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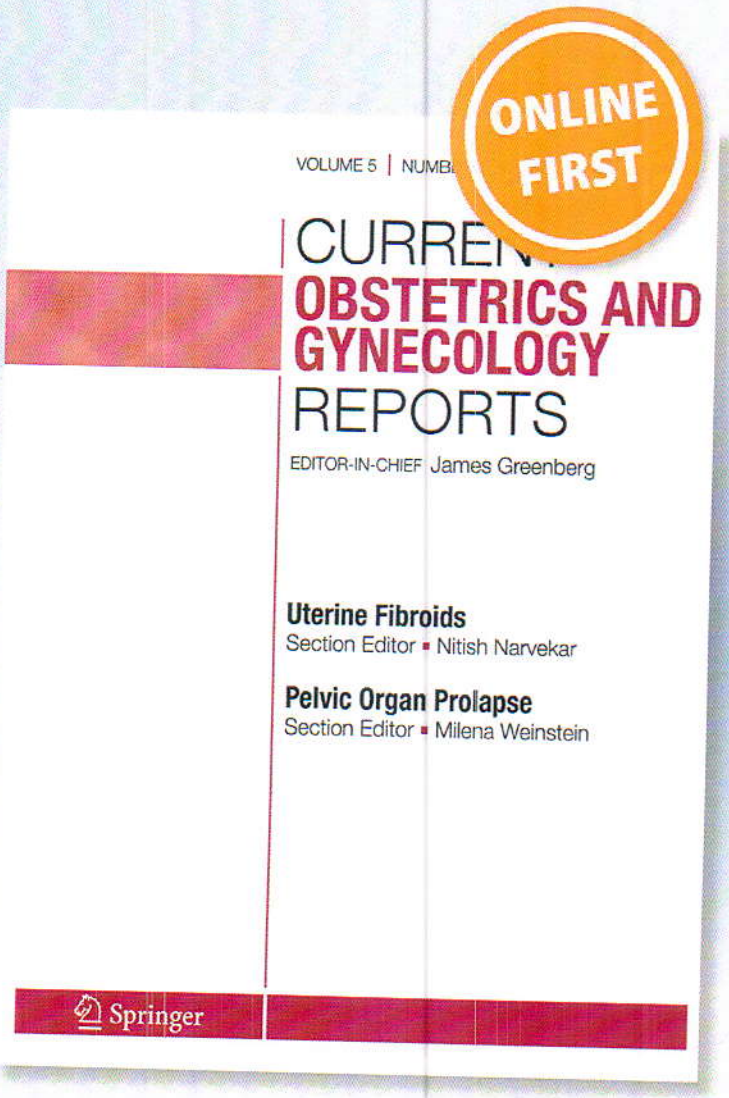

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Management of Acute Postpartum Hemorrhage in Senegal

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Abstract In Senegal, maternal mortality is 222.9 per 100,000 live births. Acute postpartum hemorrhage (PPH) complicates 3.1 % of all births, 44.2 % of direct causes of maternal deaths, and 33.6 % of all maternal deaths. Major causes include uterine atony, trauma, coagulation disorders, and total or partial retention of the placenta. A newer technique to address acute postpartum hemorrhage is the use of the condom balloon catheter. In Senegal, prevention means following the World Health Organization (WHO) recommendation of active management of the third stage of labor for all women in labor. This practice necessitates close collaboration of a multidisciplinary team comprising obstetricians, midwives, anesthetists, radiologists, and biologists. Obstetric care should be conducted simultaneously with resuscitation.

Keywords Acute postpartum hemorrhage · Condom catheter · Active management of labor · Uterine atony · Senegal

Introduction

Every day, 1500 women die from pregnancy or childbirth related to complications. In 2005, there were 536,000 maternal deaths worldwide, according to estimates by the World Health Organization (WHO). Most of them occur in developing countries like Senegal [1].

