

*Original Article*

## Management of Postpartum Hemorrhage due to Placenta Previa: A Case Series of Transverse B-Lynch Uterine Compression Sutures

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### ABSTRACT

Postpartum hemorrhage is one the major contributors to maternal death. with postpartum hemorrhage due to placenta previa being one of the most challenging conditions for the obstetricians to tackle intraoperatively. Uterine compression sutures have their own fair place in the management of postpartum hemorrhage, and it is recommended by the World Health Organization in the case of failed medical management. Currently, there are a variety of uterine compression sutures available for the management of atonic postpartum hemorrhage. In this case series, we detail a novel surgical technique for managing postpartum hemorrhage in the case of placenta previa, where placental bed bleeding and the lower uterine segment atony can cause torrential bleeding and postpartum hemorrhage. This technique named Transverse B-Lynch compression suture is used for the compression of lower uterine segment at the incision site of caesarean section in placenta previa. Here, we have retrospectively reviewed the case records of all the patients delivered by caesarean section from 2017 to 2022, having postpartum hemorrhage intraoperatively and managed by Transverse B-Lynch compression suture. Six women with postpartum hemorrhage had been managed by Transverse B-Lynch compression suture, while been operated for placenta previa. The mean age of the patients was  $26.83 \pm 3.96$  years and the mean gestational age at delivery was  $36 \pm 1.24$  weeks. The primary outcome, effectiveness of the

procedure to conserve uterus, was 100 %. The average estimated blood loss was  $1.95 \pm 0.44$  L. The mean procedure time to perform the compression suture was  $6.33 \pm 1.65$  minutes and the mean time from removal of placenta to decision to perform Transverse B-Lynch compression suture was  $84.16 \pm 10.25$  minutes. The mean intraoperative time was  $117.5 \pm 15.95$  minutes. In all 6 patients, it was possible to control postpartum hemorrhage with the compression suture. Further surgical intervention of any kind following the compression suture was not required. No patient required further hypogastric artery ligation or hysterectomy. Hence, Transverse B-Lynch uterine compression suture is an effective surgical method for the treatment of postpartum hemorrhage in placenta previa, preserving fertility by avoiding hysterectomy. However, large and more comprehensive studies need to be performed in order to further investigate and validate these findings.

### Keywords

Postpartum hemorrhage, placenta previa, uterine compression suture, Transverse B-Lynch; Hysterectomy, blood loss.

### Abbreviations

World Health Organization (WHO); Postpartum Hemorrhage (PPH); Disseminated intravascular coagulopathy (DIC); Estimated blood loss (EBL); Fresh frozen plasma (FFP); Packed red blood cells (PRBC).

## **INTRODUCTION**

As per the World Health Organization (WHO), in 2017, everyday approximately 810 women died from preventable causes related to pregnancy and childbirth. 94% of all maternal deaths occur in low and lower middle-income countries. Major complications accounting for maternal deaths are severe bleeding - postpartum hemorrhage (PPH), infections, pre-eclampsia and eclampsia and unsafe abortion. PPH has a case fatality of 1%, is a major contributor of maternal death and is a serious complication of pregnancy<sup>1</sup>.

PPH is a preventable cause of maternal death, provided the golden period of 2 hours post-delivery of placenta is managed promptly and effectively, to curb PPH. Medical management is the first line management of PPH following which, if PPH is not under control, the patient further requires blood transfusions, and it is hemodynamically unstable, further interventions are necessary. Compression by balloon tamponade, uterine compression sutures, and sequential devascularization of uterus - vessel ligation - uterine artery ligation, hypogastric artery ligation, and selective radiological arterial embolization are attempted. Hysterectomy is undertaken as last resort. Compression sutures have now a special place in management of PPH for conservative management, as also now recommended by WHO as the second line to medical management<sup>2-6</sup>. Surgical techniques, such as the hypogastric artery ligation, require opening of the retroperitoneum and surgical expertise for an obstetrician. Many times, absence of such surgical expertise could become a setback for PPH management. Hence, any efficient surgical technique that can be performed on uterus for PPH management will always be a preferred surgical technique for obstetricians with fair surgical experience.

Placenta previa cases are increasing now with increasing cesarean section rate. Placenta previa cases are at very high risk for postpartum hemorrhage and contribute significant cases of PPH. Placenta previa pose a frequent surgical challenge intraoperatively due to the PPH. Postpartum hemorrhage, multiple blood transfusions intraoperatively, as well as postoperatively, prolonge intraoperative time and result in an increased postoperative morbidity, which is a frequent sequela in PPH management in placenta previa cases.

