

## Prophylactic Modified B-Lynch suture versus Medications During Cesarean Section in women at high risk of Atonic postpartum haemorrhage

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**Abstract: Objective:** To compare between the effect of Prophylactic Modified B-Lynch suture, Carbetocin and Oxytocin on prevention of atonic postpartum hemorrhage following cesarean section in pregnant women at high risk of atonic postpartum hemorrhage. **Study design:** Randomized controlled prospective study on 150 pregnant women at high risk to develop postpartum hemorrhage were going to have Cesarean section. They were randomized to have during cesarean section either Prophylactic Modified B-Lynch suture or receive Prophylactic 100 microgram of Carbetocin IV or Prophylactic 20 units of oxytocin IV infusion on 1000 ml saline with a rate of 250 ml per hour. The primary outcomes were to estimate mean operative blood loss, compare the occurrence of major obstetric hemorrhage (Blood loss  $\geq$  1000 ml), objective changes in hemoglobin preoperatively and postoperatively, and need for additional uterotonic agents or additional interventions to control bleeding. Secondary outcomes included occurrence of severe anemia, need for blood transfusion, side effects (e.g. paralytic ileus) and postnatal hospital stay. **Results:** In our study the Estimated mean operative blood loss between the three groups was about 100ml less in Modified B-Lynch group than in Carbetocin and Oxytocin groups ( $P$ - value  $<$  0.05), Average decrease in haemoglobin 24 hours after delivery in Modified B-Lynch was  $1.1 \pm 0.5$  gm/dl compared to  $1.7 \pm 0.56$  gm/dl in Carbetocin group and  $1.8 \pm 0.58$  gm/dl in Oxytocin group ( $P$ - value  $<$  0.05), None of the patients who had Modified B-Lynch developed major obstetric haemorrhage compared to 2 patients in Carbetocin group & 3 patients in Oxytocin group, only 1 patient in Modified B-Lynch required additional uterotonic agent to control bleeding compared to 2 patients in Carbetocin group and 4 patients in oxytocin group. **Conclusion:** Modified B-Lynch suture appears to be more effective in maintaining adequate uterine tone and preventing excessive blood loss in patients undergoing cesarean section with high risk to develop postpartum hemorrhage.

[Mohamed Ali Mohamed, Abd El Sattar Farhan, Aseem Anwar Abdo, Mohamed Emad Ahmed. **Prophylactic Modified B-Lynch suture versus Medications During Cesarean Section in women at high risk of Atonic postpartum haemorrhage.** *J Am Sci* 2016;12(1):56-61]. (ISSN: 1545-1003). <http://www.jofamericanscience.org>. 7. doi:[10.7537/marsjas120116.07](https://doi.org/10.7537/marsjas120116.07).

**Keywords:** Postpartum hemorrhage, Modified B-Lynch, Carbetocin, Oxytocin, Cesarean section,

### 1. Introduction

Postpartum Haemorrhage (PPH) is commonly defined as a blood loss of 500 ml or more within 24 hours after birth. PPH is the leading cause of maternal mortality in low-income countries and the primary cause of nearly one quarter of all maternal deaths globally. Most deaths resulting from PPH occur during the first 24 hours after birth.<sup>(1)</sup>

Non fatal PPH results in further interventions, iron deficiency anemia, pituitary infarction (Sheehan's syndrome) with associated poor lactation, exposure to blood products, coagulopathy, and organ damage with associated hypotension and shock. Since all parturient women are at risk for PPH, care providers need to possess the knowledge and skills to prevent PPH and to recognize, assess, and treat excessive blood loss<sup>(2)</sup>.

The most common cause of PPH is defective function of the uterine musculature or atony. This belief of being the most common cause is based upon the fact that, in most cases of moderate hemorrhage there was no evidence of retention of placental tissue or

tears, and the bleeding has persisted until contraction of the uterus was induced<sup>(3)</sup>.

Caesarean section is a recognized risk factor for PPH and the worldwide caesarean delivery rate is increasing<sup>(4)</sup>.

Systematic reviews have concluded that prophylactic use of uterotonic agents can significantly decrease the incidence of postpartum hemorrhage<sup>(5)</sup>.

The administration of oxytocics after the delivery of the neonate reduces the likelihood of PPH, 5 IU oxytocin by slow intravenous injection is currently recommended for all caesarean sections<sup>(6)</sup>.

