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Reverse Blood Flow Cause of Fatal Bleeding in Severe Atonic Post-Partum Hemorrhage

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Abstract

Obstetric haemorrhage, is the leading cause of maternal death and accounts for 50% of maternal death in developing countries. Two third of obstetric haemorrhage is postpartum haemorrhage (PPH). Emergency Internal iliac artery ligation (EIIAL) is the most effective treatment of atonic PPH when medical management fails. Still few patients continue to bleed and Hysterectomy is the last option to control bleeding and save the bleeding.

In a case of atonic postpartum haemorrhage where EIIAL alone failed to control bleeding, Trendelenburg position controlled the bleeding. The life of the woman was saved and uterus was preserved. Here the only patent vascular connection with the Uterus is Uterine Veins. Since the Uterus lies at a lower level than Inferior Venacava (IVC), the bleeding is from reverse blood flow from (IVC) to Uterus through Pelvic and Uterine vein.

Key words: Atonic PPH, Ovarian vessels, internal iliac artery, Trendelenburg position.

Introduction

The global maternal mortality rate (MMR) is 216. Regional MMR ranged from 12 per 100,000 live births in high income regions to 546 in sub-Saharan Africa [1]. Norway has the lowest MMR of 2 and South Sudan the highest MMR of 1150. Direct causes account for 73% of maternal death. Though the maternal mortality ratio (MMR)and infant mortality rate (IMR) are decreasing, this causes the society much concern. Globally haemorrhage is the commonest cause of maternal death (27%) (2). Failure of the uterus to contract sufficiently after delivery and to arrest bleeding from vessels at the placental implantation site is called atonic PPH. Atonic PPH is every obstetrician's nightmare, however one is trained, equipped and prepared..

Lisa the story (name changed)

22 years old woman, Prime gravida in labour pain came to tertiary care hospital (KIMS) for delivery on 29.11.2018. LSCS was done and healthy baby was delivered. The placenta was delivered. Routine uterotonics were given, but Uterus did not contract, soft and bleeding profusely. The author (1) was summoned to ligate the internal iliac artery.

The blood pressure was low (60/?). **Patient was changedto Trendelenburg position from flat position.** The ovarian vessels were found grossly distended. Posterior peritoneum lateral to the right common iliac artery incised. Right IP ligament consisting ovarian artery and Pampiniform plexus of veins was clamped, cut and ligated after identifying and protecting the ureter. Aortic bifurcation identified (bifurcates at L4, above sacral Promontory). Right common Iliac artery bifurcation identified. The loose areolar tissue dissected. Internal iliac

artery dissected with right angle forceps from lateral to medial side to avoid injury to iliac veins and looped with silk. Pulse oximetry is put on ipsilateral Great toe and occluding the internal iliac artery with nontoothed forceps, oxygen saturation was observed and normal. If common or external Iliac artery is occluded, pulse oximetry will show flat line. This helps to confirm only internal iliac artery is looped. Right internal iliac artery ligated (Fig-1). Similarly left IP ligament and internal iliac artery were ligated.

Blood pressure became normal**. Bleeding stopped, but uterus not contracted, softand indenting to pressure** (Fig–2) . The uterus was soft and thin when compressed with both hands, and the hands were parallel (Fig-3). Usually when the uterus is contracted it won't be compressible and hands will be pointing towards cervix (Fig-4). **Uterine cavity examined for any left out cotyledons. Placental cotyledons are also examined and found intact**. Hysterotomy closed. Abdomen was closed. No active bleeding per vagina. One unit of blood was started during surgery.

Figure: 1.

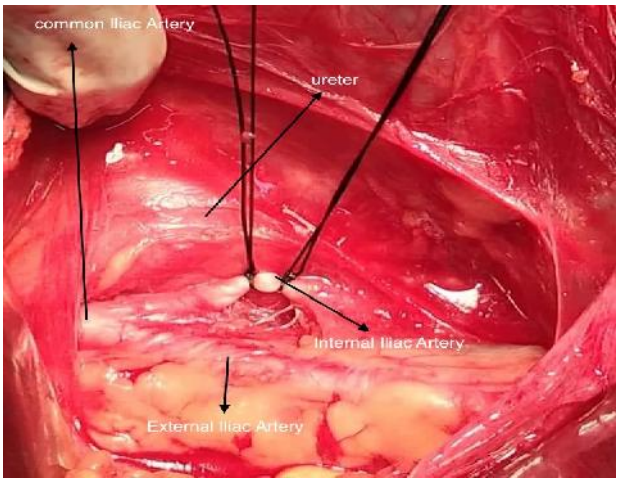


Figure:2.

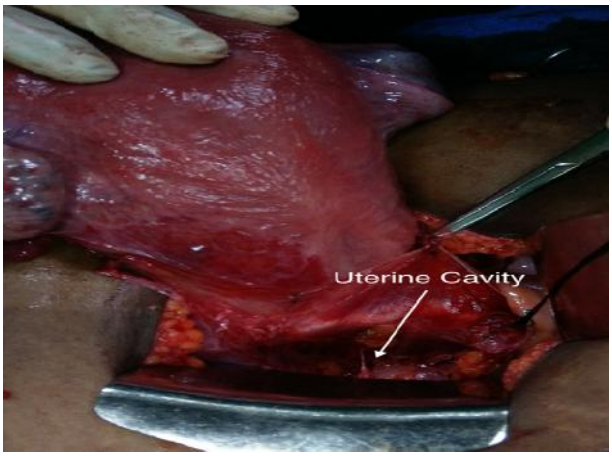


Figure-3.

Figure-4.

There was a delay in shifting the patient to intensive care unit and the patient was in flat (horizontal) position for some time. Patient had massive vaginal bleeding and was dark coloured (Venous blood). Blood pressure became low. Immediately the patient was kept in Trendelenburg position(the author keeps all hypovolemic patients in Trendelenburg position till definitive measures are taken). The first unit of blood and 300 ml of fluid rushed. The blood pressure improved and became normal. The bleeding reduced significantly. The uterus was not palpable (not contracted). After 5 hours of continued uterotonics, uterus contracted, palpable and firm. Patient position was changed from Trendelenburg to flat position. There was no bleeding. **Hysterectomy was avoided**.

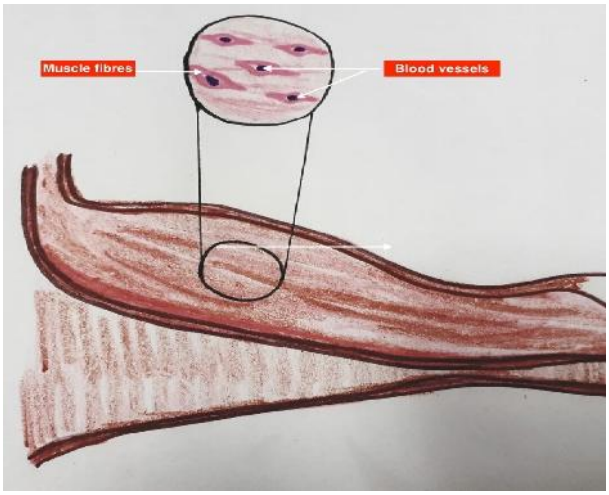
Patient had a smooth postoperative period. Wound healed well. Patient was discharged with temporary contraceptive advice.

Discussion

Women after child delivery have some vaginal bleeding. **When bleeding occurs more than 500 ml after normal delivery or 1000ml after Caesarean delivery, is called Post-partum Haemorrhage**. Atonic PPH is bleeding due to failure of Uterine muscle contraction. When the patient has bleeding due to Atonic PPH, The drugs (Uterotonics) oxytocin, misoprostol, carboprost, and Ergots are given to stimulate the Uterus to contract and decrease bleeding. Few patients continue to bleed and EIIAL is done. Rarely bleeding continues even after EIIAL and Hysterectomy is done (3) to save the life, but the woman becomes infertile. Even after Hysterectomy bleeding continued and women died.

Pregnancy stimulates uterine growth due to muscle hypertrophy. The uterine musculature is arranged in three strata. The first is an outer hood like layer, which arches over the fundus and extends into the various ligaments. The middle layer is composed of a dense network of muscle fibres perforated in all directions by blood vessels. Last one is internal layer. Most of the uterine wall is formed by the middle layer. Each cell in this layer has a double curve, so that the interlacing of the two gives approximately the form of a figure of eight (Fig-5). This arrangement is crucial because when the cells contract after delivery, they constrict penetrating blood vessels and thus act as ligatures.

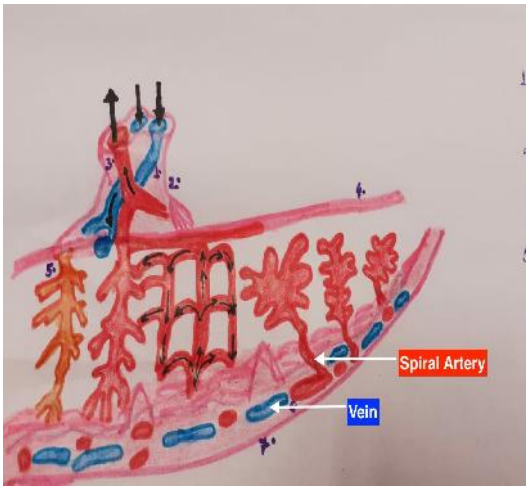
Figure-5.



