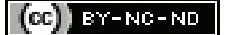


Efficacy of Bilateral Uterine Artery Ligation versus B-lynch Suture in Primary Postpartum Haemorrhage due to Uterine Atony in Lower Segment Caesarean Section: An Interventional Study

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ABSTRACT

Introduction: Postpartum Haemorrhage (PPH) is the leading cause of maternal mortality in both developing and developed countries. PPH is a severe obstetric emergency that often occurs unexpectedly, leaving birth attendants unprepared to handle it on a regular basis.

Aim: To evaluate the efficacy and complications of the Bilateral Uterine Artery Ligation (BUAL) technique and B-lynch sutures in Lower Segment Caesarean Section (LSCS) for primary PPH caused by uterine atony.

Materials and Methods: A hospital-based prospective, interventional study was conducted at a secondary care centre in the inpatient Department of Obstetrics and Gynaecology at District Hospital, Tumkur, Karnataka, India. The duration of the study was one year from August 1, 2019, to August 1, 2020. A total of 100 patients with atonic PPH were randomly assigned to receive either BUAL (group BUAL-50 patients) or B-lynch sutures (group B-lynch-50 patients). Age, parity, gravidity, socioeconomic status, and risk factors were compared. The mean drop in Haemoglobin (Hb) percentage, the need for blood transfusion, and complications were studied and analysed. The success of the method was defined as avoiding obstetric hysterectomy and major complications. The z-test was used to calculate the difference between the means of the two groups.

Results: The mean age of the patients was 25.22±4.33 years in the BUAL group and 26.02±4.32 years in the B-lynch group. During the one-year study period, the total number of deliveries in the Institution was 4,658, with 1,864 vaginal deliveries and 2,794 LSCS performed. Among the 2,794 LSCS cases, 268 women (9.58%) developed primary PPH. Out of these 268 women,

134 (50%) were managed with primary medical treatment for atonic PPH. For those who did not respond to primary medical management and met the inclusion and exclusion criteria, 50 women underwent BUAL and were assigned to the BUAL group. Another 50 cases were treated with B-lynch sutures and assigned to the B-lynch group. The patients in both groups were matched in terms of age, socio-economic status, booking status, gestational age at delivery, induction of labour, and high-risk factors for PPH. Maternal outcomes were analysed. The mean preoperative Hb level was 9.65±1.16 g/dL, which significantly decreased to 8.54±1.27 g/dL post-procedure in the BUAL group (p-value <0.001). In the B-lynch group, the mean preoperative Hb level was 9.68±0.85 g/dL, which significantly decreased to 8.52±0.95 g/dL post-procedure (p-value <0.001). The mean blood loss among patients was 1312.14±227.65 mL in the BUAL group and 1359.22±259.07 mL in the B-lynch group, but the difference was not statistically significant (p-value=0.33). In the present study, 17 patients (34%) in the BUAL group and 21 patients (42%) in the B-lynch group did not require blood transfusion. The Intensive Care Unit (ICU) care was necessary for 6 (12%) patients in the BUAL group and 8 (16%) in the B-lynch group. Postoperative fever was a common complication in both groups. The success rate of BUAL was 94%, while the B-lynch procedure was successful in 96% of cases.

Conclusion: The PPH a significant concern for obstetricians, and effective and meticulous management is crucial in reducing maternal mortality. Both BUAL and B-lynch sutures are simple, safe, and effective methods for controlling PPH during caesarean section by uterine devascularisation.

Keywords: Complications, Maternal mortality, Success, Uterine devascularisation

INTRODUCTION

Postpartum Haemorrhage is the leading cause of maternal morbidity and mortality in both developing and developed countries [1]. It is often unpredictable, as birth attendants may not be prepared to deal with postpartum haemorrhage on a regular basis [2]. The majority of these deaths (88%) occur within four hours of delivery, indicating that they are a consequence of events in the third stage of labour [2]. Nearly 140,000 women in the world die from PPH each year, one every four minutes [3]. Death from PPH occurs in about 1 per 1000 deliveries in low-resource countries compared with 1 in 100,000 deliveries in higher-resource countries [2]. Serious morbidity may follow PPH, such as hypovolemic shock, coagulopathy, sepsis, multiorgan failure, and pituitary necrosis (Sheehan syndrome) [3].

