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Research Letter

A novel approach to primary lower uterine segment atony

Hasan Yüksel*

Adnan Menderes University, Faculty of Medicine, Department of Obstetrics and Gynecology, Aydın, Turkey

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Severe postpartum hemorrhage (PPH) causes the death of 132,000 mothers annually all around the world [1]. Although the causes of PPH include genital tract lacerations, retained placenta, and less commonly, uterine rupture, uterine inversion, and coagulopathies, the leading cause of PPH is uterine atony [2,3].

Uterine atony complicates one in 20 deliveries, resulting in excessive blood loss due to inadequate myometrial contraction after delivery of the placenta [2]. Although the upper uterine segment is not atonic and is even well contracted, the lower uterine segment may bleed, albeit rarely, without any trauma or placentation abnormalities. Some authors in the past have mentioned the possibility of bleeding from the lower uterine segment, but the condition has not been well described in the obstetric literature [4]. Recently, Panda et al [5] hypothesized that primary atony of the lower uterine segment is a distinct cause of early PPH. Early PPH caused by lower uterine segment atony may occur following cesarean or vaginal delivery. The incidence of primary atony of the lower uterine segment is unknown.

Management of lower uterine segment atony is not well evaluated in the literature. There is some anecdotal data about bleeding experiences from the placenta previa and about placental adherence abnormalities in the lower uterine segment and generalized uterine atony. Lower uterine segment atony is a more challenging problem than upper segment atony in terms of its being unresponsive to uterotonics [4] and because of the difficulty of surgical intervention. Based on the successful management of a case, a novel maneuver is suggested here for the management of primary atony of the lower uterine segment.

A 41-year-old G4P3 patient was referred to our clinic at her 33th week of pregnancy for gestational diabetes. Her medical history and physical examination was normal. She was 155 cm tall and weighed 59 kg. The ultrasonography examination revealed a fetus in cephalic presentation with intrauterine growth retardation. There was no placentation abnormality such as placenta previa or a low-lying placenta. Amniotic fluid volume was normal. The fetal echocardiography showed no pathology. Her combined Down's Syndrome screening test was 1:889. The hemoglobin A1c level was 5.5% (4–6%). Under special dietary recommendations and regular exercise, her weekly glucose levels were in the normal range.

The patient was living in a town far from our clinic and was admitted to the labor and delivery service in active labor at her 40th week of pregnancy. Her hemoglobin level was 13.1 g/dL on admission. She was in active labor for 7 hours. Her pelvic examination revealed a completely dilated and effaced cervix. The vertex was at the level of the ischial spines. Meconium-stained amniotic fluid within the intact bulging membranes was observed. The membranes were artificially ruptured. A healthy, small-for-gestational-age baby (2370 g female, Apgar scores of 8 and 9 at 1 minute and 5 minutes, respectively) was delivered without any complication after a few pushing efforts in 10 minutes. Intravenous oxytocin administration was begun as 40 IU in a 1000-mL normal saline at a rate of 150 mL/h. The placenta and the membranes delivered spontaneously and completely in 10 minutes with no cord traction. A very heavy gush bleeding occurred from the uterus a few minutes following the delivery of the placenta with no signs of slowing down. The patient had no known risk factors for intrapartum or postpartum hemorrhage.

Uterotonic agents were applied to control uterine bleeding (5 IU oxytocin IM, 0.2 mg methylergobasine maleate IM, and 1000 mg misoprostol rectal). The uterine cavity was checked digitally and no clots or retained placental pieces were detected. Even though the upper uterine segment was firmly contracted, the lower uterine segment was found to be atonic and felt floppy. Primary lower uterine segment atony was diagnosed. At first, bimanual uterine compression was performed; then, a gauze tamponade was inserted into the vagina and cervix and bimanual uterine compression was performed repeatedly. Unfortunately, the heavy bleeding continued and a blood transfusion was started immediately. Estimated blood loss was at least 1000 mL as an early PPH in the first 30 minutes after delivery. The amount of blood loss was also excessive relative to the patient's weight.

I decided to stop these maneuvers and checked for any cervical or lower uterine segment lacerations by holding the cervix with two ring forceps at 3 o'clock and 9 o'clock, hoping that traction on

* Adnan Menderes University, Faculty of Medicine, Department of Obstetrics and Gynecology, 09100 Aydın, Turkey.
E-mail address: drhyuksel@gmail.com.

