Title:

ElNoury - Webster bundle: a pre-emptive surgical approach for the management of morbidly low or adherent placenta

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Abstract

Placenta accreta spectrum and placenta praevia are a significant cause of obstetric haemorrhage, maternal morbidity and mortality worldwide. We report a novel surgical technique, which pre-emptively and prophylactically reduces intrapartum bleeding during caesarean sections for these conditions and hence reducing the risk for a caesarean hysterectomy. This technique is particularly useful in low resource healthcare settings where interventional radiology is not readily available and where the woman is keen on uterine preservation. In this report we present the surgical and clinical outcomes of a case series of 16 patients on whom this technique was piloted demonstrating its feasibility and safety.

Keywords: Placenta accreta spectrum, placenta praevia, postpartum haemorrhage, uterine compression suture, uterine preservation.

Introduction

The increasing incidence of placenta praevia (PP) and placenta accreta spectrum (PAS) has been associated with the marked global rise in caesarean section rates that has reached more than 50% in some countries.[1] Despite several described techniques and measures to deal with these serious obstetric problems, PAS and PP continue to be a significant cause of obstetric haemorrhage, maternal morbidity and mortality.[2] Although planned caesarean hysterectomy might be the preferred treatment for PAS in some countries,[3] this policy is unacceptable for some women who are keen on uterine preservation for future fertility. Hence, there is always a need for approaches, which aim to avoid a peripartum hysterectomy together with its related morbidity and consequences.

There are several conservative management options that aim at uterine conservation when PAS is suspected or diagnosed. Leaving the placenta in situ or the use of intra-arterial balloon occlusion are commonly used and established techniques.[4,5] However, the reported increase risk of postnatal complications and the limited availability of the required set-up are serious limitations to these options respectively.[6]

In this paper, we report a novel intraoperative staged approach for the management of PP or PAS to prophylactically reduce the risk of associated intrapartum bleeding. We also present the clinical and surgical outcomes of implementing this surgical bundle on a case series of pregnancies complicated by PAS or PP.

The surgical bundle

We recommend that the procedure is performed under general anaesthetic and the patient placed in the Lloyd Davis horizontal position to enable intraoperative access to the vagina.

Following routine preparation, including insertion of a Foley's catheter, the steps of the bundle are as follows:

- A large lower transverse skin incision to facilitate exteriorization of the uterus later in the procedure.
- Dissecting the vesico-uterine fold displacing the urinary bladder downwards towards the vagina using sharp and blunt dissection with the aid of a diathermy tip. Dissection is performed close to the uterine segment whilst avoiding disturbing any dilated peri-vesical vessels. Enough time should be allowed to ensure haemostasis and adequate bladder displacement. This step is facilitated by counter upward pressure on the lower uterine segment by the surgical assistant. (figure 1 & video).
- A transverse incision is then performed in the lower uterine segment. It is advisable to avoid cutting through the placenta (an upper segment midline uterine incision might be occasionally used to achieve this).
- Once the baby is delivered, the uterus is immediately exteriorized, with the placenta still in situ and before clamping the umbilical cord. The surgical assistant then immediately compresses the uterine arteries bilaterally using a large swab while pressing the uterus against the symphysis pubis (figure 2A & video).
- A Satinsky vascular occluding clamp is then applied on the infundibulopelvic ligament on either side (figures 2B, 2C & video).

- Reducing the blood flow in the uterine and ovarian vessels allows the surgeon time for the retraction and thickening of the lower uterine segment and spontaneous separation of the placenta. In our experience, spontaneous placental separation usually happens. However, if this does not occur within 15 minutes, we recommend that the placenta is manually separated. If full separation is not feasible, adherent area(s) can be excised with underlying uterine tissue
- Application of the ElNoury compression suture: Using a 75 cm 1/0 polyglactin 910 suture on a 45mm half circle tapered point needle a compression suture is then applied immediately to achieve permanent haemostasis (figure 3 & video):
    - The needle is inserted on the right hand side above and lateral to the uterine incision passing through the uterine cavity to emerge at the lower uterine segment 3 cm below and approximately 3 cm lateral to the right incision angle.
    - Three bites are then taken across the lower uterine segment or just above the level of the cervical internal os one to two cm above the upper margin of the displaced urinary bladder. We recommend that two fingers are inserted through the uterine incision to ensure that the patency of the uterine cavity is maintained.
    - Finally the needle is inserted on the left hand side below and lateral to the uterine incision passing through the uterine cavity to emerge above and lateral to the uterine incision, hence, enclosing the uterine artery.
- The two ends of the compression suture are then pulled tight while the vagina is checked to ensure absence of any active bleeding.

- Once satisfactory haemostasis has been achieved, the compression suture is loosened again in order to close the uterine caesarean incision in a standard fashion. Then the ends of the compression suture are tied anteriorly securely. Finally, the vascular occluding clamps are removed and the duration of application noted.

Case series

Patients and setting

A total of 16 women with suspected PAS and / or PP, diagnosed anetanatlly by experienced sonographers independent to the study team, were managed using our surgical bundle between January 2016 and April 2020. All the women had one or more previous caesarean section(s) and expressed a strong desire to preserve their uterus. The surgery was performed by the same surgeon (MAE) in 4 different tertiary referral centres in 3 cities in Egypt (Cairo, Suez and Tanta). Participants' characteristics and operative outcomes are presented in table 1. All deliveries were elective except for one patient who was admitted as an emergency with mild antepartum bleeding. The median patient age, gestational age and length of hospital stay were 33 years (range 24 – 39), 37 weeks' gestation (range 35 –39) and 2 days (range 1 - 3), respectively.