Intractable PPH often leads up into hysterectomy with prolonged intraoperative marathon and prolonged morbidity of the patient and loss of future fertility. If PPH remains uncontrolled, it may lead to hypovolemic shock and maternal death. Hence, there is a strong need of targeted surgical management techniques, as we can say a gold standard technique, an easier technique with a small learning curve, which can be highly effective in PPH of placenta previa cases<sup>7</sup>. Compression sutures in the management of atonic PPH have shown a promising result, are lifesaving and safe and come with the benefit of preserving fertility. As compared to the devascularization of hypogastric artery requiring the opening of retroperitoneum, it is relatively a simple procedure with short learning curve. It has a high success rate and offers less morbidity and postoperative complications<sup>8</sup>. B-Lynch et al introduced the B-Lynch uterine compression suture in 1997. Later, various uterine compression sutures, such as Hayman, Cho, Pereira, Ouahba, and Hackethal suture, have been practiced worldwide<sup>9-16</sup>. In this study, we describe outcomes of the Transverse B-Lynch compression suture in managing PPH due to placenta previa.

Transverse B-Lynch compression suture is specifically designed for the localized compression of the lower uterine segment. Currently, limited knowledge and outcome of these compression sutures are available. We believe that significant further research on the use of the technique and its outcomes and promoting the method to as many obstetricians as possible will help saving lives of many pregnant women<sup>1</sup>.

We present here a retrospective study, organized as a case series of PPH cases in placenta previa managed by Transverse B-Lynch uterine compression suture. The objective of the study is to present the outcome of the surgical technique in prevention of PPH. The primary outcome of the study was to evaluate effectiveness of Transverse B-Lynch uterine compression suture to conserve the uterus. The secondary outcomes were the mean intraoperative blood loss, the time of operation, the need for hysterectomy, and the duration of the hospital stay.

## **MATERIALS AND METHODS**

We performed a review of hospital records of all the cases of PPH that occurred between January 2017

and June 2022 in Pandit Deendayal Upadhyay Medical College and Civil hospital, Rajkot which is a tertiary center with 5000 deliveries per year, in accordance with all required ethical regulatory steps. We included all women who underwent Transverse B-Lynch uterine compression suture after delivery during the study period for management of PPH. No patients were excluded. There were around 24,000 deliveries during the study period. Six women with PPH due to placenta previa were identified. They were treated with Transverse B-Lynch uterine compression suture after failing to respond to conservative measures. Clinical and laboratory dataset were extracted, surgical and follow-up data were collected from the medical case records. Blood loss in the given clinical settings is calculated by adding the amount of blood collected in suction bottle after removal of liquor and difference of weight of wet and dry mops and operative sheets (1 g = 1 ml). Same surgeon performed all surgeries.

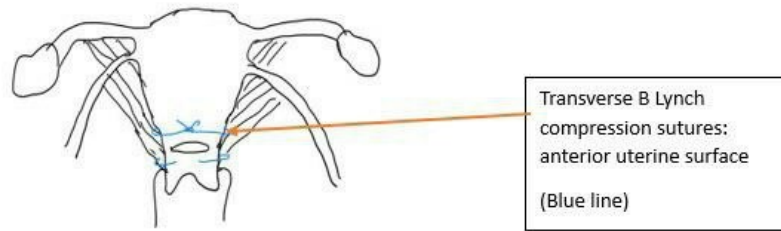
#### *Surgical Technique*

In the cases of PPH in placenta previa cases which are not controlled by medical management, compression test is bimanually performed. The operating surgeon exteriorizes the uterus and compresses the lower uterine segment. If the bleeding as checked per vaginally is stopped, Transverse B-Lynch uterine compression sutures are attempted. In the view of PPH intraoperatively, necessary consents are taken for compression sutures and the possible complications and, if required, for the need of hysterectomy. Vicryl number 1, 90 cm in length on 70 mm ½ circle needle is used. The avascular area, 3 cm above the upper margin of the incision below the utero-cornual junction is pierced with needle to reach posteriorly to the uterus and is then pierced to the posterior surface of the uterus, at the same level to enter the uterine cavity. The needle is pulled inferiorly in the same line, 3 cm below the uterine incision, almost covering the lower uterine segment and made to pierce the posterior uterine surface, bringing the needle posterior to the uterus. Then, the needle is pierced through the avascular area of broad ligament of the same side, posterior to anterior at the level 3 cm below the uterine incision, to bring the needle anteriorly to encircle the lower vascular bundles below the uterine incision. Now, a small bite in the lower uterine segment is taken, running to the opposite side of uterus to stabilize the compression suture to the uterus. And then the

