

Clinical Research

Use of Uterine Balloon Tamponade For Managing Placental Invasion Anomalies: Retrospective Study

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ABSTRACT

Objective: Conservative management of cases detected with placental invasion anomaly.

Material and Method: Analysis of the clinical characteristics of the cases, diagnosed with placental invasion anomalies, treated in our hospital.

Results: A total of ten patients diagnosed with placental invasion anomaly during two years period. Seven cases were placenta accreta and three cases were placenta percreta. The mean estimated blood loss and blood transfusion amount were 1950 (± 646) mL and 5.7 (± 3.8) units respectively. While in seven cases, Bakri balloon application controlled postpartum hemorrhage (PPH); but one case needed uterine artery ligation and the other one case needed B-lynch suturation + uterine artery ligation in addition to Bakri balloon application. In the remaining one case, hemorrhage was controlled by application of square sutures+ condom combined foley catheter tamponade + Affronti sutures. While none of the cases, where only uterine balloon tamponade (UBT) is applied, required hysterectomy, but the case received B-lynch suturation + uterine artery ligation required urgent hysterectomy due to coagulopathy. None of our cases experienced postpartum infection, mortality and pelvic organ injury.

Conclusion: In conservative management of the patients diagnosed with placental invasion anomaly, use of UBT is effective for providing hemorrhage control and protection of fertility.

Key Words: Placental invasion anomaly, Postpartum hemorrhagia, Uterine balloon tamponade.

ÖZET

Plasental İnvazyon Anomalili Olguların Yönetiminde Uterin Balon Tamponad Kullanımı

Amaç: Plasental invazyon anomalisi tespit edilen olguların konservatif yönetimi.

Gereç ve Yöntem: Hastanemizde plasental invazyon anomalisi tanısı alan ve tedavi edilen olguların klinik karakteristiklerinin analizi yapıldı.

Bulgular: İki yıllık periyotta toplam on olgu plasental invazyon anomalisi tanısı aldı. Yedi olgu plasenta akreta ve üç olgu plasenta perkreta idi. Ortalama kan kaybı ve transfüzyon miktarı sırasıyla 1950 (± 646) mL ve 5.7 (± 3.8) unite idi. Yedi olguda Bakri balon uygulaması postpartum hemorajiyi kontrol altına aldı; fakat bir olguda uterin arter ligasyonu, diğer bir olguda ise B-Lynch sütürasyonu + uterin arter ligasyonu ile birlikte Bakri balon uygulamasına ihtiyaç duyuldu. Diğer bir kare sütür + foley katater-kondom tamponadı ile birlikte Affronti sütürleri uygulanarak kanama kontrolü sağlandı. Uterin balon tamponad uygulanan olgulardan hiçbiri histerektomiye gitmezken, B-Lynch sütürasyon + uterin arter ligasyonu yapılan bir olguya koagülopatiden dolayı acil histerektomi yapıldı. Olguların hiçbirinde postpartum enfeksiyon, mortalite ve pelvik organ yaralanması olmadı.

Sonuç: Plasental invazyon anomalisi tanısı konulan hastaların konservatif yönetiminde UBT' nin kullanımı hemorajiyi kontrol altına alabilir ve fertilitiyi koruyabilir.

Anahtar Kelimeler: Plasental invazyon anomalisi, Postpartum hemoraji, Uterin balon tamponad.

Placental invasion anomalies mean that chorionic villus pass through uterine decidua and proceed until myometrium and serosa. In placenta increta, invasion of placenta towards inside of myometrium is observed. In placenta percreta, placenta penetrates into uterine serosa and sometimes into the surrounding organs. Cesarean hysterectomy specimens revealed out the percentages of placental invasion anomaly as follows: 75% placenta accreta, 18% increta and 7% placenta percreta (1).

The major risk factors of abnormal placentation are previous cesarean delivery and placenta previa (1-3). Almost every invasive procedure applied to the uterine cavity may cause abnormal placentation. The procedures which can lead to localized desidual defects are as follows: manual splitting of placenta in the previous delivery, repeating abortions, existence of submucous myomas, placenta previa, pregnancy in a rudimentary uterine horn, previous cesarean scar, hysteroscopic surgery, myomectomy, endometrial

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ablation and uterine artery embolization (1, 4-8). Advanced maternal age is an independent risk factor for abnormal placentation. Abnormal placentation risk dramatically increases together with each cesarean delivery and particularly after the third cesarean delivery (3).

All forms of the abnormal placentation is related with post partum hemorrhagia (PPH) and hypovolemic shock which increases the risk of mortality and morbidity or with massive hemorrhage which may cause disseminated intravascular coagulopathy (DIC). Uterine tamponade tools, peripartum hysterectomies, uterine and hypogastric artery ligation, prophylactic perioperative balloon occlusion of hypogastric artery are the treatment modalities used for peripartum hemorrhage due to placental invasion anomalies(9). In this study, we evaluated our uterine balloon tamponade (UBT) experience on the cases with placental invasion anomaly.

MATERIAL AND METHOD

This retrospective study was conducted in Firat University School of Medicine, Department of Obstetrics and Gynecology, with analysis of the files classified as placental invasion anomaly during December 2011 and June 2013. This study was approved by the local ethical committee. The age, gravida, parity, gestational week at delivery, previous obstetric history, history of previous uterine surgical intervention, pre- and post-operative hemoglobin levels, hematocrit % and platelet levels, liquid volume used for inflation of intrauterine balloon, proceeding hysterectomy procedure, intraoperative and postoperative first 24-hours blood loss amount, blood transfusion amount and mortality of patients have been researched. Delivery method of all the cases were cesarean delivery under general anesthesia and UBT was applied abdominally to all cases during operation. Uterine balloon was inflated approximately with 150 – 500 mL saline according to uterus volume and proceeding of hemorrhage on placental bed. In some cases with cervical dilatation, pursing suture and vaginal pack were applied to column. The balloon was maintained for a period between 48 hours and six days. Number one polyglactin suture material was used for B-Lynch compression suturation and uterine artery ligation. All the operations were performed by the same staffs.

Care during the first post-operative 24 hours:

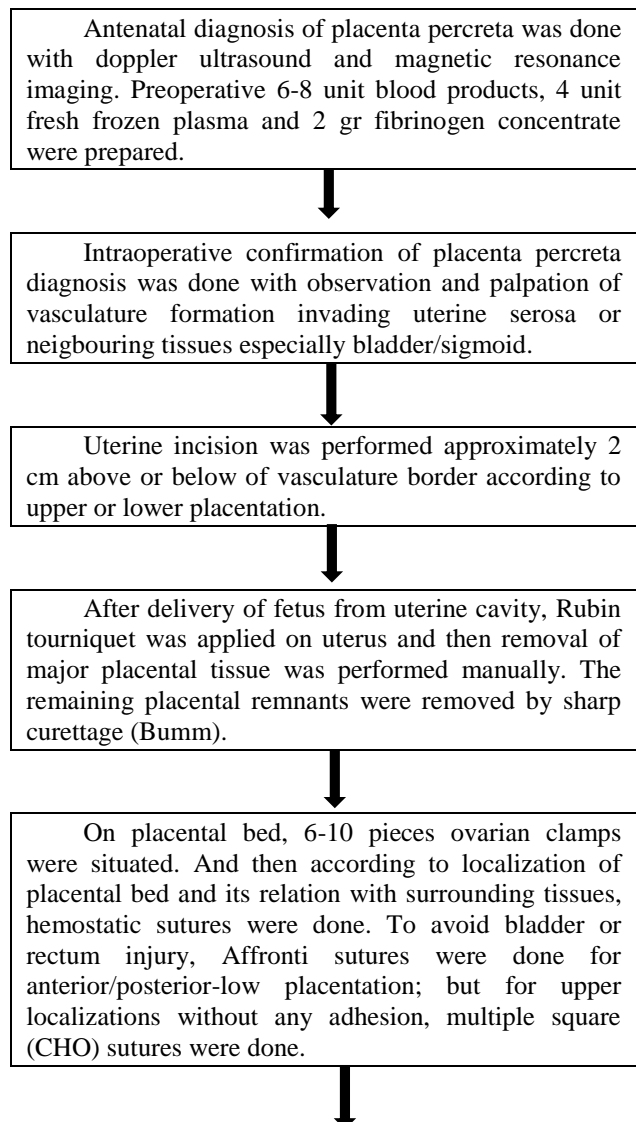
Hourly urination (mL), blood pressure (mmHg) and temperature (C°) were measured. Parenteral nutrition was performed with 100-120 mL/hour intravenous balanced fluid for 24 hours and ten unit oxytocin (Synpitan® forte ampoule 5 IU, Deva, Istanbul, Turkey) was inserted into per liter of fluid and 0,2 mg methilergonovine (Methergine® ampoule 0.2 mg,

