Original Article

Efficacy of Sandwich Technique (Balloon Tamponade and Compression Suture) in Cases of Placenta Previa and Accreta

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Abstract

Objective: To assess Sandwich Balloon Technique (SBT) efficacy in cases of Placenta Previa (PP) and Placenta Accreta (PA) as uterine conserving hemostatic method in Caesarean Sections.

Methodology: This quasi experimental study was carried out in cases of PP and PA employing SBT (compression suture + balloon tamponade) as a uterine conserving method, in a tertiary care hospital of Karachi from 1st July 2022 till 31st December 2022. Outcome measures including blood loss during surgery, intra-operative blood transfusions, post-operative complications, balloon tamponade removal time, post-operative hospital stay and hysterectomy were recorded. Descriptive statistics were analyzed by means of SPSS 22. Statistical chi-square test was applied and a p-value <0.05 was considered as significant.

Results: Out of 50 patients, 34(68%) had PP and 16(32%) PA. Mean blood loss 972±474ml; mean blood transfusion1.8±1.37units, balloon tamponade removal time in 24 hours 52% and in 48 hours 38%, average hospital stay 3.44±1.64 days, failure resulting in hysterectomy in five patients (10%) and complications including fever, haemorrhage, wound infection and bladder injury in 11 (22%) patients. There was no case of delayed hemorrhage, significant maternal morbidity or mortality. SBT was 100% effective in controlling hemorrhage in cases of PP and 68.8% in cases of PA.

Conclusion: SBT is a safe, feasible, effective hemorrhage controlling method for PP and PA cases and is extremely beneficial uterine conserving technique.

Keywords: Placenta Previa, Placenta Accreta, Postpartum hemorrhage, Hysterectomy.

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Introduction

Postpartum hemorrhage (PPH) is the major cause of maternal morbidity and mortality in obstetrics.[1] Every year One hundred and forty thousand (140,000) women die from PPH throughout the world, which is quite substantial; nevertheless 90% of these are avertible.[2] Pakistan is among the countries with the highest mortality rates in South Asia, with the main bulk owing to PPH.[3] Pakistan Maternal Mortality Survey 2019 carried out by the National Institute of Population Studies (NIPS) in collaboration with USAID quotes obstetrical hemorrhage as the leading cause (41%) of maternal mortality; hypertensive disorders being second.[4]

Placenta previa (PP) and morbidly adherent placentae (MAP), are now becoming exceedingly common due to the escalation in caesarean section rates and can lead to massive PPH. Placenta previa is implantation of placenta in lower uterine segment; partially or completely. A morbidly adherent placenta encompasses placenta accreta (PA), increta and percreta; as it invades into the uterine myometrium in varying degrees.[5] The most recent pathophysiological perception of MAP is the defect of endometrium-myometrial border that leads to pathological decidualization in uterine scar zone permitting deep penetration of placental villi and trophoblast invasion.[6]

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The management of PPH in the cases of placenta previa and MAP is challenging, as torrential bleeding starts from the lower uterine segment (LUS) as it fails to contract and subsequently unable to compress the vessels.[6] Hence this LUS placental site bleeding is mostly unresponsive to the uterotonics, uterine bimanual message and B-Lynch (external compression suture). Despite adequate pre-surgical diagnosis, planning and available surgical modalities; still hysterectomy, maternal morbidity and mortality is on the rise. Preserving the uterus or early resort to hysterectomy, in catastrophically bleeding patient still remains a tough decision.[1] Internal Artery ligation is yet another extremely valuable hemostatic and uterine conserving procedure nevertheless is difficult to perform and necessitates surgical expertise.[6] It is also noted that some cases of para uterine vascular ligation develop diffuse errhysis of lower uterus in long term follow up.[7] These methods may be inadequate in some cases of LUS bleeding, moreover uterine arterial embolization is also costly and complicated technique.[8,9] Therefore, we need other safe, effective and easy to perform techniques for controlling PPH secondary to LUS relaxation.[9]