The management of atonic PPH includes medical (oxytocics), surgical (compression sutures and stepwise devascularisation), and obstetric hysterectomy (as a life-saving procedure).

The BUAL is found to be a simple and effective method in atonic PPH in many studies [4,5]. Compression sutures (B-lynch sutures) are also effective in the management of atonic PPH [6,7]. However, there are complications like uterine necrosis when both BUAL and B-lynch sutures are combined [8,9]. Only a few foreign studies compare the methods separately [10,11]. There are sparse Indian studies available [12,13]. The present study was conducted to determine the frequency and efficacy of the BUAL technique and B-lynch sutures in LSCS for primary PPH due to uterine atony. Also, to compare the preoperative and postoperative Hb percentage

(Hb%) in both groups and to assess intraoperative or postoperative complications of the procedures.

MATERIALS AND METHODS

A hospital-based prospective, interventional study was conducted at District Hospital, Tumkur, Karnataka, India. The duration of the study was one year from August 2019 to July 2020. The sample size consisted of 100 patients, with 50 patients in the BUAL group and 50 patients in the B-lynch group. Institutional Ethics Committee clearance was obtained (SSMC/DNB/IEC-5/October 2019).

Inclusion criteria: Patients who developed primary PPH due to uterine atony during LSCS after failed medical management. Patients with gestational age between 34-41 weeks and parity ranging from nulliparity to parity 3. Presence of risk factors for primary PPH, such as uterine overdistension (foetal macrosomia, multiple pregnancy, polyhydramnios), preeclampsia and eclampsia, and use of magnesium sulfate were included in the study.

Exclusion criteria: Grand multi (parity ≥ 4). Atonic PPH after vaginal delivery. Traumatic PPH during LSCS. Patients with placenta previa and placenta accreta and those with the presence of medical disorders such as asthma, migraine, epilepsy, serious cardiovascular disorders, bleeding disorders, disseminated intravascular coagulation, and renal diseases were excluded from the study.

Study Procedure

During the one-year study period, a total of 4,658 deliveries were conducted at the Institution, with 1,864 vaginal deliveries and 2,794 LSCS. Out of the 2,794 LSCS cases, 268 women (9.58%) developed primary PPH. Among these 268 women, 134 (50%) were managed with primary medical management for atonic PPH. A total of 34 patients out of 134 patients were excluded as they did not meet the inclusion and exclusion criteria. For those who failed primary medical management and met the inclusion and exclusion criteria, 50 women underwent BUAL and were assigned to group A, while another 50 cases were treated with B-lynch sutures and assigned to group B.

Upon admission, age, parity, gestational age, socioeconomic status, and detailed medical history were recorded. The co-morbidities of the pregnant women, such as diabetes mellitus, preeclampsia, eclampsia, thrombocytopenia, and obesity, were documented through necessary investigations. Preoperative Hb% estimation was performed. Caesarean section was performed as indicated for obstetric reasons. The amount of blood loss was estimated after delivery of the placenta. Hb% was repeated 48 hours post-procedure. The parameters analysed were age, parity, gravidity, socioeconomic status, and risk factors. Mean drop in Hb%, need for blood transfusion, need for additional surgical methods (such as hysterectomy) to control primary PPH due to uterine atony, and complications were studied and analysed.

STATISTICAL ANALYSIS

The collected data was entered into Microsoft Excel 2010 and analysed using Epi Info 7 software. Descriptive statistics, such as proportions, means, and Standard Deviations (SD), were calculated. A z-test was used to determine the difference between the means of the two groups. A p-value less than 0.05 was considered statistically significant.

RESULTS

Among the BUAL group, the majority of patients (54%) were in the age group of 19-24 years, while in the B-lynch group, the majority of patients (48%) were also in the age group of 19-24 years. The mean age of the patients was 25.22 \pm 4.33 years in the BUAL group and 26.02 \pm 4.32 years in the B-lynch group. In the BUAL group, 41 (82%) patients were booked, while 9 (18%) patients were unbooked. In the B-lynch group, 43 (86%) patients were booked, while 7 (14%) patients were unbooked [Table/Fig-1]. It was observed that the

induction of labour was performed in 9 (18%) patients in the BUAL group and 12 (24%) patients in the B-lynch group. Both groups were comparable, as the p-value was 0.62.

Variables	BUAL n (%)	B-lynch n (%)	Chi-square	p-value
Age group (in years)				
19-24	27 (54)	24 (48)		
25-30	18 (36)	20 (40)		
31-38	5 (10)	6 (12)		
Total	50	50	0.54	0.469
Mean \pm SD	25.22 \pm 4.33	26.02 \pm 4.32		
Parity				
Primigravida	26 (52)	23 (46)		
Gravida 2	16 (32)	20 (40)		
Gravida 3	8 (16)	7 (14)		
Total	50	50	0.17	0.68
SES modified kuppusswamy scale				
Lower	9 (18)	12 (24)		
Lower middle	6 (12%)	8 (16)		
Upper lower	10 (20)	9 (18)		
Upper middle	18 (36)	16 (32)		
Upper	7 (14)	5 (10)		
Total	50	50	0.93	0.33
Booking status				
Booked	41 (82)	43 (86)		
Unbooked	9 (18)	7 (14)		
Total	50	50	0.07	0.78
Gestational age (in weeks)				
35-37	15 (30)	12 (24)		
38-41	35 (70)	38 (76)		
Total	50	50	0.8	0.37

[Table/Fig-1]: Distribution of age, parity, socio-economic status, gestational age. SES: Socioeconomic status

The most common high-risk factors observed for primary PPH were preeclampsia/eclampsia, followed by prolonged Premature Rupture of Membranes (PROM), in both the BUAL and B-lynch groups. One case of placental abruption was noted in the B-lynch group [Table/Fig-2]. The mean preoperative Hb level was 9.65 \pm 1.16 gm% in the BUAL group, which significantly reduced to 8.54 \pm 1.27 gm% post-procedure. In the B-lynch group, the mean preoperative Hb level was 9.68 \pm 0.85 gm%, which significantly reduced to 8.52 \pm 0.95 gm% post-procedure [Table/Fig-3].

Risk factors for primary PPH	BUAL n (%)	B-lynch n (%)	Chi-square	p-value
Preeclampsia/eclampsia	20 (40)	16 (32)	5.15	0.52
Prolonged PROM	11 (22)	12 (24)		
Big baby	10 (20)	6 (12)		
Obstructed/prolonged labour	5 (10)	10 (20)		
Multiple pregnancies	2 (4)	1 (2)		
Polyhydramnios	2 (4)	4 (8)		
Placental abruption	0	1 (2)		
Total	50 (100)	50 (100)		

[Table/Fig-2]: Distribution of patients according to risk factors for primary PPH. PROM: Premature rupture of membranes

The mean blood loss of patients was 1312.14 \pm 227.65 mL in the BUAL group and 1359.22 \pm 259.07 mL in the B-lynch group, which was not statistically significant [Table/Fig-4]. In the present study, 17 (34%) patients in the BUAL group and 21 (42%) patients in the B-lynch group did not require blood transfusion [Table/Fig-5]. ICU care was necessary for 6 (12%) patients in the BUAL group and

Parameters	BUAL	B-lynch	t-value	p-value
	Mean±SD	Mean±SD		
Preoperative Hb	9.65±1.16	9.68±0.85	0.15	0.88
Postoperative Hb	8.54±1.27	8.52±0.95	0.08	0.92
t-value	4.56	6.43		
p-value	<0.0001	<0.0001		

[Table/Fig-3]: Distribution according to pre and postoperative Hb (gm%) value.
Hb: Haemoglobin

Amount of blood loss (in mL)	BUAL	B-lynch	Chi-square	p-value
	n (%)	n (%)		
1001-1500	40 (80)	41 (82)	0.07	0.96
1501-2000	8 (16)	7 (14)		
>2000	2 (4)	2 (4)		
Total	50 (100)	50 (100)		

[Table/Fig-4]: Distribution of patients according to amount of blood loss.

