Uterine Compression Sutures as an Effective Treatment for Postpartum Hemorrhage: Case Series

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ABSTRACT

We evaluated the role of uterine compression sutures as a conservative treatment for postpartum hemorrhage (PPH) after failed medical treatment. We retrospectively reviewed the charts of all patients who delivered between 2003 and 2009 at a single tertiary care center and who underwent uterine compression sutures for PPH. Twelve women had uterine compression sutures for PPH. The mean age of the patients was 36.3 ± 5.2 years. The mean gestational age at delivery was 37.7 ± 2.0 weeks, and the average estimated blood loss was 2.1 ± 1.1 L. The mean procedure time to perform the uterine compression sutures was 9.3 ± 2.8 minutes. The success rate of compression sutures was 92% with only one failure resulting in a hysterectomy. Uterine compression sutures are an effective method for the treatment of PPH, thus avoiding hysterectomy and preserving potential fertility.

KEYWORDS: Fertility, postpartum hemorrhage, uterine compression sutures

Postpartum hemorrhage (PPH) is an obstetric emergency that occurs in 1 to 5% of both vaginal and cesarean deliveries.[1,2] 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 is also one of the top five causes of maternal mortality in both developed and developing countries, although the absolute risk of death is much lower in the former than the latter (1 in 100,000 versus 1 in 1000 births).[2]

PPH is defined as estimated blood loss of ≥ 500 mL after vaginal delivery or ≥ 1000 mL after cesarean section.[3,4] Another definition of PPH is a reduction in the patient's hematocrit level of more than 10% compared with the prenatal value or blood loss causing hemodynamic instability of sufficient degree to require blood transfusion.[5,6]

Uterine atony is the most common cause of PPH, accounting for 80% of PPH cases.[7,8] Other causes include trauma-related bleeding that can be due to lacerations (perineal, vaginal, cervical, uterine), incisions (hysterectomy, episiotomy), or uterine rupture. Lacerations of the birth canal and uterus are more common after instrumental delivery. Acquired and congenital bleeding diatheses may be associated with thrombocytopenia and/or hemostatic defects (e.g., HELLP syndrome [hemolysis, elevated liver enzymes, and low platelet count], abruptio placentae, fetal demise, amniotic fluid embolism, and

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sepsis). Coagulopathy of massive blood loss may develop in women with severe hemorrhage.

The treatment of PPH depends on the underlying cause and includes both routine prophylactic measures during the time of delivery and additional treatment in cases of PPH. Prophylactic strategies, including the administration of oxytocin after delivery, have been shown to reduce the incidence of PPH from as much as 18% to around 5 to 8%.[9] Treatment of PPH due to uterine atony comprises medical and noninvasive treatment such as bimanual compression of the uterus, uterotonic medications, and placement of intrauterine balloon. Failure of medical treatment occurs in less than 1% of patients,[10] and surgical methods combined with resuscitative measures are usually used when conservative treatment fails. Hysterectomy is considered to be the final option when all conservative and surgical treatments fail. Postpartum hysterectomy not only leads to infertility but may also be associated with surgical difficulties and further complications including injury to adjacent organs such as bladder and ureters and infection. Surgical techniques that are aimed to preserve the uterus have been developed over the past 10 years. The procedure involves uterine compression sutures by bracelike suturing as was reported by B-Lynch[11] or U-type sutures.[5] Uterine compression sutures have been reported as an effective method in treating PPH and thus avoiding hysterectomy. However, the reported experience with this method is limited.

The aim of our study was to report our experience with uterine compression sutures and evaluate the role of uterine compression sutures in treating patients with PPH and failed conservative treatment.

MATERIALS AND METHODS

The study was approved by the local Research Ethics Board. We performed a chart review of all cases of PPH that occurred between January 2003 and July 2009 in Sunnybrook Health Sciences Centre, which is a tertiary center with ~3500 deliveries per year. We included all women who underwent uterine compression sutures after delivery during the study period. We did not exclude any patient from this report. There were around 25,000 deliveries during the study period. Twelve women with PPH due to uterine atony who were treated with uterine compression sutures after failing to respond to conservative measures were identified. Clinical, laboratory, surgical and follow-up data were extracted from the charts and by contacting the relevant physicians.

The procedure was performed in the face of persistent uterine atony, refractory to uterine massage, oxytocin infusion and bolus, methylergonovine or carboprost tromethamine (Hemabate) injections using the maximum dosage.

RESULTS

Maternal characteristics are summarized in Table 1. The mean age of the women was 36.3 years (range 30 to 47 years). Mean hemoglobin concentration before delivery was 12.3 ± 1.3 g/dL and after delivery was 8.4 ± 1.8 g/dL. All women delivered by cesarean section with a mean gestational age of 37.7 ± 2.0 weeks. The procedure was not performed in women who had PPH and delivered vaginally. The intraoperative details are summarized in Table 2.

Three women had B-Lynch sutures and the rest had U-type sutures compressing the anterior and posterior wall of the uterus. The mean operative time for performing the compression sutures was 9 minutes (range 5 to 14 minutes).

