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An Overview on the Cause and Management of Postpartum Hemorrhage

Jaanam Altaf Khan¹, Shu Zhu², Xiuli Wang^{2*}

¹Department of Obstetrics and Gynecology, Nanjing Medical University, Nanjing, Jiangsu Province, China; ²Department of Gynecology, The First Affiliated Hospital of Nanjing Medical University (also named Jiangsu Province Hospital), Nanjing, Jiangsu Province, China.

ABSTRACT

Postpartum hemorrhage is a potentially lethal, hazardous whilst preventable condition making it the significant cause of maternal mortality. It is defined as loss of blood greater than 500ml in a normal delivery and more than 1000ml in C-section in the first 24 hours. One third and one fourth of the death that occurs is due to postpartum hemorrhage, Among the various causes of Postpartum hemorrhage (PPH), uterine atony is the most common cause involved in 80% of the cases. Hypovolemic shock, DIC, hepatorenal syndrome and acute distress syndrome are some of the complications in women who encounter massive postpartum hemorrhage. Death occurs in women in whom timely adequate emergency measures were not taken. Life can be saved when immediate measures are taken. When uterine atony is observed administration of utero tonic drugs such as oxytocin and prostaglandin, uterine massage, uterine compression technique and intrauterine balloon tamponade is used. When hemostasis is not achieved by conservative method then, TAE or surgical management including (vessel ligation, bilateral ligation of the uterine or internal iliac arteries), uterine compression suture, and hysterectomy is implemented in refractive cases without any further delay.

Key Words: Postpartum hemorrhage, Uterine atony, Obstetric hemorrhage, Hysterectomy

INTRODUCTION

Postpartum hemorrhage (PPH) is of utmost concern because of the mortality it causes in pregnant women and as an estimation every year, the rate of death recorded is around five thousand of which 1/4th of the women population die due to PPH [1]. It is believed that in both developed and underdeveloped countries it is one of the most common causes of maternal mortality affecting about 1-5 % of deliveries by this [2]. A blood loss greater than 500ml in 24 hours following a vaginal delivery or more than 1000ml after a Caesarean section is considered as PPH. On the basis of classification, primary and secondary are the two classification of it. PPH that occurs in the first 24 hours following delivery is known as the primary PPH and the secondary PPH is considered when it appears from more than one day up to 12th week postpartum [3]. A blood transfusion of 4 units of Blood is required, when there is blood loss of more than 1500ml it can be regarded as primary “massive” postpartum hemorrhage resulting in the down regulation of hemoglobin concentration to more than 4g/dB postpartum [4]. Formation of capil-

lary hemorrhage which leads to expulsion and shrinking of placenta due to the strong uterine contraction enables the restriction of hemorrhage due to the activation of the coagulation system and uterine contractions [5]. Among the causes of PPH, Uterine atony by far remains the most common etiological factor resulting in PPH. This is generally regarded as the primary cause of postpartum hemorrhage, involving the other potential causes too like laceration, retained tissue or placenta and coagulation defects. Secondary postpartum hemorrhage is due to congenital or Inherited defect in the coagulation, endometritis and the failure of the placenta to come back to its normal position after birth. The study involving the risk factor for PPH includes hemorrhage due to prolonged labor particularly the third stage of labor (where the delivery of placenta takes more than 30mins, after the delivery of baby), prior PPH (due to placenta accrete, Increta or percreta), preeclampsia, multiparty, twin gestation, arrest of labor, deliveries using forceps or vacuum-assisted deliveries, laceration of soft tissues and polyhydraminos [6]. The amount of blood loss can roughly be associated by the visual Inspection or by directly weighing the amount of blood in

Corresponding Author:

Xiuli Wang, Department of Gynecology, The First Affiliated Hospital of Nanjing Medical University (also named Jiangsu Province Hospital), Nanjing, Jiangsu Province, China; Phone:-008613813382653; Email: xuili_2266@163.com

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the suction canister, this report will further demonstrate the conservative and surgical technique used in the management of PPH in an obstetric field to overcome the potentially lethal cause of mortality in these women.

