

Hypogastric artery ligation for obstetrical hemorrhage: clinical experience in a tertiary care center

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Background/aim: Several authorities advocate the use of hypogastric artery ligation (HAL) in the treatment of cases of obstetrical hemorrhage related to uterine atony or placenta accreta. We assessed the morbidity and mortality of patients who underwent HAL as a component of emergency procedures to control life-threatening uterine bleeding in a tertiary-care university hospital.

Materials and methods: In this retrospective study, the clinical data of 24 eligible patients who underwent HAL between 2010 and 2013 in a university hospital to prevent or control severe uterine bleeding were collected and analyzed with regard to intraoperative and postoperative findings.

Results: In the study population, there were nine patients with uterine atony managed without hysterectomy after HAL and there were 15 patients with placenta previa complicated with placenta accreta after HAL. Of these 15 patients, seven underwent hysterectomy and eight were managed without hysterectomy. Overall, the clinical features of the patients managed with or without hysterectomy were similar for patients with uterine atony and placenta previa.

Conclusion: We suggest that if HAL is performed in a surgical setting as mentioned in this study, it may be a life-saving and fertility-sparing procedure.

Key words: Placenta previa, placenta accreta, uterine atony, hypogastric artery ligation, hysterectomy

1. Introduction

Postpartum hemorrhage (PPH) following vaginal or cesarean delivery is one of the important obstetrical emergencies and a leading cause of maternal morbidity and mortality. According to the World Health Organization (1), postpartum hemorrhage constitutes 25% of all maternal deaths worldwide. PPH is one of the leading causes of maternal mortality in both developing and developed countries, although the absolute risk of death from PPH is much lower in developed countries. PPH has two types: primary PPH occurring in the first 24 h after delivery and secondary PPH presenting 24 h to 12 weeks after delivery (2).

PPH can result from several obstetrical conditions including uterine atony, placental disorders such as placenta accreta, obstetrical trauma, bleeding diatheses, and trauma to the abdominopelvic region. If bimanual uterine compression and medical treatment are not adequate to control bleeding, the management of PPH requires surgical methods to be considered without delay (3). Surgical methods performed to preserve the uterus have long been practiced to preserve fertility in

the management of severe PPH. After the first report of hypogastric artery ligation (HAL) in 1960s as one of the surgical procedures to prevent hysterectomy, it has gained an important place in the armamentarium of conservative treatment of obstetrical hemorrhage (4).

To the best of our knowledge, there is no study emphasizing the performance of HAL before the removal of the placenta in the presence of an abnormal invasion of the placenta. There are several case reports and case series about HAL, but no information related to its time with regard to placental abnormality and placental removal. An increasing rate of repeated cesarean section results in abnormalities of placental invasion; as a consequence, intraoperative procedures vary according to the type of placental insertion and invasion. As a component of the preventive measures to decrease bleeding, both the timing and the technique of HAL need to be revisited to maximize its effectiveness. In this study, we aimed to evaluate the clinical outcome of HAL as a component of emergency procedures to control obstetrical hemorrhage in a tertiary-care university hospital.

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2. Materials and methods

Twenty-four pregnant patients admitted to the Obstetric Service of the Cumhuriyet University Hospital as obstetric emergency patients from 2010 to 2013 were retrospectively evaluated. In this retrospective evaluation of HAL cases, the cases were presented after categorization according to obstetric indication. During the study period of 3 years, 24 patients who had undergone hypogastric artery ligation were found by searching patient charts. The cases were grouped according to obstetric indications as follows: cases of uterine atony (n = 9) and cases of placenta previa complicated with placenta accreta (n = 15). The patients in the placenta previa group all had a history of previous cesarean section.

Obstetric history, physical and obstetric examination findings, and case course and outcome were abstracted from the patient charts. The approval of the Human Ethics Committee of our university was obtained and the charts of the patients were reviewed. For the collection of clinical data, an information questionnaire about HAL designed by the authors was completed for demographic, neonatal, maternal hematological, and maternal morbidity variables.

As the first step during the management of uterine atony in all patients, a bimanual compression of the uterus was performed and simultaneously medications including oxytocin (intravenous), methylergonovine maleate (intramuscular), and misoprostol (rectal route) were administered. As a standard surgical procedure, HAL was performed in our obstetrical service with the following procedure. Firstly, a midline laparotomy incision above and below the umbilicus was performed, then

the uterus was externalized, and the fetus was delivered with a fundal vertical uterine incision. Before removal of the placenta, the broad ligament was dissected to the base of the infundibulo-pelvic ligament. The bifurcation of the common iliac was visualized with about 3 cm of hypogastric artery after dissection of the surrounding tissue. After visualization of the ureter, a ligature was passed under the artery about 2 cm below the bifurcation and the hypogastric arteries were ligated bilaterally. Absorbable sutures were used in all cases.

2.1. Statistical analysis

Data were expressed as median (min–max) or percentage as appropriate. Clinical variables were analyzed with Mann–Whitney or chi-square tests as appropriate. A P value of less than 0.05 was accepted as significant.