Operative and follow-up outcomes

On average, 10 minutes (range 3 – 20 minutes) were required to displace the bladder downwards. The average time required to negotiate and remove the placenta was 5

minutes (range 2 – 13 minutes). The ElNoury suture took on average, one minute to insert and two minutes to achieve compression of the lower segment and the securing of the knot. The average duration of the ovarian vessels temporary occlusion was 12 minutes (range 8 - 18 min). The mean intraoperative estimated blood loss (EBL) was 1200 ml (range: 700-2000 ml). In 9 cases (56%) it was ≤ 1000 ml and in the remaining 7 cases (44%) between 1001 and 2000 ml.

Seven of the 16 patients (44 %) required a blood transfusion ranging from 1 – 5 units of packed RBCs. One of these women had the transfusion for an atonic postpartum haemorrhage 3 hours postoperative, which responded promptly to uterotonic agents. A 2 cm segment of the uterine wall with the overlying adherent placenta was trimmed in one patient. There was one case of a bladder injury (1.5 cm defect) recognised during dissection and repaired. This patient was discharged home on day 2 postoperative with an indwelling urinary catheter for 5 days. None of the neonates required neonatal unit admissions. One woman had a subsequent pregnancy, with normal placentation and an uncomplicated delivery by caesarean section (Table 1). None of the patients in our series had a hysterectomy, needed to return to theatre after the initial surgery or had secondary postpartum haemorrhage. All women were seen back for follow-up 6 weeks postnatal.

Discussion and conclusion

In this manuscript we report the steps of a surgical bundle for the management of pregnancies complicated by PAS and / or PP for women keen to preserve their uterus.

The bundle has three essential haemostatic components: exteriorization of the uterus with the placenta still in situ; temporary intraoperative vascular occlusion of the blood supply to the uterus, allowing time to remove the placenta; and a pre-emptive compression suture involving both uterine arteries and the lower segment. The surgical bundle was feasible to perform in all the deliveries included in our case series. The downward urinary bladder displacement to the level of the vagina is an essential preparatory step before opening the uterus. This step needs careful dissection and patience to ensure that haemostasis is achieved.

In our technique, temporary occlusion of the blood flow is achieved by the immediate exteriorisation of the uterus, manual compression by an assistant to occlude the uterine vessels and immediate application of the vascular occluding clamps to the infundibulo-pelvic ligaments. The use of prophylactic intra-arterial catheters has been used to achieve this temporary occlusion to the uterine blood supply. Nevertheless, this is not always feasible particularly in low and middle-income healthcare settings or in emergency caesarean deliveries. Moreover, our proposed technique avoids the potential complications of prophylactic intra-arterial balloon catheter that includes the higher risks of thrombosis, rupture, ischaemic injuries and fetal radiation exposure.[7,8]

The effective haemostasis achieved by the temporary occlusion of the uterine blood flow allows time for the retraction and thickening of the lower uterine segment, hence, maximizing the chance of spontaneous placental separation while minimising the risk of tearing, which may add to the surgical complexity of the procedure. In this series,

separation of the placenta was achieved in all cases with the exception of one case where a small area of adherent placenta was trimmed with the very thin lower segment. Our results are in agreement, with the concept of Matsubara and Takahashi, relating to placental separation in PAS when appropriate intraoperative haemostatic procedures are applied.[9]

The average EBL in our study was 1200 ml (range 700-2000). This EBL is slightly more than that reported with prophylactic lower abdominal aortic balloon occlusion [835 mL, range: 200–6000 mL], when the balloon was inflated prior to opening the uterus and delivery of the baby.[10] Nevertheless, it is less than that reported in a meta-analysis of studies using intra-arterial aortic balloons that were not inflated until after the delivery of the fetus and umbilical cord clamping (1200 vs. 1480 ml).[11] Furthermore, the EBL was much less than the 2000 ml reported with Internal iliac artery occlusion.[12] The ElNoury compression suture was designed to secure the uterine vessels and surrounding vesical and vaginal collaterals. The suture also provides compression to the area of the placental bed in the lower segment without passing through the posterior uterine wall and hence mitigating the risk of intrauterine adhesions associated with other compression techniques.[13]

In conclusion, the "ElNoury-Webster Bundle" is a novel stepwise surgical technique, which fulfils most of the criteria required for the conservative management of PAS and PP particularly in low and middle-income healthcare settings. Testing this bundle on a larger sample size by different surgeons is important to validate our findings.

Disclosure of interests

The authors have no interests relevant to this work to disclose.

Contribution to authorship

MAE: Conceiving the idea and designing the surgical technique, was the principal surgeon and manuscript write up.

SW: Development of the surgical technique and the bundle, Contributed the illustration of Figure 3 and Manuscript write up.

DAA: Assisted in some cases, Manuscript editing, data analysis.

All authors approved the final version of the manuscript.

Ethics approval

The surgical technique was discussed by the relevant scientific committees of each of the units prior to undertaking any procedures. The suggested technique was deemed safe and formal ethical approval was waived (copies of departmental approval letters submitted), All the women included in this series provided a written informed consent after they were informed of the potential benefits and risks of the technique. Finally, consent was acquired for the use of the video and the patient has reviewed and agreed the final edited version (Available to the editors on request).

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Tables and figures:

Table 1. Demographic and operative details of the case series participants.

Figure 1: Urinary bladder dissection

Figure 2: Temporary occlusion of the blood supply to the uterus

Figure 3: Steps of the ELNoury lower segment compression suture

Video: