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Conservative Surgical Management of Refractory Uterine Atony During Caesarean Section: A Case Series from Secondary-Level Hospitals

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Abstract: ***Background*: Post partum haemorrhage (PPH) is a common obstetric emergency, uterine atony being the leading cause, contributing to increased risk of maternal morbidity and mortality. *Purpose of the study*: To report experience with uterine compression suture, on atonic uterus refractory to medical management in low resource setting. *Methods*: 3 primigravida developed refractory uterine atony during full term lower segment caesarean section between July and December 2025 at secondary level hospitals in Ahmedabad, Gujarat. All patients received stepwise uterotonics followed by surgically intervention- bilateral uterine artery ligation and Hayman and Cho compression sutures. *Results*: Haemostasis was achieved in all cases with compression sutures. No patient had any subsequent episodes of post-partum haemorrhage and none of them required any further intervention post compression sutures. Their postoperative recovery was uneventful. *Conclusion*: Hayman and Cho compression sutures are simple, effective, life-saving and fertility preserving surgical approach in the treatment of atonic uterus refractory to medical management. Their use in atonic uterus in secondary care setting was to treat patient and prevent further blood loss and its complications.***

Keywords: Atonic uterus, uterine compression suture, Hayman suture, Cho suture.

Take home message: Prompt escalation from medical to surgical management with uterine compression sutures can be adopted in refractory cases of atonic uterus in local obstetric units to prevent hemodynamic shock and its consequences.

1. Introduction

Postpartum haemorrhage (PPH) is a serious and life-threatening obstetric emergency.

Incidence Rates:
General**:** 1%–10% of all deliveries, with a pooled prevalence of 12.6% for ≥ 500 ml blood loss.[1]

PPH after vaginal birth was 12.6% and after caesarean birth was 8.2%[1]

PPH is a major cause of morbidity and mortality. It accounts for 1 death every 6 minutes worldwide, occurring mainly in low and middle-income countries.[2]

Definition: WHO defines PPH as blood loss of more than 500 mL within 24 hours after birth.[2] Severe PPH is blood loss of 1000 ml or more in the first 24 hours after birth.[3]

PPH is a major cause of maternal morbidity, with sequela such as hemodynamic shock, renal failure, acute respiratory distress syndrome, coagulopathy, and Sheehan's syndrome.
PPH due to uterine atony (70-80%) is the most common cause.[4] Other causes include retained products of conception, trauma related bleeding and coagulopathy.

Conventionally, the first-line treatment options for atonic PPH include conservative management with fluid replacement, uterine massage, uterotonic drugs (oxytocin or prostaglandins), while second-line therapy includes uterine balloon tamponade, , or embolization of the uterine artery.[5,6]
For atonic uterus refractory to medical management- surgical options to control bleeding include selective devascularisation by ligation of uterine and other pelvic arteries, external compression with uterine sutures and hysterectomy.[5,6]

Uterine sparing surgical procedures to treat PPH refractory to medical management includes vessel ligation and uterine compression sutures. In 1997, B-Lynch described a technique of uterine compression suture to control PPH. Modifications of the original technique, as well as various other suturing techniques includes Hayman suture and Cho procedure.[7]

Current case series was conducted after ethics committee permission. 3 primigravida who developed refractory uterine atony during FTLSCS at district and sub-district level of hospitals in Ahmedabad, Gujarat, were successfully managed with conservative surgical technique- bilateral uterine artery ligation and uterine compression sutures. The compression suture techniques employed in this series were Hayman and Cho sutures.

In all 3 patients, haemostasis was achieved without the need for additional interventions. No patients required further escalation of care, and their postoperative recovery was uneventful.

Case 1
19 years old primigravida at 40+5 weeks gestation (5 days postdate) with gestational hypertension underwent emergency FTLSCS for fetal distress under spinal anesthesia, at District hospital, Singarva, Ahmedabad on July 26, 2025.

Intraoperatively, abdomen was entered, lower segment caesarean section performed, and a male child of 3kg was delivered in good condition. Anterior placenta was delivered completely by controlled cord traction with all its membranes. Intraoperatively, uterus was found to be atonic despite on Inj. Oxytocin 40 IU in 500 ml NS. Immediate bimanual uterine compression was performed.

Medical management with Uterotonics: Inj. Oxytocin infusion 50 IU in 50 ml NS at 3ml/hr, Inj. Carboprost 250 mcg IM (3 doses at 15-min intervals), Tablet Misoprostol 1000 mcg PR, Inj. Tranexamic acid 1 gm IV

No active bleeding was noted from the placental site and uterine closure done with polyglactin 910 No. 1 in continuous locking fashion. No active bleeding from uterine closure site noted, but uterine atony persisted. Obstetric emergency of atonic uterus was explained to relatives and surgical management commenced after their consent.