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Acute postpartum hemorrhage (APPH) is commonly defined as blood loss of at least 500 ml occurring within 24 h of childbirth. It is termed severe when blood loss reaches 1000 ml or more within the same time [2–4]. Despite progress made in recent years to reduce maternal mortality and morbidity associated with APPH, this complication remains the leading direct cause of maternal mortality in low-income countries. In fact, each year, APPH is responsible for nearly 130,000 deaths and 2.6 million complications worldwide [2, 5•, 6]. In Senegal, according to an assessment of obstetrical and neonatal emergency treatment conducted between July 2012 and June 2013, hemorrhages represented 44.2 % of direct causes of maternal deaths [7••]. Uterine atony is the most common cause of APPH, but genital trauma (vaginal or cervical lacerations, for example), uterine rupture, retention of placental tissue, and coagulation disorders also play significant roles. Many deaths secondary to APPH can be avoided by the prophylactic administration of uterotonics and appropriate care in a timely manner during delivery, and many techniques and protocols are available and scientifically validated for prevention, diagnosis, and treatment of APPH. However, such international standards are sometimes not appropriate to sub-Saharan Africa, a region characterized by inadequate technical know-how and health system organizational problems [8]. One technique introduced to address this technology and resource gap for the treatment of acute postpartum hemorrhage is the use of the condom balloon catheter.

The objective of this work is to review the role of condom catheters in the current management protocols and the prognosis of APPH in Senegal.

Epidemiology

In 2013, Senegal, through its centers of emergency obstetric and neonatal care, registered 7318 cases of acute postpartum hemorrhage (APPH) from a total of 237,494 documented

births, a frequency of 3.1 % [7••], representing 23.5 % of direct obstetric complications and 18.7 % of all complications managed in the centers. During the same period, the maternal mortality ratio at the national level was at 222.9 per 100,000 live births. APPH represented 44.2 % of direct causes of maternal deaths and 33.6 % of all maternal deaths [7••]. Two studies carried out in level 3 reference hospitals in Dakar in 2010 and 2015 found frequencies of APPH of 0.86 % [9•] and 1.6 % [10•] respectively. In neighboring Mali, over a period of 28 years, Téguété [8] reported a rate of 2.3 % of postpartum hemorrhage of which 99.6 % were classified as APPH.

The frequency rates reported in the general African literature are widely variable. A survey of different African hospitals found the following rates: 0.19 % by Pambou [11] in Congo, 0.89 % by Aguessy [12] in Benin, and 1.29 % by Akpadza [13] in Togo. The French series reveal rates of APPH between 2 and 9 % [14]. This variability in the frequency of APPH is probably due to different diagnostic criteria. Often, diagnoses are based solely on visual estimation of bleeding which is very subjective. Also, underreporting in the medical records is common in many African countries and further hampers a comprehensive collection of research data. Looking towards the future, in order to obtain actual and accurate frequency rates of APPH, a uniform definition of APPH needs to be adopted at the national level by all health facilities and more comprehensive clinical and biological birth data needs to be documented on the medical records of women in labor [10•].

Etiologies

In Senegal, uterine atony is the leading cause of postpartum hemorrhage, although abnormal placentation, trauma, and other causes also contribute significantly to the problem. In a study by Wiam [10•] at the Principal Hospital of Dakar, four main etiologies of APPH were isolated. These were, in order of frequency, uterine atony (28.3 %), traumatic lesions (27.2 %), coagulation disorders (18.5 %), and total or partial retention of the placenta (17.5 %). In the series by Nana [9•], uterine atony was the primary cause of APPH (31.7 %), followed by partial or complete placental retention (27.9 %) and coagulation disorders (12.5 %). The results recorded in Senegal join the trend in literature [11–17] regarding uterine atony as the leading cause of APPH. However, in neighboring Mali, the causes were dominated by traumatic lesions represented by 54.5 % of all postpartum hemorrhages of which 39.9 % were uterine ruptures and 14.6 % cervical or perineal tears [8]. Based on this literature review, in Senegal and in many similar developing countries, it seems the two main causes of APPH are uterine atony and injuries to the birth canal. Therefore, it is important to ensure that all women who give birth benefit from an active management of the third stage of labor to prevent APPH due to uterine atony, as recommended by WHO, and that trained birth attendants perform a systematic examination of the cervical-vaginal canal for signs of trauma to reduce the morbidity from lacerations.

Approaches to Managing Acute Postpartum Hemorrhage

Initial Approach

Managing APPH necessitates close collaboration of a multidisciplinary team comprising obstetricians, midwives, anesthetists, radiologists, and laboratory. The start time of treatment for PPH should be carefully documented (T0) so that team members are constantly aware of how long the hemorrhage has been occurring. As with any hemorrhagic emergency, IV access and resuscitation are important at the start. Two intravenous lines using large-bore intravenous catheters should be initiated; supplemental oxygen delivered; blood samples for CBC, coagulation profile screening (PT, APTT, fibrinogen), and blood group typing taken; and a urinary catheter placed. In addition, continuous monitoring of blood pressure and heart rate and the establishment of a chart to track all clinical and laboratory parameters are essential [18–21].

The primary treatment of hypovolemia and hemodynamic instability is vascular expansion by fluid replacement with crystalloids and/or colloids. Blood transfusion is indicated for acute anemia. The treatment of coagulation disorders is based on the addition of fibrinogen, platelets, and fresh frozen plasma depending on the results of laboratory tests though, where possible, massive transfusion protocols should be established.

Management of APPH is determined by the etiology of the hemorrhage and is facilitated by a protocol developed from the clinical practice recommendations by WHO in 2006 [21]. First, verify the bladder is empty, massage the fundus of the uterus, and use oxytocin [22]. Two scenarios then arise depending on whether the placenta has been delivered or not. If the placenta has been delivered and bleeding persists, retained pieces of the placenta must be considered. Either ultrasound or manual exploration can help to ensure or verify that the uterus is empty and without rupture. For manual explorations, regional anesthesia is often required; alternatively, administering small doses of opioids or benzodiazepines can be used. Simultaneously to this assessment, uterine fundal massage should be performed and injection of uterotonics (oxytocin or misoprostol) employed to obtain a good uterine contraction. If placental delivery has not taken place, manual delivery of the placenta is needed. Sedation, regional anesthesia, or general anesthesia is usually necessary and manual removal is always followed by a uterine inspection. Strict aseptic procedures and antibiotic prophylaxis are essential.

Mechanical Compression with a Condom Balloon Catheter

In case of failure of medical treatment or manual removal of the placenta, mechanical compression is recommended before surgery. In Senegal, the first option is an intrauterine condom balloon catheter.

Over the last 5 years, a team from the Massachusetts General Hospital in the USA designed and implemented a low-cost balloon (less than 5 USD or 3000 XOF) consisting of two condoms of a 24-gauge catheter with an anti-reflux system, a 60-ml syringe, and two small woolen wires. In order to support the introduction and implementation of the intrauterine balloon in Senegal, a 4-h practical session of train the trainers was organized in March 2014 in collaboration with the team of the Massachusetts General Hospital. Twelve health facilities were selected. For each selected health structure, an obstetrician gynecologist and two midwives were trained. They were invited to use the intrauterine balloon for the treatment of atony uterine HPPI after preventative measures have failed (active management of the third stage of labor: AMTSL) and medical treatment in force in Senegal (catheterization, uterine massage, perineal sutures or cervical lesions, of uterotonics, placenta and uterus) and before using surgery.

After the training, 60 intrauterine balloon kits were distributed at a rate of five per health facility. Each kit includes two condoms, a 24-gauge catheter equipped with an anti-reflux system, a 60-ml syringe, two small woolen wires, and an illustrated checklist and data collection form (Fig. 1).

Fig. 1 Components of the intrauterine balloon kit: two condoms, a 24-gauge catheter equipped with an anti-reflux system, a 60-ml syringe, and two small woolen wires

Outcomes with Condom Balloon Catheter Use for Acute Postpartum Hemorrhage

In collaboration with the Massachusetts General Hospital, we have initiated a multicenter, prospective and descriptive study between March 1, 2014 and December 31, 2015 (22 months) with patients who had an immediate postpartum hemorrhage with uterine atony and treated by the intrauterine balloon.

The objective of that study was to evaluate the efficacy and safety of the low-cost intrauterine balloon in the management of immediate postpartum hemorrhage in the case of persistent uterine atony after medical treatment. During the study period, 30 patients met our inclusion criteria. They had a mean age of 27 years with a mean number of deliveries of 2 and a mean number of living children of 2. The intrauterine balloon was set up in an average time of 2 h 17 min after birth and removed in an average time of 11 h 40 min. We had two hemostasis hysterectomies (6.7 %). At the time of balloon insertion, 14 patients had cardiovascular collapse with altered consciousness in 7 cases. Twenty-eight of 30 patients (93.3 %) had benefited from the active management of the third stage of labor (AMTSL). Other therapeutic procedures carried out before the introduction of the intrauterine balloon were uterine massage (24/30), uterine revision (10/30), suturing perineal lesions (14/30), bimanual compression (4/30), and misoprostol (23/30). After the insertion of the intrauterine balloon, 18 patients out of 30 (60 %) benefited from a whole blood transfusion. We did not observe any potentially related intrauterine balloon complications. Only one case of anuric acute renal failure was noted. The success rate was 93.3 % and no maternal death was recorded.

The intrauterine balloon appears to be effective, safe, and accessible for the management of immediate postpartum hemorrhage by uterine atony in countries with limited resources. It can significantly reduce the rate of hysterectomy.

The condom balloon catheter is an improvised device consisting of two condoms, a 24-Fr catheter equipped with an anti-reflux system, a 60-ml syringe, and two small wool strings. The condom is attached to the end of the catheter by both of the small strings, and the whole condom-catheter unit glided by the index and middle finger into the uterine cavity. Using the syringe, the balloon is filled with clean water. On average, 300 to 500 ml is enough. If the bleeding stops, the balloon is left in place for 6 to 24 h, on average 8 h. If the bleeding does not stop, the condom catheter is removed and the patient taken to the operating room for surgery.

Invasive Surgical Intervention for Acute Postpartum Hemorrhage

When neither basic initial interventions nor placement of a condom balloon catheter results in stabilizing an APPH, invasive surgical interventions are necessary. In Senegal, the initial

surgical interventions are often vessel ligation techniques (ligation of hypogastric arteries and uterine arteries, triple arterial ligation, ligation in stages or stepwise ligation) or kinking or uterine compression particularly by the methods of B-Lynch or Cho. Radical treatment or hysterectomy is the last resort in patients with failure of conservative surgery. Cases involving uterine rupture must be operated on through the abdomen. A conservative approach with repair of the defect is indicated if the rupture is not extensive. In case of uterine inversion, management must be rapid. It includes resuscitation and a reduction by taxis or manual reduction which involves reversing the invagination by pushing the fundus back into the uterus. It should be followed by an oxytocin infusion to prevent immediate recurrence. If unsuccessful, a surgical procedure trans-abdominal or vaginal route is necessary. Arterial embolization is not yet available in public hospitals in Senegal and is therefore not included in our management protocol of APPH.

Prognosis

Despite efforts in recent years in the prevention and treatment of APPH, maternal mortality remains high. In Senegal, according to the report of the evaluation of the Unit of Obstetrical and Neonatal Emergency Care in 2013, although the most lethal problem was uterine rupture (13.5 % mortality), APPH in general was associated with a 4.1 % mortality rate. In the Wiam study [10•], the case fatality rate was 1.1 %, much lower than those found in some African series: 39.5 % according Pambou [11] in Congo Brazzaville, 33 % according to Nana [9•] in Dakar, and 13.2 % to according to Agbetra [2] in Togo. In Mali, Téguété [8] found a mortality rate of 16.6 % with an almost tenfold risk of maternal death after APPH (OR = 9.9). These high rates in Africa could be explained by the low socioeconomic level of living, a deficit in trained medical staff, and lack of resuscitation equipment with the absence of emergency kits in labor and delivery centers. These constraints are responsible for delays in consultation, diagnosis, and treatment often with fatal results.

APPH is also associated with significant maternal morbidity. At the Principal Hospital of Dakar, Wiam noted the occurrence of complications in 48 of 92 (52.2 %) patients managed for APPH. There were 43 cases of anemia (46.7 % of all complications) of which 22 were moderate (51.2 %) (hemoglobin between 7 and 10 g/dl), 17 severe (39.5 %) (hemoglobin between 3 and 7 g/dl), and 4 life threatening (9.3 %) (hemoglobin less than 3 g/dl); 9 cases of disseminated intravascular coagulation (9.8 %); 8 cases of renal failure (8.7 %); 6 cases of HELLP syndrome (6.5 %); and 6 cases of hysterectomy for hemostasis, causing permanent infertility.

Conclusion

In Senegal, APPH is characterized by high frequency and high mortality rates. The most frequent causes of APPH are uterine atony and traumatic lesions. The management of APPH is limited by the lack of technical facilities and trained human resources. The recent introduction of condom balloon catheters may provide a helpful tool in treating APPH, but wider dissemination of this technology and further studies are needed. The adoption of simple, well-codified, and appropriate management protocols can hopefully improve prognosis.

Compliance with Ethical Standards

Conflict of Interest M. M. Niang, M. E. Faye Dieme, M. Mbaye, C. T. Cisse, and J. C. Moreau declare that they have no conflict of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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