During pregnancy, there is marked hypertrophy of the uterine vasculature. Blood flows through the intervillous space, through spiral arteries which averages 120 in number. Veins accompany these arteries (Fig-6). These vessels have no muscular layer because of their endotrophoblastic remodelling which creates low pressure system. With placental separation, these vessels at the implantation site are avulsed.

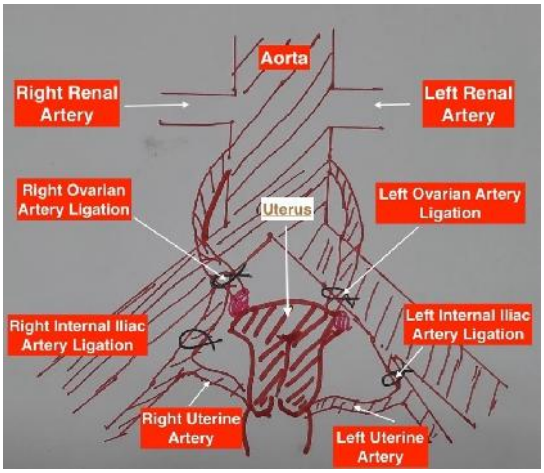
Haemostasis first achieved by myometrial contractions, **which compresses the vessels,** followed by clotting and obliteration of vessel lumens. **An intact coagulation system is not necessary for postpartum haemostasis, unless there are lacerations in the uterus, birth canal or perineum. When the uterine muscle fail to contract then haemorrhage occurs.**

Figure-6.



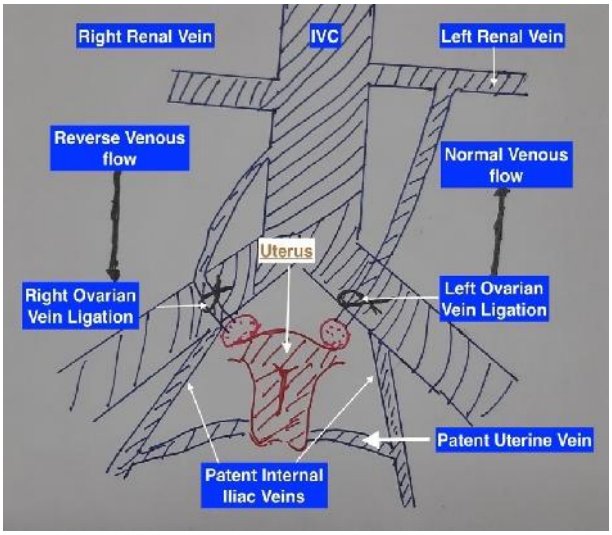
The blood supply to the uterus is by paired uterine arteries and paired ovarian arteries. The uterine artery is a branch of anterior division of internal iliac artery. the ovarian artery is the branch of abdominal aorta. The uteroplacental blood flow is 450 – 650 ml per minute near term. Assuming that blood flow equally in all four arteries, 150 ml through each artery. The internal iliac artery is ligated since access to uterine artery is difficult to access. The ovarian arteries cannot be ligated alone and both artery and vein were ligated.

Figure-7.



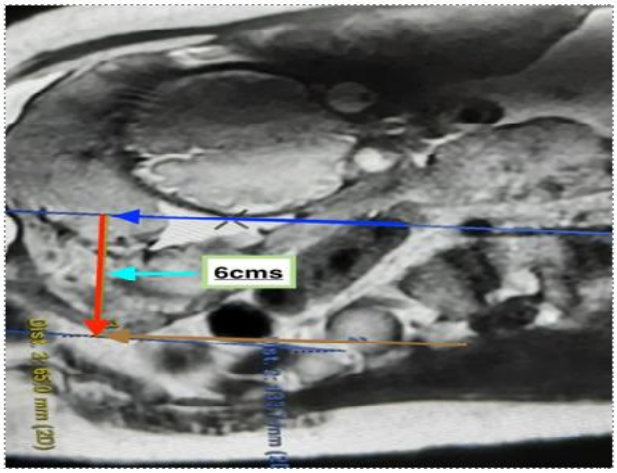
The venous return from the gravid uterus is by paired uterine veins and paired ovarian veins(pampiniform plexus). The uterine vein drain into internal iliac vein. The right ovarian vein drains into inferior vena-cava, and left ovarian vein into left Renal vein.

Figure-8.



