Aortic balloon for the intraoperative management of placenta accreta spectrum: need for standardised methodology and safety data

In 2003, Bell-Thomas et al (BJOG 2003;110:1120-1122) reported on the emergency use of a transfemoral aortic occlusion catheter to control massive haemorrhage in a case of caesarean hysterectomy for placenta percreta. This was only the second case published in the international literature on the use of an intra-abdominal aortic balloon occlusion (IABO) in the management of placenta accreta spectrum (PAS) (Paull et al. Anesth Intensive Care 1995;23:731-734). A non-exhaustive Pub-Med literature review of articles published in English on this the topic over the last 20 years, identifies 27 articles, 23 of which come from the Peoples Republic of China, where IABO seems to be increasingly popular in the management of PAS.

In brief, IABO involves the insertion of a balloon catheter into the infrarenal abdominal aorta above the aortic bifurcation under fluoroscopy guidance. The procedure is performed in a hybrid operating room or interventional radiology (IR) suite with secondary transfer to the operating room. In all but one study (Zhu et al Biomed Res Int.2017:8604849), the balloon was inflated after delivery of the newborn.

All publications so far have been retrospective and most are case-control studies, comparing the outcomes of IABO with those of routine surgical techniques with or without additional procedures such as intra-uterine tamponade. Recently, authors have also started to compare IABO with iliac artery balloon occlusion.

Overall, these studies have shown that IABO is associated with reduced estimated blood loss and transfusion requirement, ICU admission and hysterectomy and suggested that IABO is more effective than iliac artery balloon occlusion, presumably as arterial occlusion is more effective.

However, there is wide variation between studies in prenatal imaging and clinical selection criteria, intraoperative IR methodology and confirmation of the diagnosis of PAS at birth. For example, the pre-operative fluoroscopy time ranges between 2 and 25 minutes with fetal radiation exposure of 4 to 25 mGy; intraoperative balloon inflation/deflation time varies between 5-10/1 minutes and 45-80/10 minutes. The size of

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the balloon and the need for transfer between the IR room and the operative theatre is rarely described. Most studies lack histopathology confirmation of the diagnosis and/or stratification by PAS grade.

Heterogeneity in methodology and design leads to a high risk of confounding, bias or chance. There is also a high risk that the relationship is not causal. One major concern is the risks-benefit ratio of the use of IABO for both mothers and fetuses, in particular if they do not have PAS. The most commonly reported post-operative complication associated with IABO are arterial thrombosis of the external iliac or the femoral artery. There are no data on the long-term follow of the children born after IABO.

In 2018, the expert panel of the RCOG green top guidelines 27a (Jauniaux et al., BJOG.2019;126:e1-e48) concluded that larger studies are necessary to determine the safety and efficacy of IR before this technique can be advised in the routine management of PAS. The 10 new studies published in 2019-2010 on the use of IABO in the management of PAS are insufficient to change this statement (Table 1).

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Disclosure of interests

The authors declare no conflicts of interest.

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Table 1: Study characteristics of studies presenting data on the use of intra-abdominal aortic balloon occlusion (IABO) in the management of PAS.

Author (year)	Country	Study design/ No of cases	Inclusion criteria	Confirmation of diagnosis	Outcome/ IR Complications
Liu et al., Cardiovasc Intervent Radiol. 2019;42:829-834	P.R.China	Retrospective cohort of 31 cases of IABO + UAE or ovarian artery embolization	All anterior placenta accreta on US or MRI	Intra-operative & pathology grading (8 PC + 14 PI + 9 PP)	Mean estimated blood loss 1906 mL & 1 emergency hysterectomy/ 2 cases of femoral artery thrombosis.
Liu et al., J Matern Fetal Neonatal Med. 2019;23:1-8	P.R.China	Retrospective cohort of 57 cases of IABO (30 at the level of renal arteries vs 27 below)	All Prior CD and anterior placenta accreta on US or MRI	Intra-operative & pathology grading (16 PC + 28 PI + 13 PP)	No difference in estimated blood loss, need for transfusion and urine output between subgroups/ 2 cases of femoral artery thrombosis.
Mei et al., BMC Pregnancy Childbirth. 2019;19:147	P.R.China	Retrospective cohort of 174 cases (74 IABO vs 100 iliac artery balloon occlusion)	Only cases of PC (PI & PP were excluded)	N/A (no case of hysterectomy)	No difference in estimated blood loss, need for transfusion and intrauterine tamponade between subgroups/ None reported
Peng et al., Exp Ther Med. 2019;17:1492-1496	P.R.China	Retrospective cohort of 9 cases of IABO + UAE	All placenta previa accreta on US and/or MRI	N/A (no case of hysterectomy)	Mean estimated blood loss 1800 mL / mean fetal radiation dose 19.3 mGy/ None reported
Lee et al., Am J Obstet Gynecol MFM. 2020;2:100065	USA	Retrospective cohort of 28 IABO and 18 iliac artery balloon occlusion vs 125 controls	All histologically proven PAS	All cesarean hysterectomy (62 PC + 65 PI + 44 PP)	Reduced estimated blood loss, need for transfusion and ICU admission in both IR compared to controls/ None reported
Li et al., BMC	P.R.China	Retrospective cohort of 57	All placenta previa	Intra-operative &	No difference in estimated blood loss and need for

Anesthesiol. 2020;20:133		cases of IABO (low vs high suspicion of PAS subgroups on US or MRI)	on US and/or MRI	pathology (no grading)	transfusion between subgroups/ None reported
Mei et al., J Matern Fetal Neonatal Med. 2020;20:1-6	P.R.China	Retrospective cohort of 31 cases of IABO and 17 iliac artery balloon occlusion vs 15 controls	All emergency hysterectomies related to PAS	Grading (1 PC + 24 PI + 23 PP)	Reduced estimated blood loss in IR subgroups compared to controls. Lower mean fetal radiation dose in IABO subgroup compared to iliac artery balloon occlusion subgroup (1.9 vs 22.4 mGy).
Peng et al., J Obstet Gynaecol. 2020;40:609-613	P.R.China	Retrospective cohort of 252 cases of IABO and 38 iliac artery balloon occlusion vs 296 controls	All prior CD and placenta previa accreta on US and/or MRI	N/A	Reduced estimated blood loss and mean fetal radiation dose in IABO subgroup compared to iliac artery balloon occlusion subgroups/ 8 cases of femoral artery thrombosis in IR subgroups.
Tokue et al., Cardiovasc Intervent Radiol. 2020;43:1277-1284	Japan	Retrospective cohort of 28 cases of IABO and 32 iliac artery balloon occlusion	All placenta previa accreta on US and/or MRI	Grading (48 PC + 7 PI + 5 PP)	No difference in estimated blood loss and need for transfusion between subgroups. Lower mean fetal radiation dose in IABO subgroup compared to iliac artery balloon occlusion subgroup (18.2 vs 24.9 mGy) / None reported
Zhu et al., BMC Pregnancy Childbirth. 2020;20:446	P.R.China	Retrospective cohort of 25 cases of IABO vs 23 controls	All placenta previa or PAS on US or MRI	Grading (20 PC + 10 PP). No PAS in 18 cases	Reduced estimated blood loss in IABO compared to controls/ 2 cases of neurological complications of the lower limbs.

PAS= Placenta accreta spectrum; CD= Cesarean delivery; US= Ultrasound; MRI= Magnetic Resonance Imaging; PC= Placenta creta (adherenta); PI= Placenta increta; PP= Placenta percreta; ICU= Intensive care unit; N/A= Not available; MROP= Manual removal of the placenta; IR= Interventional radiology.