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the lower uterine segment might decrease the blood loss. Then, two more ring forceps at the 6 o'clock and 12 o'clock positions were placed and traction was applied down to the vaginal introitus to get a better sight of the inner cervix and lower uterine segment if possible. At ~45 minutes after delivery, bleeding was dramatically decreased with this maneuver. When the traction was loosened, bleeding restarted; however, when the cervix was sufficiently pulled down toward the vaginal introitus, the bleeding stopped almost completely. After 10 minutes of waiting in the same position, the forceps were left in hanging position with their own weight from the edge of the delivery table. A single dose of a broad-spectrum antibiotic covering for common pathogens was administered. Two units of packed red blood cells and fresh frozen plasma were transfused. The ring forceps were removed after 8 hours of observation and no bleeding was noticed. The hemoglobin level was found to be 10.1 g/dL after the transfusions. Thus, it might be assumed that the hemoglobin level probably dropped from 13.1 g/dL to about 8 g/dL in the 1st hour.

The patient's puerperal period was uneventful with a normal oral glucose tolerance test. She had her first menstruation at 8 months after delivery and continued to have regular menses. She breastfed her baby for ~2 years.

The rational explanation of the mechanism of this maneuver was probably based on the traction on the uterus, which created compression and distortion of the vessels supplying blood to the lower uterine segment and cervix (Figure 1). The firm and contracted upper uterine segment worked as a mass, squeezing the vessels that were supplying blood to the lower uterine segment, leading to compression or distortion between the uterine body itself and the vaginal wall, which might be said to have stopped the bleeding. This is a similar condition to the mushroom-like pelvic pressure pack described earlier by Logothetopulos [6] for post-hysterectomy bleedings. Here, it was the uterine body that was used instead of a gauze-filled package. The lower uterine segment was repositioned down through the vagina while the cervix was pulled outward, causing the upper uterine segment to settle on the vaginal apex like the head of a mushroom.

In another case experience in the past, I had been invited to the Emergency Room for consultation for a severe hemorrhage after vaginal delivery in a maternity hospital. I was told that, although the uterus was contractile, the uterine cavity was empty and the genital tract was intact. Profuse bleeding occurred and then was controlled in time. In that case, I put a small ribbon-like piece of gauze around the vaginal fornices and pulled at the cervical lips bringing three ring-forceps through the vaginal introitus and waited ~30 minutes. This was again effective and the bleeding was easily controlled.

In the present case, there was no need for any invasive or noninvasive intervention after the maneuver such as a hysterectomy, balloon or gauze tamponade, compression sutures, or for more medication. A minimal oozing type of bleeding from the uterine cavity lasted not more than a few hours after the maneuver. No complication occurred on the cervical lips and uterus. The usual lochia efflux continued on the next days. No infection or vaginal, cervical, or uterine pathology attributable to this maneuver occurred during the follow-up period.

Uterine atony and lacerations of the genital tract are the most common cause of immediate PPH. This might be expected to accompany the existence of placentation abnormalities. In fact, primary lower uterine segment atony might occur without any known predisposing factor as in the case mentioned above. A search of PubMed Medline in the English literature for “lower uterine segment atony” revealed only a few articles. In fact, the predisposing factors, prevention, and management of lower uterine segment atony are not well described. However, the hemorrhage of primary atony of the lower uterine segment may be severe and hysterectomy may be required for intractable bleeding.

Here, a novel maneuver is proposed for primary lower uterine segment atony. This maneuver is simple, easily practicable, noninvasive, costless, requiring no education to perform, and testing the maneuver takes only a few minutes. It can be repeatedly applied many times if needed. The maneuver follows the normal physiological puerperal course as it allows blood to ooze from the uterine cavity in the same way. It is also easy to check whether hemostasis is achieved or not. Although it is suggested for primary lower uterine segment atony, theoretically, it would probably be useful in uncontrollable placenta previa and cervical bleeding as long as the upper uterine segment is well contracted.

In the past, some procedures have been used in the management of lower segment uterine atony. Gauze packing, ligation of the arteries, compression sutures, and balloon tamponades as well as combinations of these techniques have been applied to postpartum lower uterine segment bleeding.

The B-Lynch uterine compression suture was first described in 1997 for PPH [3]. In 2000, Cho et al [7] described multiple square suturing techniques, which can be used for PPH arising from uterine atony as well as from placenta previa. The basic theory of Cho et al's [7] hemostatic multiple square suturing is similar to the B-Lynch technique. It seems that the effective techniques for the lower uterine segment bleeding are the Cho square sutures and selective lower vascular ligature [8]. Although the Cho suture is offered as more simple and successful, it takes 5–10 minutes and technical difficulty is described as mild to high-level in the application because the vesico-uterine fold must be opened [8]. Furthermore, Cho sutures can be applied during cesarean section. Similarly, a transverse annular compression suture for complete placenta previa bleeding during a cesarean section has also been reported in one case [9].

