

## Original Research

# Surgical Management of Postpartum Hemorrhage at Cocody University Hospital in the De Facto Capital City of Ivory Coast

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## Abstract

**Background:** Postpartum hemorrhage (PPH) is the most common cause of maternal mortality in low-and middle-incomes countries (LMICs). It is treated surgically when first line treatments fail. The goal of the study is to report the results of surgical management of PPH at a University Hospital in the Capital of Côte d'Ivoire from 2015–2017. **Methods:** This was a retrospective study of all cases of PPH surgically managed at the university hospital of Cocody over two years. We did not include cases of maternal soft tissue injuries such as cervical, vaginal, vulvar and perineal lacerations. We studied the sociodemographic characteristics, surgical method performed and outcome of 54 cases who were operated on for PPH. Surgical management was either Radical Uterine Surgery (RUS): postpartum hysterectomy or Conservative Uterine Surgery (CUS): hysterography, tsirulnikov triple ligation and bilateral hypogastric artery ligation (BHAL). No embolization was performed because it is not available in our country. Data were analyzed using Stata 13.1 software 2013, StataCorp, College Station-Texas, USA. **Results:** Of 23,730 deliveries there were 971 cases of PPH (4.1%) 54 of which (5.6% of PPH cases) were managed surgically. Of these, 34 were after cesarean and 20 after vaginal delivery. The mean age was 30 years and the mean parity was 3. Referred patients after PPH comprised 75.9% of cases. The average time elapsed from delivery to postpartum surgery was 133 minutes  $\pm$  33.39. The average time from admission to surgery was 86 minutes  $\pm$  53. Thirty-four underwent postpartum hysterectomy (63%) and 20 CUS (37%). N = 10 women (18.5%) died, 2 status post cesarean and 8 after vaginal delivery. All died within 120 minutes of postpartum surgery. Maternal morbidity was common such as postoperative anemia (68.2%), surgical site-infection (15.9%) and endometritis (6.8%). **Conclusions:** Postpartum hysterectomy was generally performed in older multiparous women and CUS in younger pauciparous women. None of the surgical options showed superiority over the others, however the small sample size does not allow generalization of the results. The choice of method should be guided by the condition of the mother, the experience and skill of the surgeon, the availability of the operating room, and the possibilities of resuscitation.

**Keywords:** postpartum hemorrhage; LMIC; hemostasis hysterectomy; conservative uterine surgery; post-operative outcome

## 1. Introduction

Postpartum hemorrhage (PPH) is a major cause of maternal death worldwide, particularly in low-and middle-incomes countries (LMICs) [1–10]. It is a common complication of childbirth that occurs in approximately 2% to 4% of vaginal deliveries and 6% of cesarean sections [1–6]. Uterine atony is one of the main etiologies (50%) followed by tissue retention, traumatic soft tissue injury, coagulation disorders, and uterine rupture [2,7,8]. A multidisciplinary surgical management is often essential for uterine atony and severe traumatic maternal soft tissue injury [1–5,8–10]. It can be managed by radical uterine surgery (RUS) (postpartum hysterectomy) or conservative uterine surgery (CUS), such as, intrauterine tamponade, bilateral uterine artery ligation (BUAL) and bilateral hypogastric artery ligation (BHAL) [10,11]. The efficacy of CUS has been well described in the Western literature [7,10,12] but not yet well studied in underdeveloped countries [8,9,11]. New techniques for CUS have recently been incorporated, including

arterial embolization and uterine devascularization methods [10,12–14]. Failure of these conservative methods resulted in further bleeding in the short term [1,2,5,15]. In our daily practice, where intensive care units, blood products and operating rooms are not available, we wanted to determine, through this study, the surgical data on the management of PPH in a sub-Saharan African country.