Cesarean section had been performed through a Pfannenstiel incision in all women. The uterus was exteriorized and the cavity thoroughly explored. If the bleeding was diffuse and no distinct source was identified, the uterus was compressed to assess whether the uterine compression sutures would be successful. The suture material was No. 1 Biosyn (Sichuan Biosyn Pharmaceutical Co., LTD, Deyang City, China) or 2/0 Caprosyn (Covidien, Mansfield, MA). Several sutures were inserted until the bleeding was controlled either with the B-Lynch technique or the U suture technique.[5] Two patients had a unilateral uterine artery ligation in addition to the compression sutures to control bleeding secondary to iatrogenic laceration during traumatic delivery. All the women tolerated the procedure well. Three women were transfused with packed red blood cells (ranging from 2 to 20 U). The procedure failed and resulted in a hysterectomy in one woman. This woman was a 32-year-old primiparous who had failed trial of forceps and therefore had an urgent cesarean section. She received 20 U packed red blood cells, 10 U platelets, 9 U fresh frozen plasma, and 4 U cryoprecipitate. All measures, including B-Lynch sutures and uterine packing, were performed and failed. There were no immediate postoperative

Table 1 Maternal Demographics and Characteristics

Characteristics	Mean ($n = 12$)
Age (y)	36.3 ± 5.2
Gravidity	3.5 ± 1.8
Nullipara (n)	8 (67%)
Singleton (n)	5 (42%)
Twins (n, %)	6 (50%)
Triplets (n,%)	1 (8%)
Mode of delivery	
Elective cesarean section	6 (50%)
Emergency cesarean section	6 (50%)
Gestational age at delivery (wk)	37.7 ± 2.0
Estimated blood loss (L)	2.1 ± 1.1
Predelivery hemoglobin (g/dL)	12.3 ± 1.3
Postdelivery hemoglobin (g/dL)	8.4 ± 1.8

Table 2 Characteristics of Women and Intraoperative Details

Case No.	Maternal Age	Parity	GA	Mode of Delivery	Concomitant Conditions	EBL (L)	Intraoperative Transfusions (U)	Other Procedures
1	30	0	35	C/S	Triples/Bicor Ut	3	4 PRBC	U-type
2	32	0	39	C/S	Failed forceps	5	20 PRBC, 9 FFP 4 Cryo, 10 Plts	B Lynch hysterectomy
3	33	0	37	C/S	Twins	1.4		U-type
4	32	1	38	C/S	Twins	2		U-type and L uterine a lig
5	32	0	38	C/S	Twins	2	2 PRBC	U-type
6	47	0	36	C/S	Twins	3	2 PRBC	B-Lynch and R uterine a lig
7	40	0	36	C/S	Twins	1.2		U-type
8	38	0	36	C/S	Twins	2		U-type
9	39	0	42	C/S	Prolonged labor	1.2		U-type
10	40	1	38	C/S	Repeat C/S	1.9		U-type
11	32	1	41	C/S	Prolonged labor	1.5		U-type and B-Lynch
12	41	2	37	C/S	Repeat C/S	0.7		U-type

Bicor Ut, bicornuate uterus; C/S, cesarean section; Cryo, cryoprecipitate; EBL, estimated blood loss; FFP, fresh frozen plasma; GA, gestational age; L, left; Plts, platelets; PRBC, packed red blood cells; R, right; uterine a lig, uterine artery ligation.

complications in all women, and the mean discharge time was 5.1 ± 1.4 days.

Long-term follow-up revealed complications in two patients. One patient had myometrial necrosis identified in a subsequent pregnancy. This was a 32-year-old woman who underwent a cesarean section in her first pregnancy for failure to progress. One B-Lynch suture and two Cho[12] sutures were used to control PPH. In the subsequent pregnancy, a large triangular myometrial defect was identified in the midanterior uterine wall, and two smaller defects in the posterior wall were noted during her elective repeat cesarean section. The second patient was treated by B-Lynch suture due to persistent uterine atony in her first delivery. In her second pregnancy, she presented at 32 weeks with signs of preterm labor and was delivered by urgent cesarean section due to hemodynamic shock caused by uterine rupture.

DISCUSSION

PPH is a life threatening condition. Fortunately, medical management of PPH is quite successful, and surgical interventions are not needed in the vast majority of the cases. However, when surgical interventions are required, a procedure that is efficient and preserves fertility is preferable. We report our experience with uterine compression sutures that were developed as uterine-salvaging procedures for the treatment of PPH. Most of our patients (92%) responded well to the procedure and no other surgical interventions were needed. The procedure was performed by various physicians. Two patients had partial uterine wall necrosis or uterine rupture after B-Lynch suture, and one had a uterine artery ligation in addition to compression sutures. None

of the more simple U-shaped sutures was associated with long-term complications.