In this study we employed sandwich balloon technique (SBT); balloon tamponade and the lower uterine segment suture (box suture) simultaneously to provide both intrinsic and extrinsic pressure on myometrium & uterine walls to stop bleeding from LUS in cases of placenta previa or accreta.[9] Uterine compression sutures are considered as credible methods and Bakri balloon tamponade has been recommended by RCOG,ACOG & WHO for PPH management.[10,11] As this technique avoids hysterectomy in high-risk patients, so it can prove promising for majority of subjects in placenta previa or accreta where the likelihood of hysterectomy is far higher. Moreover, hysterectomy during hemorrhage can lead to bladder, ureteric injuries, heavy blood loss, increased intra-operative time, post-traumatic stress disorder; therefore, morbidity associated with obstetrical hysterectomy can also be avoided by this technique.[11]

To our knowledge, the sandwich technique is a novel procedure in our country and few local studies are so far available where isolated compression sutures or balloon tamponades are used however no local study has been found where lower segment compression suture and balloon tamponade has been combined as a sandwich especially in the cases of PP and PA. The aim of this study was to determine the efficacy of sandwich technique to preserve fertility, and also to prevent hysterectomy & hemorrhage related morbidity in high risk cases of PP and PA.

Methodology

This was an experimental study conducted at OBGYN Department of Jinnah Postgraduate Medical Centre (JPMC), Karachi. Fifty consecutive patients were inducted from 1st July 2022 to 31st December 2022, after approval from Institutional Ethical Review Committee (Ref. No.F.2-81/2022-GENL/226/JPMC; dated August 29, 2022).

Patients aged 25-40 years, Gestational age greater than 24 weeks of pregnancy with low lying placentae, placenta previa and placenta accreta on Doppler ultrasound and Intraoperative blood loss of more than 500ml not responding to uterine massage, misoprostol or oxytocin were included, where as patients beyond 24 weeks of pregnancy with placenta increta or percreta on Doppler ultrasound, Severe PPH (> 2000ml) and vitally unstable patients and patients with bleeding diathesis, retained placental pieces, genital tract trauma or on blood thinners were excluded from the study.

During this study, total blood loss was estimated by the adding the blood volume in graduated suction canister and the blood volume calculated by weighing abdominal swabs and all blood-soaked materials including draping sheets.

Patients meeting the inclusion criteria were counseled regarding merits and demerits of study and written informed consent was taken. Senior Consultant Obstetricians performed the surgeries. Detailed history, examination, investigations and pre-operative surgical planning was carried out and data collected and recorded in the pre-designed Performa. The recorded variables were age, parity, previous mode of delivery, estimated blood loss, post-operative stay, units of blood transfused, time of balloon removal and post-operative complications. Data analyzed by plotting on SPSS version 22 and tests applied are Chi-square/Fisher's exact test. P value calculated by Mann Whitney U test and values were presented as Median (Interquartile range).

All the data was entered and analyzed using SPSS version 26. Categorical variables were computed in frequency and percentage, while numerical variables were computed in mean and standard deviation.

Statistical chi-square test was applied and a p-value <0.05 was considered as significant.

Once fetal delivery was achieved in Cesarean Section, and after placental expulsion; uterus was exteriorized for proper visualization of bleeding and easy placement of balloon tamponade and compression suture. Uterine cavity was examined for bleeding and complete removal of placenta was ensured. For the sandwich technique, we used Foleys catheter for tamponade effect as well as two vertical compression sutures on each side of the uterus (right and left) (Figure 1).