## 2. Methods

We undertook a retrospective descriptive study for 24 months (January 2015 to December 2017) at the university hospital of Cocody (Côte d'Ivoire). All PPH cases that were surgically managed in the department were included. We did not include maternal lower genital tract soft tissue injuries (cervical, vaginal, vulvar and perineal lacerations). Sociodemographic data, surgical method performed and its results were studied. The surgical management was either RUS (postpartum hysterectomy) or CUS (hysterorrhaphy, Tsirulnikov triple ligation and BHAL). No



**Table 1. Sociodemographic characteristics of patients and data at admission.**

Data	n = 54	%
Age (years)		
• ≤20	6	11.1
• 20–30	25	46.3
• 30–40	16	29.7
• >40	7	12.9
Parity		
• Nulliparous	8	14.8
• Primiparous	5	9.3
• Pauciparous	27	50
• Multiparous	14	25.9
Admission mode		
• Walk-in	13	24.1
• Referred	41	75.9
Origin of referral		
• Northern Abidjan	40	74.1
• Southern Abidjan	9	16.7
• Outside Abidjan	5	9.3
Reason of admission		
• Postpartum hemorrhage (PPH)	15	22.2
• Antepartum hemorrhage	9	
• Dystocic labor	23	25.9
• Uterine contractions	2	3.7
• Eclampsia	3	5.6
• Bi-scarred uterus	2	3.7

embolization was performed because it is not available in our country. Data were analyzed using Stata 13.1 software 2013 (StataCorp, College Station-Texas, College Station, TX, USA).

### 3. Results

We recorded 23,730 deliveries. Of these 971 were PPH cases (4.1%). The mean age of women giving birth was 30 years with extremes of 15 and 44 years. The average parity was 3 with extremes of 0 and 9. The sociodemographic and admission data of the patients are summarized in Table 1.

24% of deliveries took place at Cocody hospital and 76% were referred from outside the hospital. These referrals arrived by cab (57%), 43% arrived on foot or by ambulance or other means of transportation. Delivery and postpartum parameters are presented in Table 2. The mean time from delivery to postpartum surgery was 133 minutes  $\pm$  33.39. The mean time from admission to postpartum surgery was 86 minutes  $\pm$  53. Thirty-four and 20 underwent RUS (63%) and CUS (37%), respectively. The duration of the of the surgical procedure ranged from 13 and 225 minutes.

Data on surgical management of PPH and postoperative outcome (Tables 3,4).

**Table 2. Delivery and immediate postpartum data.**

Features	n	%
Mode of delivery		
• Cesarean section	30	55.5
• Vaginal birth	24	44.4
Etiology of PPH		
• Uterine atony	34	63.0
• Uterine rupture	13	24.1
• Placenta accreta	7	13.0
Time from admission to diagnosis (min)		
• ≤30	22	46.8
• >60	25	53.2
Time from delivery to PPH surgery (min)		
• ≤30	12	25.5
• >60	35	74.5
Time from diagnosis to surgery (min)		
• ≤30	19	40.4
• >60	28	59.6

Scheduled cesarean section (n = 4) and Emergency caesarean section (n = 26).

Surgical management of PPH accounted for 5.6% of cases (n = 54) including RUS (n = 34 or 63.0%) and CUS (n = 20 or 37.0%). We recorded a high case fatality rate of 18.5% (n = 10 MD (maternal deaths)). MDs occurred within 120 minutes after the procedure (70%). One woman who waited 225 minutes for surgery obviously died. Overall maternal morbidity was high (77.3%) with postoperative anemia being the dominant etiology (68.2%) followed by surgical site-infection (15.9%) and endometritis (6.8%).

### 4. Discussion

We conducted a retrospective study that had the classic limitations of this type of study. Indeed, some essential data were not found in the patients' medical records, and some records were not found because of poor archiving in our hospital. However, we believe it is unlikely that this generated too much bias in data quality and conclusions.

PPH is the leading cause of maternal death worldwide, particularly in LMICs [1,3]. Most maternal deaths (MD) occur in the first 24 hours after delivery and can be prevented in vaginal deliveries with proper management of the third stage of labor [16–18]. The incidence of PPH was significant in this study (4.1% of deliveries) as reported in the African [3,4,8,11] and Western literature [10,12,18]. There are some divergent data that can be attributed to the methodology of the study and subjectivity of PPH diagnosis. Indeed, in underdeveloped countries [3,4,8,11], PPH diagnosis is based on blood loss via visual estimation and maternal repercussions, while in developed countries it is much more objective, as assessed with a measuring bag [15,16]. We describe a young population of women (30  $\pm$  2 years) aged between 25 and 35 years (60.26%). Similar results have been reported by some sub-

