POSTPARTUM HEMORRHAGE - A REVIEW
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POSTPARTUM HEMORRHAGE – A REVIEW (Abstract): Postpartum hemorrhage has been defined as either a 10% change in hematocrit between admission and postpartum period or a need of erythrocyte transfusion. The incidence of postpartum hemorrhage is 3.9% for vaginal deliveries and 6.4% for cesarean delivery. Clinically the blood loss is often underestimated by as much as 30% - 50% resulting in a delay in addressing the problem. Postpartum hemorrhage can become rapidly catastrophic. The ACOG ranks postpartum hemorrhage as the third cause of maternal mortality after embolism and hypertensive disease. Predisposing factors for postpartum hemorrhage are: uterine atony (50%), lower genital tract lacerations (20%), uterine abnormalities (20%) etc. Management of the postpartum hemorrhage includes a rapid but thorough physical examination, specifically of the abdominal and pelvic regions, concurrent with laboratory evaluation and volume replacement therapy. Coagulation studies are also necessary. If no genital tract lacerations are found, some maneuvers must be done: uterine exploration followed by uterine massage and blunt curettage, if the products of conception are found in the uterine cavity. If postpartum hemorrhage is due to uterine atony then, uterotonic regimens should be used (methyl-ergonovine, 15-methyl prostaglandin F2 (alpha), prostaglandin E2 or misoprostol). When all other conservative methods of treatment of postpartum hemorrhage failed, before going for invasive procedures as uterine embolization and laparotomy, I strongly suggest the use of Intrauterine Balloon Tamponade. Invasive procedures comprise embolization and laparotomy with conservative techniques (ligation of the uterine blood supply and uterine compression sutures) or hysterectomy or/and Transvaginal Pressure Pelvic Pack. In conclusion, post-partum hemorrhage can become rapidly catastrophic. Once the diagnosis is made, a quick and methodic approach to the problem, following the algorithm bellow, can be very helpful. Also, remember the intrauterine balloon tamponade: very effective, does not require specialized training, it is easy to use and readily available in OR (operating room) and in my opinion it is underutilised.

KEY WORDS: POSTPARTUM HEMORRHAGE, INTRAUTERINE BALLOON TAMPONADE, EMBOLISATION, HYSTERECTOMY, TRANSVAGINAL PRESSURE PELVIC PACK

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INTRODUCTION
Hemorrhage means Excessive Blood Loss. Postpartum Hemorrhage has been defined as either a 10% change in hematocrit between admission and postpartum period or a need of erythrocyte transfusion. Prichard et al [1] found average blood losses at Vaginal Delivery of about 500 mL, at Cesarean Delivery approximately of 1000 mL and at Repeat Cesarean Section + Hysterectomy of about 1500 mL. Based on this definition the incidence of postpartum hemorrhage is 3.9% for vaginal deliveries and 6.4% for cesarean delivery. Early postpartum hemorrhage occurs 24 hours after delivery. Late postpartum hemorrhage occurs after 24 hours but before 6 weeks after delivery.

It is important to remember that clinically the blood loss is often underestimated by as much as 30-50% resulting in a delay in addressing the problem. The blood volume expansion that occurs during pregnancy compensate for normal blood loss at delivery. Postpartum hemorrhage can become rapidly catastrophic. The ACOG [2] ranks postpartum hemorrhage as the third cause of maternal mortality after embolism and hypertensive disease. The maternal mortality in 1995 was 7.1 per 100,000 live births.

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The morbidity associated with postpartum hemorrhage is significant:

A. Hypotension after severe postpartum hemorrhage may lead to:
   1) panhypopituitarism, 2) renal damage, 3) severe respiratory complications.

