

# BALLOON OCCLUSION OF INTERNAL ILIAC ARTERIES IN MANAGEMENT OF MORBIDLY ADHERENT PLACENTA: INITIAL EXPERIENCE AT OUR CENTER

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## ABSTRACT

**PURPOSE:** To evaluate the initial results of per operative intra-arterial occluding balloons when used as an adjunct to surgery to reduce patient morbidity in patients with morbidly adherent placenta. **PATIENTS AND METHODS:** This is a retrospective study conducted at radiology and gynecology departments of Rehman Medical Institute Peshawar. We retrospectively studied eleven cases over a period of two years from May 2015 to May 2017 and patients were diagnosed of having morbidly adherent placenta during antenatal period either by ultrasound or magnetic resonance imaging (MRI). The mean gestational age at presentation was 36 weeks. All patients were in age group of 30-36 yrs with mean age of  $\pm 33.37$  yrs. All were multiparous with a mean parity of  $\pm 4-5$ . Previous Cesarean Section delivery was the major independent risk factor in most of the cases. About 60% cases were diagnosed during antenatal checkup and in most of the cases the placenta were type IV Placenta previa. Patients were divided into two groups. 5 patients were managed by conventional treatment (conventional group). In 6 cases, interventional radiologist was involved for trans-catheter arterial balloon occlusion balloon occlusion (study group). The internal iliac balloons were inserted pre-operatively and arterial occlusion was done just after the delivery and in one case additional uterine artery embolization was done post-operatively. In conventional treatment, no prophylactic temporary balloon occlusion was done and patients were treated by either removal of placenta and oversewing of the placental bed or caesarean hysterectomy. One patient presented postoperatively with placenta in situ and septicemia. **RESULTS:** The results of the two groups were compared taking different variables into account. In comparing the operating time the mean operating time in conventional group was + 2.37 hr and that in interventional group was  $\pm 1.25$  hr with a total increase of approx. 1.12 hr, which is quiet significant. The average blood loss was 962 ml more in conventional group (mean 2037 ml vs 1075 ml) and consequently increased transfusion of blood (mean  $\pm 6.5$  packs vs. 2.25 packs i.e 4.25 packs more). In our comparative study platelets and fresh frozen plasma (FFP) was exclusively needed in conventional group. Mean stay in intensive care unit (ICU) was more in conventional group with a mean of 2.7 days as compared to 1 day in interventional group. In 2 cases there was per-operative injury to surrounding structures attributed to difficult obstetric emergency and excessive blood loss. In one case the patient had ureteric injury and in other case there was bladder injury. In interventional group, not even a single case of damage to surrounding structure was noted, which can be partly attributed to less stress of the surgeon due to comparatively better hemodynamic stability of patient and partly due to clear field of the surgeon. **CONCLUSION:** We conclude that use of per-operative arterial occlusive balloons for managing morbidly adherent placenta at our center showed good initial results with decreased patient morbidity.

**Key words:** Placenta percreta; Morbidly adherent placenta; Placenta accreta; Placenta increta; Intra-arterial occlusive balloons.

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## Introduction

Abnormal placentation is a potential cause of maternal morbidity and mortality from massive postpartum bleeding.<sup>1</sup> The reported complications associated with it are postpartum hemorrhage (PPH), massive blood transfusion, need for blood products, disseminated intravascular coagulation (DIC), Peripartum Hysterectomy, need for admission in intensive care unit (ICU), surgical complications, endometritis, endovascular events and mortality. Timely diagnosis during antenatal period with proper evaluation of risk factors and pre hand patient counselling regarding need for abdominal delivery, arrangements of blood and blood products & consent for Cesarean hysterectomy is important. The incidence of morbidly adherent placenta is rising and is directly proportional to the rate of rise of caesarean deliveries.

Management of pregnancies with a morbidly adherent placenta is extremely challenging and is becoming an increasingly common problem for maternity units globally. Despite improvement in antenatal diagnosis by accuracy of ultrasound and MRI techniques, it is still associated with a high maternal morbidity rate. The main challenges include controlling hemorrhage and dissection of the invaded tissues.