The etiology of postpartum hemorrhage causing potentially lethal mortality

- 1) Uterine Atony (Over-distended uterus, muscle floppiness)- Uterine atony is most common etiological factor in aiding postpartum hemorrhage, In the third stage of labor where the delivery of placenta takes place, the prevention of uterine atony has led to significant decline in the rate of postpartum hemorrhage[7].
- 2) Retained Placenta Products (accrete, increta, percreta)- The second most common cause of PPH after uterine atony is said to be Retained placenta, It has risk factors including maternal age more than 35 years, a prior dilatation and curettage, placenta weighing less than 500g and multiparty making it a major Indicator in the requirement of blood transfusion protocol in the stage of labor where the delivery of placenta takes place, after the delivery of the baby[8].
- 3) Multiple gestation – Multiple Gestation has led to the two fold increase in the rate of mortality as compared to primipara.
- 4) Laceration of soft tissues (perineum, vagina, cervix due to fetal malpresentation or forceps and vacuum-assisted deliveries) – Trans catheter arterial embolization (TAE) is an effective method in patients, who bleed due to laceration in genital tract or inpatient with forceps-assisted deliveries, TAE helps in evacuation of Para vaginal hematoma in these patient [9].
- 5) Coagulation defect (Acquired Congenital defect – hemophilia and Von Willebrand disease, Inherited Congenital defect – DIC, low fibrinogen level, and hyperfibrinolysis)- The early indicator in the severity of bleeding in postpartum hemorrhage is assumed to be the low levels of fibrinogen, fibrinogen value less than 2g/L is 100% for positive predictive value[10].
- 6) Uterine rupture – A woman's chance of uterine rupture increases among those with prior Cesarean section and also in women whom labor is induced with prostaglandins confers the greatest risk of uterine rupture [11].
- 7) Prolonged third stage labor – The stage of labor where the delivery of placenta takes more than 30minutes the risk of having postpartum hemorrhage is increased to Six folds than before 30minutes[12].

Diagnosis

Diagnosis can be achieved by following ways depending upon the type of postpartum hemorrhage, If it's a primary postpartum hemorrhage, the patient or the caregiver may no-

tice excessive bleeding, which will prompt them to use more than one pads in 5 minutes due to increased saturation of the pad, patient may also become light-headed, nauseated, clammy or dyspneic due to the excessive amount of blood loss. Excessive pain and hematoma occur at the site when there is bleeding in the soft tissues. Inpatient with secondary postpartum hemorrhage, the patient will note abrupt escalation of vaginal bleeding, In cases where the placenta is retained or the product of conception is retained, bloody discharge may be characterized by a foul odor and patient may experience severe cramping sensation and low abdominal pain. The patient also have similar symptoms of anemia.

Clinical Manifestation in a patient with postpartum hemorrhage

Prolonged and excessive bleeding due to hemorrhage can cause hemodynamic instability resulting in volume depletion thus known as hypovolemic Shock. Hypovolemia can cause circulatory collapse, end-organ damage and finally death due to depletion in a large amount of blood volume as a compensatory mechanism of the body, patients have increased heart rate and Increased breath rate (Reflex Tachycardia and Tachypnea)[13]. Based on the classification of postpartum hemorrhage in accordance with the class, It is divided into four classes, when the amount of blood loss is 1000ml with loss in blood volume of 15% it is regarded as Class 1, the clinical symptoms are characterized by palpitations, feeling of dizziness and a certain decrease in the amount of blood pressure. When the blood loss is estimated to be around 1500ml that is (20-25%) loss it is Class 2, symptoms of increased heart rate, Increased breath rate, excessive sweating, weakness, and narrowed pulse pressure is observed, for the Class 3 it is the volume of blood loss of 2000ml (30-35%) it is manifested by significant increased in heart rate, increased in breath rate, agitation, pallor and cool extremities, the last stage which is class 4 it is the volume loss of 2500ml or more (40% or more) It is associated with shock, air hunger and decreased urine output. According to the severity of shock, a Volume loss of less than 20% can result in symptoms of excessive sweating, increased capillary refill, cool extremities and anxiety which can be regarded as Mild Shock. However, when there is volume loss of approximately 20-40% symptoms of Tachycardia, tachypnea, postural hypotension and oliguria can be seen which is regarded as the moderate degree of shock. In severe degree of Shock, there is blood loss greater than 40% resulting in agitation, hypo tension and hemodynamic Instability.

Conservative and surgical approach in the management of postpartum hemorrhage in a patient with postpartum hemorrhage

The treatment option for the early management of primary postpartum hemorrhage is to maintain the fluid loss by re-

placing the amount of both blood loss and fluid loss, also to control the site and cause of bleeding and look for the coagulopathy if present. It should be ensured that the airway is clear without any obstruction and there is proper ventilation taking place. If the respiration is compromised and there is an altered level of consciousness then Intubation is considered with an adequate amount of oxygen supplementation. IV access should be obtained with the help of large bore cannula and also a urinary catheter should be placed and to monitor the urine output (greater than 30ml/hour).

