	19–46	32.83 ± 6.62	33.0
Gravida	1–11	5.26 ± 2.75	5.0
Parity	0–10	4.39 ± 2.64	4.0
Number of alive children	0–9	4.35 ± 2.55	4.0

delivery cases. No statistically significant difference was determined between the groups in respect of neonatal outcomes (Table 4).

When the cases were evaluated according to the indication for surgery, no significant difference was observed between the rates of referral to the tertiary center, maternal outcomes, maternal complications, or need for maternal intensive care ($p > 0.05$). However, a highly significant difference was observed between neonatal outcomes ($p = 0.001$). Neonatal outcomes were better in cases of uterine atony, while mortality rates in cases of placental abruption and uterine rupture were significantly higher (Table 5). When the types of surgery were evaluated, no significant difference was observed in the cases referred to tertiary care, neonatal outcomes, maternal outcomes, maternal complication rate, or the need for maternal intensive care ($p > 0.05$) (Table 6). Erythrocyte and fresh frozen plasma transfusions were provided to all patients.

Discussion

Over the course of this study, the incidence of peripartum hysterectomy at our hospital was observed to be 1.2 per 1000 deliveries. In comparison, the incidence in Ireland, United Kingdom and Italy is 0.4, 0.41 and 2.2 per 1000

Table 4 Evaluations according to home delivery

	Home delivery		*p* value
	Yes ($n = 3$) *n* (%)	No ($n = 20$) *n* (%)	
Referral to advanced center			
Present	3 (100 %)	4 (20 %)	0.020[b]*
Absent	0 (0 %)	16 (80 %)	
Perinatal outcome			
Good	3 (100 %)	10 (50 %)	0.383[a]
Intensive care	0 (0 %)	4 (20 %)	
Death	0 (0 %)	6 (30 %)**	
Maternal outcome			
Good	2 (66.7 %)	20 (100 %)	0.130[b]
Death	1 (33.3 %)	0 (0 %)	
Maternal complication			
Present	3 (100 %)	7 (35 %)	0.068[b]
Absent	0 (0 %)	13 (65 %)	
Maternal intensive care			
Present	2 (66.7 %)	2 (10 %)	0.067[b]
Absent	1 (33.3 %)	18 (90 %)	

* $p < 0.05$

** 2 out of the 6 cases were fetal exitus at the time of admission

[a] Fisher-Freeman-Halton test

[b] Fisher's exact test

deliveries, respectively [8, 9]. However, when Turkish data are examined, the results are noticeably different. The incidence in tertiary centers in the eastern part of Turkey is reportedly 5.09–5.38 per 1000 deliveries, while the incidence in tertiary centers in the western part of Turkey is reportedly 0.48 per 1000 deliveries and the number of gynecologists per 100,000 patients in Turkey is 6.78 [10–13]. According to Yalinkaya et al. [8], this difference may be caused by many factors, including differences in socioeconomic status, standards of healthcare, traditions and beliefs, higher parity, delayed transportation to the hospital, and ongoing conflicts in the eastern regions. Therefore, the low incidence observed in our center may be related to the hospital being a non-tertiary center and/or the referral of patients from this center to tertiary centers.

The results of this study indicate that the most important risk factors for peripartum hysterectomy were grand multiparity, uterine rupture and uterine atony. Advancing maternal age and grand multiparity have also been reported as independent risk factors in previous studies [3, 10, 14]. In addition, low birth weight has been reported by Chen et al., intrauterine manipulation and oxytocin induction by Babinszki et al., abnormal placentation, preeclampsia, and eclampsia by Wie et al. and antepartum hemorrhage associated with placenta previa by D'Arpe et al. to be risk factors [3, 15–17].