Interventional radiology has impressive role in management of various obstetrical emergencies. Pelvic arterial occlusion and embolization has added a new dimension in the management of obstetric hemorrhage.<sup>2</sup>

Traditionally, these cases were managed by caesarean hysterectomy. There has now been a shift towards conservative management of morbidly adherent placenta, involving uterine and placental conservation, with the aid of interventional radiology by means of insertion of occluding balloons into appropriate vessels.<sup>3</sup> This technique has nowadays gained acceptance as a first line treatment option for controlling post-partum hemorrhage when the conservative measures fail. It is more commonly done to control bleeding in cases of uterine atony, though pelvic arterial embolization is also indicated in bleeding due to lacerations of female genital tract, abnormal placentation, arteriovenous malformations and postsurgical complications and uterine tears at the time of C-sections.<sup>4</sup>

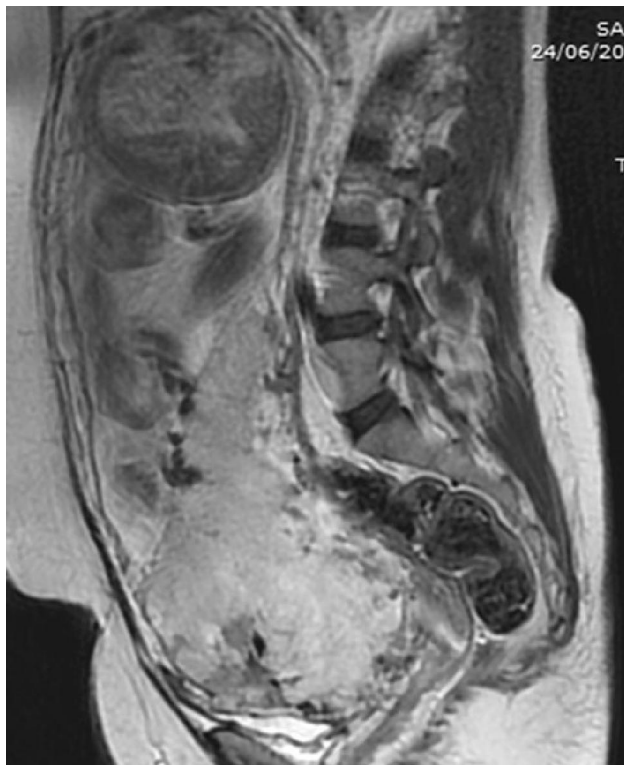
This study describes morbidly adherent placentas

managed at our unit where meticulous preoperative planning, multidisciplinary approach and the key role of interventional radiology led to a safe outcome for both the mother and the baby. The aim of this article is to discuss the valuable role that radiologists play with obstetricians and anesthesiologists in the management of these obstetric emergencies.

## Patients and Methods

This is a retrospective study conducted at radiology and gynecology departments of Rehman Medical Institute Peshawar. We studied eleven cases over a period of two years from May 2015 to May 2017 and patients who were diagnosed of having morbidly adherent placenta during antenatal period and got operated at our center. The mean gestational age at presentation was 36 weeks. Patient's detailed record including number of cesarean sections, placental location, presence of placenta previa, estimated blood loss during the operation, amounts of transfusion, intensive care unit (ICU) admission, stay in hospital and peripartum hysterectomy were obtained from gynecology unit. Estimated blood loss was quantified. Morbidly adherent placenta was diagnosed on ultrasound (US). On US, placental adhesion showed an irregular, thin uterine wall, prominent placental vessels and in some cases disruption of the bladder to the myometrial interface. Magnetic resonance imaging (MRI) was done in 6 patients (Fig. 1), which showed uterine bulging, heterogeneous signal intensity within the placenta, dark intraplacental bands, focal interruption in the myometrial wall and invasion of pelvic structures by placental tissue.

The patients were divided into two groups: one group had undergone a conventional cesarean section (control group, n=5) and in the other group interventional radiologist was involved for per operative trans catheter arterial internal iliac balloon insertion pre-operatively with arterial occlusion just after the delivery (study group, n=6). Of 6 patients in the study group, 1 patient had uterine artery embolization after the surgery. In control group, no prophylactic temporary balloon occlusion was done and patients were treated by either removal of placenta and oversewing of the placental bed or caesarean hysterectomy. One patient presented postoperatively with placenta in situ and



**Figure 1:** MRI of placenta percreta: Sagittal T2WI shows heterogenous placenta previa having internal low bands, anterior lower bulging component with thinning of myometrium and loss of myometrial-placental interface.

septicemia. The internal iliac arteries were catheterized bilaterally and a guide wires inserted with the distal end placed in the rear branch of the internal iliac arteries. Occlusion balloon catheters inserted in both internal iliac arteries. Following insertion of the angiographic guidewire, a balloon catheter was introduced into the artery using pulsed low-dose fluoroscopic guidance to minimize radiation exposure. The time of PTABO and operation was scheduled after full discussion with interventional radiology and anesthesiology the day before the cesarean section. Following delivery of baby during cesarean section, temporary arterial balloon occlusion was performed prior to placental dissection. Following removal of the placenta, the blood vessels on the uterine wall were ligated during inflation of the balloon. If operation was prolonged, the balloons were deflated for a while and then inflated to avoid clotting. Bleeding continued after occluding balloons in one patient, so patient was moved to the interventional radiology suite from operating room immediately after the caesarian section and uterine artery embolization (UAE) was performed.