Postpartum hemorrhage has been the leading cause of maternal death. A variety of approaches have been used in dealing with the most lethal cause of maternal mortality during the postpartum period which includes the Active management of the third stage of labor (AMTSL) which has three components 1) use of utero tonic agents like misoprostol (prostaglandins PGE1), methergine, carbetocin (oxytocin) immediately after birth of the baby 2) Control cord traction for the delivery of placenta and early clamping of umbilical cord 3) Continuous uterine massage[14]. Uterine tamponade such as Balloon tamponade, Bi manual compression and tight intrauterine packing under anesthesia surgical approach has also been used in achieving hemostasis, surgical technique which include, uterine devascularization procedure which are as follows B-Lynch Compression and suture, Ligation of uterine artery, Ligation of anterior division of Internal Iliac artery, arterial embolization, If these procedures are not adequate enough to achieve arrest of bleeding then Hysterectomy is performed as an ultimate resort[15]. Hysterectomy has two types the total and the subtotal which is different for each individual depending on the situation.

Utero tonic Agents

If Uterine atony is suspected then utero tonic agents should be used as soon as possible

Oxytocin

It is the first line choice for the prevention of PPH because of the lesser side effect as compared to the drugs with similar efficacy, Oxytocin can be administered in two ways Intravenously and Intramuscularly, the prior has an instant effect at a concentration of 10IU IV at 30 minutes which plays a significant role in reducing the risk of PPH, however the latter takes about 3-7 minute for the drug to show its effect and it persists for 30-60minutes. Intravenous administration has been associated with adverse effect including increased heart rate, hypo-tension, and CVS side effects[16]. Oxytocin 10IU, IV/IM is recommended, continuous infusion of 10-40 units in 1L of crystalloid solution. When oxytocin is not available other drugs like Methergine 0.2mg by IV/IM as the first line and PO as the second line is used in every 2-4 hours, however, caution must be taken in patients with the hypertensive disorder as it is contraindicated in those patient[17].

To prevent the degradation and ineffectiveness of oxytocin drug, World Health Organization recommend that the drug should be stored between 2-8 C° [18].

Misoprostol

Prostaglandin E1 is a potent vasodilator, Misoprostol is an E1 derivative of synthetic prostaglandin, It is a low-cost drug, which can be stored easily, 600ug PO of misoprostol (PGE1) proved as an effective drug in the prevention of PPH but there is an adverse effect of this drug including Fever, tachycardia and face flushing[19]. Misoprostol is used as an alternative when other parenteral prostaglandins are either contraindicated or unavailable for the treatment of Postpartum hemorrhage[20]. In countries with low socioeconomic status, misoprostol is the first drug of choice because of the reasonable cost and easy availability, it can be used both orally, sublingually and rectally as a prophylactic measure in a woman who prefers to deliver at home[21]. As by the International Federation of Obstetric and Gynecology (FIGO) guidelines when 40 IU IV oxytocin is unavailable, administration of single dose of 800µg of misoprostol is indicated for the treatment of PPH[22]. Misoprostol is also used prophylactically in the third stage of labor, it can be administered by different routes like orally, sublingually by vaginal route and also rectally[23].

Carbetocin

Where Oxytocin and other utero tonic drugs including ergometrine, misoprostol degrades in response to heat or light, the efficacy of the drug diminishes making it less effective in the use of the management of PPH [24]. On contrary Carbetocin has met the requirement of the International Council for Harmonization (ICH) to be used in hot and humid climates (Zone IVA and B) for the period of two years at 30 °C and half a year at 40 °C[25]. Inpatient with elective C-section Carbetocin 100ug of IV, bolus should be preferred over continuous oxytocin infusion to prevent PPH[26]. The use of 100ug IM of carbetocin in women delivered vaginally with a prior risk factor of PPH showed the decrease in the need of a uterine massage to prevent PPH as compared to continuous oxytocin infusion[27].

Tranexamic acid

when bleeding still persists then Tranexamic acid is given, It is an anti-fibrinolytic agent which works by activating the plasminogen to plasma to achieve hemostasis [28]. It is known to reduce maternal mortality and the requirement for surgery with the use of 1g of Intravenous Tranexamic acid (TA) which is given within 3 hours following a PPH [29]. Its ability to reduce bleeding and decrease the need for transfusion has been well known in different elective surgeries[30]. TA has also helped in reducing hemorrhage in diseases where there is heavy bleeding (menorrhagia), hysterectomy and myomectomy. It should be avoided in renal failure pa-

tients because it is excreted through urine; it has an adverse effect including feeling nauseated along with dizziness and hypo tension.

When hemostasis is not achieved after the use of utero tonic agent, other technologies such as uterine artery ligation, hypo gastric artery ligation, B-Lynch sutures or Balloon Tamponade should be considered.