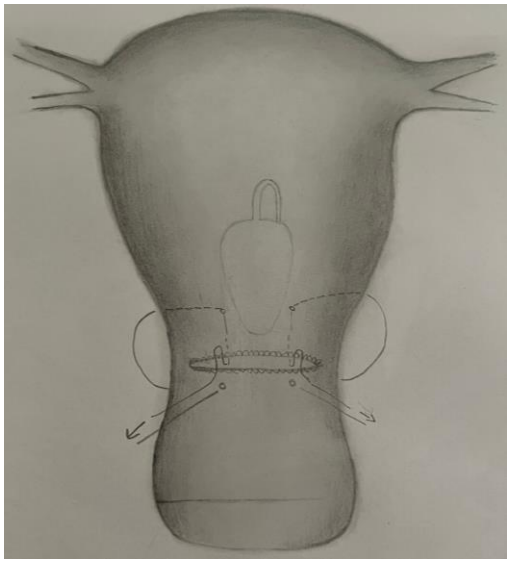

Figure 1. Technique of Sandwich Balloon Technique.

Uterine cavity was closed and abdominal drain was placed. 24-28Fr Foleys catheter was inserted from the uterine incision into the uterine cavity, with its caudal end being put in the vagina through the cervix and its balloon inflated initially with 20-30ml of distilled water to keep it in place and later with 80-100ml of water. Subsequently, we applied two compression sutures with polyglactin (0,1) on either side of Foleys catheter.

For right sided suture, we inserted needle about 3cm below the lower margin of uterine incision and 3cm medial to the right border of uterus, from anterior wall of uterus penetrating through the full thickness of myometrium to the posterior wall. The needle was then threaded along a vertical course on the posterior wall, and then it was inserted from a point on posterior wall to emerge approximately 3cm above the upper margin of uterine incision on anterior wall of uterus, again penetrating through the full myometrial layers. From here, the needle was inserted on anterior wall approximately 2cm above the upper margin of the uterine incision and emerges into the uterine cavity; and then from here to 2cm below the lower margin of uterine incision. Same suture was taken on the contralateral side of uterus. The procedure was defined as successful if only sandwich technique at the time of primary surgery was able to achieve adequate hemostasis and no subsequent surgical procedure was needed for the patient.

The balloon tamponade was kept in situ for 24-48 hours and antibiotics were also administered for infection prophylaxis. Time of balloon removal after SBT was decided on two factors. First is blood loss at the time of surgery (If its more than 1000 ml it was preferred to keep for 48 hours), second is optimization of hemoglobin and clotting profile before removal. Mean duration was 21.88+-6.6 hrs. Uterotonics (misoprostol 800mcg, 12 hourly) was also given initially for 24 hours. Patient was monitored for 48-72 hours for vitals, wound drainage, drain output, balloon tamponade output, lochia and vaginal bleeding. Blood was also kept arranged in case hysterectomy was needed. If patient remained stable, balloon tamponade was removed periodically by removing 20cc water hourly from balloon and if no bleeding observed then removed completely by deflating balloons.

Results

Out of total 50 patients, 34 were of placenta previa (PP) and 16 were of placenta accrete (PA). Mean age was 29.14±3.7 years. Mean parity was 2.32±1.56. Total 27 patients had previous Cesarean sections. In PP group, 23 patients were unscarred.

The mean intra-operative blood loss was 972±474.68 ml per patient. Intra-operative mean blood transfusion was 1.8±1.37units.

In 26 patients (52%) who achieved hemostasis intra-operatively, the balloon was removed successfully at 24 hours, out of which 23 were PP patients and three were PA. While in 19 patients (38%) the balloon was removed successfully at 48 hours, out of which 11 were PP cases and eight were accreta cases. Five accreta patients (10%) had failure of procedure and had obstetrical hysterectomy at the time of primary surgery; due to inability to secure bleeding by balloon tamponade and compression suture. Average length of hospital stay was 2.8 days in PP and whereas 4.2 days for successful SBT PA cases and 5.4 days in hysterectomy cases.

Table I summarizes the demographic data and clinical outcomes. There were no cases of maternal mortality or severe morbidities; either placental related or procedure related.

Table I: Demographic data and clinical outcomes of the study.

