
Prophylactic Bilateral Uterine Artery Ligation During Cesaerean Section in Women at Risk of Postpartum Hemorrhage

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Abstract

Objective : The purpose of this study is to Evaluate the effect of bilateral uterine artery ligation on operative and post-operative blood loss in C.S in high risk patients of Postpartum Hge.

Background: Obstetric hemorrhage is a principal cause of maternal death in both high-and low-income countries. Because it is a leading cause of maternal mortality and morbidity, and most fatal cases are due to substandard care , Bilateral uterine artery ligation (BUAL) is a quick and easy surgical procedure that can be coupled with uterotonics to prevent PPH in high-risk cases such as placenta previa. It is also the first step in a uterine devascularization approach that can bring about bleeding control in established cases of PPH and it can be used prophylactically to reduce the incidence of PPH in high-risk cases.

Methods : This is a prospective Randomized clinical trial that was conducted among 484 women attending the labor ward at Menoufia university hospital.

Results: Intraoperative blood loss during cesarean was highly significant lower in the BUAL group than in the control group (524.26 ± 12.17 vs 610.58 ± 18.41 mL; $P < 0.001$). Hb deficit postoperative was also significantly lower in the BUAL group than in the control group (0.63 ± 0.14 vs 1.76 ± 0.57 g/dl ; $P < 0.001$). There was a statistical significant difference in the AFC of non lactating women after 3 months in the BUAL group than in the control group (10.10 ± 1.3 vs 12.6 ± 0.09 , $P < 0.001$).

Conclusion: BUAL during cesarean was found to be an effective method for decreasing blood loss during and after cesarean delivery among women at risk of uterine atony and subsequent PPH.

Keywords: BUAL , Postpartum hemorrhage , High risk pregnancy.

Introduction

Obstetric hemorrhage is a principal cause of maternal death in both high-and low-income countries.(1)

As most fatal cases are due to substandard care, obstetric hemorrhage should be a priority in the development of national care guidelines. (2)

postpartum hemorrhage is estimated by blood loss in excess of 500 mL following the birth of a single baby in vaginal delivery or a loss of greater than 1,000 mL following cesarean birth or twins vaginal delivery often has been used for the diagnosis, but the average volume of blood lost at delivery can approach these amounts (3) Bilateral uterine artery ligation (BUAL) is a quick and easy surgical procedure that can be coupled with uterotonics to prevent PPH in high-risk cases such as placenta previa. (4)

It is also the first step in a uterine devascularization approach that can bring about bleeding control in established cases of PPH(5) and it can be used prophylactically to reduce the incidence of PPH in high-risk cases. A recent prospective study showed that the uterine artery ligation technique has significant improvements in the reduction of massive PPH, hysterectomy and inpatient stay in low-resource settings and placenta accreta cases; however, this approach is a safe alternative to peripartum hysterectomy with high uterine preservation rate, less intraoperative and postoperative morbidity and less need for blood transfusion. (6)

Patients and Methods

This is a prospective randomized clinical trial that was conducted among women who were attending the labor ward of Menoufia university hospital having elective or emergency C.S from (11/2021 to 2/2023). The study was approved by the eithical committe of faculty of medicine menoufia university with a number (5/2021OBSGN32). Informed consent of

all participants after full explanation of the benefits and risks of the procedure was taken. Closed (Sealed) envelope randomization is used for protecting the randomization process so that the treatment to be allocated is not known before the patient is entered into the study. In this participating clinicians are given randomaly generated treatment allocations within sealed opaque envelops. Once a patient has consented to enter a trial an envelope is opened and the patient is then offered the allocated treatment regimen..

Participant were divided into two groups

Group A (control group):- Patients delivered by cs without any surgical intervention to prevent PPH and only had uterotonics like oxytocin (5 IU)

Group B(Study group):-Patients underwent LSCS and had prophylactic bilateral uterine artery ligation and uterotonics (5 IU)

The inclusion criteria:- Patients planned for elective or emergency C.S with one or more of the following high risk group of pregnancy:-

1. Maternal anemia
2. Over distended uterus (Macrosomia > 4 kg, Multiple pregnancy, Polyhydramnios).
3. Grand Multipara.
4. Previous history of atonic PPH
5. Pre-eclampsia
6. Prolonged Augmentation
7. Chorioamnionitis
8. High order pregnancy

The exclusion criteria:-

1. Placenta previa or accreta.
2. Bleeding tendency (congenital or acquired), Coagulopathy.
3. Antepartum hemorrhage

Most of the patients were having routine ANC and measuring of AFC after 3 months postoperation at the Outpatient Clinic at Menoufia University Hospital using ultrasound Machine. Patients had been investigated for HB and HCT level before and after operation. Measurement of blood loss was done in the operative theatre during operation time by measuring of the weight of soaked blood towels minus weight of the dry towel and blood in container of suction apparatus.