Balloon Tamponade

If bleeding still persists after the use of utero tonic agent then consider balloon tamponade, the success rate in achieving hemostasis by using balloon tamponade has increased from 71 to 87% and the use of it has been reported for the last 20 years in the management of a patient with obstetric hemorrhage. In this procedure the uterine cavity is filled with pressure to control bleeding, the balloon is inserted in the uterine cavity, it is made up of silicone or rubber, It is inflated with normal saline[31]. There is various kind of balloon depending on the cost which includes the Sengstaken – Blakemore tube, Foley catheter, Condom catheter, the Bakri balloon and the Rusch Balloon[32]. These catheters can be inserted in the Delivery room or the operating room, however, there are cases where the failure of Balloon Tamponade has taken place[33].

Uterus preserving Surgery (UPS)

When conservative therapy fails before performing Hysterectomy, ligation technique is used to decrease the blood flow to the uterus, to achieve hemostasis and to prevent the ongoing life-threatening condition. It involves ligation of pelvic arteries for example bilateral hypo gastric artery ligation, Uterine artery ligation or application of B lynch Uterine compression sutures, Tsirulnikov triple ligation, and Hystero-graphy to achieve hemostasis[34]. 90% of the blood supply to the uterus comes from the bilateral uterine artery, ligation of this artery can prevent hemorrhage , If this step is unsuccessful then the next step is the Ligation of the ovarian artery, which arises from abdominal aorta and form an anastomosis called utero-ovarian anastomosis, a suture is placed in mesovarium, however if this fails too, Internal iliac artery ligation is done which can cause reduction in pulse pressure by 85%. It needs a professional to do this to avoid unwanted complications involving the injury to vessel and ureter [35]. B- lynch compression suture involves the procedure in which the opening is made in the transverse lower segment of the uterus also known as transverse hysterectomy or involves the application of bilateral uterine brace sutures to stop the bleeding[36]. Uterine compression sutures work as a mechanical compressor of the vascular sinuses of the uterus without blocking the uterine vessels and uterine cavity. Introduction of compression sutures by B-Lynch has made a significant decline in the rate of hysterectomy for patients who have severe postpartum Hemorrhage and thus

avoiding the rate of blood loss in a patient with peripartum hysterectomy[37].

Trans arterial Embolization

The ability of TAE to preserve uterus and make future fertility possible has made it a widely accepted modality in the treatment of PPH [38]. It has an advantage of being quick and being performed without the use of general anesthesia. TAE usage is attainable to the patient where TAE is available. The earlier the use of TAE the higher chances of reducing blood loss and easy consequent surgery with a clear field of vision [39].

Hysterectomy

When hemostasis is difficult to establish despite all the trials including bimanual uterine compression, administration of utero tonic agent, B-Lynch compression sutures, Emergency Hysterectomy is performed to save women from death, placenta accrete is the most common Indication for hysterectomy[40] PPH related hysterectomy was 3.87 times higher in those women who already had a prior C-section than those who didn't have prior C-section[41]. The psychological trauma of not being able to bear a child , loss of fertility and many short term and long term complications such as injury of other organs, poor wound healing, Infection still makes Hysterectomy as the ultimate and the most common procedure to save life and to achieve arrest of bleeding from severe postpartum hemorrhage [42].

DISCUSSION

Postpartum hemorrhage(PPH) is an obstetric emergency and the leading cause of maternal mortality, potentially life threatening whilst preventable condition when timely actions are taken. It is defined as loss of blood above 500 ml in a normal delivery and greater than 1000ml following a cesarean delivery. Uterine atony is the leading cause of it. Signs and symptoms varies with the degree of blood loss, circulatory collapse may occur in cases, where there is massive hemorrhage followed with tachycardia, tachypnea, postural hypo tension and oliguria. Management of PPH includes, use of utero tonic agents, balloon tamponade, use of ligation technique, uterine compression sutures, If hemostasis is still not achieved despite these techniques, hysterectomy is the last resort for such patients.

CONCLUSION

Postpartum hemorrhage is a life-threatening, hazardous, whilst preventable condition when correct measures and management are taken at the right time. Emergency measures are taken to save the patient's life from this lethal cause

of death and to prevent ongoing long-term complications. Although the newer drug requires more studies, experiments, and trials, it gives us an encouragement to use them in everyday practice. In this review the new advancement in the treatment of postpartum hemorrhage have been enlightened based on the research outcomes and also the effectiveness to achieve homeostasis based on the previous trials and research outcomes have been discussed. More scientific trials and experiments are necessary to confirm the efficacy and effectiveness of these newer drugs before its application on patients.

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Declaration of Interests

The authors declare that there is no conflict of interest that could be perceived as prejudicing the impartiality of the research reported.

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