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Hypogastric arteries ligation for the management of postpartum hemorrhage: a simple method of reducing uterine bleeding during surgery

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Abstract

This prospective descriptive study, aimed at evaluating the efficacy of hypogastric arteries ligation (HAL) for the conservative surgical management of postpartum hemorrhage (PPH), as well as the maternal outcome, was conducted between April 1st 2010 and March 31st 2014 in the University Teaching Hospital of Yaoundé (Cameroon). Sixteen women treated initially with HAL for PPH were recruited. The main variables recorded were maternal age and parity, the cause of PPH, the success of HAL, the additional surgical approach and the maternal outcome. Data were analyzed using SPSS version 20.0. Mean maternal age was 29 years while mean parity was 2.4. PPH was mainly due to uterine atony and placental abruption. The success rate of HAL alone was 75% and 93.7% when HAL was combined with ovarian arteries ligation. No maternal death was recorded, certainly favored by the placement of a garrote at the level of the uterine lower segment to reduce uterine bleeding during surgery. HAL can be considered as one of the first surgical options that should be given to women desiring uterine preservation. In cases of failure, selective ovarian arteries ligation should be performed before resorting to hysterectomy in cases of failure of ovarian arteries ligation.

Introduction

Postpartum hemorrhage (PPH) is one of the leading cause of maternal mortality worldwide and the first cause of maternal mortality in Africa [1-3]. Causes of PPH include uterine atony, genital tract lacerations, retention of placenta or placental debris and coagulation disorders.

The risk factors for PPH depend on each cause and are not all known. Risk factors for coagulation disorders can be inherited or acquired, while genital lacerations can be due to excessive fetal weight, adolescent pregnancy or elderly primiparity [4]. Uterine atony is favored by many factors that include over-distended uterus, retention of placenta debris, maternal anemia, placenta abruption, prolonged or precipitate labor and administration of some medications [5].

The management of PPH depends on the cause. Genital lacerations are sutured, while retention of placenta or its debris is treated with (manual) uterine revision. Uterine atony is managed with the use of uterotonics, uterine massage, manual uterine revision and emptiness of the bladder, while coagulations disorders are treated with administration of coagulation factors, fibrinogen concentrates and transfusion of fresh frozen plasma or fresh whole blood [6].

In some cases, medical approaches for the management of uterine atony or coagulation disorders are unsuccessful, requiring immediate surgical management. The choice between conservative (uterus preservation) and radical (uterus ablation) surgical management depends on many factors with the most important being the woman's need of future childbirth. Hysterectomy should be offered to women who do not desire future childbirth and when there is failure of the conservative approach [7,8]. When there is need of subsequent deliveries, the tendency is to choose a conservative surgical approach. This include uterine arteries ligation with or without ovarian arteries ligation[9], B-Lynch suturing technique[8,9], hypogastric arteries ligation (HAL) [10-12] and sometimes hypogastric arteries embolization [13,14].

The aims of this study were to evaluate the efficacy of HAL for the conservative surgical management of PPH in our service, the additional surgical approach needed to stop the hemorrhage when HAL was unsuccessful as well as the maternal outcome.

Methods

This prospective descriptive study was conducted between April 1st 2010 and March 31st 2014 in the University Teaching Hospital of Yaoundé (Cameroon). Were included women who developed PPH (vaginal blood loss ≥500 ml for a vaginal delivery or total blood loss ≥1000 ml for cesarean section), women with failure of medical treatment, who needed future deliveries and who were treated with HAL as the first surgical option.

In this study, women who developed PPH were counselled on the different possible evolutions and management. An informed consent

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form was obtained from each of them. When conservative medical management was unsuccessful, a surgical approach was carried out within 30 minutes, depending on the surgeon preference for the method.

When HAL was chosen, the procedure was as follows: after opening the abdominal wall, a sterile urinary catheter was used as a garrote to tie the lower part of the uterus just above the bladder (lower uterine segment) to reduce the hemorrhage. After this, the uterus was shifted to the right side first. Then, the posterior parietal peritoneum was opened at the level of the left common iliac artery and extended to the level of the left hypogastric artery (internal iliac artery). Soon afterward, a single ligation was placed before the division of the left hypogastric artery with Vicryl® n°0 (polyglactin). The same procedure was carried out on the right side. After, the urinary catheter was removed. If there was persistence of vaginal bleeding two minutes after the bilateral ligation, then, the procedure was considered unsuccessful. The garrote was placed again and another surgical approach was attempted such as selective ovarian arteries ligation or (sub) total hysterectomy.

The variables recorded on a pre-established questionnaire by the principal investigator were maternal age and parity, gestational age at delivery (confirmed by an ultrasound scan performed before 20 weeks gestation), past history of clandestine abortion, mode of delivery, the birth weight and the sex of newborn, the cause of PPH, the blood loss during surgery (beginning from the garrote placement to the end of surgery needed), the success of HAL, the duration of the surgery (from garrote placement to the end of surgery needed) and the maternal outcome.

This study was approved by the institutional ethics committee. Our minimal sample size of 15 patients was calculated using the following formula [15] for descriptive studies $N=P(1-P)\ Z\alpha^2/D^2$ where $Z\alpha=1.96$ corresponds to a confidence level of 0.05, D=0.02 is the degree of precision and assuming that the prevalence of surgical management of PPH in Yaoundé (P) might be around 0.15% of all deliveries.