If the patient's condition was unstable, the doctor of department of anesthesiology kept monitoring the patient's condition during the procedure. Hysterectomy was performed after failure to control bleeding with both occluding balloons and UAE.

## Results

The results of the two groups were compared taking different variables into account (Tab.1 & 2). In comparing the operating time the mean operating time in conventional group was  $\pm 2.37$  hr and that in

S.No	Age	Gravida	Parity	POG	Previous C-section / placenta previa
1	32	4	P2+1	37	Previous 2 C- Section
2	30	3	P2	36+4	Previous 2 C- Section
3	32	5	P2+2	36+5	Previous 2 C- Section with type 4 previa
4	32	3	P1+1	36	Previous 1 C- Section
5	35	6	P5	36+4	Previous 2 C- Section with type 4 previa
6	35	5	P3+1	36	Previous 3 C- Section with type 4 previa
7	36	4	P2+1	36	Previous 2 C- Section with type 4 previa
8	35	6	P5	36+4	Previous 3 C- Section with type 4 previa
9	33	4	3	35	Previous 3 C- Section with type 4 previa
10	30	3	2	35	Previous 2 C- Section with type 4 previa
11	34	3	2	36	Previous 2 C- Section with type 4 previa

**Table 1:** Showing risks for morbidly adherent placenta including multiparity, placenta previa and previous Cesarean section (C-section).

	S.No	Per-op complication	Days in ICU	Total hospital stay	Endovascular events
<b>Control Group</b>	1	Ureteric ligation	5days	8	---
	2	---	1day	5	---
	3	Bladder injury	2days	5	---
	4	---		3	---
	5	Reopening	2 days	7	
<b>Study Group</b>	1	---	1day	3	---
	2	---	1day	3	----
	3	---	1day	4	----
	4	---	1day	3	----
	5	---	1	3	
	6	---	2	5	Acute limb ischemia

**Table 2:** Comparison of patient morbidity in two groups.

interventional group was  $\pm 1.25$  hr with a total increase of approx. 1.12 hr, which is quite significant. The average blood loss was 962 ml more in conventional group (mean 2037 ml vs 1075 ml) and consequently increased transfusion of blood (mean  $\pm 6.5$  packs vs. 2.25 packs i.e 4.25 packs more). In our comparative study platelets and fresh frozen plasma (FFP) was exclusively needed in conventional group. Mean stay in intensive care unit (ICU) was more in conventional group with a mean of 2.7 days as compared to 1 day in interventional group. In 2 cases there was peri-operative injury to surrounding structures attributed to difficult obstetric emergency and excessive blood loss. In one case the patient had ureteric injury and in other case there was bladder injury. In interventional group, not even a single case of damage to surrounding structure was noted, which can be partly attributed to less stress of the surgeon due to comparatively better hemodynamic stability of patient and partly due to clear field of the surgeon.

## Discussion

Morbidly adherent placenta, including accreta, increta and percreta is potentially life threatening condition. It is in other words called as obstetric nightmare as mostly it is undiagnosed emergency. The current rate is 1 per 2500.<sup>5</sup> Its incidence is on rise mostly because of rising rate of cesarean section delivery, advanced maternal age and placenta previa. Taking into account the increasing incidence of placenta praevia, accreta, percreta, increta antenatal diagnosis should be emphasized for which proper antenatal booking and follow up of all the high risk cases on standard protocols is necessary.

In our study, in-time antenatal diagnosis of placental adhesion reduced hemorrhage and the need for blood transfusion. This may be the result of differences in the management of antenatally diagnosed and undiagnosed women. Imaging study is important for diagnosis antenatally, which revealed placental lacunae, loss of clear space, disruption of bladder-myometrial interface, increased vascularity by ultrasonography and uterine bulging, heterogeneous signal intensity within placenta, dark intraplacental bands, focal interruptions in myometrial wall and invasion of pelvic structures by placental tissue by MRI. Although diag-

nosis is made by Doppler US in most of the cases but now MRI is increasingly being used for assessment of depth of invasion into the bladder and posterior placenta. MRI is gold standard investigation to see the depth of placenta when suspicion is raised by Doppler US.