B. Administration of blood products may lead to:
   1) hepatitis, 2) transfusion reactions, 3) AIDS.

C. Hysterectomy, while life saving, may result in lost fertility in a young woman.

Predisposing factors for postpartum hemorrhage are:

A. Uterine Atony (50%)
   - Precipitous Labor
   - Overdistended Uterus
   - Amnionitis
   - Multiparity
   - Prolonged Labor
   - Medications
   - Previous Postpartum Hemorrhage
   - Breech Extraction
   - Fetal Demise

B. Lower Genital Tract Lacerations (20%)
   - Vulva
   - Rectum
   - Vagina
   - Cervix

C. Uterine Abnormalities (20%)
   - Rupture
   - Placenta Previa
   - Uterine Inversion
   - Leiomyomata

D. Others (10%)
   - Clotting Disorders
   - Retained Placenta

**MANAGEMENT OF POSTPARTUM HEMORRHAGE**

A. As soon as the diagnostic is made the obstetrician should make a rapid but thorough physical examination, specifically of the abdominal and pelvic regions, concurrent with laboratory evaluation and volume replacement therapy.

B. Effective volume resuscitation depends upon venous access using a 16 gauge catheter or larger and arterial or central line in selected cases.

C. Do coagulation studies, including: CBC, platelet count, PT, PTT, fibrinogen, Fibrinogen Degradation Products (FDP) and Clot observation test (firm clot = fibrinogen > 100 mg/dl; soft clot that dissolves easily = fibrinogen= 50-100 mg/ dl; No Clot = fibrinogen < 50 mg/ dl and CLINICAL DIC quite likely).

If no genital tract lacerations are found, then, do next:
1. uterine exploration,
2. followed by uterine massage and
3. blunt curettage if products of conception are found in the uterine cavity.
If postpartum hemorrhage is due to uterine atony then, uterotonic regimens should be used:

1. Methyl ergonovine, 0.2 mg IM (intramuscular)
2. 15-methyl prostaglandin F2 (alpha), 0.25 mg IM or intramyometrial
3. Prostaglandin E2, 20 mg - suppository placed in lower uterine segment
4. Misoprostol: rectally or orally in doses of 400 to 1,000 µg, it is rapidly absorbed and can effectively prevent and treat uterine atony

**TIP:** Keep five 200-µg tablets of misoprostol in the delivery or operating room. If uterine atony occurs and doesn't respond to oxytocin or ergometrine (or if ergometrine is contraindicated), place the patient in the frog-leg position, and while assessing the extent of vaginal bleeding, place five tablets in her rectum.

*When all other conservative methods of treatment of postpartum hemorrhage failed, before going for invasive procedures as uterine embolization and laparotomy, I strongly suggest the use of Intrauterine Balloon Tamponade.*

A review through MEDLINE of English-language literature, from 1983 to present shows that the use of Intrauterine Foley Balloon Tamponade is quite effective! Goldrath et al [3], 1983, used successfully the Intrauterine Ballon Tamponade (IBT) in 17 of 20 patients with profuse uterine bleeding. Three had late postpartum hemorrhage, two were controlled with IBT, while the third one had uterine and ovarian artery ligation 24 hours later, after the balloon came out spontaneously. IBT was also successful use after laser endometrial ablation, in one case of two voluntary abortions: in one case with Thrombocytic Thrombocytopenic Purpura and one case with leukemia.

DeLoor and vanDeme [4], used successfully five Foley catheters inflated to 80 mL saline each to achieve uterine tamponade. The patient’s estimated blood loss was 8 L and 34 units of blood products were used.

Marcovici and Scoccia [5], described one case of profuse hemorrhage following evacuation of the fetus after intrauterine fetal demise at 17 weeks, controlled with intrauterine balloon tamponade (IBT) and two cases of severe postpartum hemorrhage (one early and one late) controlled with IBT. In either case the patient required no blood transfusion and major surgery was avoided. The use of intrauterine tamponade does not require specialized training, it is easy to use and readily available in OR and in my opinion it is underutilized.
Invasive procedures comprise Embolization and Laparotomy

1. Embolization of uterine artery

The procedure is usually performed under fluoroscopic guidance in the angiography suite and is based on the tendency of small emboli to preferentially enter bleeding vessels because of lower resistance (Fig. 2). Once the patient is in the angiography suite, embolization can usually be completed within 30 minutes. A catheter is introduced via the femoral artery into the target vessel - usually either the hypogastric or uterine arteries. Patients usually respond immediately. Unlike other interventions, uterine embolization can be highly effective when coagulopathy is present. With more than 150 cases in the literature, uterine embolization has a reported success rates of up to 97% [6].

