

Research Article

B-Lynch Compression Suture as a Uterus-Preserving Technique for Uncontrolled Atonic Postpartum Haemorrhage During Caesarean Section: A Retrospective Study

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Abstract

Background

Atonic postpartum hemorrhage (PPH) is a major obstetric emergency and can progress rapidly despite pharmacological treatment. If uterotonics are not successful in achieving adequate hemostasis, then surgical intervention may be required. B-Lynch uterine compression suturing is a relatively rapid method of controlling hemorrhage with preservation of the uterus and may reduce the need for more invasive procedures including peripartum hysterectomy.

Objective

To assess the efficacy of B-Lynch compression suturing in the management of uncontrolled atonic PPH in cesarean section and its role as a uterus-preserving surgical option prior to hysterectomy.

Methods

This was a retrospective observational study at Father Muller Medical College Hospital, Mangalore. Women who had undergone B-Lynch suturing for atonic PPH during cesarean section from 1st September 2014 to 30th September 2018 were reviewed from hospital records. The study records identified 3681 cases of atonic PPH during the study period, out of which 43 were

reported to have had B-Lynch suturing. Detailed demographic, obstetric, laboratory, transfusion and operative outcome data were available in the source material and reported for 15 cases.

Results

The overall reported success rate for the 43 identified B-Lynch cases was 46%. In the detailed 15-case dataset the average maternal age was 26.5 years and 12 women (80%) were younger than 30 years. Nine (60%) of the 15 women were primigravida. The average gestational age was 39.10 weeks. Oxytocin augmentation had been used in 11 of 15 cases (73.3%) The most common indication for cesarean section was failed induction in 9 cases (60%). Prostaglandins, methergin and misoprostol were the uterotonics used before compression suturing. The reported mean neonatal birth weight was 2.97 kg . Other surgical procedures included uterine artery ligation in 3 cases, stepwise devascularisation in 2, uterine packing in 1 and peripartum hysterectomy in 1 case. Detailed dataset showed transfusion of packed red blood cells in 11 cases.

Conclusion

B-Lynch compression suturing has been used as a uterus preserving surgical procedure for

uncontrolled atonic PPH during cesarean section in a detailed case series and was successful in 46% of cases with a relatively low incidence of progression to hysterectomy. The procedure can be considered as a first conservative surgical option when medical management fails, provided that facilities for upgrading to devascularisation or hysterectomy are immediately available.

Keywords: postpartum haemorrhage; uterine atony; B-Lynch suture; uterine compression suture; caesarean section; hysterectomy; obstetric haemorrhage.

INTRODUCTION.

Postpartum hemorrhage remains one of the major obstetric emergencies since deterioration can occur rapidly and severe bleeding may require blood transfusion and operative intervention. Uterine atony is a major cause of PPH especially after cesarean delivery. Current management is focused on early detection, administration of uterotonics, correction of hypovolaemia and rapid escalation of care if bleeding is not controlled. [1]

When drug therapy is unsuccessful, conservative surgical procedures may achieve hemostasis while preserving the uterus. Uterine compression sutures were introduced in an effort to obtain mechanical compression of the uterus and thus control bleeding without hysterectomy. The B-Lynch technique is the most commonly reported uterine compression suture and was first described in 1997. Since then, it has been integrated into surgical approaches to refractory uterine atony. [2,3]

The major clinical benefit of B-Lynch suturing is the organ preservation in women of reproductive age. Observational evidence suggests that uterine compression sutures can achieve hemostasis in a significant proportion of women with atonic PPH, although high-quality comparative evidence is still lacking. [3,4] A recent meta-analysis of 30 studies with 1,270 women reported control of PPH in around 94% of cases and hysterectomy in around 7% . However, there was considerable heterogeneity between studies. [5] This study was conducted in a tertiary-care hospital to assess the use of B-Lynch compression suturing in women with uncontrolled atonic PPH during cesarean section. In particular, the study looked at the demographic and obstetric characteristics of women involved,

previous medical management, changes in hemoglobin, requirements for transfusion, further surgery and the reported success of B-Lynch suturing.

Objective

The main goal was to assess the efficacy of B-Lynch compression suturing as a uterus-preserving alternative to immediate hysterectomy in controlling uncontrolled atonic PPH during cesarean section.

Secondary objectives were to describe the clinical profile of women undergoing B-Lynch suturing and to assess change in hemoglobin, transfusion requirements, neonatal birth weight and the requirement for additional surgical hemostatic procedures.

MATERIALS AND METHODS

Study design and setting

This was a retrospective observational study conducted in Department of Obstetrics and Gynecology, Father Muller Medical College Hospital, Mangalore.

Study period

The cases were treated from 1 September 2014 to 30 September 2018.

Study Subjects

We reviewed the hospital case records of pregnant women who had cesarean section complicated by atonic PPH and who were subsequently subjected to B-Lynch compression suturing.

The study reported 3,681 cases of atonic PPH and 43 B-Lynch cases (1.16% of the atonic PPH cohort reported) during the study period.

The records had detailed tables of demographics and outcomes with data for 15 cases. These detailed observations are thus presented separately from the 43-case cohort overall.

Inclusion criteria

The study included all pregnant women who had a B-Lynch suturing for atonic PPH during lower segment cesarean section.

Data collection:

Data were collected retrospectively from hospital case record files. The analyzed variables were maternal age, gestational age, parity, maternal disorders, oxytocin augmentation, indication for cesarean section, uterotonic treatment, neonatal birth weight, change of hemoglobin postoperatively, blood transfusion and additional surgical procedures.

Results Assessment

The main finding was the reported success of B-Lynch suturing in controlling uncontrolled atonic PPH. The overall success rate in the study was found to be 46%. Secondary outcomes were the need for uterine artery ligation, stepwise devascularisation, uterine packing and peripartum hysterectomy.

Statistical Analysis

Categorical variables are displayed as frequencies and percentages.

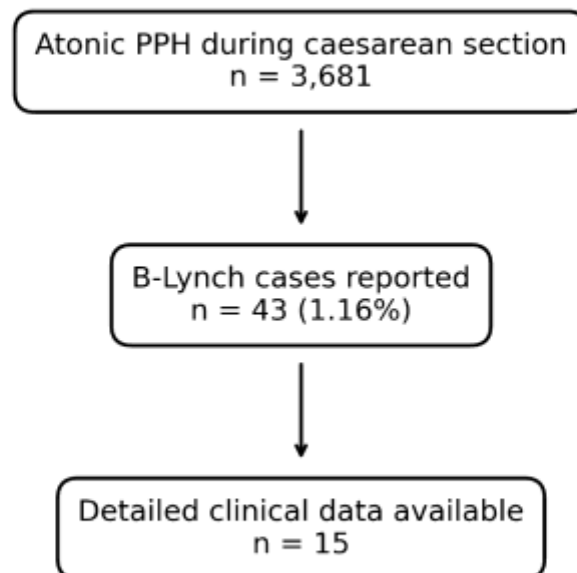
RESULTS

Study cohort

During the study period, **3,681 cases of atonic PPH during caesarean section** were reported. Of these, **43 women underwent B-Lynch suturing**, representing **1.16%** of the reported atonic PPH cohort.

Detailed demographic and clinical information available in the presentation was reported for **15 women**. These 15 cases form the denominator for the detailed descriptive tables below

Figure 1. Study population flow



Source presentation reports 43 B-Lynch cases; detailed tables contain 15 cases.

Maternal demographic and obstetric characteristics

The mean maternal age in the detailed cohort was **26.5 years**. Twelve women (80%) were younger than 30 years and three (20%) were older than 30 years. The mean gestational age was **39 weeks**. Nine women (60%) were primigravidae and six (40%) were multigravidae.

Table 1. Demographic and obstetric characteristics of the detailed cohort (n=15)

Characteristic	n	%
Maternal age		
<30 years	12	80.0
>30 years	3	20.0
Mean maternal age	26.5 years	—
Gestational age		
Preterm	1	6.7
Term	8	53.3
Post-term	6	40.0
Mean gestational age	39 weeks	—
Parity		
Primigravida	9	60.0
Multigravida	6	40.0

The distribution demonstrates that most women were young and that primigravida women constituted the majority of the detailed cohort.

Figure 2. Maternal age distribution (detailed cohort, n=15)

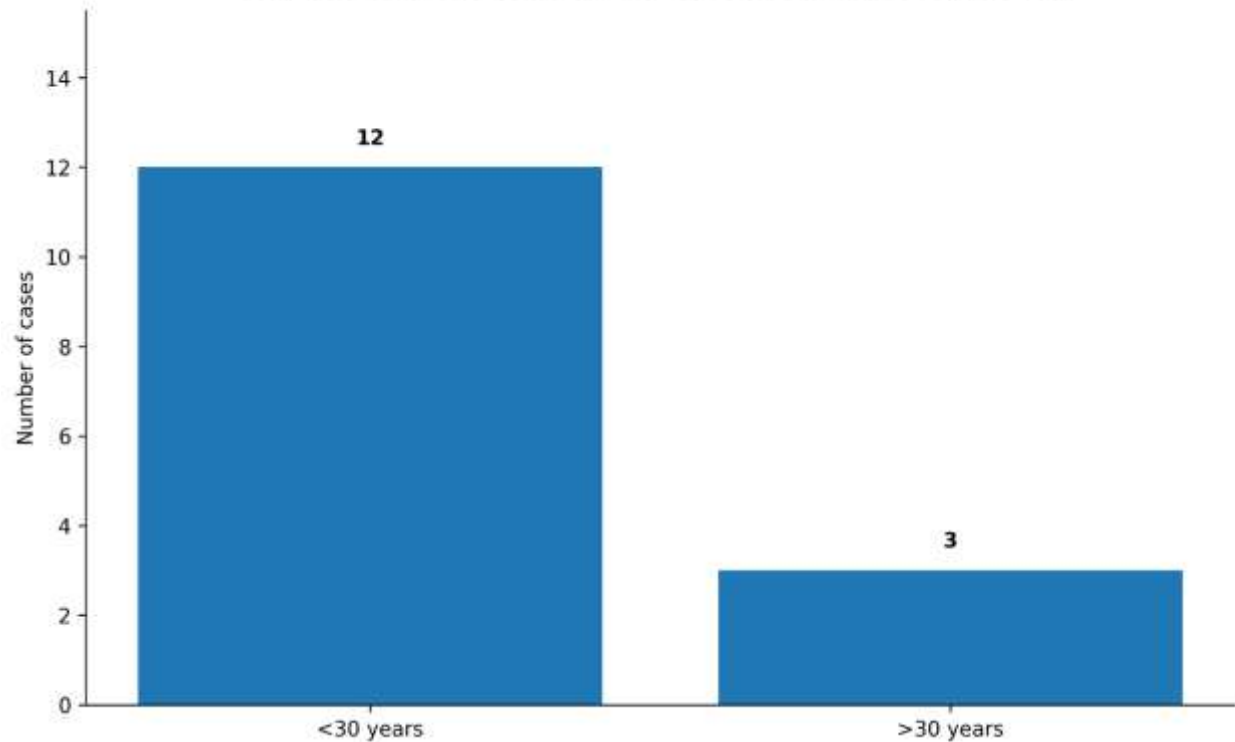


Figure 3. Gestational-age distribution (detailed cohort, n=15)

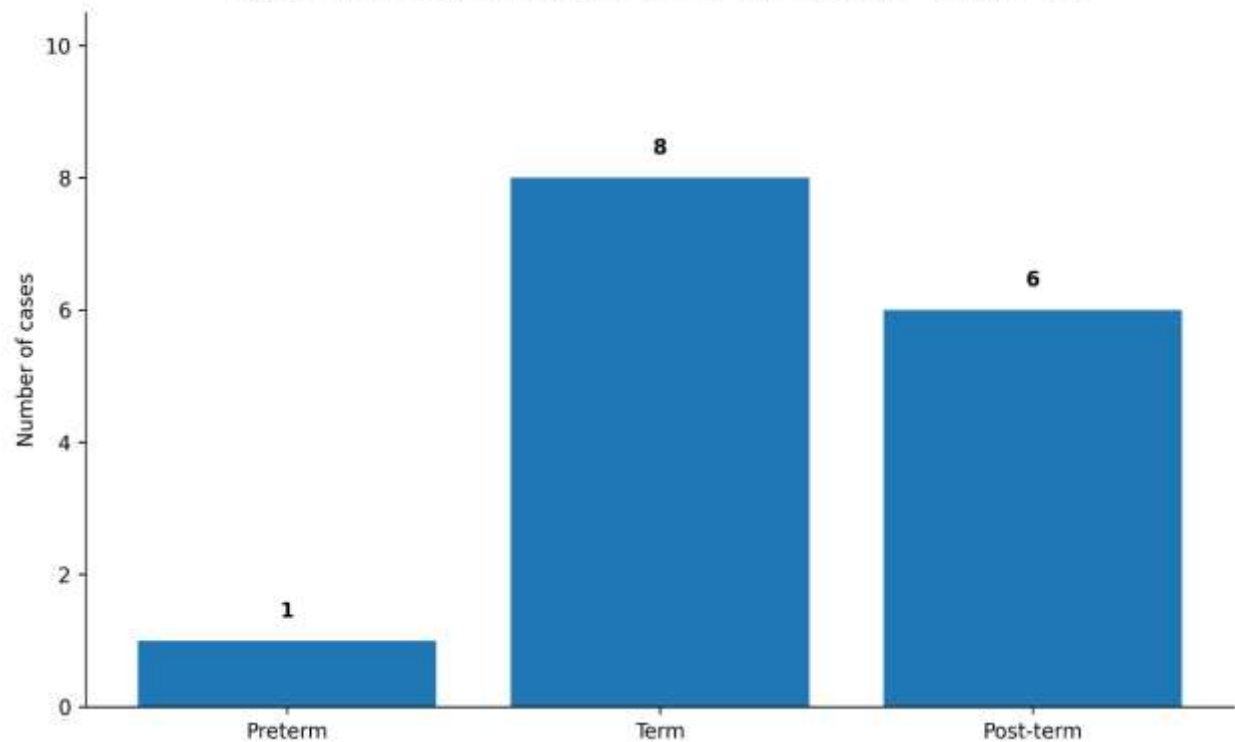
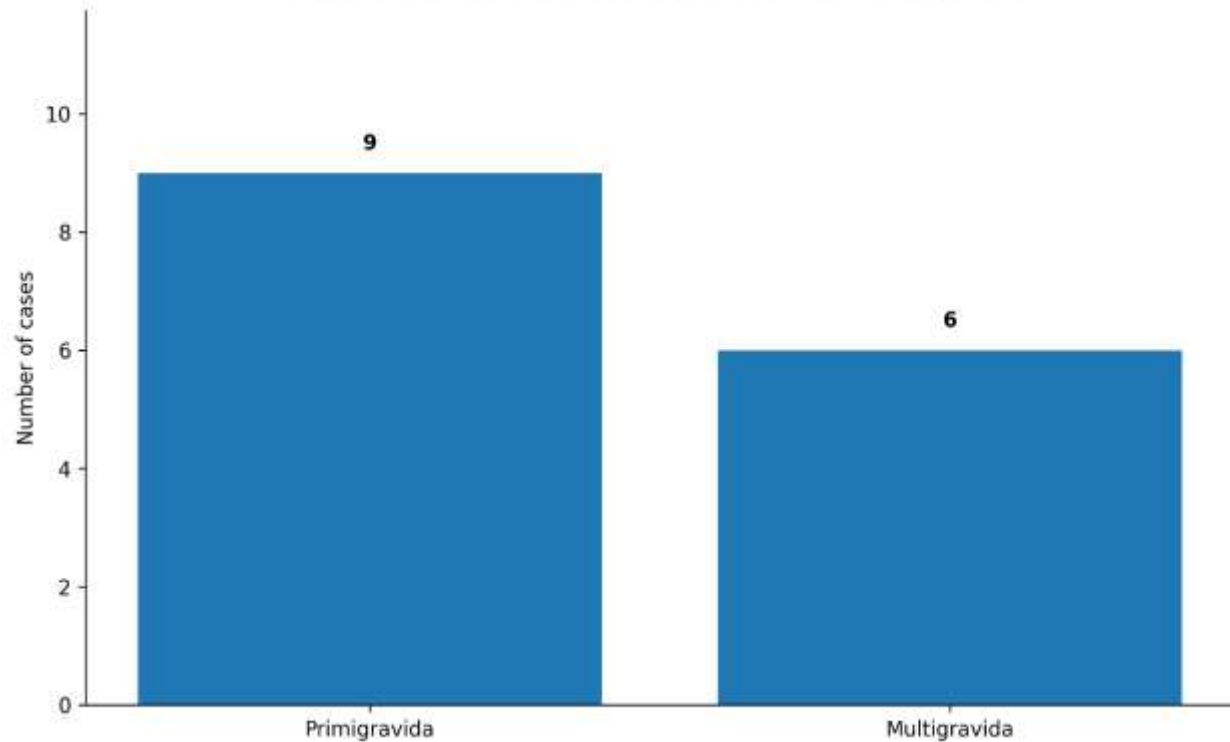


Figure 4. Parity distribution (detailed cohort, n=15)



Maternal disorders

Several maternal medical and obstetric disorders were documented. Preeclampsia and hypothyroidism were recorded in two women each. Gestational diabetes mellitus, abruptio placentae, Rh-negative pregnancy, corrected anaemia and eclampsia were documented in one woman each.

Table 2. Maternal medical and obstetric disorders

Disorder	n	% of detailed cohort
Preeclampsia	2	13.3
Hypothyroidism	2	13.3
Gestational diabetes mellitus	1	6.7
Abruptio placentae	1	6.7
Rh-negative pregnancy	1	6.7
Corrected anaemia	1	6.7

Eclampsia	1	6.7
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These categories should be interpreted as descriptive because the source does not establish whether individual women could have had more than one disorder.

Oxytocin augmentation

Oxytocin augmentation had been used in **11 of 15 women (73.3%)**, while four women (26.7%) had not received oxytocin augmentation.

Table 3. Oxytocin augmentation

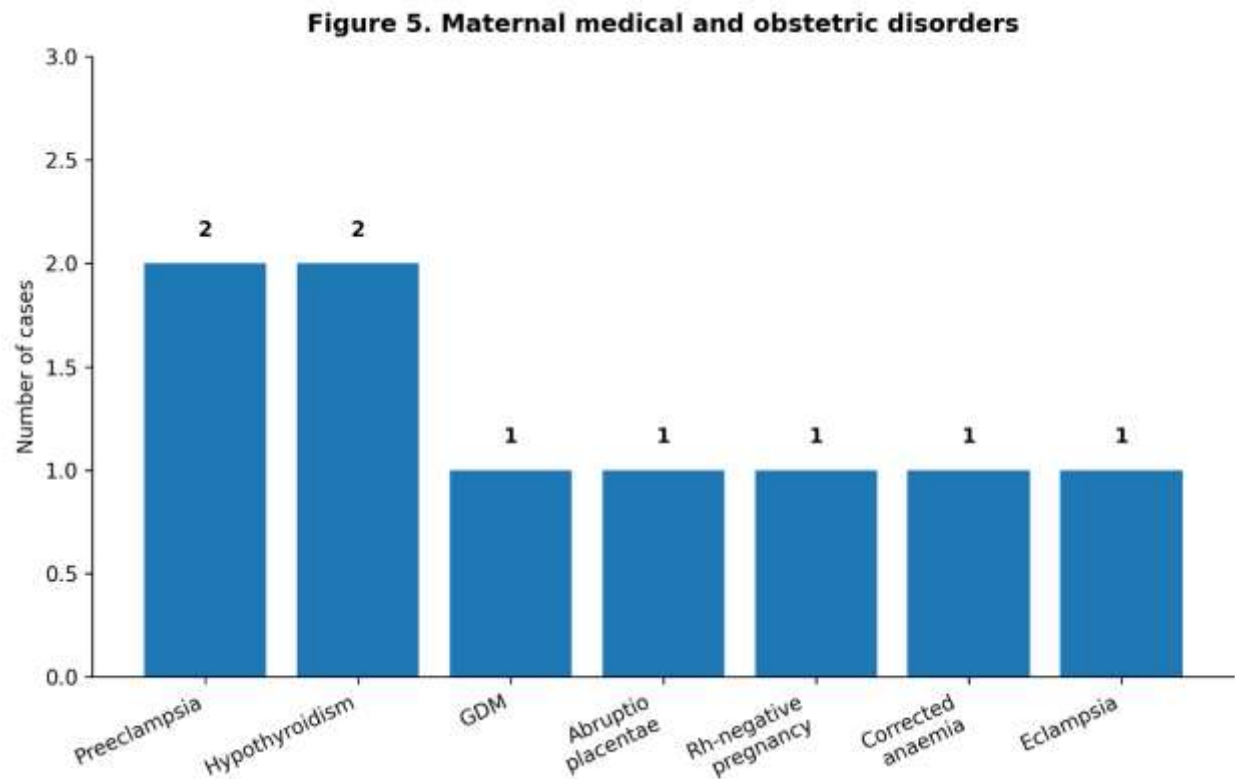
Oxytocin augmentation	n	%
Yes	11	73.3
No	4	26.7

Indications for caesarean section

Failed induction was the most frequent indication for caesarean section, accounting for nine of the 15 cases (60%). Abruptio placentae, placenta previa, premature rupture of membranes, cephalopelvic disproportion and imminent eclampsia were each reported in one case.

Table 4. Indications for caesarean section

Indication	n	%
Failed induction	9	60.0
Abruptio placentae	1	6.7
Placenta previa	1	6.7
PROM	1	6.7
CPD	1	6.7
Imminent eclampsia	1	6.7



Uterotonic treatment before B-Lynch suturing

Prostaglandin administration was documented as one dose in two cases, two doses in four cases, three doses in five cases and more than three doses in two cases. Intramyometrial prostaglandin administration was reported in five cases. Methergin was used in nine cases and misoprostol in four cases.

Table 5. Uterotonic treatment documented before B-Lynch suturing

Treatment	n
Prostaglandin, 1 dose	2
Prostaglandin, 2 doses	4
Prostaglandin, 3 doses	5
Prostaglandin, >3 doses	2

Intramyometrial prostaglandin	5
Methergin	9
Misoprostol	4

Because our study source material did not explicitly state that these treatment categories were mutually exclusive, the frequencies were not be summed.

Perinatal outcome

The reported mean neonatal birth weight was **2.97 kg**. The detailed distribution provided in the source consisted of three neonates weighing 2.5 kg, four weighing 2.5–3 kg, six weighing 3–3.5 kg and three weighing more than 3.5 kg.

Table 6. Reported neonatal birth-weight distribution

Birth weight	Reported n
2.5 kg	3
2.5–3.0 kg	4
3.0–3.5 kg	6
>3.5 kg	2
Mean birth weight	2.97 kg

Postoperative haemoglobin change

A postoperative haemoglobin decrease of less than 1 g/dL was reported in five cases, a decrease of 1–2 g/dL in three cases and a decrease greater than 2 g/dL in two cases. Five cases were additionally reported to have an increase in haemoglobin following intravenous/blood replacement.

Table 7. Reported postoperative haemoglobin change

Change in haemoglobin	n
Decrease <1 g/dL	5
Decrease 1–2 g/dL	3
Decrease >2 g/dL	2
Increase following IV/blood treatment	5

Blood transfusion requirements

Packed red blood cell transfusion was documented in the detailed cohort. Six women received one unit each, four received two units each and one received more than three units.

Table 8. Packed red blood cell transfusion

Number of units	n
1 unit	6
2 units	4
>3 units	1

Blood-component and iron replacement therapies documented in the presentation included fresh frozen plasma in two cases, injectable Orofer 200 mg in one case, ferric carboxymaltose 500 mg in two cases and ferric carboxymaltose 1 g in one case.

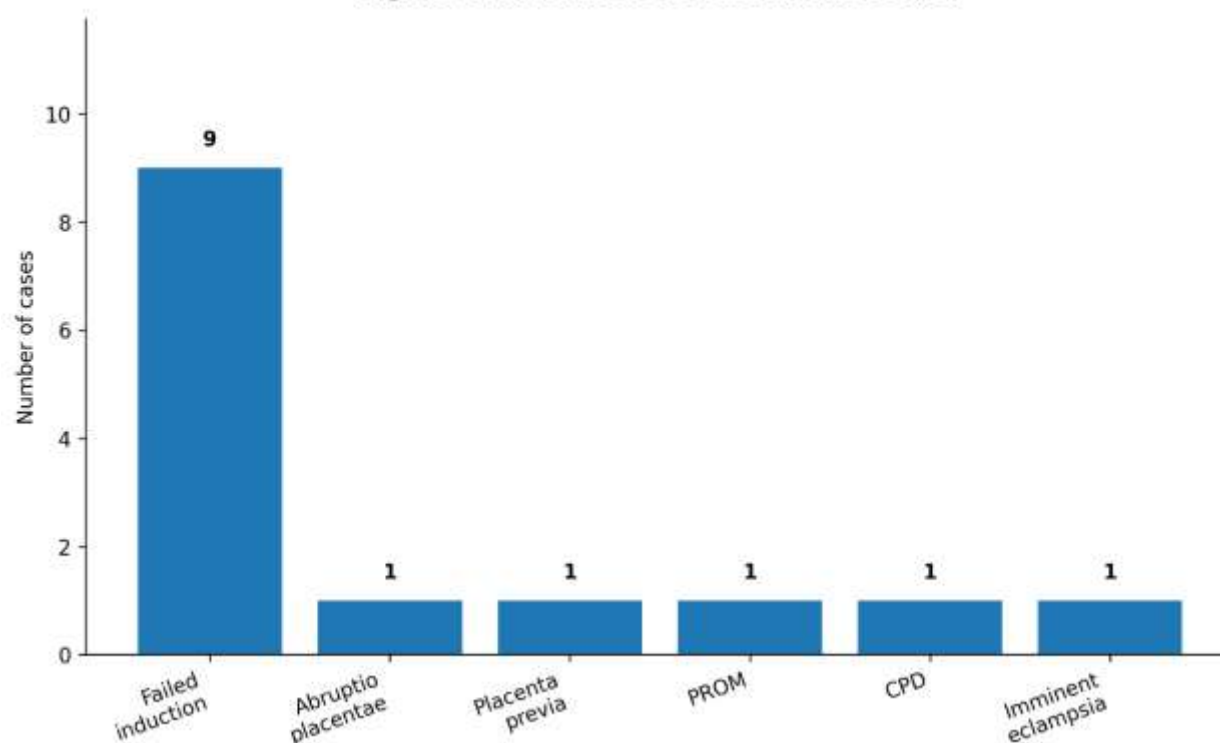
Additional surgical procedures

Additional surgical procedures were required in some women despite B-Lynch compression suturing. Uterine artery ligation was performed in three cases, stepwise devascularisation in two cases, uterine packing in one case and permpartum hysterectomy in one case.

Table 9. Additional surgical procedures

Additional procedure	n	% of detailed cohort
Uterine artery ligation	3	20.0
Stepwise devascularisation	2	13.3
Uterine packing	1	6.7
Peripartum hysterectomy	1	6.7

Figure 6. Indications for caesarean section



Primary outcome

The source presentation reports an overall **B-Lynch success rate of 46%**. It further reports uterine artery ligation in 20%, stepwise devascularisation in 13%, uterine packing in one case and peripartum hysterectomy in one case.

DISCUSSION

Atonic PPH is a time critical obstetric emergency where delay in controlling hemorrhage can lead to massive transfusion, organ failure and

emergency hysterectomy. The present study evaluated B-Lynch compression suturing as uterus-preserving surgical intervention for

women with uncontrolled atonic PPH during cesarean section.

During the study period, 3,681 cases of atonic PPH during cesarean section were reported, 43 of which were B-Lynch cases. The presentation featured a detailed clinical dataset of 15 cases. Our study reports an overall success rate of 46% with only one peripartum hysterectomy recorded in the detailed cases.

The average maternal age in the detailed cohort was 26.5 years (range 16–45 years) with 80% of women <30 years of age. This finding is consistent with the young reproductive-age population in which the preservation of reproductive potential is of particular relevance. In their original study, Kalkal et al. evaluated B-Lynch suturing in women with atonic PPH during cesarean delivery and concluded that timely compression suturing could help to avoid hysterectomy in appropriately selected cases. [6] In the detailed cohort, 60% were primigravidae. The mean gestational age was 39 weeks. The majority of the recorded pregnancies were term or post-term. In 60% of the detailed cases the reason for cesarean delivery was failed induction. Oxytocin augmentation was used in 73.3% and it was emphasized that uterine atony can occur in spite of active intrapartum management and that persistence of hemorrhage necessitates prompt escalation.

The use of multiple uterotonics before the application of B-Lynch suggests that the compression suturing was performed after failure to control the bleeding by medical measures. This is in line with the principle that conservative surgical approaches should be considered in case of failure of pharmacological treatment and before more invasive procedures when clinically indicated. Contemporary international guidance emphasizes rapid escalation in refractory PPH with conservative surgical measures including compression sutures as part of the surgical management pathway. [1,7]

The role of uterine compression sutures has been mostly supported by observational data. Previous reviews have highlighted the absence of randomized controlled evidence, but accumulating case series reported high rates of hemostatic control. [3,4] A subsequent meta-analysis of 30 studies of 1,270 women reported a pooled PPH-control rate of 94% and a pooled

hysterectomy rate of 7%, although there was significant heterogeneity. [5] These results support the overall utility of B-Lynch suturing but also demonstrate that individual success rates vary depending on the selection of patients, the definition of success, severity of hemorrhage and whether additional procedures are included as treatment failure.

A portion of the detailed cohort had additional surgical procedures. Uterine artery ligation and stepwise devascularisation were the additional procedures most commonly performed. One woman had a peripartum hysterectomy. These findings are clinically relevant, as B-Lynch should not be considered as a procedure that obviates escalation. Rather it provides the option of rapid mechanical hemostasis whilst preserving the uterus if successful with devascularisation and hysterectomy options still available for persistent life threatening bleeding.

The fact that only one woman needed peripartum hysterectomy also supports the importance of not being too optimistic about conservative surgery. Conservative measures failing or bleeding not being controlled quickly, hysterectomy still represents a major life-saving procedure. Thus the clinical value of B-Lynch is not to replace hysterectomy in all cases, but to potentially avoid hysterectomy in appropriately selected women.

Mean reported neonatal birth weight was 2.97 kg. The study was not designed to assess neonatal outcomes and therefore this finding should be considered descriptive rather than an outcome attributable to B-Lynch suturing.

The transfusion and hemoglobin findings illustrate the significant blood loss burden of the clinical conditions for which B-Lynch was used. Several women required packed red blood cell transfusion, with six women receiving one unit each and four women receiving two units each. Our analysis also reports additional giving of blood products and iron replacement. As our study did not have a comparison group, so these observations cannot prove that B-Lynch cut transfusion needs.

The main strength of the study is the evaluation of a real-world uterus-preserving surgical technique in a tertiary-care obstetric setting. It also gives information on the sequence of medical treatment, compression suturing and subsequent escalation to surgery.

LIMITATIONS

There are several caveats to bear in mind. Firstly, the study was a retrospective study based on hospital case records. Secondly, the detailed dataset presented is only 15 cases, while the reported overall B-Lynch cohort has 43 women. Third, the study does not have a control group, so no comparison can be made with uterine artery ligation, balloon tamponade, other compression sutures or primary hysterectomy.

These limitations underscore the need for careful interpretation. However, this study supports the use of B-Lynch compression suturing as part of a stepwise surgical approach to the management of uncontrolled atonic PPH during cesarean section. The current evidence also supports the concept of uterine compression sutures as uterus-preserving interventions, but the evidence base still remains to be largely observational. [4,5]

CONCLUSIONS

B-Lynch compression suturing is a viable uterus-preserving surgical technique in uncontrolled atonic PPH during cesarean section when medical management fails. In this study, 43 B-Lynch cases were identified among 3,681 reported cases of atonic PPH, and detailed clinical data were available for 15 cases. This study reports an overall success rate of 46% and documented further uterine artery ligation, stepwise devascularisation, uterine packing and peripartum hysterectomy when bleeding persisted.

B-Lynch suturing should therefore be considered an important conservative surgical option in a structured PPH management pathway rather than an absolute replacement for hysterectomy. However, definitive surgical management should not be delayed where hemorrhage remains life threatening, but early application in appropriately selected patients may provide opportunity for hemostasis whilst preserving fertility.

The relative efficacy of B-Lynch suturing versus other conservative surgical techniques needs to be determined in prospective multicentre studies with standardized definitions of PPH, treatment success, blood loss and transfusion requirements.

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