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## Aortic Clamp: A Solution to Prevent Massive Obstetric Haemorrhage in Cases of Placenta Previa

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## ABSTRACT

Massive obstetric haemorrhage can occur in cases of atonic post-partum haemorrhage, abruption, placenta previa, placenta accreta syndrome, ruptured uterus and such others. The major consequences of this being-massive blood transfusion, inotropic supports, need for mechanical ventilation, DIC, acute kidney injury, prolonged hospital stay, morbidity and maternal mortality. Aortic clamping at the initial stage can reduce the initial stage of sudden blood loss and thus preventing all the dire consequences associated with it. Known cases of placenta previa/placenta accreta syndrome were considered into the study. With informed consent, under general anaesthesia the procedure was undertaken. After the extraction of the foetus, Aorta was identified just above its bifurcation and Pailly's clamp was applied. Details regarding the duration application, blood loss during the procedure, total duration of the procedure and post-operative follow up and maternal outcome was followed up. 10 cases of pre-diagnosed placenta previa patients were applied with intraoperative aortic clamp. The average age of the patients was 28.9 years. The mean duration of aortic clamp application was 18.8 minutes. The minimum blood loss was 250ml. excluding the extremes, the mean blood loss was 726.25mL. Two of the patients underwent obstetric hysterectomy. 7 patients needed post-operative blood products transfusion and zero maternal mortality. Aortic clamp is an effective method to prevent and treat massive obstetric haemorrhage, save the uterus and maternal lives.

## INTRODUCTION

Massive/Major obstetric haemorrhage (MOH) is a lethal yet preventable aetiology of maternal mortality worldwide. MOH has various definitions based on the various bodies and organizations that define it. But the most commonly followed definition of MOH is-bleeding at  $\geq 20$  weeks' gestation or postpartum requiring  $\geq 5$  red blood cells (RBC) units within 4 h, or fall in 4g/dL of hemoglobin or  $>1500$  mL blood loss<sup>[1]</sup>. Major haemorrhage can also be defined as-bleeding which leads to a systolic blood pressure of  $< 90$  mmHg or a heart rate of  $>110$  beats/min<sup>[2]</sup>. Whereas in trauma, major haemorrhage is considered as-loss of more than one circulating blood volume within 24 h (around 70 mL/kg-1, approximately 5 l in a 70 kg adult), loss of 50% of total blood volume in  $<3$  h, or bleeding in excess of 150 mL/min<sup>[2]</sup>. MOH can occur either antepartum, intrapartum or postpartum depending on the preceding cause. The various causes for MOH can be-ruptured ectopic pregnancy, incomplete abortion, molar pregnancy, placenta previa, revealed/concealed abruption, uterine rupture, atonic PPH (postpartum haemorrhage), traumatic PPH, placenta accreta syndrome (PAS), secondary PPH and so on. The major complications of MOH include, hypotensive shock, need for massive blood transfusion, acute kidney injury, cardiac failure, need for inotropic support, need for ventilator support, morbidity and mortality. According to WHO reports, PPH occurs in 14 million women per year across the world and leads to 70,000 maternal deaths worldwide. In India, PPH contributes to 19.9 percent of the causes for maternal mortality<sup>[3]</sup>. With increasing rates of caesarean deliveries, the rates of placenta previa and PAS are on the rise. Obstetric haemorrhage in these two cases can be due to atonicity, retained placenta or placental site sinus bleed which majority of the time requires-stepwise devascularisation of the uterus, cervico-isthmus sutures and in cases of obstetric hysterectomy. By the time these surgical interventions are done, the woman might suffer massive blood loss leading to a state of irreversible damage despite the above surgical interventions. In such cases, temporary aortic clamp may be used to prevent the initial blood loss and hence preventing the subsequent morbidities.