Before surgery, the medical history (including detailed obstetric history) was recorded,

Laboratory tests such as blood count, liver and kidney function tests, and coagulation profile were also performed. Gestational age was determined by the first day of the last menstrual period or by first-trimester ultrasound Two-dimensional transabdominal ultrasound, Amniotic fluid index and placental site.

For women in the study group, BUAL was performed after delivery of the neonate and before placental separation as follows. we palpate the uterine artery at the lateral side of the uterus then we use a 0 sized vicryl absorbable sutures with a large atraumatic round needle, then we place the stitch approximately about 2-3 cm medial to the uterine vessels below the level of the lower uterine incision site from Anterior to the posterior part of the uterus including the whole thickness of the Myometrium to ensure including all the uterine vessels then we enter through avascular area at the broad ligament then Ligate anteriorly.

For women in the control group, cesarean delivery was performed without BUAL. Both groups received an infusion of 5 IU of oxytocin in 5% dextrose immediately after delivery of the fetus.

Patient Evaluation

1. Blood loss intraoperative which was estimated by the weight of blood-soaked towels (weight of soaked towel— weight of dry towel)
2. Need for blood transfusion during operation or postoperative.
3. Need for another measures for control of bleeding as Intrauterine-ballon or pack, internal iliac artery ligation & hysterectomy.
4. Hb% difference ≥ 2 gm/dl after 24 hour.
5. Patients who had atonic postpartum hemorrhage post operative
6. Following up of patients for antral follicle count and time of return of menstruation in non-lactating patients after 3 months after delivery.

Data were collected, tabulated and statistically analyzed using an IBM compatible personal computer with Statistical Package for the Social Sciences (SPSS) version 28 (SPSS Inc. Released 2020. IBM SPSS statistics for windows, version 28.0, Armonk, NY: IBM Corp.). Student's t-test (t) and Mann-Whitney's test were used for comparison of quantitative variables between two groups, while Chi-square test (χ^2) was used to study association between qualitative variables.

Results

A total of 484 women were invited to participate in the study. The preoperative characteristics of the study women are summarized in Table 1 & Fig 1. The participants in the two study groups regarding the (age, gestational age, gravidity, parity previous abortions and number of previous abortion) shows no statistically significant difference $P > 0.05$

As regard the causes of C.S, there was no statistical difference between the two study group ($P=0.190$).

The primary and secondary outcomes of the study women were summarized in Tables (2,3,4,5,6,7).

As regarding the change in Hg & in HCT pre and postoperative and blood Loss. In the study group Hb deficit about 0.63mg/dl and Hct deficit about 5.24%. while in the con-

trol group Hb deficit about 1.76mg/dl and Hct deficit about 7.41%. There was a highly significant difference between the two study groups ($P<0.001$).

Intraoperative blood loss in the study group by a mean of 524.26ml while in the control group by a mean of 610.58 ml. There were highly significant lower in the BUAL group than in the control group ($P<0.001$).

The Need of blood transfusion in the study group was 4.5% and in the control group was 14% with a P value <0.001

As regarding the need for any additional

measures intra or postoperative. In the study group it was about 8.67% while in the control group by 14.46%.

In the study group 6 (2.5%) participants developed postpartum hemorrhage while 23 (9.5%) participants in the control group ($P= 0.001$)

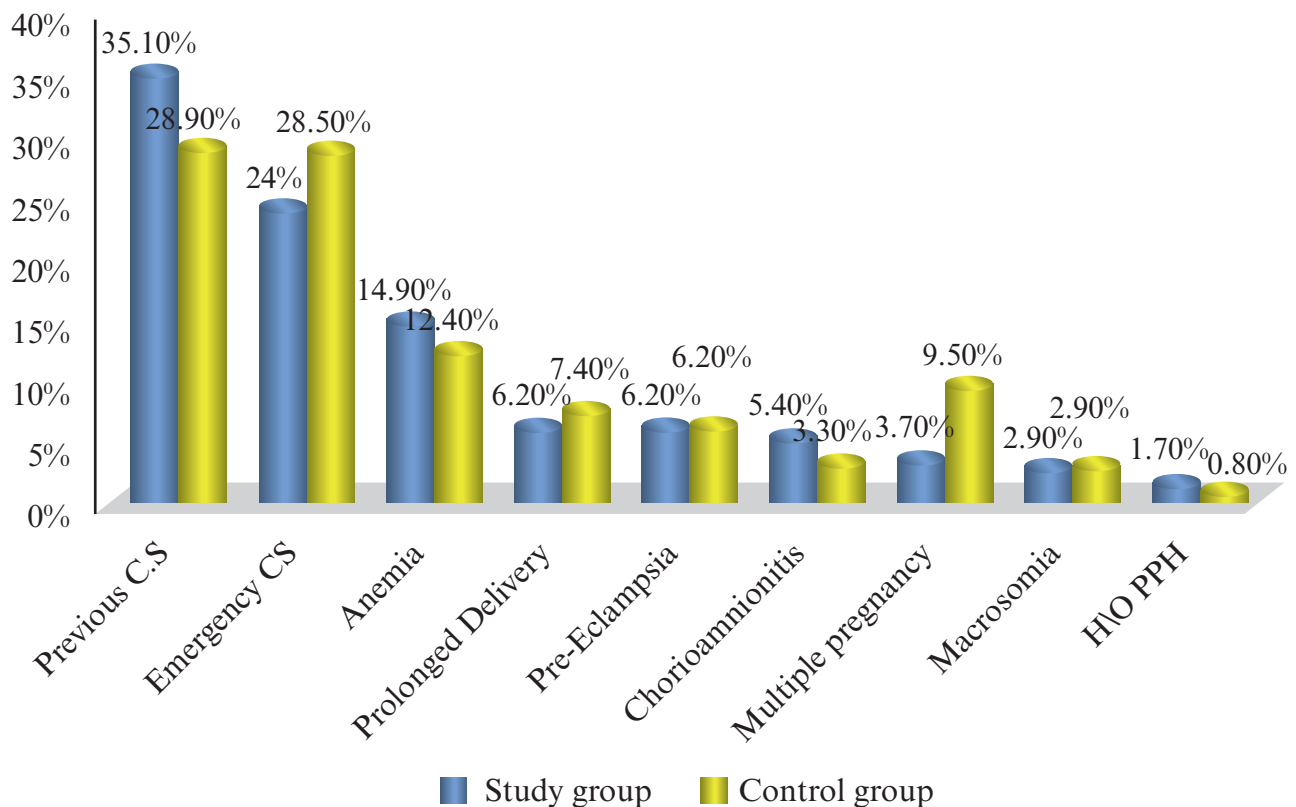
As regarding measurement of Antral follicular count (AFC) in Non-lactating women after 3 months as a marker for ovarian reserve and fertility. In the study group the mean AFC was (10.0), while in the control group was (12.6).. There was a highly significant difference between the two study groups ($P<0.001$)

Table 1. Clinical and obstetric history of the studied groups

	Study group (N= 242)		Control group (N= 242)		Test of sig- nificance	P-value
	Mean ± SD Range		Mean ± SD Range			
Age (years)	28.89±4.23 22-38		28.88±3.38 22-35		t= 0.036	0.972
Gestational age (weeks)	38.27±0.49 36-39		38.35±0.93 37-39		t= 1.180	0.237
Gravidity	4.1±1.3 3-8		4.0±1.0 3-8		t= 0.397	0.692
Parity: Para 2 Para 3 Para > 4	No	%	No	%	X²= 2.010	0.366
	135	55.8	125	51.7		
	61	25.2	75	31.0		
	46	19.0	42	17.3		
Previous abortion: Yes No	50	20.7	62	25.6	X²= 1.670	0.196
	192	79.3	180	74.4		
Number of previous abortions: One time Two times Three times Four times	34	68.0	42	67.7	X²= 2.620	0.455
	16	32.0	17	27.4		
	-	-	2	3.2		
	-	-	1	1.6		

SD: standard deviation, Range: minimum- maximum

t: student t test, X²: Chi square test

Fig (1) . Causes of CS in the studied groups**Table 2. Hb and blood loss data of the studied groups**

	Study group (N= 242)		Control group (N= 242)		Test of significance	P-value
	Mean ± SD Range		Mean ± SD Range			
Pre-operative Hb	10.07±0.64 8.0-10.8		11.16±1.07 8.8-12.2		13.631	<0.001**
Hb after 24 hours	9.45±0.61 8.0-10.4		9.40±0.92 8.0-10.7		0.598	0.550
Hb deficit	0.63±0.14 -0.1 - 1.1		1.76±0.57 0.8-3.4		30.161	<0.001**
Intra-operative blood loss	524.26±12.17 500-550		610.58±18.41 570-640		60.833	<0.001**
Blood transfusion Yes NO	No	%	No	%	X²=12.961	<0.001**
	11 231	4.5 95.5	34 208	14 86		

t: student t test, **Highly significant

Table (3) . Hct of the studied groups

	Study group (N= 242)	Control group (N= 242)	Test of significance (t)	P-value
	Mean ± SD Range	Mean ± SD Range		
Pre-operative Hct	30.79±0.78 29.5-31.8	31.04±0.80 29.8-32.0	3.546	<0.001**
Hct after 24 hours	25.55±0.70 24.0-26.6	23.63±0.41 23.0-24.5	36.826	<0.001**
Hct deficit	5.24±0.17 5.0-5.5	7.41±0.45 6.8-7.8	70.201	<0.001**

Table (4) Comparison between the studied groups of Non-lactating women regarding AFC after 3 months

	Study group (N= 110)	Control group (N= 131)	Test of significance	P-value
	Mean ± SD Range	Mean ± SD Range		
AFC after 3 months	10.0±1.3 8.0-13.0	12.6±0.9 11.0-14.0	t= 17.67	<0.001**

*Significant (P <0.05), **Highly significant

Table (5). Efficacy of uterotonics only like oxytocin in the control group & Efficacy of BUAL in the study group

Efficacy of uterotonics only like oxytocin in the control group & Efficacy of BUAL in the study group	Control group (N= 242)			
	Control group (N=242)		Study group (N=242)	
	N	%	N	%
Effective	207	85.5	221	91.3
Need other interventional measures	35	14.46	21	8.67

Table (6). Other interventional methods needed in the two study group

Other Interventional measures	Study group (N= 21)		Control group (N= 35)		Test of sig. (z-test)	P-value
	N	%	N	%		
Hysterectomy	1	4.8	2	5.7	0.46	0.646
Internal iliac artery Ligation	2	9.5	3	8.6	0.36	0.717
Intrauterine Packing	2	9.5	-	-	-	-
BUAL	-	-	9	25.7	-	-
More Uterotonics	16	76.2	21	60.0	0.95	0.343

Table (7) Patients who had atonic postpartum hemorrhage post operative

POST PARTUM	Study group (N= 242)		Control group (N= 242)		Test of significance (X ²)	P-value
	N	%	N	%		
NORMAL	236	97.5	219	90.5	10.60	0.001*
Post partum hemorrhage (Atony)	6	2.5	23	9.5		

*: Significant (P<0.05)

Conflict of interest :- NO

Discussion

Accurate and rapid assessment of blood loss in the delivery suite is important in the management of postpartum haemorrhage (PPH). Current UK obstetric guidelines recommend that with blood loss of 500–1000 mL clinicians should undertake “basic measures of monitoring” and “readiness for resuscitation”, and after >1000 mL a “full protocol ... to resuscitate, monitor and arrest bleeding” should be used. Rapid and accurate measurement of blood loss is important in the management of obstetric haemorrhage because it facilitates early diagnosis and intervention, permits appropriate and timely administration of blood and blood products.(7)

The aim of this study was to evaluate the effect of bilateral uterine artery ligation on operative and post-operative blood loss during C.S in patients of high risk of PPH.

Our study was conducted on 484 high risk patients of Postpartum Hge, who were attending at the labor ward at Menoufia university hospital

They were divided into two equal groups. Study group: 242 Patients had prophylactic bilateral uterine artery ligation and uterotonics (oxytocin 5 IU), and control group: 242 Patients had uterotonics only (oxytocin 5 IU).

The present study revealed a mean pre-operative Hb 10.07 mg/dl , Mean post-operative Hb was 9.45 mg/dl with a mean Hb deficit about 0.63mg/dl and the mean intraoperative

blood loss was about 524.26 ml in the study group

The Mean pre-operative Hct 30.79% and Mean Hct after 24hr 25.55% with a Hct deficit about 5.24% in the study group.

While In the control group the mean pre-operative Hb was 11.16 mg/dl , mean post operative Hb was 9.40 mg/dl with a mean Hb deficit about 1.76mg/dl and the mean intra-operative blood loss was about 610.58 ml. The Mean pre-operative Hct 31.04% , Mean Hct after 24hr 23.63% with a Hct deficit about 7.41%.

Regarding the need for Blood transfusion intra or postoperative. In the study group there was about (11) 4.5% of participants who needed blood transfusion and about 231 (95.5%) didn't need blood transfusion , while in the control group there was about 34 (14%) who need blood transfusion and about 208 (86%) didn't need blood transfusion .

There was a statistical significance relation between the Hb pre operative , Hb deficit , intra-operative blood loss and the need for blood transfusion with P value <0.05.

There was a reduction of Hb deficit , intra-operative blood loss and need for blood transfusion in the study group than the control group.

Similarly, Liu et al. reported higher first-day postoperative hemoglobin in the BUAL group than in the control group; however, the difference between the two groups was not significant, possibly because of the small sample size of 48 women(8). Also Sanad et al. found higher postoperative hemoglobin

and lower requirement for blood transfusion in the study group than the control group(9).

Conversly Abbas et al. found that total blood loss in patients received Tranexemic acid was significantly lower than those underwent BUAL alone during CS ($p=.001$) (10).

Our Trial regarding the efficacy of BUAL & Uterotonics and the efficacy of uterotonics only like oxytocin and the need for any additional measures intra or postoperative.

In the study group It was effective in 221 (91.3%) participants and about 21 (8.67%) patients who needed additional measures.

While in the Control group It was effective in 207 (85.5%) participants and about 35 (14.46%) patients who needed additional measures

Doumouchtsis et al. Confirmed Also that uterovarian and internal iliac artery ligation are technically difficult to perform and require experienced surgeons and BUAL is considered a simple, fast, and technically easy procedure for obstetricians. In addition, ligation of the main source of bleeding during cesarean seems to be very effective for women at risk of atonic PPH (11).

Also Doumouchtsis et al. found that after calculating the success rates of the various management options for the treatment of PPH after failure of medical therapy. It had shown that the success rates for arresting PPH are 84.0% for balloon tamponade, 90.7% for arterial embolization, 91.7% for compression sutures, and 84.6% for pelvic devascularization (including uterine or internal iliac artery ligation). There is no statistically significant difference in success rates between these procedures (11).

In this study regarding changes in the AFC after 3 months

Measurement of Antral follicular count (AFC) in non- lactating women after 3 months of operation as a marker for ovarian reserve and fertiltiy. There was a decrease In the study group the mean AFC was (10.0)

than in the control group which was (12.6).

There was a highly significant difference between the two study groups ($P<0.001$).

Our findings are consistent with the work of FF Verit et al. their study showed that BUAL is one of the most important fertility-preserving techniques in patients experiencing PPH, and also that it did not compromise ovarian blood supply and ovarian reserve in those patients, suggesting that BUAL should be used to avoid hysterectomy in cases of PPH.(12)

There may be some explanations by Kaplanoglu M et al. for why uterine blood flow was restored 3-6 months after surgery. As they used absorbable suture material, and the recanalization rate of the uterine artery was found to be high at 6 months after surgery (13).

Greenwood .LH et al. have also documented the possibility of increased collateral blood flow after BUAL.The patients were re-evaluated at 6 months after surgery in this study because Vicryl theoretically undergoes complete absorption within 6 months. (14).

Conclusion & Recommendation

In conclusion, the current study indicates that BUAL during cesarean for women at high risk pregnancy is an easy and effective procedure that can be used as an adjunctive measure to uterotonic drugs in reducing blood loss and the need for blood transfusion . More studies needed to support or deny BUAL effect on ovarian reserve and fertility with longer term follow up on subsequent pregnancy and outcome However, further trials should be performed to confirm these results.

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