Clinical Practice

Folding Sutures Following Tourniquet Binding as a Conservative Surgical Approach for Placenta Previa Combined with Morbidly Adherent Placenta

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INTRODUCTION
The incidence of the morbidly adherent placenta has been increasing due to the increased rate of cesarean section. Life-threatening hemorrhage is the major concern for the morbidly adherent placenta, and efficient bleeding control of lower uterine segment is critical to improve outcomes. When traditional conservative methods do not work, further surgical procedures should be attempted. There are several conservative surgical approaches for lower uterine compression, and peripartum hysterectomy is avoided. In the present study, we aimed to report a rather easy suturing method to compress the lower uterine.

Between April 2012 and December 2014, at Peking University First Hospital, Beijing, China, the folding sutures following tourniquet binding procedure was performed on 12 women with placenta previa combined with placenta increta (7 of them with placenta percreta) [Table 1]. Our institution did not require ethics committee approval for this variation of surgical technique.

PROCEDURES
The folding sutures following tourniquet binding is a conservative surgical approach for placenta previa combined with the morbidly adherent placenta. The approach includes three steps: (1) Perioperative placenta localization and delivery of the fetus; (2) tourniquet binding and placenta removal; and (3) folding sutures.

Perioperative placenta localization and delivery of the fetus (step 1)
The cesarean section plan should be fully discussed in the surgical team in advance. Ultrasound was performed prior to the procedure to localize the placenta and to check the degree of the adherent placenta. Once the abdomen was opened, direct visualization of the anterior uterine wall was carried out, and further incision plan should be made. The myometrium was incised transversely, and the incision was made above the border of the placenta without cutting through the placenta. The fetus was delivered via transverse uterine incision above the upper border of the placenta.

Tourniquet binding and placenta removal (step 2)
Once the fetus was delivered, uterine blood supply was reduced by tourniquet binding around lower uterine segment like a belt. Then, placenta can be removed from uterus. Because the margin between placenta and myometrium was not clear, the placenta removal was rather difficult. As much placenta as possible was removed piecemeal from the uterine incision. Partial placenta would be left in situ when the placenta was deeply adherent. This approach can achieve uterine devascularization.
and significantly reduce the amount of bleeding through applying tourniquet.

**Folding sutures (step 3)**

After placenta removal, folding sutures were made in lower uterine segment [Figure 1]. The folding sutures started from one side of the lower uterine segment to the other. No. 1 chromic catgut suture was used to puncture the uterus posterior wall vertically to the anterior wall from the right lateral border of the lower uterine segment. The suture was pulling horizontally to the left for 2–3 cm. The catgut was fed posteriorly and vertically to enter the uterine cavity. The suture was passed backward approximately 1.0–1.5 cm and emerged at the anterior wall at the same level as the entry point. The catgut was pulled moderate tension and was passed in the same fashion toward the left for 2–3 cm. The suture was then passed over vertically to the posterior wall on the left border of the lower uterine segment.

The two lengths of catgut were pulled to achieve compression. The cervical canal was checked open before the knot was made from the back. The tourniquet then was removed in time to observe bleeding from the uterine incision. Other folding sutures could be performed either above or below the previous sutures until the bleeding was well-controlled. The uterine incision was then closed in the normal way. Uterine arteries ligation may be carried out before folding sutures if necessary.

**Discussion**

The separation of the morbidly adherent placenta from its underlying placental bed is the major cause of massive obstetric hemorrhage. The approach described here is to avoid separating the adherent placenta from its placenta bed and potentially preserve fertility. Postoperative infection and hemorrhage will be monitored if placenta is not entirely removed. Serial monitoring of blood routine test and β-human chorionic gonadotropin levels is essential to evaluate placental resorption.

There are several suture techniques in lower uterine segment to control hemorrhage during cesarean delivery for complete placenta previa including Cho’s hemostatic suturing technique, Hwu’s parallel vertical compression sutures, and circular isthmic-cervical sutures. Other strategies include procedure using Foley catheter to compress the lower uterine segment and Triple-P procedure using balloon catheters to occlude internal iliac artery blood flow in order to reduce the amount of bleeding. Nevertheless, facilities for interventional radiology are not always available. Compared to the balloon catheters, tourniquet is rather easy to access. However, if the compression suturing methods did not work, hysterectomy will be probably carried out.

Overall, the folding sutures following tourniquet binding, which we introduced here, is an effective conservative surgical approach for placenta previa combined with the morbidly adherent placenta. It can largely reduce the bleeding and improve outcomes of the morbidly adherent placenta.

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Conflicts of interest
There are no conflicts of interest.

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