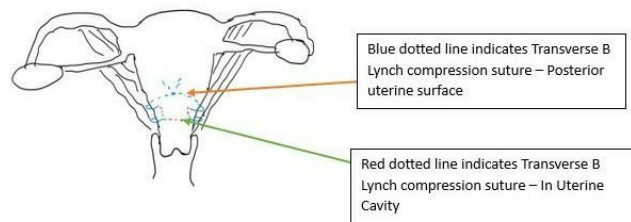
needle is passed through the avascular area in the lower uterine segment 3 cm below the incision to run posteriorly. The posteriorly entered needle is now pierced through the posterior uterine wall into the uterine cavity same side at the level of 3 cm below the uterine incision. From the uterine cavity the needle is pierced upwards at the level of 3 cm above the uterine incision to pierce the posterior wall on the same side. The needle coming out posterior to the uterine wall at the level of 3 cm above the uterine incision now pierces the avascular area 3 cm above the uterine incision below the utero-cornual junction to reach anteriorly at the same level as the first pierce of the needle on the opposite side. Now the needle end thread is tied with the end of suture material tight enough after the compression of the lower uterine segment transversely, to ensure the bleeding stops. After the completion of the procedure, bleeding is vaginally checked, to ensure that the PPH is under control after uterine compression suturing. If the PPH is under control, uterine incision closure is performed. Before the compression sutures are attempted, adequate separation of bladder is done from the lower uterine segment exposing latter at least more than 3 cm bare of the bladder reflection, which also ensures the ureter getting away from the procedure field. In Figure 1 and Figure 2 we show the anterior and posterior uterine surface, with Transverse B-Lynch uterine compression suture. Figure 3 shows intraoperative picture of the uterus with Transverse B-Lynch uterine compression suture during one of the surgeries, of a case included in the study.

#### **RESULTS**

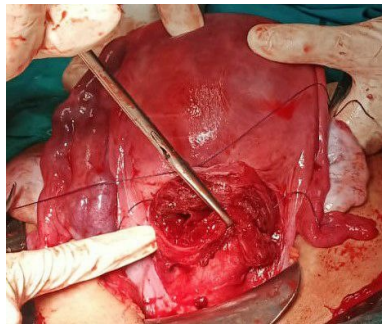
We identified six cases managed with Transverse B-Lynch uterine compression suture for PPH, having placenta previa during the study period. The procedure was performed in case of failed medical management to uterine massage, oxytocin infusion and bolus, carboprost tromethamine injections for its maximum dose or was performed earlier in the case of torrential bleeding with suddenly deteriorating and unstable hemodynamic conditions. Maternal characteristics and surgical details of the study cases are detailed in Table 1. The mean age of the patients was  $26.83 \pm 3.96$  years. The gestational age of women at the time of caesarean section was  $36 \pm 1.24$  weeks. Hemoglobin concentration before caesarean section was  $12.6 \pm 1.4$  g/dl. The average



**Figure 1. Anterior surface of uterus with Transverse B-Lynch compression suture**



**Figure 2. Posterior surface of the uterus with Transverse B-Lynch compression suture**



**Figure 3. Intraoperative image of the uterus with Transverse B-Lynch compression suture in case of postpartum hemorrhage due to placenta previa**

estimated blood loss was  $1.95 \pm 0.44$  L. The postoperative hemoglobin on day 2 of surgery was  $8.8 \pm 1.6$  g/dl. Case wise intraoperative details of the caesarean section and PPH management details and maternal characteristics of individual cases are summarized in Table 2. All the cases were operated by the same obstetrician. In the case of distinctive bleeders from the placental bed haemostatic sutures were taken at the placental bed, after which in the case of diffuse bleeding and of lower uterine segment atony, Transverse B-Lynch uterine compression suture was performed. The mean

operative time to perform the Transverse B-Lynch transverse uterine compression suture was  $6.33 \pm 1.65$  minutes. For two patients, bilateral uterine artery ligation was done prior to compression suturing. Skin incision for caesarean section was Pfannenstiel incision and uterine incision closure was done in single layer with Vicryl number 1 on round body needle. The mean time from removal of placenta to decision to perform Transverse B-Lynch compression suture was  $84.16 \pm 10.25$  minutes. The mean intraoperative time was  $117.5 \pm 15.95$  minutes. None of the patients required hysterectomy to

**Table 1. Maternal characteristics and surgical details**

Characteristics	Mean (n=6)
Age	26.83 ± 3.96 years
Gravidity	2.16 ± 0.66
Gestational age at delivery	36 ± 1.24 weeks
Estimated blood loss (L)	1.95 ± 0.44 L
Predelivery hemoglobin (g/dL)	12.6 +/- 1.4
Postdelivery hemoglobin (g/dL)	8.8 +/- 1.6
Elective Caesarean section	1
Emergency Caesarean section	5
Time to perform compression suture	6.33 ± 1.65 minutes
Time from removal of placenta to decision to perform compression suture	84.16 ± 10.25 minutes
Total Operative time	117.5 ± 15.95 minutes

**Table 2. Case wise maternal characteristics and intraoperative details**

Case No.	M. Age	Gravidity	GA (weeks)	Placenta previa grade	EBL (L)	Blood Transfusions	Time to perform Compression suture	Removal of placenta to decision to perform Cm Sutures (minutes)	Operative time (minutes)
1	28	1	38	3	1.5	1 PRBC	7	70	100
2	25	3	35	4	3	4 PRBC 4FFP	9	100	150
3	28	3	37	4	1.5	2 PRBC	8	80	105
4	20	1	34	4	1.75	2 PRBC	6	70	100
5	25	3	35	4	2	3 PRBC	4	90	120
6	35	2	37	4	2	3 PRBC 3 FFP	4	95	130

M. Age-Maternal age, EBL- Estimated blood loss, FFP- Fresh frozen plasma, PRBC- Packed red blood cells, Cm Sutures- Transverse B-Lynch Compression suture

control PPH and Transverse B-Lynch uterine compression suture was 100 % effective to manage PPH. None of the patients had any postoperative PPH or any further complications and postoperative period was uneventful. All patients got discharged on 8<sup>th</sup> postoperative days. And the total hospital stay of the patients was 8.16 ± 0.32 days. Long term follow up was possible only up to 6 weeks and none of the patients had any complaints. Two patients had early clinical picture of DIC intraoperatively and were supplemented with FFP.

**DISCUSSION AND CONCLUSION**

In our study, Transverse B-Lynch uterine compression sutures were 100 % efficacious in dealing with PPH due to placenta previa. Postoperative wellbeing of the patients was not compromised and the follow up period of 6 weeks in all six women was uneventful. For the Transverse B-Lynch sutures, as they pierce the anterior lower uterine segment below the uterine incision and posterior uterine segment bilaterally, and pierces the broad ligaments bilaterally, chances of slippage of

the sutures is not there, as with B-Lynch and Hayman sutures<sup>17,18</sup>. Since the compression sutures did not encircle the posterior surface completely, the patency of the lower uterine segment was considered not to be compromised. The non-circumferential suturing technique does not occlude the utero-cervical canal. Also, all women had normal amount of lochial discharge, ruling out the blockage of utero-cervical canal. None of the six patients developed any postoperative fever or complications.

Compression sutures are now an established surgical technique in management of PPH. However, with further experiences, unwarranted postoperative sequela has now been recognized. The technique of Transverse B-Lynch uterine compression suture has a drawback of performing the sutures in open uterine cavity, like that of B-lynch brace sutures<sup>19</sup>. Pyometra, pelvic adhesions, synechiae, serosal and myometrial erosion and necrosis cases following various types of uterine compression sutures have been reported. With future further experiences in more patients, we will be able to identify the possible complications with this novel Transverse B lynch surgical technique<sup>20</sup>.

In our study, in two cases, bilateral uterine artery ligation was performed prior to resorting to compression suturing. As per WHO's guidelines, compression sutures should be attempted prior to vessel ligation<sup>21</sup>. However, Sentilhes et al., advocates bilateral uterine artery ligation prior to resorting compression sutures owing to the easier and less time-consuming technique, its high efficacy and easy accessibility of uterine artery<sup>22</sup>. Thus, the choice of the preferable sequential treatment preference depends on the skill of the surgeon, treatment as per patient individualization and with further research recommendations with the compression sutures. Transverse B-Lynch uterine compression suture is a quick, economical, practical, and safe method to treat PPH in women with placenta previa with a short learning curve, less postoperative morbidity. It is a highly efficient surgical technique to preserve the uterus. However, large and more comprehensive studies are required to be performed in order to further investigate and validate the findings.

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The retrospective study was performed in accordance with all the required ethical regulatory steps of our host institution. The study was

performed in the Department of Obstetrics and Gynecology of Pandit Deendayal Upadhyay Medical College, Rajkot. We are grateful to the patients, Dr. Kavita Dudhrejiya and Dr. Kamal Goswami, the Head of Department, for their constant support. Dr. Zalak Karena created Figures 1 and 2 and contributed Figure 3.

#### Conflict of Interest

The authors declare no conflict of interest.

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