8 (16%) patients in the B-lynch group. BUAL was successful in 47 out of 50 (94%), while hysterectomy was performed in three cases. The B-lynch procedure was successful in 48 out of 50 cases (96%), while hysterectomy was performed in two cases. Both groups were comparable, as the p-value was 0.65.

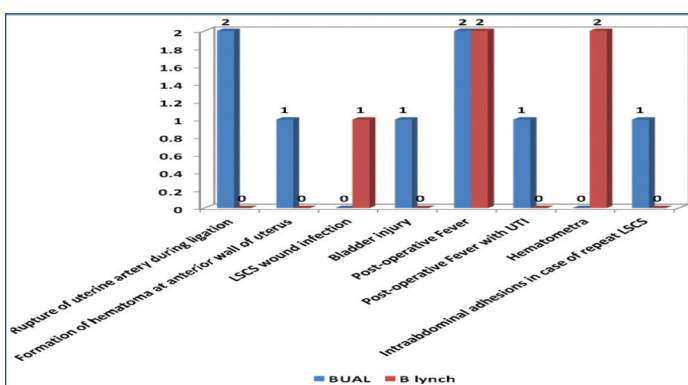
Requirement of blood transfusion	BUAL	B-lynch	Chi-square	p-value
	n (%)	n (%)		
1 unit	15 (30)	11 (22)	1.59	0.66
2 units	12 (24)	14 (28)		
≥3 units	6 (12)	4 (8)		
No requirement	17 (34)	21 (42)		
Total	50 (100)	50 (100)		

[Table/Fig-5]: Distribution of patients according to requirement of blood transfusion.

Among the BUAL group, the mean blood loss was around 1312.14 mL in patients where the procedure was successful and around 2080 mL in those where hysterectomy was performed as a last life-saving procedure, which was highly statistically significant. Similarly, among the B-lynch group, the mean blood loss was around 1359.22 mL in patients where the procedure was successful and around 2134 mL in those where hysterectomy was performed, which was also found to be significant [Table/Fig-6]. Postoperative fever was the common complication among both groups [Table/Fig-7].

Parameters	BUAL	B-lynch
	Mean±SD	Mean±SD
Success	1312.14±227.65	1359.22±259.07
Failure (hysterectomy procedure)	2080±81.85	2134±9.89
t-value	22.44	21.13
p-value	<0.0001	<0.0001

[Table/Fig-6]: Distribution of amount of blood loss in successful and hysterectomy procedures in both the groups.



DISCUSSION

In the present study, the mean age of the patients was 25.22±4.33 years in the BUAL group and 26.02±4.32 years in the B-lynch group. These results are similar to the study conducted by Abdel-Fatah AT et al., where the mean age in the BUAL group was 30.63±3.27 years and in the B-lynch group was 30.33±3.27 years [10]. In a study by Devendra BN et al., the majority of patients were in the age group of 20-25 years [12]. In the present study, the majority of patients were from the upper middle class. This is in contrast with a study done by Cengiz H et al., where the majority of patients were from a low socioeconomic status (68%) [14]. This difference may be due to the presence of more morbid factors in the present study groups. The majority of the population in the study was primigravida in both groups. This is similar to the study done by Devendra BN et al., where primigravidas accounted for 61% of the cases [12].

In the present study, 82% of Antenatal Care (ANC) visits were booked and 18% were unbooked in the BUAL group. This is comparable to the study conducted by Atin H and Shyamapada P, where 80% of cases were booked and 20% were unbooked [5]. It was observed in the present study that the majority of patients were at 38-41 weeks of gestation, which accounted for about 70% in the BUAL group and 76% in the B-lynch group. This is similar to the study by Puangsricharoen P and Manchana T, where 67.7% of patients were at term gestation [11].

In the present study, the major risk factor observed was preeclampsia/eclampsia in both groups. This is in contrast to a study done by Abdel-Fatah AT et al., where multiparity was the major risk factor [10]. This difference may be due to the lower incidence of primary caesarean section in multiparous women in the Institution, and grand multiparity was an exclusion criterion in present study. Another reason may be that only PPH during caesarean section was included in the study group [Table/Fig-8] [10].