Several methods have been described for the treatment of PPH secondary to uterine atony including mechanical and pharmacological methods. If bleeding persists despite these measures, surgical interventions such as uterine artery ligation, hypogastric or internal artery ligation, and finally hysterectomy[13] may be performed.

In 1997, B-Lynch et al described a highly effective surgical technique for the control of postpartum bleeding in five women with PPH: compressing the uterus with two longitudinal sutures along its long axis and preventing the uterus from relaxing and filling with blood.[11] Other techniques for uterine compression sutures have been reported in small case series.[5,12,14–16] Hayman et al described placement of two to four vertical compression sutures from the anterior uterine wall to the posterior uterine wall without hysterotomy.[5,17] A transverse cervicoisthmic suture can also be placed if needed to control bleeding from the lower uterine segment. Pereira et al described a technique in which a series of transverse and longitudinal stitches of a delayed absorbable multifilament suture are placed around the uterus via a series of bites into the subserosal myometrium, without entering the uterine cavity.[16] Two or three rows of these sutures are placed in each direction to completely envelope and compress the uterus. Cho et al described another technique, where multiple square sutures using a straight number 7 or 8 needle and number 1 chromic catgut is used to approximate the anterior and posterior uterine walls.[12] The U-type suture was described by Hackethal et al, where the needle was inserted at the ventral uterine wall, led through the

posterior wall, and then passed back to the ventral wall where the thread was joined with a flat double knot.[5]

The success rate of uterine compression sutures has been reported to be 77 to 82% in several case series. Price and B-Lynch presented a detailed review of 15 published reports, which included 46 cases with two failures.[18]

Baskett described the largest series of 28 cases, in which hysterectomy was avoided in 23 patients.[19] Wohlmuth et al described 22 cases: 11 cases obtained hemostasis with the B-Lynch suture alone and six cases with the suture and uterine and/or ovarian artery ligation.[20] They had a 77.3% success rate, similar to the 28 cases reported by Baskett, who had an 82.1% success rate.[19]

In our series of 12 patients, our success rate was 92%, which is comparable to previous reports, with one case requiring a hysterectomy. Though the evidence for the use of compression sutures is based on case series without proper control groups, it is apparent that uterine compression sutures are successful in most of the cases and should be incorporated or even be the first-line surgical treatment for PPH due to uterine causes. When PPH due to uterine atony appears during cesarean section and does not respond to medical treatment, it is reasonable to perform compression sutures before the patient's condition deteriorates and hemodynamic decompensation occurs. In our series, we identified four patients who were treated by compression sutures after relative mild PPH of ~1.2 to 1.9 L. Because it was reported that obstetricians tend to underestimate blood loss during delivery,[3] we speculate that the actual blood loss was likely higher and therefore surgical intervention was indicated.

PPH after vaginal delivery is treated somewhat differently with the intention to prevent surgical interventions if at all possible. Transcervical placement of an intrauterine balloon may achieve intrauterine pressure without surgery. However, if an intrauterine balloon is unavailable or unsuccessful, then uterine compression sutures can be performed within a short period of time even by physicians who have no previous experience with performing the technique.

Although uterine compression sutures appear to be effective in treating PPH, there are known complications following their use. Wu and Yeh[21,22] reported uterine synechiae formation following square sutures, which were visible at hysteroscopy 2 years after the procedure. This may have been caused by use of delayed absorbable suture (1–0 dexon polyglycolic acid suture). Ochoa et al[23] reported development of pyometra following square sutures in a case of chorioamnionitis. The patient presented 4 weeks postpartum with fever and an enlarged uterus filled with infected lochia. Two other instances of uterine necrosis following B-Lynch sutures have also been reported. Dadhwal et al[24] reported a patient presenting 4 months postpartum with cramping due to development of hematometra, which collected between the Cho sutures. Akoury and Sherman[25] described a case from our center in which a B-Lynch compression sutures were complicated by subsequent myometrial necrosis. However, this patient had two uncomplicated subsequent pregnancies and caesarean section at term of two healthy babies.

Health care providers should be aware of the possible complications associated with compression sutures, and patients treated by uterine compression sutures should have long-term follow-up postoperatively to ensure early identification of complications. The reported complications of uterine compression sutures were mainly after using the B-Lynch technique or the Cho square sutures. Therefore, we suggest using the simple U sutures as the method of choice for uterine compression sutures. This kind of suture is relatively easy to perform, does not distort the uterine shape, and does not form closed space inside the uterus. Our case series, as with previous case series, is limited because there is no comparison to a control group. However, uterine compression sutures in our cases were the only available treatment before other surgical interventions or hysterectomy, and therefore we believe that uterine compression sutures are efficient in controlling PPH.

In summary, in our experience uterine compression sutures were an effective treatment for PPH with a success rate of over 90%. The complications of uterine compression sutures are probably more common with the B-Lynch and Cho techniques, and therefore a simple U-shaped sutures appears to be the method of choice. Early identification of PPH and immediate treatment by both conservative and surgical procedures such as uterine compression sutures are the key to successful treatment and prevention of hemodynamic shock and its consequences.

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