Variables	Mean ±SD
Age	29.14 ± 3.70
Parity	2.32 ± 1.56
Previous C-section	0.94 ± 1.08
SVD	1.38 ± 1.65
Blood Loss	972.00 ± 474.68
Post-operative Stay (days)	3.44 ± 1.64
Blood Transfusion	1.80 ± 1.37
Complications	**N(%)**
No	39 (78%)
Yes	11 (22%)
Wound Infection	**N(%)**
No	47 (94%)
Yes	3 (6%)
Hemorrhage	**N(%)**
No	45 (90%)
Yes	5 (10%)
Balloon removed at 24 hours	**N(%)**
No	19 (38%)
Yes	26 (52%)
Balloon removed at 48 hours	**N(%)**
No	26 (52%)
Yes	19 (38%)
Failure	**N(%)**
No	45 (90%)
Yes	5 (10%)
Fever	**N(%)**
No	48 (96%)
Yes	2 (4%)
Septicemia	**N(%)**
No	50 (100%)
Yes	0 (0%)
Bladder Injury (n=19)	**N(%)**
No	49 (98%)
Yes	1 (2%)

Table II shows association of PP and PA with study variables and complications. Intra-operative blood loss ranged from 700ml (500-1000ml) for PP cases, 1500ml (850-2000ml) for PA including hysterectomy cases and blood transfusions were needed in 42 patients. The table depicts that 11 patients had complications, wound infection was seen in one of placenta previa cases and two in placenta accreta. There was no hemorrhage after SBT in cases of placenta previa. In Placenta accreta hemorrhage was seen in five patients after SBT and they ended up in hysterectomy. In PP two patients had wound infection while in PA one patient suffers wound infection. Frequency of fever post operatively was same in both groups. Bladder injury occurred in one case of placenta accreta while none in placenta previa. The overall success rate of sandwich balloon technique was 90%.

Table II: Association of Accreta and Previa Patients with study variables.

Variables		Placenta Previa (n=34)	Accreta (n=16)	p-value
Age (years)*		29.5 (25-30)	30 (29-34)	0.47
Parity*		2 (1-3)	2.5 (2-4)	0.192
Blood Loss*		700 (500-1000)	1500 (850-2000)	0.001
Post-operative Stay (days)*		3 (2-3)	4 (4-5)	< 0.001
Blood Transfusion*		1 (1-2)	2.5 (2-3.75	0.001
Complications	No	32 (94.1%)	7(43.7%)	0.002
	Yes	2 (5.9%)	9 (56.25%)	
Wound Infection	No	33 (97.1%)	14 (87.5%)	0.237
	Yes	1 (2.9%)	2 (12.5%)	
Hemorrhage	No	34 (100.0%)	11 (68.8%)	0.002
	Yes	0 (0.0%)	5 (31.3%)	
Fever	No	33 (97.1%)	15 (93.8%)	0.542
	Yes	1 (2.9%)	1 (6.3%)	
Bladder Injury	No	34 (100.0%)	10 (90.9%)	0.999
	Yes	0 (0.0%)	1 (9.1%)	
Balloon removed at 24 hours	No	11 (32.3%)	13 (81.25%)	0.000
	Yes	23 (67.7%)	3 (18.75%)	
Balloon removed at 48 hours	No	23 (67.7%)	8 (50.0%)	0.230
	Yes	11 (32.3%)	8 (50.0%)	
Success of SBT	No	0(0.0%)	5 (31.3%)	0.002
	Yes	34(100.0%)	11 (68.8%)	

-value calculated by Chi-square / Fisher's exact test.
**P-value calculated by Mann Whitney U test and values were presented as Median (Interquartile range).*

Discussion

PPH accounts for nearly 25% of all maternal deaths, placental abnormalities being among major contributors to PPH[7]. Previous caesarean sections and history of PP are the most common causative factors for this morbidly adherent placenta.[12]

In our study the success rate of SBT is 100% in PP and 68.8% in PA whereas Li GT et al reported the success rate for stopping hemorrhage was 86.7% by longitudinal parallel compression sutures in cases of PP and PA[8] which might be due to reason that Li GT et al only used compression sutures and not balloon tamponade, our result is more similar to Ozgen et al reported success of Bakri Balloon tamponade for PP and PAS to be 91.3%.[11] However he also used only balloon tamponade and not compression sutures and he also included cases other than PP and PA. The success of hemostatic suture in PAS documented by Chohan et al in a local study is 97.8% using A. Chohan continuous squeezing suture which is in contrast to our

study as in this technique he used multiple squeezing sutures in uterus.[13]