**Table 3. Surgical management of PPH data and postoperative outcome.**

Data	n = 54	%
Radical uterine surgery (RUS)	34	63.0
• Total hysterectomy	20	58.8
• Subtotal hysterectomy	14	41.2
Conservative uterine surgery (CUS)	20	37.0
• Tsirulnikov triple vascular ligation	8	60.0
• Hysterorraphy	6	20.0
• BHAL	6	20.0
Operative indications for RUS	n = 34	
• Uterine atony	22	64.7
• Uterine rupture	10	29.4
• Placenta accreta	2	5.9
Operative indications for CUS	n = 20	
• Uterine atony	12	60.0
• Placenta accreta	5	25.0
• Uterine rupture	3	15.0
Postoperative outcome	n = 54	
• Stop bleeding	44	81.5
• Maternal death	10	18.5
• Anemia	34/44	77.3
• Surgical site-infection	7/44	15.9
• Endometritis	3/44	6.8

BHAL, bilateral hypogastric artery ligation.

Saharan African authors [3,6,7,10]. Housewives with low socio-economic level were dominant suggesting that PPH occurs preferentially in the lower socio-professional strata of LMICs [3,4,6,9,15]. Uterine atony represented the main cause of PPH, as has been widely reported in the literature [1–5,10,13–19]. In this study, very few cases of PPH underwent surgical management (5.6%), as these were second-line measures reserved for refractory PPH [1,5,10,13,15]. RUS (63.0%) was the predominant surgical technique used, as highlighted by many African authors. It was performed because of the poor condition of the mother, fear of re-bleeding and unavailability of blood transfusion [3,4,6,11]. Subtotal hysterectomy was the main RUS performed because it is simple and quick to performed (58.8%). Postpartum hysterectomy was mainly indicated for uterine atony (64.7%) and uterine rupture (29.4%) but a significant statistical relationship was not verified in this study because this surgical procedure is commonly performed in poor countries [5,10] because of the competence of the practitioner and the safety of the patients (extensive and old uterine lesions, unavailability of resuscitation and blood products, and operating rooms). CUS was rarely but not negligible (37.0%) with a predominance of Tsirulnikov triple vascular ligation (40.0%) because it is easier to perform in case of uterine atony (60.0%) with significantly positive results in the range of 60–70% [1,10]. BHAL is also a very simple method with a very low risk of immediate complications [1,10]. Simple suturing of uterine injuries (Hysterog-

**Table 4. Maternal death profile data.**

Deceased women risk factors	n = 10	%
Age (years)		
• <30	2	20.0
• >30	8	80.0
Parity		
• <4	3	30.0
• >4	7	70.0
Reason for admission or PPH etiology		
• Uterine atony	4	40.0
• Placenta accreta	4	40.0
• Uterine rupture	2	20.0
Method of delivery		
• Vaginal	5	50.0
• Cesarean	5	50.0
Time from vaginal birth until surgery for PPH		
• <30 minutes	2	20.0
• ≥30 minutes	8	80.0
Type of surgery		
• Radical uterine surgery (RUS)	3	30.0
• Conservative uterine surgery (CUS)	7	70.0
Time from surgery until death		
• <30 minutes	3	30.0
• ≥30 minutes	7	70.0

raphy) required prompt surgical management on admission for recent, and non-extensive traumatic uterine injuries in young pauciparous women. In developed countries, conservative surgical methods have been used as the first line of care because of their accessibility, low amounts of blood loss and duration, effective resuscitative measures and short management [1,10]. As in this study, it is common to perform a RUS in elderly multiparous women with extensive and long-standing traumatic uterine injury [3,6,9,11,18–24]. Subtotal hysterectomy is the gold standard procedure for RUS because of its simplicity and the rapidity of execution [15,18]. When comparing surgical procedures, none has shown superiority over the others as demonstrated by some authors [10,13]. The choice of surgical techniques in the treatment of PPH should be guided by the experience and competence of the surgeon [5,10,24,25], which our study was not intended to demonstrate. Difficulties with blood transfusion and fear of rebleeding are key factors in the choice of a surgical method [9–11,22,24]. In addition, the high number of young females in the population, a consistent demographic factor in LMICs, makes it difficult to assess the effectiveness of surgery [8,16,21–23,25]. In developed countries, RUS is frequently performed as a last option, in cases of failure of embolization and surgical uterine devascularization procedures [1,5,12]. The association between age and the surgical method performed in uterine atony is widely described in the literature [8,16,21–23]. An increase in postpartum hysterectomy with maternal age has been demonstrated with an odds ratio of 1.6 (95% confi-