Surgical management: Bilateral uterine artery ligated with polyglactin 910 No. 1 suture.

Due to persistent uterine atony- 2 Hayman compression sutures and 2 Cho compression sutures placed in the upper uterine segment with polyglactin 910 on a straight needle as shown in the image 1. Adequate uterine tone and haemostasis were achieved following these interventions. An intraperitoneal drain was placed prior to abdominal closure.

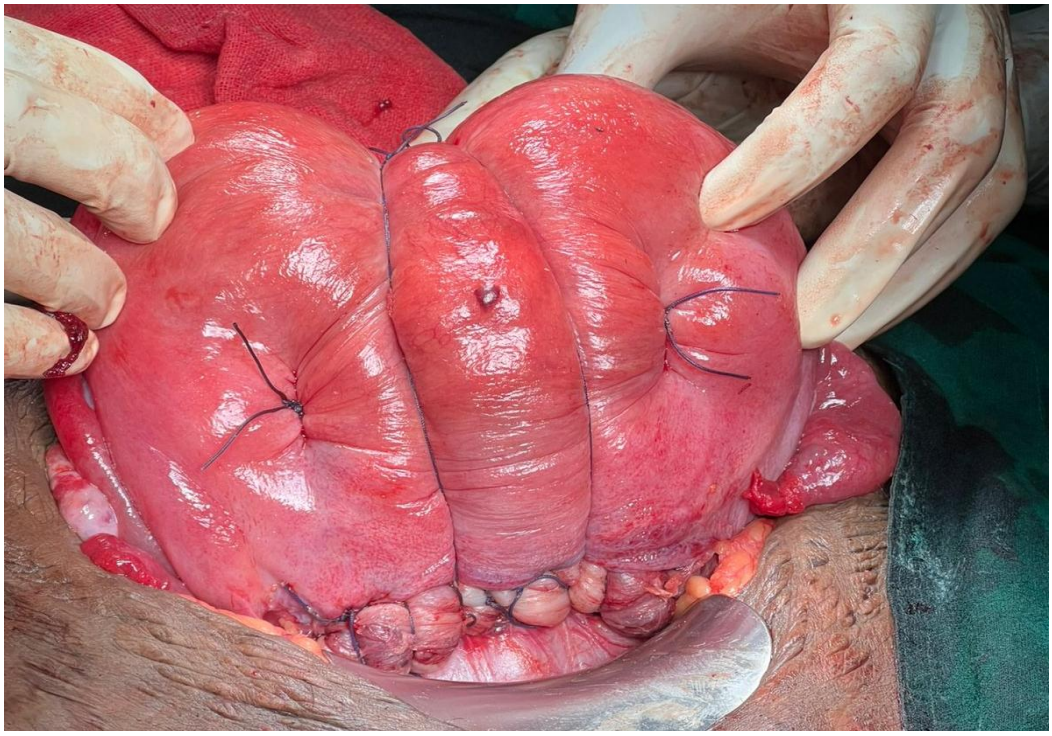

Image 1: showing anterior view of uterus showing 2 Hayman and 2 Cho compression sutures taken in case 1.

Estimated blood loss was about 800 to 1000ml. Before abdominal closure, vagina was swabbed to confirm that loss was minimal.

She received 1 unit of PRBCs perioperatively and vitally stable patient was referred to tertiary center for intensive care unit monitoring after delivery. She received 1 additional unit of PRBCs at higher center. Her postoperative recovery was uneventful. No further episodes of PPH occurred during the puerperium. She was discharged on postoperative day 5 in stable condition.

Case 2

20 years old primigravida at 41 weeks gestation (7 days postdate), Rh negative (A negative) underwent elective FTLSCS i/v/o CPD under spinal anesthesia, at District hospital, Singarva, Ahmedabad on August 30, 2025.

Intraoperatively, abdomen was entered, lower segment caesarean section performed, and a female child of 3.4kg was delivered, thick meconium-stained liquor was noted, neonate was handed to pediatrician. Fundal placenta was delivered by controlled cord traction completely with all its membranes, but after this, uterus became atonic despite on Inj. Oxytocin 20 IU in 500 ml NS. Bimanual uterine compression was initiated.

Medical management with sequential uterotonics: Inj. Oxytocin 20 IU in 500 ml NS followed by Inj. Oxytocin infusion 40 IU in 500 ml NS, Inj. Carboprost 250 mcg IM (5 doses at 15-minute intervals), Inj. Carboprost 250 mcg intra-myometrial (single dose), Inj. Methylergometrine 0.2 mg IV, Tablet Misoprostol 1000 mcg PR, Inj. Tranexamic acid 1 gm IV.

No active bleeding was observed from placental bed. The uterine incision was closed with polyglactin 910 No. 1 in continuous locking fashion, there was no active bleeding from uterine closure site; however, uterine atony persisted.

After counselling relatives regarding the obstetric emergency of atonic uterus, surgical management was commenced after their consent.

Surgical management: Bilateral uterine artery ligated with polyglactin 910 No. 1 suture.

Due to persistent uterine atony- 2 Hayman sutures and 3 Cho compression sutures in upper segment of uterus were taken with polyglactin 910 as shown in the Image 2 (a) and (b). Adequate uterine tone and haemostasis were achieved following these interventions. An intraperitoneal drain was placed prior to abdominal closure.

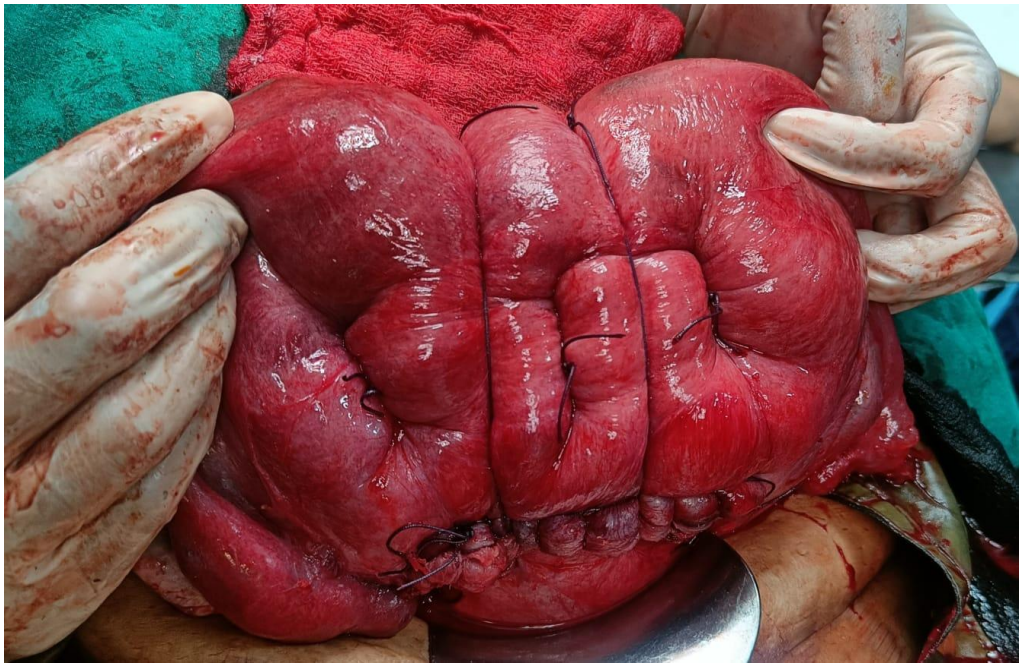

Image 2 (a): showing Anterior view of uterus with 2 Hayman and 3 Cho compression sutures taken in case 2.

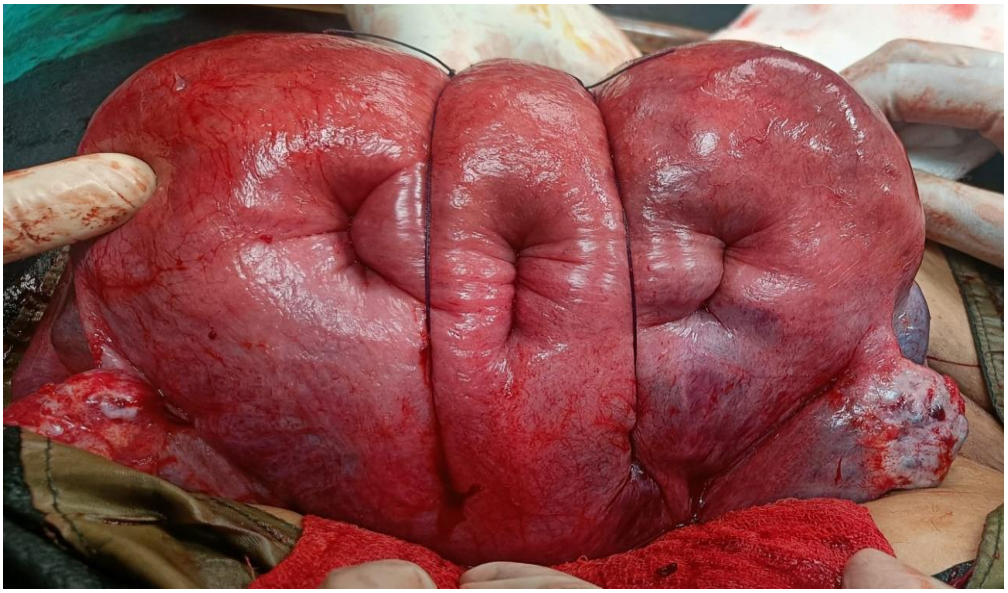

Image 2(b) showing Posterior view of uterus with 2 Hayman and 3 Cho compression sutures taken in case 2.

Estimated blood loss was about 1000 to 1100ml, Hemoglobin dropped from 10gm/dl preoperatively to 7.9gm/dl postoperatively. Vaginal swabbing prior to abdominal closure confirmed minimal ongoing bleeding.

The patient received 1 unit of PRBCs perioperatively and vitally stable patient was referred to tertiary center for intensive care unit monitoring after delivery. 2 additional units PRBCs were transfused at higher center. Inj. Anti-D 300 mcg IM and broad-spectrum higher antibiotics were given.

Her postoperative recovery was uneventful. She experienced no further episodes of PPH during puerperium and was discharged on postoperative day 6 in stable condition.

Case 3

28 years old primigravida at 39weeks 4 days gestation presented with PROM of 6 hours duration. She underwent emergency FTLSCS for CPD + PROM under spinal anesthesia, at sub-district hospital, Viramgam, Ahmedabad on December 31, 2025

Intraoperatively, abdomen was entered, lower segment caesarean section performed, and a male child of 3.4kg was

delivered in good condition. Anterior placenta was delivered completely by controlled cord traction. Intraoperatively, uterus was found to be atonic despite on Inj. Oxytocin 20 IU in 500 ml NS. Bimanual uterine compression initiated. No active bleeding was observed from the placental site.

Medical management with Uterotonics: Inj. Oxytocin 40 IU in 500 ml NS followed by Inj. Oxytocin infusion 50 IU in 50 ml at 3ml/hr, Inj. Carboprost 250 mcg IM (3 doses at 15-min intervals), Inj. Carboprost 250 mcg intramyometrial (single dose), Inj. Methylergometrine 0.2 mg iv, Tablet Misoprostol 1000 mcg PR, Inj. Tranexamic acid 1 gm iv (2 doses, 1 hour apart).

The uterine incision was closed with polyglactin 910 No. 1 in continuous locking fashion. No active bleeding was observed from uterine closure site.

Despite these measures, uterine atony persisted. Obstetric emergency of atonic uterus was explained to relatives and surgical management commenced after their consent.

Surgical management: Bilateral uterine artery ligated with polyglactin 910 No. 1 suture.

For persistent atonic uterus, 2 Hayman sutures and 2 Cho compression sutures in upper uterine segment were taken with polyglactin 910 on a straight needle as shown in Image 3. Adequate uterine tone and haemostasis were achieved following these interventions. Intraperitoneal drain was placed prior to abdominal closure.

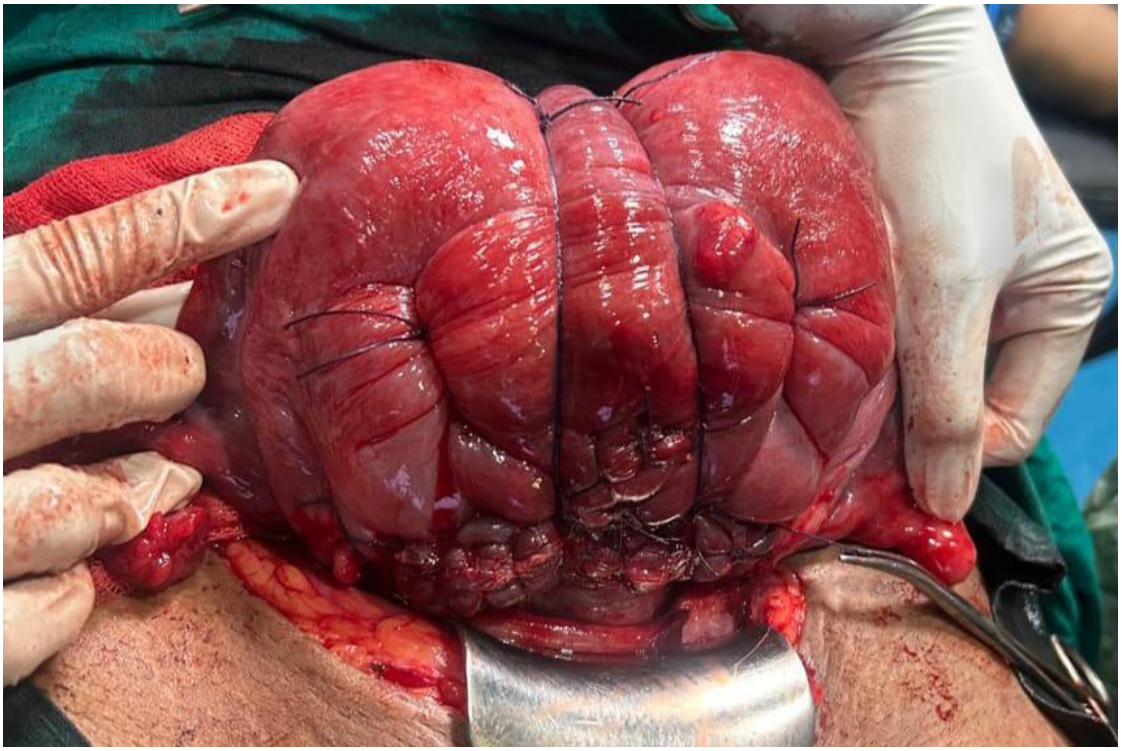

Image 3 showing anterior view of uterus showing 2 Hayman and 2 Cho compression sutures taken in case 3.

Estimated blood loss was about 1300 to 1400ml. Vaginal reassessment confirmed minimal bleeding prior to abdominal closure.
She received 1 unit of PRBCs perioperatively and vitally stable patient was referred to tertiary center (Civil hospital, Asarwa, Ahmedabad) for intensive care unit monitoring. 3 additional units PRBCs were transfused at higher center. Her postoperative recovery was uneventful. No further episodes of PPH occurred during puerperium. She was discharged on postoperative day 5 in stable condition.

2. Technique

Hayman suture
Aim - Transfixing the entire uterine wall.

Vertical compression suture placed, with polyglactin 910 No. 1 on a straight needle, below left lower edge of uterine closure and medial to edge of lower segment, passing the needle from anterior to posterior wall, care being taken to protect the bowel. This was tied over the fundus of uterus with surgical knot, while assistant applied bimanual compression to uterus. Similar procedure was repeated on right side.

Cho suture
Polyglactin 910 No. 1 on a straight needle was passed from anterior to posterior uterine wall and then from posterior to anterior uterine wall to approximate both walls in a square manner.

3. Discussion

Despite adequate uterotonic therapy, the uterus remained atonic without significant active bleeding from the placental bed, suggesting global uterine atony.

The results from this case series suggest that compression sutures (Hayman and Cho techniques) is an effective and safe

surgical measure to control haemorrhage while preserving the uterus. Early escalation from medical to surgical intervention prevented progression to massive haemorrhage and its consequences.

In this case series none of the patients had any adverse outcome post-surgical management. Fertility-preserving surgical techniques can be successfully implemented at secondary-level healthcare facilities.

4. Conclusion

Hayman and Cho compression sutures placed on postpartum uterus due to atonicity may provide simple surgical step to control bleeding when routine oxytocic measures have failed. They are easy, quick to perform, safe, effective, life-saving, uterine conserving surgical procedure for treating uncontrollable PPH due to atonic uterus especially in secondary care setting to stabilize patient and prevent further blood loss, before their transfer to tertiary care for further management. Timely decision-making and stepwise escalation are crucial in preventing severe maternal morbidity.

5. Implications for Clinical Practice

- Stepwise management of postpartum haemorrhage- beginning with uterotonics and progressing to surgical devascularization and compression sutures- remains the cornerstone of successful uterine preservation.
- Uterine compression sutures can be adopted as a part of surgical management of post-partum hemorrhage due to atonic uterus refractory to medical management in local obstetric units.
- Early escalation, timely transfusion, and appropriate referral are critical in resource-limited settings for the treatment of PPH and prevention of hemodynamic shock and its consequences.

Abbreviations

World Health Organization (WHO); Postpartum Haemorrhage (PPH); Full Term Lower Segment Caesarean Section (FTLSCS); Known case of (k/c/o); In view of (i/v/o); Packed Red Blood Cells (PRBCs); Cephalopelvic Disproportion (CPD); Premature Rupture of Membrane (PROM)

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