The success rates of balloon tamponade was 84.21% in cases with placenta accreta/increta with additional square suture requirement in few cases in Pala et al study[12] vs 68.75% in PA group of our study, where the lower success rate can be due to higher number of prior CS in our study, leading to more adherence of placenta and subsequently hysterectomies. Cho et al. reported success rate of uterine Bakri balloon tamponade in PP patients being 75%.[14] Suarez et al stated the overall success of 85.9% for balloon tamponade with the highest 87.1% for atony, 86.8% in PP cases, 76.8% retained products of conception and 66.7% in placenta accreta spectrum.[15] In our study in PP group, the success of SBT was greater(100%) may be due to additional effect of box compression suture and few no of prior CS in this group, while the success mentioned by Suarez et al (66.7%) in PA spectrum is comparable to our study which is 68.8%.

In a study by Durukan et al, the balloon tamponade was more successful in patients with low parity.[16] Akhtar et al also reported balloon tamponade to be highly effective (88.8%) in the cases of primary PPH.[17] The study by Meng et al was comparable to our study where spiral suture was highly successful in 33 PP cases and none of the patients had hemorrhage or required hysterectomy.[18] In a case report of two patients by Esike, he successfully demonstrated three brace sutures as an alternative uterine conserving and safe method in controlling devastating PPH.[19]

Our study is also among potent techniques to preserve uterus in cases of PP and PA. It compresses the bleeding sites of both the endometrium and myometrium; especially suitable for LUS bleeding as in cases of PP and PA. The failure rate is less and is judged instantly during the procedure by directly observing the amount of bleeding and with extremely low risk of subsequent surgeries to control hemorrhage.[7] The SBT technique is easy to apply and learn, can be performed by less experienced surgeon, in less equipped hospitals; and is very safe as risk of adjacent organ injury is minimum.[2, 8]

The intra-operative average blood in our study was 972ml; in PP 750mls and 1425mls in PA including hysterectomy cases. In a study by Pala et al where they compared Bakri balloon tamponade and caesarean hysterectomy in PA spectrum, the mean total blood loss amount was 1794ml ±725ml in balloon group and 2694±893ml in hysterectomy group, while in our study, it was 865± in SBT group versus 1900ml in cases of hysterectomy. Pala et al also mentioned that mean packed red blood requirement was 2.7±2.6u in balloon group and 5.7±2.4u in hysterectomy group versus 1.57u and 3.8u respectively in our study.[11] The mean blood loss in our study was 1.80 ± 1.37ml comparable to Chohan et al (1.85±1.02ml).[12] The blood loss and requirement was less in SBT group in our study, as two methods (balloon + box suture) were employed simultaneously, both having synergistic effect to control bleeding effectively as compared to Bakri balloon alone.

Limitation: The limitation of this technique is in cases of adhesions where uterus cannot be exteriorized, small study, long term comparison with other suturing technique is not available.[8] Moreover, the diagnosis of PPH is very subjective as accurate assessment of blood loss is not attainable. This implies to all studies in relation to hemorrhage.[1] In addition, it cannot be applied in the cases of placenta Percreta and cases where placenta fails to separate, and also in subjects with deficient LUS. The hysterectomy blood loss cannot be compared as we had only five failed cases of SBT in this group.

Conclusion

In this study, we found SBT to be an effective uterine-sparing technique in maintaining hemostasis in patients of PP and PA with a high overall success rate of 90%. It is easy to perform, safe and effective procedure that does not require any skill and is also free of cost and complications. The success rate was higher in cases of PP (100%) as compared to PA (68.75%). There was no failure of SBT in PP group while it failed in 31.25% cases of PA who required Obstetrical hysterectomy.

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