Uterine arteries embolisation has advantages: 1) easy identification of the site of bleeding, 2) preservation of the uterus and the fertility, 3) a theoretical decrease in the incidence of re-bleeding from collaterals as a result of more distal occlusions obtained with embolization than with surgical ligation, 4) most important is the fact that surgical options are always available for embolization failures, whereas failed arterial ligation therapy can render later embolization difficult or impossible.
2. Laparotomy and conservative surgery

Two types of conservative surgical procedures have been recommended: A) ligation of the uterine blood supply and B) uterine compression sutures.

*Uterine Artery Ligation (with or without) Ovarian Artery Ligation*, can be effective. As with any vascular ligation, the mechanism of action relies upon significant decrease in blood flow circulation through the vessel to such a point that the coagulation system is activated and the formed clot “plugs” the bleeding vessel. Bilateral ligation of the uterine arteries and veins can be performed rapidly and easily by placing a single suture 2 to 3 cm below the usual site of the uterine incision and incorporating 2 to 3 cm of myometrium. Its effectiveness was reported in one study to be excellent, with only 10 failures out of 265 patients treated [7]. The safety has also been documented with return of regular menstruation and subsequent successful pregnancies [8].

Hypogastric Artery Ligation, quite popular in the 90s, came out of favor lately because of a roughly 50% success rate (Fig. 3). The reason for this is the anatomical variations in the branching of arteries originating from the hypogastric arteries and the existence of anastomosis between the external and internal iliac arteries. Serious complications associated with the procedure are: laceration of the internal iliac vein, accidental ligation of the external iliac artery, and ureteric injury.

The second type of conservative surgical method involves sutures that compress the uterine body. The theory behind each technique is the same: the mechanical compression of uterine vascular sinuses prevents further engorgement with blood and continued hemorrhage. When used to treat atony and hemorrhage that does not respond to pharmacologic intervention, the techniques appears to be very effective.

a) One technique involves placement of a large mattress suture approximating the anterior and posterior walls of the uterus. This technique was reported in 23 women with severe PPH at cesarean delivery not responding to medical treatment. In all cases, treatment was successful and hysterectomy was avoided [9].

b) Another recently described technique is the B-Lynch suture (Fig. 4), which involves a single large suture compressing the whole body of the uterus [10]. B-Lynch Suture, originally described using No. 2 chromic catgut, with its unique uterine ligation technique seems to be useful in certain cases. A woman meets the criteria for the B-Lynch compression suture if bimanual compression decreases the amount of uterine bleeding. B-Lynch technique...
had been reported as successfully avoiding hysterectomy [10]. The principle on which the B-Lynch suture is based is that postpartum bleeding usually occurs when the uterus is relaxed, and that continued compression of the uterus will prevent, or lead to the cessation of, hemorrhage. The procedure, unlike ligation of the internal iliac or uterine vessels, or hysterectomy, can be performed by a relatively inexperienced surgeon, and is associated with minimal morbidity. In addition, the fact that it is based on the physiological principle that the well-contracted uterus will not bleed means that it has a high likelihood of success, unlike uterine or hypogastric vessel ligation, which act by reducing pulse pressure.

3. Hysterectomy and Transvaginal Pressure Pelvic Pack (TPPP)
A technique that has been reported to be effective in controlling bleeding persisting after hysterectomy is pelvic pressure packing. This last-resort intervention involves placement of a large pressure pack into the pelvic bowl with one end exiting through the vagina. Although associated with significant morbidity, the technique has been shown to be quite effective [11]. A 2 to 4 inch Kerlix gauze is tightly packed over a fibrin glue bed from side to side in the pelvis (Fig. 5). Only the skin is closed using towel clips or a running suture. The patient is immediately transferred to intensive care, where acidosis, coagulopathy, and hypothermia are corrected. In 48 to 72 hours, the packs are gently removed with saline drip assistance. If hemostasis still has not been achieved, repacking is an option.
CONCLUSION

In conclusion, post-partum hemorrhage can become rapidly catastrophic. Once the diagnosis is made, a quick and methodic approach to the problem, following the algorithm bellow (Fig. 6), can be very helpful. Also, remember the intrauterine balloon tamponade: very effective, does not require specialized training, it is easy to use and readily available in OR and in my opinion it is underutilized.

REFERENCES: