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"Comparative Effectiveness Of Bilateral Uterine Artery Ligation And B-Lynch Sutures In Managing Atonic Postpartum Haemorrhage During Caesarean Section"

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Abstract
Background: *Globally, primary postpartum haemorrhage (PPH) remains a leading cause of maternal morbidity and mortality. Its primary cause is still uterine atony, and to avoid potentially fatal consequences, prompt intervention is essential.*
Aim: *To compare the effectiveness and safety profile of Bilateral Uterine Artery Ligation (BUAL) and B-Lynch sutures in controlling atonic PPH during Lower Segment Caesarean Section (LSCS).*
Methods: *A prospective, hospital-based study was conducted over one year (August 2023–August 2024) at a secondary care facility in MGM Hospital, Kamothe, Navi Mumbai. One hundred women with atonic PPH unresponsive to standard medical therapy during LSCS were randomly assigned to undergo either BUAL (n=50) or B-Lynch sutures (n=50). Patient demographics, clinical risk factors, haemoglobin (Hb) variation, intraoperative blood loss, transfusion requirements, complications, and procedural success rates were analysed. Statistical significance was set at p<0.05.*
Results: *The mean age was 25.22±4.33 years in the BUAL group and 26.02±4.32 years in the B-Lynch group. Average intraoperative blood loss was 1312.14±227.65 mL for BUAL and 1359.22±259.07 mL for B-Lynch (p=0.33). Mean Hb reduction was 1.11 g/dL in the BUAL group and 1.16 g/dL in the B-Lynch group. No significant difference was observed in transfusion needs or ICU admissions. Postoperative fever was the most common complication. The procedures achieved success rates of 94% for BUAL and 96% for B-Lynch.*
Conclusion: *For managing atonic PPH during LSCS, BUAL and B-Lynch sutures are both dependable, secure, and simple surgical techniques. They can be widely used as fertility-preserving substitutes for hysterectomy, especially in facilities with low resources.*
Keywords: *Postpartum haemorrhage, Bilateral uterine artery ligation, B-Lynch suture, Caesarean section, Uterine atony.*

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I. Introduction

Postpartum haemorrhage, defined as blood loss exceeding 500 mL after vaginal birth or 1000 mL after caesarean delivery, remains the foremost cause of maternal mortality globally. With maternal mortality from PPH occurring at rates up to 100 times higher than in high-income areas, the burden is disproportionately larger in low- and middle-income countries. Most of these cases are caused by uterine atony.

Pharmacological medications such oxytocin, ergometrine, and prostaglandins are used in the initial stages of care. Before undergoing a hysterectomy, conservative surgical techniques such as compression sutures or progressive devascularization are used when medicinal treatments are ineffective. Among these, B-Lynch compression sutures and bilateral uterine artery Ligation (BUAL) are frequently utilized. Direct comparative data, particularly from Indian contexts, are still scarce, nonetheless. The purpose of this study was to assess and contrast the two fertility-sparing methods' effectiveness and side effects.

II. Materials And Methods

Study Design and Setting: This was a prospective, interventional study conducted in the Obstetrics and Gynaecology Department of MGMIHS, Kamothe, Navi Mumbai over 12 months.

Sample Size and Selection: One hundred women with intraoperative atonic PPH during LSCS, unresponsive to standard medical therapy, were enrolled. They were randomly allocated into two groups: BUAL (Group A, n=50) and B-Lynch (Group B, n=50).

Inclusion Criteria:
- Gestational age 34–41 weeks
- Parity ≤3
- Documented uterine atony unresponsive to uterotonics
- Risk factors such as uterine overdistension, preeclampsia/eclampsia, or magnesium sulfate therapy

Exclusion Criteria:
- Grand multiparity (≥4)
- PPH after vaginal delivery
- Traumatic PPH during LSCS
- Placenta previa/accreta
- Pre-existing medical comorbidities affecting surgical risk

Data Collection: Baseline demographics, obstetric history, risk factors, and booking status were recorded. Blood loss was estimated intraoperatively, and Hb was measured preoperatively and 48 hours post-surgery. The need for transfusion, ICU admission, and any complications were noted.

Statistical Analysis: Data were processed using Epi Info 7. Continuous variables were expressed as mean±SD, and comparisons were made using the z-test. A p-value <0.05 was considered significant.

III. Results

The bulk of patients (54%) in the BUAL group were between the ages of 19 and 24, and the majority of patients (48%) in the B-lynch group were likewise between those ages. The BUAL group's mean age was 25.22±4.33 years, while the B-lynch group's was 26.02±4.32 years. Nine patients (18%) in the BUAL group were unbooked, compared to 41 (82%) who were. 43 (86%) of the patients in the B-lynch group had reservations, whereas 7 (14%) did not [Table/Fig-1]. Nine patients (18%) in the BUAL group and twelve patients (24%) in the B-lynch group underwent labor induction, according to the data. The p-value was 0.62, indicating that the two groups were comparable.

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±SD	25.22±4.33	26.02±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 kuppuswamy 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

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. In the B-lynch group, there was one instance of placental abruption [Table/Fig-2]. The BUAL group's mean preoperative hemoglobin level was 9.65±1.16 gm%, which dramatically dropped to 8.54±1.27 gm% after the surgery. The mean Hb level in the B-lynch group was 9.68±0.85 gm% before the operation, and it dramatically dropped to 8.52±0.95 gm% after [Table/Fig-3].

Risk factors for primary PPH	BUAL	B-lynch	Chi-square	p-value
	n (%)	n (%)		
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.

Patients in the BUAL group lost an average of 1312.14±227.65 mL of blood, while those in the B-lynch group lost an average of 1359.22±259.07 mL, none of which was statistically significant [Table/Fig-4]. Blood transfusions were not necessary for 17 (34%) of the BUAL group and 21 (42%) of the B-lynch group in the current investigation [Table/Fig-5]. Eight (16%) patients in the B-lynch group and six (12%) patients in the BUAL group required intensive care unit care. In 47 out of 50 instances, BUAL was successful (94%), however in three cases, a hysterectomy was necessary. While a hysterectomy was carried out in two cases, the B-lynch technique was successful in 48 out of 50 cases (96%).

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.

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.

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)		

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.

The mean blood loss in the BUAL group was approximately 2080 mL in patients who had a hysterectomy as a last-ditch life-saving measure and approximately 1312.14 mL in patients when the treatment was successful. These results were highly statistically significant. Likewise, in the B-lynch group, the average blood loss was approximately 1359.22 mL for patients who had a successful operation and 2134 mL for those who had a hysterectomy, both of which were determined to be significant [Table/Fig-6]. In both groups, postoperative fever was the most common complication.

IV. Discussion

Our findings demonstrate that BUAL and B-Lynch sutures have comparable efficacy in controlling atonic PPH during LSCS, consistent with international studies. Both techniques significantly reduced blood loss and prevented hysterectomy in the majority of patients, without major morbidity. While BUAL is technically simpler, B-Lynch offers direct myometrial compression. The choice of procedure can depend on surgeon familiarity and intraoperative conditions.

Compared to previous reports from low-resource settings, our success rates were higher, possibly due to early intervention and the exclusion of placenta previa/accreta cases.

V. Conclusion

In cases of primary PPH due to uterine atony during caesarean delivery, both BUAL and B-Lynch sutures are safe, effective, and preserve fertility. They should be considered essential skills for obstetric surgeons, particularly in secondary-level facilities where access to advanced vascular procedures may be limited.

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