Aortic clamping (below the infrarenal level-just above the aortic bifurcation) reduces the blood flow to the pelvis completely, reduces the blood pressure in the pelvis and thereby reducing the initial phase of obstetric blood loss, giving ample time for surgical interventions (like stepwise devascularisation) to secure haemostasis. The merits of the procedure involve-cost effective, quick and a short learning curve. The procedure can be done in a regular OT setup,

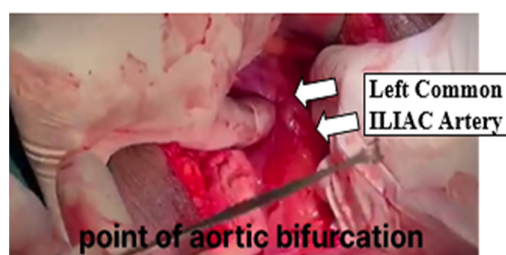
without the need for high-level imaging or instrumentation and hence can be done in even poor resource setups. The possible demerits of the procedure involve-anaesthetic complications, sudden rise in blood pressure in the coronary or cerebral vasculature, ureteric injuries, possible lower limb ischemic. These complications can be prevented by intra operative heparin and multi disciplinary approach with a trained anaesthesia team.

## MATERIALS AND METHODS

The study was done at OBG department at Vani Vilas hospital, BMCRI, Bangalore, Karnataka. The women who were pre-diagnosed with placenta previa or placenta accreta spectrum were considered into the study. Patient demographic details were documented and with written informed consent from the patient and the party (including consent for SOS obstetric hysterectomy) and prior information to the anaesthesia team, the procedure was started. Under general anaesthesia, the patient was put into position, parts painted and draped. With an arterial line, a central line in situ, intravenous heparin administered and strict vitals monitoring, including that of the lower limb pulse-oximetry being done, a midline infraumbilical vertical incision was taken (for better operative exposure). Even the uterine incision was a classical caesarean incision (to avoid the placental bed). Once the baby was extracted, uterus was exteriorised and the abdomen pack was placed posteriorly. Sacroiliac joint identified, the common iliac artery was identified and traced proximally upto the aortic bifurcation. The Aorta was first held with a Babcock's forceps and then the Paily's aortic clamp was applied such that the larger tooth was laterally placed and all the three locks were secured on the clamp. The clamp was left in situ undisturbed and the rest of the interventions-like cervico-isthmus sutures for the placental bleed were taken. Once the placenta separated and the uterine closure was done, the clamp was released. Haemostasis was achieved, closure was done. Post procedure-blood loss, surgical time, need for blood and blood products, maternal outcome was documented and analysed.



Fig. 1: Aortic Clamp



**Fig. 2:** Aortic Bifurcation Point



**Fig. 3:** Application of Aortic Clamp

## RESULTS AND DISCUSSIONS

A total of ten cases of prediagnosed low lying placenta or placenta previa applied with aortic clamp. The mean age of the patients was 28.9 years with the mean gestational age of presentation 34+2 weeks. The minimum time for which the clamp was applied was for 9 minutes and the maximum time was 32 minutes (mean- 18.8minutes). The average blood loss during the procedure was 726.25mL (excluding the outliers) (Maximum 3000ml, minimum 200mL). Two of the patients underwent obstetric hysterectomy in view of intractable atonicity. All the patients were shifted to the ICU for postoperative monitoring. 7 of the cases needed blood transfusion but only one of the cases needed FFP transfusion. There were no maternal mortalities reported. In the postoperative period, the patients were also started on enoxaparin as a method of DVT prophylaxis. The mean duration of hospital stay was 5 days. A study by Jayaprakash *et al.*, at Thrissur, recognized the use of Paileys aortic clamp during caesarean hysterectomy for cases of placenta accreta syndrome<sup>[4]</sup>. The mean duration of clamp application was 28.21±12.49min. Despite there being a mean blood loss of 1.77±0.96 litres, there was no maternal mortality recorded and no significant postoperative complications. A study by Paily<sup>[5]</sup> demonstrated the use of Paileys aortic clamp in cases of PAS. PAC was applied for a median of 55±20 min. 29 cases had underwent obstetric hysterectomy, while 4 of them had conservative procedure. There were no perivascular injuries noted.

## CONCLUSION

The application of aortic clamp is highly effective in reducing the initial blood loss in cases of placenta previa and even placenta accreta syndrome and hence

preventing the complications of massive obstetric haemorrhage. Aortic clamping can also be used as a method of PPH management it not only reduces the morbidity but also prevents maternal mortality and can save the uterus.

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