3. Results

The uterine atony group consisted of nine patients who delivered vaginally and were managed without hysterectomy. The placenta previa group had 15 patients that delivered by cesarean section, seven of whom were managed with hysterectomy and eight of whom were managed without hysterectomy. Tables 1 and 2 present selected demographic, neonatal, and intraoperative parameters of the study population. None of the patients in the study groups had a history of previous uterine surgery. There was no maternal mortality in the study groups. No preoperative urethral catheterization was performed in the study population. All patients in the study groups received general anesthesia. Of the patients without hysterectomy in

Table 1. Demographic and neonatal data of the study population.

	Uterine atony (n = 9)	Placenta previa (n = 15)	
	No hysterectomy (n = 9)	Hysterectomy (n = 7)	No hysterectomy (n = 8)
Age, years	34 (21–36)	31 (20–37)	26.5 (23–35)
Gravidity	3 (1–5)	3 (2–7)	3.5 (2–6)
Parity	3 (1–3)	3 (2–6)	3 (2–4)
Dilatation & curettage	0 (0–1)	0	0
Gestational age, weeks	37 (28–39)	36 (25–39)	36 (32–40)
Delivery mode (vaginal/cesarean)	9 (100%) / 0	0 / 7 (100%)	0 / 8 (100%)
History of uterine surgery (yes/no)	0 / 9 (100%)	7 (100%) / 0	8 (100%) / 0
Newborn weight, g	3075 (1040–3400)	2785 (740–3300)	3217 (1660–3560)
Apgar score (1 min/5 min)	8 (0–9) / 9 (0–10)	9 (4–9) / 10 (5–10)	8.5 (4–9) / 10 (4–10)
Umbilical vein blood pH	7.35 (7.26–7.70)	7.36 (7.33–7.39)	7.38 (7.34–7.48)
Neonatal intensive care (yes/no)	1 (11%) / 8 (89%)	3 (43%) / 4 (57%)	1 (13%) / 7 (87%)

Table 2. Intraoperative data of the study population.

Transfusion parameters			
Blood components (yes/no)	9 (100%) / 0	7 (100%) / 0	7 (88%) / 1 (12%)
Red blood cells (U)	3 (0–5)	7 (3–9)	4 (0–7)
Fresh frozen plasma (U)	4 (1–8)	5 (1–8)	4.5 (0–7)
Operation parameters			
Need for relaparotomy (yes/no)	1 (11%) / 8 (89%)	2 (29%) / 5 (71%)	0 / 8 (100%)
Operation time, min	130 (80–180)	160 (95–230) ^a	120 (80–150)
Duration of hospital stay, days	4 (3–8)	7 (5–13) ^b	4.5 (3–7)
Maternal mortality (yes/no)	0 / 9 (100%)	0 / 7 (100%)	0 / 8 (100%)
Preoperative			
Hemoglobin, g/dL	12.3 (10.4–14.5)	11.7 (10.1–13)	11.2 (9.5–13.4)
Thrombocyte, ×1000/μL	229 (159–347)	191 (126–291)	223.5 (115–310)
Postoperative			
Hemoglobin, g/dL	9.5 (8.6–11)	9.8 (8.2–12.4)	9.4 (8.3–13.4)
Thrombocyte, ×1000/μL	223 (116–270)	151 (95–203)	166.5 (146–299)
Intraoperative blood loss, L	0.6 (0.5–2.1)	1.25 (0.5–2)	0.9 (0.8–2)
DIC (yes/no)	1 (11%) / 8 (89%)	1 (14%) / 6 (86%)	2 (25%) / 6 (75%)
Surgical site infection (yes/no)	0 / 9 (100%)	0 / 7 (100%)	1 (13%) / 7 (87%)
Preoperative UC (yes/no)	0 / 9 (100%)	0 / 7 (100%)	0 / 8 (100%)
Type of anesthesia (general/regional)	9 (100%) / 0	7 (100%) / 0	8 (100%) / 0

Data are expressed as median (min–max) or percentage as appropriate.

^{a,b} = $P < 0.05$ vs. no hysterectomy subgroup of placenta previa group.

DIC = disseminated intravascular coagulation and UC = ureteral catheterization.

the uterine atony and placenta previa groups, demographic, neonatal variables, maternal hematological variables, and maternal morbidities were found to be similar ($P > 0.05$). Of the patients in the placenta previa group, demographic, neonatal variables, maternal hematological variables, and maternal morbidities were found to be comparable ($P > 0.05$) regardless of whether they underwent hysterectomy or not, except for operation time and duration of hospital stay. The operation times and durations of hospital stay of the hysterectomy subgroup were significantly higher than those of the no hysterectomy subgroup ($P < 0.05$).

4. Discussion

In this study, of 24 patients who underwent HAL, nine had uterine atony managed without hysterectomy, and 15 had placenta previa complicated with placenta accreta, seven of whom required hysterectomy while in eight of them, uterine bleeding could be controlled by HAL only.

