

The efficacy of Hayman's modified B - Lynch compression suture versus other surgical techniques to control atonic postpartum hemorrhage - an experience from a tertiary teaching institute

Anjan Dasgupta, Abirbhab Pal, Pradip Kumar Saha, Kamal Kumar Dash, Bivash Mondal

Corresponding author: Dr Abirbhab Pal, Senior Resident, Midnapore Medical College, Medinipur, WB, India; Email – abirbhabpl@gmail.com

Distributed under Attribution-Non Commercial – Share Alike 4.0 International (CC BY-NC-SA 4.0)

ABSTRACT

Background: Primary postpartum hemorrhage (PPH) often encountered during caesarean sections and uterine atony itself is the single leading cause in almost 80% of cases. Recent interest on the surgical compression sutures for the treatment of massive atonic PPH has come up in the front line not only for its easy applicability, but also for its uterine salvage and future fertility preserving procedure. **Aims and objectives:** 1) To determine the efficacy of modified B-Lynch (Hayman's technique) procedure over other surgical technique in managing atonic PPH; 2) To determine how this procedure obviates the need for hysterectomy in young mothers; 3) Short term maternal outcome. **Methodology:** This is an ethically approved hospital based prospective study, conducted at Midnapore Medical College, West Bengal, India, from January 2019 to April 2020. Atonic PPH mothers ineffective to medical management during LSCS were included as 'study cases' and applied either modified B-Lynch stitches (Group-A, n=100) or stepwise pelvic devascularization technique (Group B, n=100) with proper counseling and written consent prior to operation. **Results:** Among modified B-Lynch group (group - A), 93% cases found to be successful to control PPH; in other surgical group (group - B) 82% cases were found successful which is statistically significant ($p < 0.05$). Those having risk factor for atony like post CS and repeat CS pregnancy ($p < 0.05$), multiparity ($p < 0.05$), prolong labor ($p < 0.05$), anaemia ($p < 0.05$) and PIH ($p < 0.05$) achieved statistically significant success among group - A than group - B. Other statistically significant favorable parameters that were found in modified group - A were less mean duration of operation ($p < 0.05$), less mean intra-operative blood loss ($p < 0.05$), less hospital stay ($p < 0.05$), less first 6 hour postoperative bleeding ($p < 0.05$), less post-operative blood product requirements ($p < 0.05$) and less number of mothers having ICU/HDU admissions ($p < 0.05$). Requirement of general anesthesia found to be less among group A in comparison to group B ($p < 0.05$). **Conclusion:** Modified B-Lynch uterine compression suture can be a useful alternative to radical surgeries in primary massive atonic PPH which are unresponsive to medical management. It is safe, easier to perform, requires less expertization, less time consuming and with minimum complications. It can be performed in low resource environment and an excellent uterine salvage procedure.

Keywords: Postpartum hemorrhage, uterine atony, modified B-Lynch technique, perinatal hysterectomy.

Post partum hemorrhage (PPH) is the leading cause of maternal morbidity and mortality all over the world¹ and refers blood loss estimated in more than 500 ml in first 24 hours after vaginal delivery, greater than 1000 ml after a

caesarean or blood loss that causes hemodynamic instability in the postpartum² making it necessary to transfer blood products³. It is still one of the main challenges in obstetric care despite many advances in modern medicines and

Received: 22nd January 2022, Peer review completed: 4th August 2022, Accepted: 10th August 2022.

Dusgupta A, Pal A, Saha PK, Dash KK, Mondal B. The efficacy of Hayman's modified B - Lynch compression suture versus other surgical techniques to control atonic postpartum hemorrhage - an experience from a tertiary teaching institute. The New Indian Journal of OBGYN. 2024; 11(1): 118 - 23.

surgical techniques. Uterine atony singly responsible for almost 80% cases of primary PPH⁴. The varieties of treatment modalities like bimanual compression, medications like oxytocin, ergometrine and prostaglandins, which are otherwise safe and effective, sometimes appear to be ineffective. Various surgical methods for reducing vascular blood flow in the pelvis are well established, i.e. from bilateral uterine artery ligation to more complicated ligation of utero-ovarian anastomosis and ligation of anterior division of internal iliac artery. The later procedure requires enormous surgical skills and can't be possible by every obstetrician at crucial moments.

Recently interest in the surgical compression sutures for the treatment of massive PPH has come up in the front line⁵⁻⁷. The principle of this technique is to oppose anterior and posterior uterine walls tightly together with the help of two vertical brace sutures over the uterus resulting in continuous compression⁵. B - Lynch pioneered this technique, applied on PPH achieved great success, thus avoiding hazardous pelvic surgery and potentially preserving future fertility⁵. Modification to the original B-Lynch suture by Hayman may have the advantage as it is easy to perform, need less skill, can be done without opening the uterine cavity and uterine walls can be more tightly brought together by two separate sutures rather than a single continuous suture as described by B Lynch⁷. The aim of the study was to determine the efficacy of modified B-Lynch suture (Hayman's technique) in the management of atonic PPH and to establish it as uterine salvage procedure in comparison to other surgical methods⁸.

Objectives -

1. To determine the efficacy of modified B-Lynch (Hayman's technique) procedure over other surgical techniques in managing atonic PPH.
2. To determine how it's timely application obviates the need for hysterectomy in young patients.
3. Short term maternal outcome.

Methods

This was ethically (MMC/IEC/2019/193) approved hospital based prospective observational study which was conducted at Midnapore Medical College, West Bengal, India, during a period from January 2019 to April 2020. Average yearly delivery of this peripheral medical college during 2018 - 19 was 13305, of which number of vaginal and caesarean delivery was 8919 and 4386 respectively.

Atonic PPH mothers ineffective to medical management during LSCS were included as 'study cases'. The study

population included 200 women divided into two groups and was randomly allocated in any of the two groups. Group A (case) included 100 women underwent modified B-Lynch and group B (control) also included 100 women underwent other surgical procedure to manage atonic PPH. All the operative procedures were performed by highly experienced and skilled obstetricians who were well conversant with all these surgical techniques.

In group A, those who responded were recorded as B Lynch success, and those not were as B Lynch failure and were tried in addition with step wise pelvic devascularization techniques/ internal iliac artery ligation or perinatal hysterectomy depending upon the situation.

In group B i.e. other surgical technique, 100 control subjects are taken randomly and given step wise pelvic devascularization techniques/internal iliac artery ligation to control PPH; if failed, perinatal hysterectomy was undertaken.

Inclusion criteria include patients carrying 34-42 weeks pregnancy with primary atonic PPH during LUCS with failed medical management and not completed her family. Those patients who were not giving consent, PPH following vaginal delivery or causes other than atonicity, bleeding disorders, previous two LUCS or complications that have aroused during LUCS (like bladder injury) were excluded from the study.

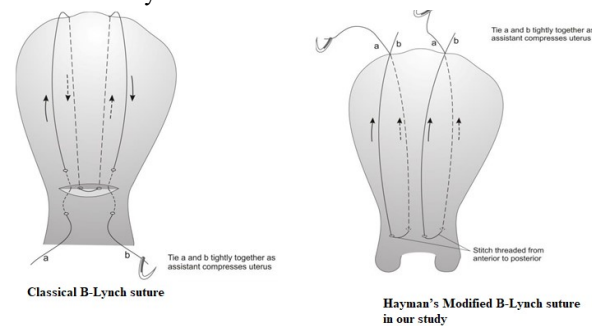


Figure 1: Diagrams showing classical B-Lynch suture and Hayman's modified B-Lynch suture

Original B-Lynch technique uses a continuous suture to envelop and mechanically compress the uterus in an attempt to control PPH and thus to avoid hysterectomy⁵. Hayman's suture, a modification of B-Lynch suture, offers a potential advantage of much easier and less time consuming procedure, even avoiding a lower segment incision when PPH follows a vaginal delivery⁸.

Modified B - Lynch (Hayman's) suture (figure 1): Original B-Lynch technique uses a continuous suture to

envelop and mechanically compress the uterus in an attempt to control PPH and thus to avoid hysterectomy⁵. In modified B - Lynch (Hayman's) suture technique, after delivery of fetus and placenta in LSCS, uterus was exteriorized and rechecked to identify any bleeding point. If bleeding found to be diffuse in nature, then simple bimanual compression applied first to assess the effect of compression. When bleeding found to be decreased as confirmed by vaginal swabbing, there were potential chances of success by compression sutures. After the closure of caesarean incision, a straight or curved needle was used which pierced the lower segment from front to back just above the reflection of bladder fold, one on either side of angle of LSCS incision. The two sutures tied separately at the fundus of the uterus while assistant compress the uterus at the same time, or sometimes more than two sutures can be applied if uterus found to be broad⁹. No 1 chromic catgut was used as compression sutures. After the procedure was over, the vagina was swabbed again to confirm satisfactory control of bleeding.

Other surgical methods - 100 other surgical cases taken with other methods like stepwise selective pelvic devascularization, bilateral uterine artery ligation, utero-ovarian anastomosis ligation or bilateral internal iliac artery ligation were undertaken either single or in combination as uterine salvage procedures, failing which total or subtotal hysterectomy was done as life saving resort. Blood loss estimation - The blood loss was estimated¹⁰ by measuring the amount of blood suctioned out in suction apparatus after the placental delivery and by mops soaked with blood. The clots and blood from the vagina were collected in a separate kidney tray and measured. Approximately 1 gram of blood clot was considered equivalent to 3 (ml) milliliter of blood loss. The total amount of blood loss was estimated by adding all the values and subtracting the amount of liquor measured following amniotomy.

Data collection - A detailed record regarding patient's age, parity, gravida, gestational weeks at which caesarean section done, indication of caesarean section, cause and type of PPH was kept. A detailed medical history was also taken

to rule out any contraindication regarding use of uterotonics. Surgical procedure was undertaken only when conservative medical management failed.

Data analysis - Collected data were entered in to Microsoft Excel Spread sheet and analyzed by SPSS 25.0 and Graph Pad Prism Version 5. Data has been summarized as mean and standard deviation for numerical variables and count and percentage for categorical variables. Two sample t - tests for a difference in mean involved independent or unpaired samples. Unpaired proportions were compared by Chi-squared test or Fischer's exact test as appropriate. The student t test was used to determine whether two interdependent samples were selected from populations having the same distribution. A p-value ≤ 0.05 was considered statistically significant.

Results

Out of total 200 cases of atonic PPH came to face during caesarean section, 100 (Group A) had applied modified B - Lynch (in our case Hayman's technique) of which 93 cases (93%) found to be successful to control bleeding whereas 7 (7%) cases failed (p-value 0.004194) to do so. Those failed cases then tried other methods like stepwise selective pelvic devascularization or bilateral internal iliac artery ligation as uterine salvage procedures, failing which total or subtotal hysterectomy was done as life saving resort. In other group (control group, group B), 100 cases were tried with other

Table 1: Comparison of different demographic - clinical, antenatal, intraoperative and postoperative variables (multiple risk factors persisted in each subjects)

Different variables	Group A (N=100)	Group B (N=100)	P value
Mean age in years	22.87±5.133	22.26± 4.021	0.350
Mean gestational age in weeks (Mean ±SD)	37.03 ±3.076	37.69 ±1.862	0.0679
Number of previous LUCS among groups	4	8	0.000284
Incidence of PIH	51	16	<0.0001
Incidence of labor induction	46	50	0.4237
Incidence of multifetal pregnancy	12	6	0.0115
Incidence of prolonged labor	11	18	0.0684
Incidence of operative anesthesia (GA : SA)	9:91	21:79	0.00321
Average operative time distribution (Min) (Mean ±SD)	48.56 ±2.74	70.43 ±6.31	<0.005
Average HB% (gm) on admission (Mean ±SD)	10.745 ±1.00758	10.353±0.567	0.00084
Fetal weight (live) in kg (Mean ±SD)	2.5049±0.61023	2.20 ±0.3011	0.000018
Blood products requirements	28	32	0.3911
Distribution of unbooked and booked cases	12/88	14/86	0.564

surgical methods to control PPH, failing which subtotal or total hysterectomy were undertaken. The detailed results were given in table number 1, 2, 3, 4, 5 and 6 respectively.

In modified B - Lynch group, the mean Hb on admission of patients was 10.76 ± 1.0124 gm/dl whereas in other surgical group was 10.353 ± 0.5675 gm/dl. In modified B - Lynch success, the mean Hb on immediate postoperative period of patients was 10.418 ± 1.0193 gm/dl. In among other surgical group, the mean Hb on 24hrs postoperative period

of patients was 9.91 ± 0.0438 gm/dl. Association of Hb difference in two groups was statistically significant ($p < 0.05$).

Table 2: Comparison of risk factors for atony between modified B - Lynch (group A) and other surgical group (group B) (multiple risk factor present in single subject)

Risk factors for atony	Group A (N=100)	Group B (N=100)	P-value
Multiparity	44	55	0.027
HB% (<11.0gm)	70	89	<0.001
Prolonged labor	11	18	0.0684
Multifetal pregnancy	12	6	0.011
Fetal macrosomia	1	0	0
Induction of labor	46	50	0.423
Pregnancy induced hypertension	51	16	<0.001

Table 3: Comparison of postoperative Hb% change between modified group A and group B

Total study population (n=100)	Group A (N=100)	Group B (N=100)	P-value
Average Hb% on admission	10.724	10.353	0.0142
SD	1.0124	0.5675	
Average Hb% immediate post operative	10.418	9.91	0.003122
SD	1.0193	0.0438	
Difference in Hb%	0.324	0.443	0.00953

Table 4: Post operative status among study subjects

Post operative events	Group A (N=100)	Group B (N=100)	P-Value
Hospital stay in days (Mean \pm SD)	6.84 \pm 0.091	7.1 \pm 1.23	0.0008
Hb% (gm) change immediate post op	0.324	0.443	0.0031
Blood transfusion	54	72	<0.005
Wound complications	7	22	<0.05
Fever (>100 degree F)	2	5	0.16867
ICU admission	17	33	0.00067
Hysterectomy	7	18	0.00419
Bladder injury	2	9	0.0144
Relaparotomy	1	3	0.2410

Table 5: Fetal outcome among study subjects

Apgar score at 5 minutes	Apgar < 7	Apgar > 7	P value
Group A (N=100)	27	73	<0.00001
Group B (N=100)	31	69	

Table 6: Surgical outcome of group A and group B

Categories	Group A	Group B	P value
Success	93	82	0.0041
Failed/hysterectomy	7	18	

Discussion

Unfortunately many women die during or after delivery and PPH accounts for most cases of maternal mortality in developing countries¹¹. It may occur after vaginal delivery in 4% of cases¹² and after caesarean section in 6% of cases¹³. Severe PPH increases the need for blood transfusions, obstetric hysterectomies¹⁴ and other complex emergency surgical procedures. Fortunately, majorities of PPH cases can

be controlled with conservative treatment like uterine massage, bimanual compression, uterotonics and sometimes balloon tamponade¹⁴. If all these measures failed to manage PPH due to uterine atonicity, different compression sutures (B-Lynch, modified B-Lynch or multiple square sutures) or stepwise devascularization technique are tried with variable outcomes and still may end up in emergency hysterectomy in some cases^{14, 15}. In fact, it should be keep in mind that, after trying all these conservative medical and surgical procedures and eventually failed, caesarean hysterectomy at that stage is always very difficult, challenging and risky procedure¹⁶.

The mean age in our study subjects was 22.87 ± 5.133

years in group A and 22.26 ± 4.021 in group B which was similar to that of 26.6 years found in a study by Kalkal N et al in Mumbai, India¹⁷, can be explained by early age of marriage and conception as in developing world status. The mean gestational age was 37.03 ± 3.076 weeks in group A and 37.69 ± 1.862 in group B and comparable with studies done by Vachani et al¹⁸,

Nalini et al¹⁹ and Kalkal et al¹⁷, clearly suggests that compression suture had intervened at term pregnancy. In group A 4% had past history of one caesarean section and 1% had repeat caesarean section in whereas group B having 8% h/o caesarean section that had failed to control PPH and is statistically significant ($p < 0.0005$).

In group A, the average duration of operation among patients was 48.56 ± 2.74 min whereas in group B, average duration was 70.43 ± 6.31 min. Association of operation duration in two groups was statistically significant ($p < 0.05$). In our study, spinal anesthesia was given in 91(91%) subjects in group A and 9 (9%) was given general anesthesia whereas 21 (21%) cases was given general anesthesia in group B. It has revealed that increased requirements of general anesthesia among failure group and group B was due to longer duration of operative intervention which is statistically significant ($p < 0.05$).

There are multiple co-factors present either singly or in combination, may be responsible for initiation of uterine atony and PPH though the exact etiology is unknown. In group A, multiparity among study subjects was 44 whereas in group B, it was 55 which is comparable to 46.6% of Gadappa SN et al²⁰. Thus, multiparity is a risk factor for atonicity and increased multiparty found among group B which was statistically significant ($p < 0.05$).

In group A, the multifetal pregnancy among study subjects was 12 whereas in group B, it was 6 and is

comparable with 7% of Nalini et al¹⁹ and 4% by Gadappa et al²⁰. The study showed modified B-Lynch compression suture is a good option in the management of atonic PPH due to multifetal pregnancy. In group A, PIH patients was 51 whereas in group B, PIH patients was 16 and statistical association was significant ($p < 0.05$). In group A, the rate of labor induction among subjects were 46% whereas in group B, it was 50%; association of this co-factor between two groups was statistically non-significant ($p < 0.05$). In a similar way, association of prolonged labor found to be insignificant between the two groups ($p > 0.05$).

The mean Hb (gm %) in group A on admission was 10.724 ± 1.012 gm%, whereas in group B, it was 10.353 ± 0.567 gm%, was statistically insignificant ($p > 0.05$) proves homogenous association of the groups and can be comparable to study done by Kalkal N et al¹⁷ where it was 10.16 gm%. The mean Hb% concentration on immediate postoperative period in group A was 10.418 ± 1.019 gm% and group B was 9.91 ± 0.0438 gm% which was statistically highly significant ($p < 0.005$) and proves the effectiveness of modified B-Lynch technique.

In our study, Hb% change after immediate postoperative period among the patients of group A was 0.324 gm% whereas in group B, Hb change among the patients was 0.443 gm% which is comparable to 0.8 gm% (0.3 - 1.8) by a study done by Vachani et al¹⁸. It showed more blood loss among other surgical failure group and is statistically significant ($p < 0.05$).

The average duration of hospital stay among patients in group A was 6.84 ± 0.091 days compared to 7.1 ± 1.23 days among group B patients, suggestive of increased bed occupancy in later group and statistically highly significant ($p < 0.005$). In our study, number of patients having more than average bleeding during first 6 hour postoperative period in group A was 7/100 (7%) whereas in group B the number of patients were 22/100 (22 %) and is statistically significant ($p < 0.05$). In modified B-Lynch group, blood products requirements among patients were 28%, whereas in other surgical group, requirements were 32% in comparison to 16.67% of study done by Kalkal et al¹⁷ suggestive of increased blood product requirements among other surgical group in respect to modified B-Lynch group ($p < 0.005$). In our study, number of ICU/HDU admission among patients of group A were 17 (17%) whereas in group B, the number of admissions were 33 (33%) concludes more admission in moribund conditions among other surgical group and statistically significant ($p < 0.005$).

Limitations: Like all other studies, our study has few limitations: As the study comprising of a small sample size, extensive study with larger sample needed to evaluate the efficacy of this modified technique. The study duration was one year, causing constraints and variation in the study sample; a long term study would produce more reproducible data. Long term follow up of study subjects could not be done in our study, thus prediction of future fertility impact analysis was not possible. As it was a prospective observational study, it might have some selection bias because of urgency of the surgical methods and less time to take vital decisions.

Conclusion

Modified B-Lynch uterine compression suture (Hayman's technique) can be a useful alternative to radical surgeries in case of primary massive atonic PPH which are unresponsive to medical management. In comparison to other surgical methods (e.g. Stepwise pelvic devascularization, internal iliac artery ligation and perinatal hysterectomy), it is safe, easier to perform, requires less expertization, less time consuming and with minimum complications. It can be performed even in low resource environment. This procedure has a high success rate (87%) to control atonic PPH where medical management fails and where patient wants to retain fertility.

Conflict of interest: None. **Disclaimer:** Nil.

References

1. Guidelines Review Committee, Maternal, Newborn, Child & Adolescent Health & Ageing (MCA), Sexual and Reproductive Health and Research (SRH). World Health Organization. WHO recommendations for prevention and treatment of postpartum hemorrhage. Geneva: WHO; 2012.
2. American college of obstetricians and gynecologists. ACOG Practice Bulletin: clinical management guidelines for obstetricians & gynecologists member 76. Postpartum hemorrhage. *Obstet Gynecol.* 2006; 108: 1039-47.
3. Cabrera S. Hemorrhagia postpartio. *Rev Per Gynecol Obstet.* 56: 23-31.
4. Tamizin O, Arulkumaran S. The surgical management of postpartum hemorrhage. *Best Pract Res Clin Obstet Gynecol.* 2002; 16: 81-98.
5. B Lynch C, Coker A, Lawal AH, Abu J, Cowen MJ. The B Lynch surgical technique for control of massive

- postpartum hemorrhage: an alternative to hysterectomy? Five cases reported. *Br J Obstet Gynecol.* 1997; 104: 372-5.
6. Ferguson JE, Bourgeois FS, Underwood PB. B-Lynch suture for postpartum hemorrhage. *Obstet Gynecol.* 2000; 95:1020-2.
 7. Hayman RG, Arulkumaran S, Steer PJ. Uterine compressor sutures: surgical management of postpartum hemorrhage. *Obstet Gynecol.* 2002; 99: 502-6.
 8. Ghezzi F, Cromi A, Uccella S, Raio L, Bolis P, Surbek D. The Hayman's technique: a simple method to treat postpartum hemorrhage. *BJOG.* 2007; 114: 362-5.
 9. Ghodake VB, Pandit SN, Umbardand SM. Role of modified B-Lynch suture in modern day management of atonic postpartum hemorrhage. *JOGC, Bombay hospital journal.* 2008; 50: 206-7.
 10. Kalkal N, Sarmalkar MS, Nayak AH. The effectiveness of B-lynch sutures in management of atonic postpartum hemorrhage during caesarean section. *Int J Reprod Contracept Obstet Gynecol.* 2017; 5(9): 2915-20.
 11. World Health Organization. Maternal Mortality. A Global Factbook. Geneva: WHO;1991.
 12. Combs CA, Murphy EL, Laros Jr RK. Factors associated with postpartum hemorrhage with vaginal birth. *Obstet Gynecol.* 1991; 77(1): 69-70.
 13. Prasertcharoensuk W, Swadpanich U, Lumbiganon P. Accuracy of blood loss estimation in the third stage of labor. *Int. J Gynecol Obstet.*2000; 71(1): 69-70.
 14. Weisbrod AB, Sheppard FR, Chernofsky MR. Emergent management of postpartum hemorrhage for general and acute care surgeon. *World Journal of Emergency Surgery.* 2009; 4(1): 43.
 15. Hwu YM, Chen CP, Chen HS, Su TH. Parallel vertical compression sutures: a technique to control bleeding from placenta praevia or accreta during caesarean section. *BJOG.* 2005; 112(10): 1420-3.
 16. Matsubara S, Kuwata T, Usui R, Watanabe T, Izumi A, et al. Important surgical measures and techniques at caesarean hysterectomy for placenta previa accreta. *Acta Obstet Gynecol Scand.* 2013; 92: 372-7.
 17. Kalkal N, Sarmalkar MS, Nayak AH. The effectiveness of B-Lynch sutures in management of atonic postpartum hemorrhage during caesarean section. *Int J Reprod Contracept Obstet Gynecol.* 2017; 5 (9): 2915-20.
 18. Vachani M, Virkud A. Prophylactic B-Lynch suturing emergency caesarean section in women at high risk of uterine atony: A pilot study. *Internet J Gyne Obst.*2007; 7(1):1-8.
 19. Nalini N, Singh JK. B-Lynch suture- an experience. *J Obstet Gynecol.* 2010; 60 (2):128-34.
 20. Gadappa SN, Gavit YB, Sharma D, Mahajan R. Study of efficacy of compression suture in the surgical management of atonic PPH. *Int J Reprod Contracept Obstet Gynecol.* 2018; 7: 4261-6.
-
- Anjan Dasgupta¹, Abirbhab Pal², Pradip Kumar Saha³, Kamal Kumar Dash⁴, Bivash Mondal⁵**
¹ Associate Professor, Midnapore Medical College, Medinipur, WB, India; ² Senior Resident, Midnapore Medical College, Medinipur, WB, India; ³ Assistant Professor, Midnapore Medical College, Medinipur, WB, India; ⁴ Assistant Professor, Midnapore Medical College, Medinipur, WB, India; ⁵ RMO, Midnapore Medical College, Medinipur, WB, India.