Risk factors of primary PPH	Present study		Abdel-Fatah AT et al., [10]	
	BUAL (%)	B-lynch (%)	BUAL (%)	B-lynch (%)
Preeclampsia/eclampsia	40	32	-	-
Prolonged PROM	22	24	6	6
Big baby	20	12	4	4
Obstructed/prolonged labour	10	20	6	4
Multiple pregnancy	4	2	4	4
Polyhydramnios	4	8	6	6
Placental abruption	0	2	-	-

[Table/Fig-8]: Risk factors for Postpartum Haemorrhage (PPH) [10].
PROM: Premature rupture of membranes

The mean blood loss in the BUAL group was 1312.14±227.65 mL, while in the B-lynch group it was 1359.22±259.05 mL. However, in contrast, a study by Puangsricharoen P and Manchana T, reported mean blood losses of 2133 mL in the BUAL group and 2984 mL in the B-lynch group [Table/Fig-9] [10,11].

Blood loss (mL)	Present study		Abdel-Fatah et al., [10]		Puangsricharoen P and Manchana T, [11]	
	BUAL	B-lynch	BUAL	B-lynch	BUAL	B-lynch
Mean±SD	1312.14±227.65	1359.22±259.07	770.19±51.28	785.91±52.33	2,133±1,001	2,984±2,540

[Table/Fig-9]: Amount of blood loss [10,11].

The mean number of blood units required in the BUAL and B-lynch groups were 1.73±0.76 units and 1.76±0.69 units, respectively. The present study coincides with a study performed by Cengiz H et al., who found that the mean transfused blood volume was 2.4 units of packed red cells (range 0-9 units) [14]. In the present study, 12% of patients in the BUAL group were admitted to the ICU. However, a study conducted by Cengiz H et al., showed ICU admissions of

26.3%, likely due to a higher number of placenta previa cases in their study [14].

The most common complication among the BUAL and B-lynch groups in the present study was postoperative fever. This is similar to the study by Dohbit JS et al., where 41.7% of patients in the uterus-preserving surgery group developed postoperative infections [15]. However, in contrast, findings were observed by Puangricharoen P and Manchana T, where 23.1% of cases in the B-lynch group developed disseminated intravascular coagulation, 7.7% developed bladder injury, and 7.7% developed bowel injury, while none developed any perioperative complications in the BUAL group [11].

The success rate in present study was defined as the avoidance of hysterectomy and a low complication rate. The success rates for BUAL and B-lynch were 94% and 96%, respectively. In a study by Puangricharoen P and Manchana T, the success rates were reported as 66% and 80%, respectively [Table/Fig-10] [5,11,15,16].

Success rate	BUAL	B-lynch
Present study	94%	96%
Atin H and Shyamapada P, [5]	92.8%	-
Dohbit JS et al., [15]	66.7	100%
Palacios-Jaraquemada JM, [16]	82.6%	92.4%
Puangricharoen P and Manchana T, [11]	66.7%	76.9%

[Table/Fig-10]: Success rate of uterine conservative surgeries [5,11,15,16].

This is one of the few Indian studies comparing the efficacy of BUAL and B-lynch in atonic PPH. The sample size is good, and both conservative methods can be adopted in atonic PPH, especially in secondary centres.

Limitation(s)

Atonic PPH during a caesarean section, after failed medical management, was managed using either BUAL or B-lynch sutures. In cases of failure, obstetric hysterectomy was performed. The expertise to perform internal iliac artery ligation was not available, as it was a secondary care centre. Therefore, the success rate of internal iliac artery ligation could not be evaluated, as it is also a conservative but complicated procedure.

CONCLUSION(S)

The PPH remains a significant concern for obstetricians, and effective and meticulous management is crucial for reducing maternal mortality. Both BUAL and B-lynch sutures are simple, safe, and effective methods for controlling PPH during a caesarean section. They serve as life-saving alternatives to hysterectomy and

help preserve the patient's fertility following PPH. Uterine artery ligation and the B-lynch technique demonstrate similar efficacy in reducing blood loss. A team approach involving obstetricians is crucial to increasing the success rate of these procedures. Additionally, these procedures do not require extensive expertise or special training, making them valuable additions to the conservative treatment of PPH.

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