Table 5 Evaluations according to surgical indications

	Surgical indications					*p* value[a]
	Atony ($n = 11$) *n* (%)	Decollement atony ($n = 3$) *n* (%)	Placenta accreta ($n = 1$) *n* (%)	Previa accreta ($n = 1$) *n* (%)	Uterine rupture ($n = 7$) *n* (%)	
Referral to advanced center						
Present	3 (27.3 %)	2 (66.7 %)	0 (0 %)	0 (0 %)	2 (28.6 %)	0.797
Absent	8 (72.7 %)	1 (33.3 %)	1 (100 %)	1 (100 %)	5 (71.4 %)	
Neonatal outcome						
Good	10 (90.9 %)	0 (0 %)	1 (100 %)	1 (100 %)	1 (14.3 %)	0.001**
Intensive care	1 (9.1 %)	0 (0 %)	0 (0 %)	0 (0 %)	3 (42.9 %)	
Death	0 (0 %)	3 (100 %)	0 (0 %)	0 (0 %)	3 (42.9 %)	
Maternal outcome						
Good	10 (90.9 %)	3 (100 %)	1 (100 %)	1 (100 %)	7 (100 %)	1.000
Death	1 (9.1 %)	0 (0 %)	0 (0 %)	0 (0 %)	0 (0 %)	
Maternal complication						
Present	4 (36.4 %)	2 (66.7 %)	1 (100 %)	1 (100 %)	2 (28.6 %)	0.454
Absent	7 (63.6 %)	1 (33.3 %)	0(0 %)	0 (0 %)	5 (71.4 %)	
Maternal intensive care						
Present	2 (18.2 %)	2 (66.7 %)	0 (0 %)	0 (0 %)	0 (0 %)	0.176
Absent	9 (81.8 %)	1 (33.3 %)	1 (100 %)	1 (100 %)	7 (100 %)	

** $p < 0.01$

[a] Fisher-Freeman-Halton test

Table 6 Evaluations according to type of surgery

	Surgery				p value[a]
	Hypogastric artery ligation + TAH *n* (%)	Primary repair + hypogastric artery ligation *n* (%)	Subtotal hysterectomy *n* (%)	TAH *n* (%)	
Referral to advanced center					
Present	0 (0 %)	1 (100 %)	1 (25 %)	5 (33.3 %)	0.403
Absent	3 (100 %)	0 (0 %)	3 (75 %)	10 (66.7 %)	
Neonatal outcome					
Good	3 (100 %)	0 (0 %)	2 (50 %)	8 (53.3 %)	0.717
Intensive care	0 (0 %)	0 (0 %)	1 (25 %)	3 (20 %)	
Death	0 (0 %)	1 (100 %)	1 (25 %)	4 (26.7 %)	
Maternal outcome					
Good	3 (100 %)	1 (100 %)	4 (100 %)	14 (93.3 %)	1.000
Death	0 (0 %)	0 (0 %)	0 (0 %)	1 (6.7 %)	
Maternal complication					
Present	1 (33.3 %)	1 (100 %)	1 (25 %)	7 (46.7 %)	0.741
Absent	2 (66.7 %)	0 (0 %)	3 (75 %)	8 (53.3 %)	
Maternal intensive care					
Present	0 (0 %)	0 (0 %)	1 (25 %)	3 (20 %)	1.000
Absent	3 (100 %)	1 (100 %)	3 (75 %)	12 (80 %)	

TAH total abdominal hysterectomy

[a] Fisher-Freeman-Halton test

The most common indication for peripartum hysterectomy in this study was uterine atony. Although uterine atony and uterine rupture are the leading indications in less-developed countries, the most common indication in developed countries is abnormal placentation, [3, 4, 7, 10, 18–20]. In line with the current study, previous studies have also reported that uterine atony is the most common indication in rural parts of eastern Turkey [5, 6]. Although the incidence of cesarean section has significantly increased in our hospital, the incidence of abnormal placentation was not parallel with the indications of peripartum hysterectomy. This may be due to the referral of such patients to tertiary centers before the onset of labor. In these regions, the rate of out-of-hospital deliveries appears to remain high, and oxytocin induction without medical supervision is used to induce vaginal delivery in the event of delayed delivery [21]. These factors may contribute to the fact that uterine rupture or postpartum bleeding is the most commonly encountered indication.

The second most common indication in our study was uterine rupture. Although the incidence of uterine rupture decreases with decreasing parity in developed and undeveloped populations, it remains one of the most frequent indications for peripartum hysterectomy in less-developed regions [4, 10–12]. Among the seven cases of uterine rupture in the current study, cesarean scar dehiscence occurred only in one case, while real rupture was observed in six cases, and was significantly associated with neonatal death.

In this study, TAH was applied as the most common procedure for bleeding control. However, in similar cases in literature, subtotal hysterectomy has been typically used [4, 6, 7, 10] as it provides shorter operation times, rapid control of bleeding, and fewer surgical complications. In contrast, TAH is inevitable, especially in cases with abnormal placentation [10, 17]. However, a previous study has reported that total hysterectomy was associated with a greater need for intensive care [22]. In addition, Lau et al. [23] reported that urinary tract injury was twofold greater after TAH. In the current study, placenta accreta was present in only 1 patient who had undergone TAH, while the remaining cases were of uterine atony and uterine rupture. All cases with urinary bladder, ureter, or obturator nerve injuries were in the group that underwent TAH. In the presence of bleeding and rupture, acting quickly to save time during surgery, and especially surgical procedures below the uterine isthmus, carries an increased risk of ureter ligation. In addition, new dangerous bleeding may develop due to the dilated parametrial vascular structures in the pregnant uterus. Similarly, during hypogastric artery ligation, nerve plexus injury or dangerous hypogastric vein injury can occur. In 3 patients, unilateral salphingo-oopherectomy was performed to control bleeding. As the operation reports were checked, it was noticed that all of

the salphingo-oopherectomies had been performed because of iatrogenic infundibulopelvic ligament injury. These iatrogenic injuries could be a consequence of a rapid hysterectomy procedure. On the other hand, uterus preservation can be an alternative to hysterectomy, especially in young patients. Therefore, to achieve this, uterine artery embolization, compression suture and uterine or hypogastric artery ligation can be applied and hysterectomy can be considered the last choice if these methods fail [24].

The most severe complication of peripartum hysterectomy is maternal death, and incidence has been reported ranging from 0 to 12.5 % [17]. In this study, the maternal mortality rate was 4.34 %. In contrast, the maternal mortality rate was 16.7 % in a study by Zeteroglu et al., and 9.28 % in a study by Yalinkaya et al., and these were mostly related to hemorrhage and subsequent DIC [11, 12]. However, Sahin et al. reported that the maternal mortality rate was 4.5 %, and the major cause was DIC [10]. In African countries, the mortality rate ranges from 3.3 to 23 %, and it appears to be higher in sub-Saharan Africa. In those areas, hemorrhage, delayed presentation to the hospital, delays in decision to perform hysterectomy, and acute renal failure were considered as potential causes [4, 7, 18, 25, 26]. When the cause of mortality was evaluated in 1 patient in the current study, it was found that she had delivered at home and had been admitted to the hospital with bleeding. TAH was performed with a diagnosis of uterine atony, four units of erythrocytes and four units of fresh frozen plasma were transfused, and she was subsequently referred to a tertiary center. Re-laparotomy was performed with the diagnosis of intra-abdominal hemorrhage, and mortality was a consequence of these events following multiorgan failure on the 4th day after admission. As mentioned above, patient preference to avoid hospital delivery and a delay in admission to hospital after delivery appears to be associated with DIC and death.

The rate of neonatal mortality has been reported as 26.08 % [19]. When the admission diagnoses were investigated, intra-uterine fetal death in 2 cases, vaginal bleeding in 1 case, and term pregnancy with labor pain in 3 cases were recorded. When the indications for surgery were investigated, the diagnoses were uterine atony due to placental abruption (3 cases) and uterine rupture (3 cases). Intra-uterine fetal death and vaginal bleeding were observed in the three patients with delayed admission to the hospital. In this study, the mortality rate is consistent with that reported by Allam et al. [18]. Of the four cases requiring neonatal intensive care, all were hospital deliveries. In this group, uterine rupture was observed in three patients, and uterine atony in one patient. These rates are also consistent with previous studies [18, 19].

Erythrocyte and fresh frozen plasma were transfused to all of the patients. Massive bleeding, DIC, and anemia were present in most patients before transfusions, and the rate is consistent with those in previous studies where transfusion rates have been reported to be 90–100 % [3, 27]. In patients with DIC, intensive care was needed for 4 patients, 2 of whom had delivered at home, 1 had presented with intra-uterine fetal death, and 1 had presented with vaginal bleeding at 32 weeks gestation. Contrary to other studies, DIC developed in all the current study patients who required intensive care, and all were referred to a tertiary center (with only one mortality) [25, 28, 29].

The limitations of this study were the retrospective design and the inclusion of a relatively small number of patients. In addition, the absence of more detailed data regarding the medical interventions before admission to hospital and possibly because of social, political, and cultural reasons, the subsequent lack of any correlations between these factors and the study results, are also limitations.

In conclusion, these results indicate that the most important risk factors associated with peripartum hysterectomy in this region are uterine atony, grand multiparity, and uterine rupture. Maternal intensive care, maternal death, neonatal death, or neonatal intensive care referrals were associated with home delivery or delayed presentation at hospital. In such rural regions, it appears that political, social, and cultural factors affect the indications and outcomes of peripartum hysterectomy. Therefore, additional detailed studies are needed to investigate the correlation between these factors and maternal and fetal outcomes in similar regions.

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