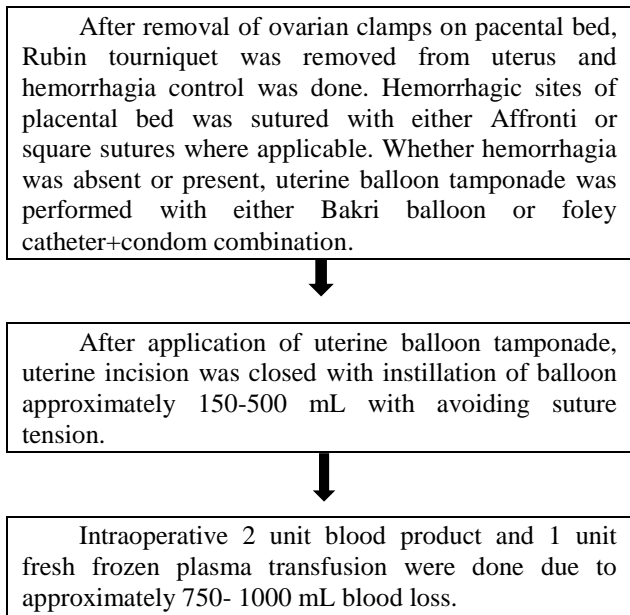
Sandoz, Istanbul, Turkey) was applied as intramuscularly with 2x1 posology.

Calculation of estimated hemorrhage amount:

Blood loss during operation was calculated by a specialist anesthetist. In order to prevent the amnion fluid to cause mistake in hemorrhage amount by mixing with the blood, after opening the amnion membrane, the amnion fluid was taken to another collection vial by the assistant surgeon. The blood collected in the aspirator bottle was further recorded. Furthermore, the gauze bandage used for bleeding control was weighed before the operation and after use and intra-operative estimated blood amount was calculated. In the first postoperative 24-hour-period, the hemorrhage amount collected in the drainage sack of Bakri balloon was recorded. In order to evaluate blood loss, hemoglobin (g/dL) and hematocrit (%) values were monitored in preoperative and post-operative period.

Our conservative management algorithm of patient with placenta percreta





Intra-operative medical treatment: 20 units bolus oxytocin (Synpitan® forte ampoule 5 IU, Deva, Istanbul, Turkey) was administered intravenously and than 20 units oxytocin was administered with an infusion speed of 125 mL/h. Methyl ergonovin maleat (Methergine® ampoule 0.2 mg, Sandoz, Istanbul, Turkey) was intravenously administered on the cases without high blood pressure.

Statistical analysis: The statistical analysis of data were performed by using SPSS 12.0 version (SPSS Inc. IL, USA).

RESULTS

In this retrospective study, the treatment modalities of the cases with placental invasion anomaly were as follows: B-Lynch compression suturation, square

suturation, affronting suturation, uterine artery ligation and UBT.

Between December 2011 and June 2013, a total of ten patients diagnosed as placental invasion anomaly. While the diagnoses of placentation anomaly of two cases were done preoperatively, eight cases were diagnosed during intraopertaive period. In terms of obstetric risk factors; seven cases had previous cesarean history, two cases had placenta previa totalis and one case had twin pregnancy. In all cases, cesarean delivery was performed.

Seven cases were presented as placenta accreta and three cases were presented as placenta percreta. The mean age of women was 32.9 ± 5.9 years and the mean number of gravida was 3.2 ± 1.7 . The mean estimated blood loss was 1950 ± 646 mL and the mean transfusion amount was 5.7 ± 3.8 units. While in seven cases, only Bakri balloon application provided bleeding control, but one case received Bakri balloon application + uterine artery ligation and one case received B-lynch suturation + uterine artery ligation. In one case, square sutures + Affronti sutures were combined with intrauterine foley catheter-condome application for bleeding control. The cases with only UBT application did not required hysterectomy, but urgent hysterectomy was performed due to DIC development on the case who received B-lynch suturation+ uterine artery ligation. None of our cases developed postpartum infection and organ injury. There was no mortal case. The mean operation duration was 63 ± 22 minutes and the mean inflation volume of the balloon was 294.4 ± 98 mL. Clinical characteristics of all cases were presented in Table 1.

UBT and combined sutures enabled bleeding control in all cases. While the balloon was removed in the 48th hour in eight cases, it was removed on the fifth day in one case and on the sixth day in another case, until the uterine bleeding stopped.