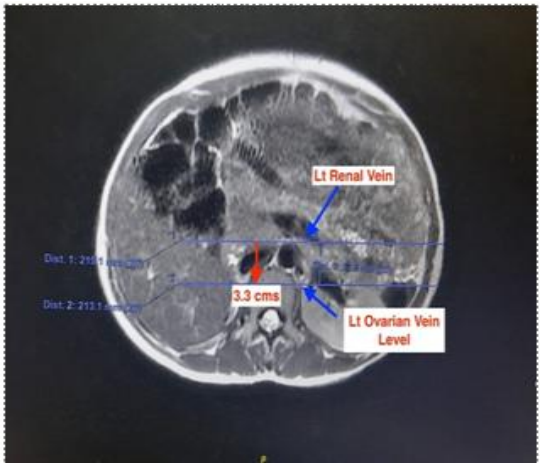
1. The uterus is 6cms lower than IVC in horizontal position (Fig-9). In atonic PPH blood will easily flow from IVC to uterus through common and internal iliac veins.

Figure-9.



2. The left ovarian vein joins the left Renal vein (Fig-10). The left Renal Vein ascends 3cms and crosses the Aorta to join IVC. 600ml of blood from left kidney has to go against gravity to reach IVC. The ovarian veins are dilated around 10cms, hence the blood from left kidney also flows back to Uterus in Atonic PPH.The Left Adrenal Vein also drain into the left Renal Vein. So, the blood from left Adrenal gland also backflow into Uterus through Adrenal Vein, Renal Vein and Gonadal Vein.

Figure-10.



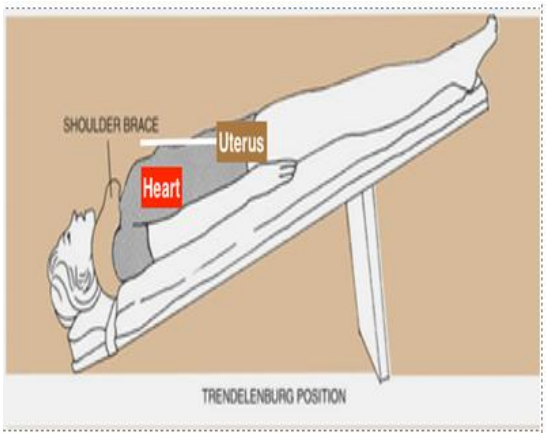
3. The IVC itself goes anteriorly as it ascends, blood has to go against the gravity. In Atonic PPH blood flow may reverse in horizontal supine position.

In Atonic PPH 500 ml of arterial blood to the Uterus, and 600 ml of blood from left renal vein and some more Blood through uterine veins and right ovarian vein occurs. so **more than 1000 ml of blood will be lost per minute.** The blood volume of woman is around 5000ml.

If the myometrium is not at all contracted, both arterial and reverse blood leads to **severe PPH** and patient dies quickly. If there is partial contraction of myometrium, then veins may be compressed and arterial bleeding alone may lead to **mild PPH**.

Trendelenburg Position: German Surgeon Friedrich Trendelenburg (1844-1924) described this position, to improve surgical exposure of the pelvic organs. The patient is laid supine, on a 15 to 30 degree incline with the feet elevated above the head (Fig-4). This position is contraindicated in cardiogenic shock.

Figure:11.



Emergency internal iliac artery ligation: EIIAL is an effective adjunctive Surgical procedures done to arrest Obstetrical haemorrhage. This procedure was performed first by Sir Howard Kelly in 1893 to control haemorrhage during hysterectomy for uterine carcinoma (3). Clark etal (4) reported 42% control of post -partum haemorrhage with EIIAL and resorted to hysterectomy when EIIAL failed to control bleeding.

The Author has been doing this procedure for the past 35 yrs. On an average 5 cases of an year the author do. The author keeps all hypovolemic patients in Trendelenburg position till definitive measures are taken, so also in Atonic PPH. Bleeding controlled in all patients and nil mortality. No woman needed Hysterectomy. Simple wooden blocks are used to elevate the foot end of bed (Fig-12).

The author ligates the Ovarian vessels and trunk of the Internal Iliac artery. no ischemic event has occurred.

Figure:12.

Subsequent Pregnancy: All women who underwent EIIAL were advised temporary contraception for 2 to 3 years. women who want to have children became pregnant and delivered normal babies. William etal (5) and Nizard etal (6) reported pregnancy after EIIAL.

Conclusion

The very fact that after interrupting the arterial blood supply to the Uterus, bleeding continues and leads to death of the women indicates other source of major blood flow into the uterus. This has to be the reverse blood flow from the IVC and left Renal vein aided by Gravity. Simple measure of keeping the patient in Trendelenburg position the gravity aided reverse blood flow can be prevented.

Bilateral ovarian vessel and internal Iliac artery ligation and Trendelenburg position will reduce bleeding due to Atonic PPH, save the life of woman and Obstetric Hysterectomy no longer will be required.

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