dence interval (CI): 0.9 to 2.9) for the age group between 20 and 29 years, 4.0 (95% CI: 2.2 to 7.1) for those between 30 and 39 years, and 7.6 (95% CI: 4.0 to 14.3) beyond 40 years [17–20]. Uterine atony is described as a pathology of older multiparous women due to an exhausted and aged myometrium [8,17,21–23].

Surgical results were satisfactory in this study with high rate of cessation of bleeding (81.5%). Nevertheless, maternal lethality related to PPH was significantly high (18.51%). Maternal deaths (MD) were mainly related to multiparous women over 30 years of age, with placenta accreta. In the literature, observations have been described with the risk of MD increasing from an odds ratio (OR) = 1 in those under 20 years to an OR = 2.15 after 35 years of age [7,21–26]. The profile of MDs was consistent with the socio-demographic findings of LMICs. In this study, most MDs were rapidly seen within 30 minutes of admission because these patients were hemodynamically unstable and did not receive effective resuscitative care. This was illustrated by the predominance of MDs (70%) in placenta accreta despite the small number ( $n = 7$ ) because they were seen two hours after surgery. Due to a more favorable prognosis, many authors propose radical management, in case of morbid placental insertion [6–11]. These MDs may not be related to surgery but exacerbating factors such as poor maternal hemodynamic status on admission, late referral after prolonged hemorrhage. Regarding the evaluation of the effectiveness of surgical methods, there was no significant association with the mode of delivery or the etiology of PPH and surgical technique used. This is similar to many authors who show that surgical outcome is better when performed promptly by competent surgeons [9,14,18]. MDs are more likely due to uncompensated blood loss than as a consequence of surgery. Implementation of guidelines is needed to improve surgeon selection for surgical treatment of PPH, as hospital-based shifts are often performed by resident physicians. Surgical failure and poor prognostic factors may include prolonged vaginal bleeding, hemorrhagic shock, severe anemia, and unmet transfusion needs. Most of these factors are interrelated and are found in underdeveloped countries [10,23–25]. Further operational research would effectively evaluate the choice of surgical method for the management in our LMICs. Prompt initiation of these therapeutic measures in first-contact health care setting facilities is essential to improve maternal prognosis [24,26–28]. Implementation of these actions is essential in choosing the type of surgery to minimize patient risks and ensure surgical success.

## 5. Conclusions

Postpartum hemorrhage (PPH) is the predominant severe complication of childbirth. Surgical management remains the last resort to stop hemorrhage but is the first line of defense in underdeveloped countries for safety reasons. No surgical method has been shown to be superior to the

other; however, the small size of our population does not allow us to generalize these observations. The choice of a surgical method must take into account the preservation of women's lives as determined by maternal status on admission, surgeon skill, availability of operating rooms, and resuscitation options.

## Availability of Data and Materials

Data supporting the results of this study are available from the corresponding author, but restrictions apply to their availability. The data were used under license for the current study, and are therefore not publicly available. However, the data are available from the authors upon reasonable request and with permission from Dehi Boston Mian.

## Author Contributions

DBM, FT, VA, AY, CB, KNG and SB have contributed to the conception of the work, the acquisition, analysis and interpretation of data collected during this survey. DBM, FT, VA, AY and CB have contributed in extraction of data. DBM, VA, KNG, SB have made the final manuscript draft, reviewed it critically for important intellectual content and achieved the published version. All authors contributed to editorial changes in manuscript. All authors read and approved this final manuscript, and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

## Ethics Approval and Consent to Participate

We have obtained the approval of the National Committee of Ethics of Health and Life (N 255451-CI/2020) of the Felix Houphouët Boigny University for the publication of this manuscript. The informed consent of the patient was obtained for this study.

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## Conflict of Interest

The authors declare no conflict of interest.

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