Table 1. Clinical characteristics of all the cases

Case no	1	2	3	4	5	6	7	8	9	10
Age (years)	34	42	30	28	38	30	23	41	30	33
Gestational week	35 ³	37 ⁵	36 ¹	18 ²	38 ¹	29 ²	38 ¹	38 ²	37	27 ²
Gravida	3	4	6	1	3	2	2	5	5	1
Parity	2	2	4	0	2	0	1	4	3	0
Placentation anomaly and diagnosis period	accreta intraop	accreta intraop	percreta preop	accreta intraop	percreta intraop	accreta intraop	accreta intraop	accreta intraop	percreta Preop	accreta intraop
Risk factor	Previous two sectio	Previous two sectio	Previous three sectio + curettage	curettage	Previous two sectio	Placenta previa	Placenta previa + curettage	Placenta previa	Placenta previa+ Previous one sectio	Twin pregnancy
Delivery way	Cesarean section	Cesarean section	Cesarean section	Hysterotomy	Cesarean section	Cesarean section	Cesarean section	Cesarean section	Cesarean section	Cesarean section
Treatment modality for hemorrhagia control	Bakri balloon	Bakri balloon	Bakri balloon + Uterine artery ligation	Bakri balloon	Foley+condom + Affronti suture	Bakri balloon	Bakri balloon	Bakri balloon	Bakri balloon	B-Lynch+ uterine artery ligation
Pre-operative hemoglobin (gr/dL)	9.4	11.8	11.3	10.6	11.4	11.2	12.0	12.6	10.3	10.7
Post operative hemoglobin (gr/dL)	5.2	9.1	5.5	6.3	5.6	9.1	5.7	7.1	7.4	6.3
Platelet count (/mm ³)	230000	104000	105000	156000	139000	355000	129000	199000	189000	51000
Blood loss volume (L)	2	1	2.6	1.9	2.7	0.8	2.1	2.4	1.6	2.4
Transfusion amount (unit)	4 LES+ 4 FFP	-	6 LES+ 4 FFP	4 LES+ 2 FFP	6 LES+ 4 FFP	-	4 LES+ 2 FFP	4 LES	2 LES+ 1 FFP	5 LES+ 4 FFP+ 1 PS
Balloon instillation volume (mL)	200	300	300	150	500	250	350	300	300	-
Morbidity	none	none	None	none	none	none	none	none	none	DIC+ hysterectomy
Mortality	none	none	None	none	none	none	none	none	none	none
Operation duration (minute)	45	60	80	45	100	45	50	55	50	100

Note: LES= leukocyte extracted erythrocyte suspension; FFP= fresh frozen plasma; PS= platelet suspension; DIC= disseminated intravascular coagulation

DISCUSSION

Main findings

We have reviewed the conservative treatment methods and results of the patients diagnosed with placental invasion anomaly retrospectively in this study. We observed that, UBT apparatus was effective for controlling hemorrhagia due to placental invasion anomaly. In some of our cases, we applied methods such as square or Affronti sutures and uterine artery ligation in addition to UBT.

Strength and limitations

Obstetric hemorrhage is one of the major reason of maternal mortality (10). Also in our clinic, previously, for the cases with placental invasion anomaly, uterine or internal iliac artery ligation methods were applied as a first choice and hysterectomy was applied for the cases where the bleeding continued. However, recently we have applied UBT for these cases and our morbidity rate has significantly decreased and none of our cases died due to placental invasion anomaly.

The clinical presentation of placentation anomalies may differ. Placenta percreta is the most serious one among these, due to uterine rupture and subsequent hemorrhage risk. However, placenta accreta and increta also constitute increased bleeding risk. Miller et al. have measured the estimated blood loss volume during placenta accreta related cesarean hysterectomy in a group of 62 patients (1). The reported blood loss volumes were as follows: 2000 mL in 41 patients, 5000 mL in nine patients, 10000 mL in four patients and 20000 mL in two patients. Despite our low study population, the highest blood loss volume was 2700 mL and our mean blood loss volume was 1950 (800- 2700) mL. The low bleeding volume in our study may arise from UBT application without trying any other invasive method. However, one of our cases received uterine artery ligation combined with B-Lynch saturation, but the bleeding continued and urgent hysterectomy was applied on this case by re-operation due to DIC development. During this patient's term, we have not yet started to use the UBT tools in our clinic.