The use of additional oxytocic medication is common to arrest bleeding, or prophylactically if there are risk factors for PPH<sup>(7)</sup>.

Carbetocin is a synthetic analogue of human oxytocin with structural modifications that increase its half life thereby prolonging its pharmacological effects. double- blind randomised trials compared 100 Microgram carbetocin (the licensed dose) with different combinations of oxytocin, bolus and infusion, fol-

lowing caesarean section. The trial found that significantly more women needed additional oxytocic interventions in the oxytocin group.<sup>(2)</sup>

Surgical prophylaxis in the form of B-Lynch and other compression sutures to reduce intraoperative blood loss is being tried in many cases<sup>(8)</sup>. Elective B-Lynch suture was described during caesarean section in parturient with congenital heart disease, to avoid the need for Oxytocin and to prevent atony of uterus<sup>(9)</sup>.

Prophylactic B-Lynch suture was described in women undergoing emergency caesarean section who have additional high risk factors for atony of uterus to prevent PPH<sup>(10)</sup>.

## 2. Method and Materials

The study included 150 pregnant women who underwent cesarean section with the following criteria:

### Inclusion criteria:

Maternal Age (years): range from 21yrs to 35yrs, Gestational Age (weeks): range from 35wks to 40wks, Parity: from 0 parity(PG) to 4<sup>th</sup> parity, Risk Factors for Atonic PPH included Past history of Atonic PPH, Over distension of the uterus (polyhydraminos, multiple pregnancy and fetal macrosomia), Uterine muscle exhaustion (prolonged labour and obstructed labour).

### Exclusion criteria:

Medical disorders with pregnancy e.g hypertensive disorder, Diabetes Mellitus, serious cardiovascular disorders, migraine, epilepsy, asthma etc...

The patients were divided randomly by Computerized Simple Randomization technique into 3 GROUPS:

**Group 1:** 50 patients had prophylactic Modified B-Lynch suture after closure of the uterus and assessment for early signs of PPH.

**Group 2:** 50 patients received 100 microgram of Carbetocin (Pabal) IV after closure of the uterus and assessment for early signs of PPH.

**Group 3:** 50 patients received 20 IU of Oxytocin infusion on 1000 ml saline at a rate of 250 ml per hour after closure of the uterus and assessment for early signs of PPH.

### All the patients were subjected to the following after taking informed written consent:

Full history taking, General examination & Recording of vital signs(Bp, Pulse, Temp.), Abdominal examination including obstetric ultrasound, Routine laboratory tests including haemoglobin and haematocrit.

Anesthesia technique was standardized general anesthesia for all Patients. All Patients received an intravenous bolus of 500 mL crystalloid before anesthesia. Anesthetists was instructed to : Inject each patients in the three groups with 10 IU Oxytocin immediately

after delivery of fetus as a routine standardized prophylaxis against PPH for all patients.

Blood loss was replaced at operation with colloid infusion or blood when deemed necessary. Intravenous crystalloids were continued at 1 L every 8 hours until the morning after surgery.

The surgical approach to caesarean section is standardized. Surgeons were asked to operate to a standard procedure that specifies transverse lower segment Cesarean section, delivery of uterus (exteriorization), closure of uterus in two layers then the uterus was assessed for early signs of postpartum hemorrhage including Weak uterine tone (lax uterus with doughy consistency or Delayed involution and enlargement of uterus (fundus was above umbilicus in absence of uterine fibroid).

Only cases where the uterus showed early signs of postpartum hemorrhage were included in the study If the uterus didn't show any of the above signs the patient was excluded from the study.

Follow up the patients postoperative regarding vital signs and haemoglobin and hematocrite 24 hours after surgery.

### The Modified B-Lynch suture was done by a different technique than that originally described by Professor Christopher B-Lynch in 1997:

#### Suturing material:

A 70 mm round bodied hand needle on which a No. 2 chromic catgut is mounted.

#### Technique:

1) After closure of the uterus in 2 layers it remains exteriorized until application of the suture is complete. The senior assistant takes over in performing compression and maintains it with two hands during the placement of the suture by the principal surgeon.

2) With the bladder displaced inferiorly, the first stitch is placed 2 cm below the closed incision on the patient's left side and emerged 2 cm above the upper incision margin approximately 4 cm from the left lateral border of the uterus.

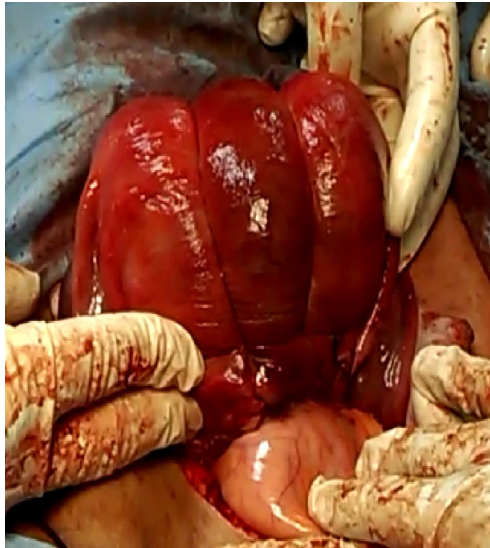
3) The suture is now milked through upward till the fundus where it's carried over the top of the uterus and to the posterior surface. Once situated over the fundus, the suture should be more or less vertical and lie about 4 cm from the cornu. It does not tend to slip laterally toward the broad ligament because the uterus has been compressed then the suture milked through, ensuring that proper placement is achieved and maintained.

4) On the posterior surface of the uterus The suture is milked through downward till the level of insertion of uterosacral ligaments where needle is entered from left to right for 2 cm in a horizontal plane with depth of full thickness of posterior wall through the insertion of uterosacral ligament.

5) After emerging of needle from right side of posterior wall of uterus the suture is milked through upward till the fundus where it's carried over the top of the uterus and to the anterior surface. Once situated over the fundus about 4 cm from the cornu, the suture is milked through downward on anterior surface of uterus it should be more or less vertical.

6) The needle is then entered 2 cm above the closed incision on the right side of patient approximately 4 cm from the right lateral border then emerged 2 cm below the incision.

7) The assistant maintains the compression as the suture material is milked through from its different portals to ensure uniform tension and no slipping. The two ends of the suture are put under tension and a double throw knot is placed for security to maintain tension.



**Fig. 1: Front of Uterus After Application of Modified B-Lynch suture via Modified technique**



**Fig. 2: Back of Uterus showing anchoring of Modified B-Lynch suture at insertion of uterosacral ligament**

### 3. Results

The primary outcomes were to estimate mean operative blood loss, compare the occurrence of major obstetric hemorrhage (Blood loss  $\geq 1000$  ml), objective changes in hemoglobin preoperatively and post-operatively, and need for additional uterotonic agents or additional interventions to control bleeding. Secondary outcomes included occurrence of severe anemia, need for blood transfusion, side effects (e.g. paralytic ileus) and postnatal hospital stay.

Regarding maternal age, gestational age, parity there were no statistical significance between the different groups (Table 1).

**Table 1: Demographic Data (maternal age, gestational age, parity)**

	Group I B-Lynch	Group II Carbetocin	Group III Oxytocin	P-value
<b>Pt. Age (yrs)</b>	27.82 $\pm$ 3.1	28.04 $\pm$ 2.3	28.36 $\pm$ 2.7	0.618
<b>Gest. Age (wks)</b>	37.98 $\pm$ 1.1	38.3 $\pm$ 1.2	38.1 $\pm$ 1.3	0.445
<b>Parity (no.)</b>				0.936
<b>PG</b>	3	2	5	
<b>P1</b>	9	9	7	
<b>P2</b>	21	20	17	
<b>P3</b>	14	17	18	
<b>P4</b>	3	2	3	

### Primary outcomes to be assessed (Table 2)

The Estimated mean operative blood loss between the three groups (as measured by theatre staff) was about 100ml less in Modified B-Lynch group than in Carbetocin and Oxytocin groups, None of the pa-

tients who had Modified B-Lynch developed major obstetric haemorrhage compared to 2 patients in Carbetocin group & 3 patients in Oxytocin group, only 1 patient in Modified B-Lynch required additional uterotonic agent to control bleeding compared to 2

patients in Carbetocin group and 4 patients in Oxytocin group, Average decrease in hemoglobin 24 hours after delivery in Modified B-Lynch was  $1.1 \pm 0.5$  gm/dl compared to  $1.7 \pm 0.56$  gm/dl in Carbetocin group and  $1.8 \pm 0.58$  gm/dl in Oxytocin group.

**Secondary outcome parameters (other outcomes to be assessed) (Table 4)**

Only 1 patient developed severe anaemia (Hb fall  $\geq 20\%$ ) 24 hours after delivery in Modified B-Lynch groups compared to 3 patients in Carbetocin

group and 4 patients in Oxytocin group which resulted in 1 patient in Modified B-Lynch required blood transfusion compared to 2 patients in Carbetocin group and 3 patients in Oxytocin group.

Regarding occurrence of paralytic ileus (as a side effect) 3 patients developed paralytic ileus in Modified B-Lynch compared to 4 patients in Carbetocin group and 6 patients in Oxytocin group, postnatal length of stay in theatre/recovery and in the hospital was average 55 hours among the 3 groups.

**Table 2: Estimated mean operative blood loss was 100ml less in Modified B-Lynch group than in Carbetocin and Oxytocin groups, occurrence of major obstetric hemorrhage and requirement of additional uterotonic agents to maintain uterine tone was less in Modified B-Lynch group than in Carbetocin and Oxytocin group.**

	Group I B-Lynch	Group II Carbetocin	Group III Oxytocin	P-value
<b>Estimated mean operative blood loss (ml)</b>	757.2 $\pm$ 159.74	865 $\pm$ 197.82	878.8 $\pm$ 218.09	0.003*
<b>Major obstetric hemorrhage (PPH) (No. of Patients)</b>	0	2	3	0.2349
<b>Need for additional uterotonic agents (No. of Patients)</b>	1	2	4	0.3503

**Tables 3: difference in haemoglobin preoperatively and 24 hours postoperatively between the three groups. There were no statistical differences among the studied three groups regarding preoperative haemoglobin. However, 24 hour postoperative haemoglobin drop among patients had Modified B-lynch suture was less than those received Carbetocin or Oxytocin. There were statistical significant differences between the three groups (*P*- value < 0.05)**

		Change in (gm/dl)						Paired Differences		Paired Samples Test	
		Pre-operative			Post-operative			Mean	$\pm$ SD	t	P-value
<b>Group I</b>	<b>Range</b>	9.700	-	12.100	7.700	-	11.300	1.116	0.504	15.670	<0.001*
	<b>Mean <math>\pm</math>SD</b>	10.724	$\pm$	0.681	9.608	$\pm$	0.748				
<b>Group II</b>	<b>Range</b>	9.700	-	12.200	7.500	-	11.000	1.702	0.564	21.336	<0.001*
	<b>Mean <math>\pm</math>SD</b>	10.814	$\pm$	0.712	9.112	$\pm$	0.929				
<b>Group III</b>	<b>Range</b>	9.800	-	12.100	7.300	-	11.000	1.810	0.587	21.803	<0.001*
	<b>Mean <math>\pm</math>SD</b>	10.742	$\pm$	0.689	8.932	$\pm$	0.889				
<b>ANOVA</b>	<b>F</b>	0.235			8.308						
	<b>P-value</b>	0.791			<0.001*						
<b>TUKEY'S Test</b>	<b>I&amp;II</b>	0.793			0.011*						
	<b>I&amp;III</b>	0.991			<0.001*						
	<b>II&amp;III</b>	0.862			0.547						

#### 4. Discussion

Postpartum hemorrhage (PPH) is the leading cause of maternal death worldwide, with an estimated mortality rate of 140,000 women per year, or 1 maternal death every 4 minutes<sup>(2)</sup>. Administering prophylactic uterotonic agents promotes strong uterine contractions and leads to faster retraction. This has the effect of decreasing the amount of maternal blood loss and the rate of PPH<sup>(11)</sup>.

In 1997 professor C. B-Lynch described the effect of B-Lynch suture in controlling massive pphge with satisfactory haemostasis immediately after application of suture thus the invention of the B-Lynch brace suturing technique has proved valuable in the control of massive postpartum haemorrhage as an alternative to hysterectomy<sup>(12)</sup>.