Data were analyzed using SPSS version 20.0. The results are presented as mean ± standard deviation (SD) for quantitative data and frequencies for qualitative data.

Results

Out of 6465 deliveries, a total of 419 cases of PPH (6.4%) was recorded, among which 16 HAL were carried out (3.8% of PPH, or 0.2% of all deliveries).

The maternal ages ranged between 20 and 42 years, with a mean of 29 ± 5.6 years. Parity ranged between 1 and 4 with a mean of 2.4 ± 1.0. Gestational ages at delivery varied between 34 and 41 completed weeks with a mean of 38.4 ± 1.7 weeks.

Prior clandestine abortion was performed by the majority of women (9/16 or 56.2%) (Table 1).

HAL occurred in 11 cases (68.7%) after vaginal delivery and in 5 cases after CS (31.3%).

Mean birth weight was 3401.2 ± 608.8 (range 2045-4200). Fetal sex was usually female (12 or 75%).

PPH was mainly due to uterine atony (Table 2). HAL was successful in 12 cases (75%) and requested no additional treatment. In the last four cases, selective ovarian arteries ligation was done additionally and the hemorrhage stopped in three women. Subtotal abdominal hysterectomy was necessary to manage PPH in the other case after failure of the additional B-Lynch uterine suturing technique. One case of left hypogastric vein injury was noticed during HAL.

Table 1. Past history of clandestine abortion.

Abortion	Number of women	%
0	7	43.7
1	7	43.7
2	1	6.3
10	1	6.3
Total	16	100

Table 2. Causes of postpartum hemorrhage.

Cause	number	%
Uterine atony alone	7	43.7
Placenta abruption + uterine atony	4	24
Placenta increta on placenta praevia	3	18.8
Coagulation disorders	2	12.5
Total	16	100

Mean duration of surgery to stop the hemorrhage was 92.3 ± 42.6 minutes (60-175). The longest was observed in the woman who needed subtotal hysterectomy, while the shortest occurred in a woman who was delivered by cesarean section. The estimated blood loss during surgery was 872.7 ± 495.6 ml (450-1600). No case of maternal death occurred. The post-operative complaints commonly reported by women were lower limbs heaviness and tingling.

Discussion

Our prevalence of PPH (6.4%) is within the range of 3-15% described in literature[1]. The mean maternal age noticed in our study (29 years) is similar to that of 29.3 years reported in Tunisia [10], showing that HAL is usually offered to younger women who need future childbirth. This is also proven by the fact that the mean parity was low in our study (2.4), such as that of 2.2 found by the same authors [10].

The main cause of PPH was uterine atony in our series. This has been observed also in Tunisia [10]. We noticed in our study that 56.2% of women with PPH requiring HAL had prior clandestine abortion. This shows that clandestine abortion may increase the risk of abnormal placentation, consequently, of uterine atony.

HAL alone was successful in 75% of our patients (12/16), meaning that this can be the first option to be offered to women who need uterine preservation. A similar success rate (76.9%) has been obtained by some authors in Turkey [12]. A higher success rate of 90.5% has been observed in Tunisia [10]. Even in cases of failure of HAL, additional ovarian arteries ligation improved the success rate to 93.7% (15/16). This is explained by the fact that uterine arterial vascularization comes from both the uterine and ovarian arteries. One woman did not respond positively to the various methods used for uterine preservation. Henceforth, subtotal hysterectomy was carried out, as this was the final resort in the studies conducted in Turkey and Tunisia [7,10]. This failure is explained by the fact that there is frequently vascular anastomoses between the external and the internal iliac (hypogastric) arteries. This shows that adequate counselling for total hysterectomy in case of failure should be given to women prior to surgery, so that they will not be surprised to have had an eventual hysterectomy.

We had one case of left hypogastric vein injury during HAL. This shows that we should be careful during this procedure. Moreover, it has to be done by well-trained surgeons. The mean length of surgery in our series (92.3 minutes) was longer than the length of 61.2 minutes needed by Gezginç *et al.* for the B-Lynch suturing technique[9].

Blood should be made available for the management of PPH even if surgical approach has to be conducted. Indeed, mean blood loss during surgery alone was 872 ml. If this amount is added to blood lost before surgery, it might reach even 4000 ml in some women.

No maternal death was observed in our series, in contrast to other studies in Turkey where there were cases of maternal death[11]. This better outcome in our series might be due to the fact that we used a garrote to stop the bleeding while performing the surgery. This simple technique of garrote placement can be recommended to other authors in low resource countries who wish to perform HAL. The side effects observed post-partum were all due to disturbances of lower limb vascularization. Indeed, after HAL, there is disturbance of blood flow at the level of external iliac arteries due to the fact that the hypogastric arteries are no more functional.

Conclusion

This study showed that HAL can be considered as one of the surgical options that should be given to women desiring uterine preservation. In cases of failure, selective ovarian arteries ligation should be performed before resorting to hysterectomy in cases of failure of ovarian arteries ligation. Adequate counseling for hysterectomy should be offered to all women because all conservative surgical options can fail in stopping hemorrhage. To reduce the complication rate, HAL has to be performed by well-trained surgeons.

Conflicts of interest

The authors have none to declare.

Contribution of authors

Conception and study design: E.N.; Collection and analysis of data: C.T, Y.N.M.; Preparation of the manuscript: E.N. Critical review of the manuscript: J.N.F.; All authors approved the manuscript.

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