Interpretation

Canonico et al. states that following catheterization of descendant aorta prophylactically by transhumeral or transphemoral access; B-Lynch saturation + Bakri balloon application "sandwich method" (11) combined with Affronti sutures is effective for PPH control (12). By application of intra-aortic balloon from distal descendant aorta, vascularization of uterus is provided by ovarian arteries. Catheterization of aorta from upper parts may disrupt uterine perfusion. Furthermore, a qualified radiologist is required for this procedure. We have

provided uterine de-vascularization by applying uterine artery ligation together with triple tourniquet method to the istmic region, infundibulopelvic region and cervical region of a case with placenta percreta (Case no.3 in Table 1). Removal of placental tissue of this case was performed by curettage later. After curettage of placental tissue, we were able to control bleeding by inflating Bakri balloon 500 mL. Also this method may be applied in clinics where a qualified radiologist is not available to apply invasive procedure. In another case with placenta percreta (Case no.5 in Table 1), we applied Affronti suture and then Bakri balloon together with square sutures. In this case, there were dense intrabdominal adhesions due to previous repeated cesarean sections. Optimal exploration of the pelvic region and determination of the borders of the bladder were very difficult. Therefore we inflated the bladder with methylene blue using foley catheter. We were able to perceive the borders of the bladder only by feeling the coldness of the installed blue into bladder and then were able to apply the Affronti sutures. We were not able to insert B-Lynch compression suture on uterus due to abdominal adhesions. Furthermore, we used condom combined foley catheter as UBT tool. Also in this case, PPH was taken under control, no hysterectomy was required and no infection had occurred. In similar cases, application of UBT together with Affronti sutures instead of B-Lynch suture may also be effective.

In insufficient clinic opportunities, PPH treatment modalities such as uterotonics, transfusion of blood products and surgical intervention are generally limited. In a systematic review, 241 women with complaint of PPH were analysed for treatment modalities (six case reports or case series, five prospective studies and two retrospective studies for a total of 241 women). They reported that UBT successfully treated PPH in 234 out of 241 women and they strongly suggested that UBT is an effective treatment method in PPH treatment (13). In studies conducted until today, it is stated that UBT is useful for management of PPH which occurs secondarily to uterine atonia, coagulopathy, rest placenta, placenta previa and placenta accrete (14). In our clinic we observed that UBT is effective in all cases with invasion anomaly for controlling PPH, together with additional saturation procedures in some cases. The advantages of UBT confirmed in our clinic are short period of operation, less morbidity and infection, decrease in transfusion amount, ease of application and non-requirement of advanced surgical ability. Furthermore, particularly in cases with dense pelvic adhesions due to previous abdominal operations, it may be difficult to be able to apply suture techniques such a B-Lynch. Application of UBT, will both decrease loss of time and loss of blood for these cases. Also no need

to obtain assistance from another surgical branch may be another advantage of UBT.

Tindell et al. have reviewed eight studies in which condom catheter is used for PPH. Only in seven of 193 cases, the procedure was unsuccessful. The complication rates have found to be low in all types where UBT was used. No uterine rupture and no increase in infection risk had been reported (13). We provided hemorrhage control in a case with percreta by applying foley catheter-condom in a clinic which did not have Bakri balloon. In cases when Bakri balloon is not available, foley catheter-condom can also provide effective uterine tamponade. Georgiou showed that it was not necessary for the pressure inside the balloon to be above the systemic pressure (15). Furthermore, in five controlled PPH cases, a foley catheter inflated with 30 mL has been used. Therefore, it was stated that the impact mechanism of UBT may comprise not only tamponade but also release of natural prostaglandins. We observed that Bakri balloon tamponade with 150-250 mL instillation volume was also effective for preventing hemorrhage. The effect of balloon tamponade may be searched for lower volumes. When

we gradually brought down and up the UBT tool during the first 48th hour of operation, we observed that PPH was controlled in most of our cases. Only in two cases, UBT tool was maintained for more than 48 hours. Our main problem experienced during Bakri balloon applications was extraction of the balloon from uterus due to cervical dilatation. For preventing the extraction of balloon, we performed vaginal packing and insertion of cervical pursing suture.

Conclusion

It is stated that UBT is effective and should be integrated to the PPH treatment in all levels of the health system (13). In a review conducted by Doumouchtsis et al., UBT is defined as “the least invasive, the easiest and the fastest approach” for treatment of PPH (16). UBT tools should be made available for all kinds of obstetric clinics. We can say that UBT tools will be the unique weapon of obstetrician in management of PPH. In conservative management of the patients diagnosed with placental invasion anomaly and PPH, use of UBT is effective for providing hemorrhage control and preserving fertility.

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