**Table 4: secondary outcomes to be assessed including occurrence of anemia, need for blood transfusion, occurrence of paralytic ileus and postoperative hospital stay there were no statistical difference among the three groups**

	Group I B-Lynch	Group II Carbetocin	Group III Oxytocin	P-value
Occurrence of severe anemia (No. of Patients)	1	3	4	0.3968
Need for blood transfusion (No. of Patients)	1	2	3	0.5940
Occurrence of Paralytic ileus (No. of Patients)	3	4	6	0.5545
Postoperative hospital stay (hrs)	54.44 ± 2.51	55.06 ± 2.53	55.20 ± 2.30	0.260

One of our primary outcomes for the study was to compare estimated mean operative blood loss as measured by operative staff. Mean blood loss after Modified B-lynch application in Modified B-Lynch group was about 100 ml less than after Carbetocin administration in Carbetocin group and than after Oxytocin in Oxytocin group.

Regarding the occurrence of major obstetric hemorrhage (Blood loss > 1000ml), None of the patients in the Modified B-Lynch group developed such hemorrhage compared to 2 patients in the Carbetocin group and 3 patients in the Oxytocin group. (Shazia *et al.*, 2013) performed emergency B-Lynch brace suture for the management of massive postpartum hemorrhage and described that the technique was successful in 83% of cases while failure rate is only 17%. There were no intra-operative complications and few post-operative complications. Thus B-Lynch suture is considered a safe, highly effective and easy method to stop bleeding in massive primary PPH<sup>(13)</sup>.

B-Lynch suture was performed for persistent PPH it appears to be an effective procedure in controlling the hemorrhage and resulted in an avoidance of immediate hysterectomy in 12 of 15 cases (80%) with a relatively low morbidity following a failure of vessel ligation before considering hysterectomy. In the present study, to maintain adequate uterine tone, number of the patients who had B-Lynch suture and required additional uterotonic agents were less than those received Carbetocin and Oxytocin (Sentilhes *et al.*, 2008). None of patients in all of the three groups required additional surgical intervention to maintain uterine tone or hysterectomy to control bleeding. A pilot study to evaluate effect of elective B-Lynch suture in preventing atonic PPH, the study noted that none of the patients required any other means of surgical or additional pharmacological intervention for prevention of PPH also None of them required blood transfusion may (Vachhani *et al.*, 2006).

Average preoperative hemoglobin among the three groups there were no statistical significance be-

tween the three groups, However postoperative hemoglobin for the patients who Had Modified B-Lynch Suture was significantly more than postoperative hemoglobin for patients received Carbetocin or oxytocin. This means that haemoglobin drop among patients who had Modified B-Lynch suture was much less than those received Carbetocin or Oxytocin (Table 3). This may be attributed to that the estimated mean operative blood loss after Modified B-lynch application in Modified B-Lynch group was about 100 ml less than after Carbetocin administration in Carbetocin group or Oxytocin administration in Oxytocin group.

Regarding the occurrence of Paralytic ileus as a side effect, there was no statistical significance among the studied groups (3 patients experienced Paralytic ileus in the Modified B-Lynch group, 4 patients in the Carbetocin group, 6 patients in the Oxytocin group).

as for postoperative hospital stay, the present study demonstrated that postnatal hospitalization period carries no statistical significance between the three groups This outcome was not included in similar studies available.

Advantages of the new Modification of B-Lynch suture:

1. More easy, rapid, less time consuming.
2. Being done after closure of uterine incision.
  - a) Reduce amount of blood loss while applying the suture.
  - b) Reduce degree & duration of uterine atone as closing the incision usually enhances the uterine contraction and it therefore should be done as soon as possible.
3. Anchoring the suture posteriorly at insertion of uterosacral ligaments which are a tough structure in the posterior uterine wall thus protecting posterior uterine wall from risk of injury while tightening the suture.

## Conclusion

Prophylactic Modified B-Lynch suture seems to be more effective in maintaining adequate uterine tone

and preventing excessive blood loss in patients undergoing cesarean section at high risk to develop postpartum hemorrhage. Modified B-Lynch suture was also well tolerated with nearly similar safety profile to uterotonic agents.

Regarding cost effectiveness of the Modified B-Lynch Suture compared to the Carbetocin and the oxytocin, Apparently Modified B-Lynch required less expenses than Carbetocin and oxytocin. The only drawback for the prophylactic use of Modified B-Lynch suture was that it requires a skilled & expert surgeon, However the technique described in this study is more easy and less time consuming than that originally described by professor C. B-Lynch so it can be taught to any surgeon making the application of Modified B-Lynch suture a safe possible first line of management of postpartum hemorrhage.

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