The use of uterine compression sutures, however, may result in some severe and potentially life-threatening complications and a routine follow-up by hysteroscopy and/or imaging techniques may be needed [10]. Late PPH may result from the use of the hemostatic

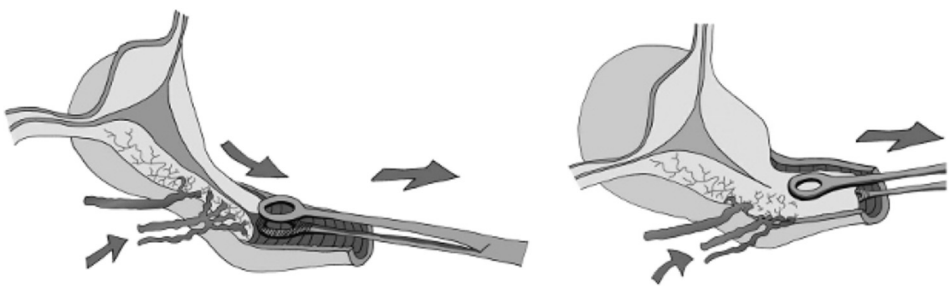

Figure 1. The uterine cervix is repositioned down into the introitus vagina by traction, created obstruction of the vessels supplying blood to lower uterine segment.

Cho square suture technique [11]. Selective lower vascular ligature is also an abdominal procedure and applied during cesarean section. After vaginal delivery, gauze packing and balloon tamponades might be used for PPH arising from lower uterine segment atony; these can also be applied during cesarean sections.

Recently, many attempts have been made to find alternatives to uterine packing using tamponades such as tubes, balloons, and some types of catheters [12,13]. However, the problem with using balloons for lower uterine segment atony is maintaining the balloon in the lower uterine segment, which is dilated along with the cervix. Vaginal packing might be needed in cases of PPH involving a dilated cervix. Bakri et al [14] proposed an intrauterine balloon tamponade combined with vaginal gauze packing for lower uterine segment bleedings in placental insertion abnormalities.

Interestingly, Chantrapitak et al [15,16], suggested lower uterine segment compression abdominally for management of all early PPHs after vaginal delivery and even routinely for prevention, except in the case of lacerations. It was thought that good contractions occur at the body of the uterus while there is less contraction at the lower uterine segment because of the lesser quantity of muscles. It was not clear, however, if there was any bleeding from lower uterine segment atony. I was unaware of these studies and I used uterotonics, vaginal packing, and bimanual compression before I decided to employ the novel technique described above for lower uterine segment atony.

Vascular topographical areas of the uterus are well defined by Palacios Jaraquemada et al [17]. They showed that the lower uterine segment, uterine cervix, and upper part of the vagina are supplied by a group of pelvic subperitoneal collaterals, originating from the internal pudendal artery, and by accessory collateral vessels from the internal iliac arteries, uterine artery, and lower vesical arteries [8,17]. Thus, bilateral uterine artery ligation is not useful for lower uterine segment bleeding although it is a very successful procedure in upper segment bleedings [8]. In the maneuver described in this paper, however, compression and distortion of the descending branches of the uterine artery, the primary blood-supplying vessels, and other vessels is achieved.

This maneuver may have some limitations. The probable objection to the practice of this maneuver may be cervical lips necrosis and separation. Although the maneuver might have lowered perfusion of the lower uterine segment and cervix after the pulling of the cervix, the traction should not be very brutal. Ischemia in the cervical lips and separation did not occur in the case and, to avoid this complication, the color of the cervical lips can be observed. During pregnancy, uterine ligaments lose their tension and allow repositioning down through the vaginal outlet. If the ligaments are stretched, manual abdominal compression may also contribute to this maneuver in nonobese women.

In conclusion, this novel maneuver for the management of a hemorrhage from the lower uterine segment atony is an easy, safe, and practical method that can preclude a further invasive approach. More focus should be given to the management of lower uterine segment atony or bleeding from the lower uterine segment. This may include compression of the lower uterine segment, direct injections of uterotonics, or perhaps ligation of the cervical branches of the uterine arteries, and balloon tamponade with vaginal packing. It is my hope that my limited experience with this case may lead to increased recognition of lower uterine segment atony and stimulate colleagues to focus more on lower uterine segment atony. The current maneuver may be a life-saving and fertility preserving option in this situation.

Conflicts of interest

The author has no conflicts of interest relevant to this article.

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