In all patients, uterine bleeding did not result in maternal mortality. Overall, the clinical features of patients managed with or without hysterectomy were similar in the study groups. Operation time and duration of hospital stay were longer in patients who required a hysterectomy, as expected. Since the morbidity of patients managed with or without hysterectomy was comparable, we think that the HAL procedures performed to control uterine bleeding in uterine atony and placenta previa complicated with placenta accreta need to be accepted as successful. Cetin et al. (5) reported the indications for emergency peripartum hysterectomy as placenta accreta, placenta previa, uterine atony, and uterine rupture, respectively, in their case series. In another study by Yalınkaya et al. (6), they reported that uterine atony was the most common reason for emergency peripartum hysterectomy. In a study by Turgut et al. (7) including 189 patients who had undergone peripartum hysterectomy, the indications were

listed as uterine atony (31.7%), uterine rupture (25.4%), and placentation abnormalities (22.2%). In the same study, the most common causes of morbidity were, in order of frequency, relaparotomy (22.8%), febrile reaction (12.2%), and wound infection (9%).

When surgical interventions are not performed at the appropriate time, PPH may lead to maternal death. Thus, HAL is a lifesaving surgical intervention in the management of obstetrical hemorrhage that does not respond to pharmacological measures. In this study, HAL was performed to avoid maternal death in the cases of intractable obstetrical hemorrhage with uterine atony or placental abnormalities. As summarized in a recent review by Morel et al. (8), HAL requires an adequate surgical exposure of the lower abdomen. In most cases, the abdominal incision of a cesarean section is suitable for this procedure. Bilateral HAL is a major surgical intervention in patients with severe obstetrical hemorrhage done to preserve the uterus, but its efficacy is controversial (9). Hypogastric artery ligation was defined as a surgical technique for obstetrical hemorrhage in 1960 (10,11). HAL is usually performed when the obstetrical hemorrhage occurs during caesarean section or after vaginal or caesarean delivery (12). Bilateral HAL causes a significant decrease in the blood circulation of the female genital system but does not block it completely (13). Şimşek et al. (14) evaluated the ovarian reserve by measuring serum FSH levels, estradiol levels, and ovarian volume after bilateral HAL procedure for uterine atony and found that the ovarian reserve was not affected adversely by the bilateral HAL. Unal et al. (15) analyzed the data of 58 patients who had undergone bilateral HAL for obstetrical hemorrhage and they found that 30 women desired future fertility, 56.7% of whom became pregnant within 1 year.

Iwata et al. (16) evaluated the effect of HAL as a bleeding control measure during cesarean hysterectomy for placenta accreta. In their 23 cases of placenta accreta managed over a 20-year period, they evaluated the factors that affected surgical outcome. In their cases, HAL was performed before hysterectomy. They found that the intraoperative blood loss and length of hospitalization were comparable in patients that either underwent HAL or did not. They stated that there were no patients who underwent HAL without hysterectomy. Based on analyses of clinical data related to blood loss, hospital stay, need for admission to the intensive care unit, and need for hysterectomy, overall we suggest that, although contrary to the findings of Iwata et al. (16), HAL is a very successful procedure for reducing blood loss and the need for hysterectomy.

It is well known that placenta accreta and placenta previa are commonly seen together. As the rate of cesarean section rises, the incidence of placenta previa and placenta accreta increases. The other risk factors for placenta accreta are multiparity, advanced maternal age, and history of uterine curettage (17,18). The risk of placental adhesive disorders increases based on the implantation site of the placenta with regard to the uterine scar in patients with a history of cesarean delivery (19). The risk of placenta accreta located anteriorly or centrally is about 35% in women with a history of two or more cesarean sections (20). In our clinical practice, we prefer midline abdominal incision in patients with placenta previa with a potential for requirement of HAL with or without hysterectomy. We think that considering HAL in patients with placenta previa complicated with placenta accreta may improve the surgical exposure and ease the control of excessive uterine bleeding related to the removal of the placenta. We suggest that performing HAL before starting the removal of placenta was very effective for decreasing uterine bleeding related to removal of the placenta in patients managed without hysterectomy.

The American College of Obstetricians and Gynecologists recommends the use of HAL in the management of severe obstetrical hemorrhage (21). In patients with obstetrical hemorrhage not controlled by pharmacological measures, immediate surgical intervention may save both the life and the uterus of the patient. It was suggested that HAL would block the blood flow to female pelvic organs completely; however, due to the anastomosis of the female pelvic vasculature, blood flow does not completely cease (22,23). It is well known that after a bilateral HAL, patients can achieve term pregnancies (24–27).

The limitations of this study were its retrospective design, insufficient statistical power because of the small sample size, and being limited to a single center's experience. Despite these limitations, our findings were in accordance with the current knowledge in the literature. Future studies designed prospectively with a large sample size need to be performed to further clarify the place of HAL in the management of obstetrical hemorrhage.

In conclusion, the results of this study suggest that if HAL is performed with appropriate timing and the surgical technique as described above, it may be a life-saving and fertility-sparing procedure in patients managed without hysterectomy. As a surgical technique, the preference of a midline abdominal incision and HAL before placental removal may be beneficial to reduce the morbidity of placenta previa complicated with placenta accreta.

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