Recently, radiological interventional procedures such as trans catheter occluding balloons and uterine artery embolization are being performed for postpartum hemorrhage. There are potential benefits to decreasing the risk of postpartum hemorrhage and hysterectomy by administering prophylactic intervention especially occluding balloons. In its clinical application, the most difficult problem is moving patients with the balloon catheter from the intervention room of radiology to the operation room for cesarean section. Vinas<sup>6</sup> reported 2 cases of balloon catheter migration during patient transfer to delivery site from the IR suite. In our study group, fortunately, no women underwent displacement of the balloon catheter or had failure of bleeding control due to dislocation of the balloon catheter. After the balloons were inserted, opsite adhesive drapes were used to secure the catheters and patients transfer to Operation Theater was under supervision of interventional radiology staff, requiring great care.

Interventional radiology is now increasingly involved for catheterization of internal iliac artery to control blood loss by balloon occlusion per-operatively. In our study, the average blood loss was 962 ml more in control group (mean 2037 ml for control vs 1075 ml for study) and consequently large number of blood transfusion packs were used (mean  $\pm 6.5$  packs for control vs. 2.25 packs for study group i.e.  $\pm 4.25$  packs more). In our comparative study, platelets and FFPs were exclusively needed in control group. In comparing the operating time, the mean operating time in control group was  $\pm 2.37$  hr and that in study group was  $\pm 1.25$  hr, with a total increase of approx. 1.12 hr which is quite significant. Mean stay in ICU was again more in control group with a mean of 2.7 days as compared to 1 day in interventional group. These results indicate that intra-arterial occluding balloons had some effect in reducing maternal morbidity during cesarean section in cases of placental adhesion.

Comparison made with results of previous studies. Cali et al<sup>7</sup> observed no improvement in the outcomes of women treated with occluding balloons, compared



with the outcomes of women treated without occluding balloons. Recently, a study published in Korea by Cho and fellows<sup>8</sup> showed that occluding balloons had some effect in reducing maternal morbidity during cesarean section in cases of placental adhesion. These results are comparable with our study. However, in our study the number of ICU and total hospital stay was also less for study group, which is a good indicator.

Regarding the procedure related complications, in one patient there was an endovascular event with patient complaining of right leg pain post operatively. The interventional radiologist was informed and embolectomy was performed immediately and the patient was started on intravenous heparin. The patient was discharged home stable on fifth day. No other procedure related complications observed in the group.

Surgery related complications were in 2 cases of control group with injury to surrounding structures attributed to difficult obstetric emergency and excessive blood loss. In one case the patient had ureteric injury and in other case there was bladder injury. In study group, not even a single case of damage to surrounding structures was noted, which can be partly attributed to less stress of the surgeon due to comparatively better hemodynamic stability of the patient and partly due to clear field of the surgeon.

In control group, there was 100% peripartum hysterectomy rate, while in study group it was reduced to about 50%. In one case, there was technical difficulty due to intra-abdominal adhesions and intractable hemorrhage with a chance of iatrogenic injury to the surrounding structures. Uterine packing was done and interventional radiologist was involved for uterine artery embolization (UAE), which proved to be life-saving as the bleeding got controlled and uterus saved.

All the necessary pre-operative preparations should be made before hand during last trimester with proper counselling of the patient. In developing country like ours, the main issue is un-booked, undiagnosed obstetric emergencies where the diagnosis is often made when difficulty is encountered in establishing the cleavage plane while removing placenta or when complete placental removal does not occur during vaginal delivery. Conventionally in PPH, hysterectomy has been traditionally advised. Conservative manage-

ment i.e leaving placenta in situ is usually opted at cost of higher risk of maternal sepsis, where the fertility preservation is important.

Bilateral trans catheter occluding balloons in internal iliac arteries prior to elective caesarean delivery in patients with morbidly adherent placenta, in whom uterine preservation is planned leads to improved outcomes. If massive bleeding continues after cesarean section, both UAE can be performed immediately after occluding balloons, which further decreases the risk of maternal mortality and morbidity. This approach should be considered when recommending this practice in all women identified as having placenta adhesion. In our study the integration of this intervention showed remarkable results in reducing all the related complications, i.e blood loss, Hospital stay duration, blood transfusion packs required etc.

The main limitation of this study is the small number of cases. There are a large number of trials going on with involvement of interventional radiologist for the management of this severely morbid condition. Per-op internal iliac artery balloon occlusion by a radiologist with proper expertise, or pre-op or post-op uterine embolization is tried in centers where facilities are available and the data is slowly and gradually booking.


The major constraints are need of the facilities in hospitals, proper referral pathways, expertise in the field of interventional radiology and high costs of the procedure.

## Conclusion

We conclude that use of per-operative intra-arterial occlusive balloons for managing morbidly adherent placenta at our center showed good initial results with decreased patient morbidity.

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