Hayman Uterine Compression Suture in Upper Egypt

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Abstract

Aim: The current study was performed to evaluate the value of the Hayman uterine compression suture in patients with atonic postpartum hemorrhage (postpartum hemorrhage caused by uterine atony).

Methods: This retrospective study was carried out from January 2010 to December 2014 at a tertiary care center in Upper Egypt and involved 82 women with severe atonic postpartum hemorrhage that failed to respond to medical treatment. Data were gathered exclusively from the medical records of patients who underwent the Hayman uterine compression suture. This suture is used to apply mechanical compression on the uterine vascular wall without occluding either the uterine arteries or the uterine cavity. Details regarding risk factors, management, and outcomes were recorded.

Results: Good compression of the uterus was achieved and hemostasis was established in 53 (64.63%) women with the Hayman suture alone, and no further interferences were necessary. Twenty-five women needed secondary procedures to achieve good hemostasis, among whom 9 (10.97%) needed uterine devascularization, and 16 (19.51%) needed internal iliac artery ligation. Four women (4.87%) insisted to bleed after application of the compression suture and required hysterectomy because of hemodynamic instability. Thus, using the Hayman suture, hysterectomy could be avoided in 95.12% (78 of 82) of women with postpartum hemorrhage.

Conclusion: The Hayman suture is easy and rapid and requires minimal technical skill. This simple procedure should be tried before other complex measures to achieve good hemostasis.

Key Words: Upper Egypt – Postpartum hemorrhage – Hayman sutures – Uterine hemorrhage – Uterine inertia.

Introduction

POSTPARTUM Hemorrhage (PPH) is the most common cause of maternal mortality worldwide, ranging from 13% in developed countries to 34% in developing countries [1]. The definition of PPH differs among authors; in general; it is defined as a loss of >500ml of blood after vaginal delivery or 1000ml after caesarean section [2]. Uterine atony is the most frequent cause of PPH and accounts for 80% of all cases. Although assessment of risk factors is important, PPH typically occurs unpredictably, and no parturient is immune to the risk. When PPH persists despite aggressive medical treatment, attention should be given to early surgical intervention to avoid morbidity [3].

In recent decades, dynamic efforts have been made to introduce conservative measures with which to avoid hysterectomy when uterotonics fail to stop bleeding in patients with enormous PPH. Particularly, within the past several years, more attention has been given to the use of surgical compression sutures to manage PPH due to uterine atony. These sutures mechanically compress the uterine vascular sinuses without occluding either the uterine arteries or the uterine cavity [4].

Since the first publication of the B-Lynch technique in 1997 [8], different uterine compression sutures have been used as an alternative to hysterectomy. In 2002, Hayman et al., [6] suggested an easy uterine compression suture technique that involved slight changes to the B-Lynch technique. The Hayman suture can be applied more rapidly and easily, which is key in an emergency situation. It also avoids the need for lower segment hysterectomy when PPH follows a vaginal delivery, therefore decreasing the trauma to the atonic bleeding uterus [4].

Uterine compression sutures, including B-Lynch and Hayman sutures, have become widely used for PPH, especially atonic bleeding [7]. However, theoretical concerns have been raised regarding the potential risk of occlusion of the uterine cavity and blood entrapment because the uterus is transfixed from front to back to place the suture. Data
on its safety and efficacy are limited to a few case reports [6,8].

We here in report our use of the Hayman suture for the conservative surgical management of massive PPH. The aim of our study was to review cases in our hospital in which atonic PPH was not controlled with available drugs (uterotonics) and in which fertility-preserving Hayman sutures were applied.

**Patients and Methods**

This retrospective study was conducted from January 2010 to December 2014 in the Department of Obstetrics and Gynecology of Aswan University Hospital, a teaching tertiary care referral hospital in Upper Egypt.

The study was approved by the Ethical Review Committee of Aswan University Hospital. Informed consent was not required because of the retrospective study design and nameless presentation of the patients’ data.

All cases of atonic PPH with an estimated total intrapartum and postpartum blood loss of $>$ 1000 ml identified from January 2010 to December 2014 were retrospectively reviewed. Blood loss was estimated by both subjective and objective methods. Subjective measures included counting soaked swabs and estimating blood clots and blood in the suction bottle. Objective measures included serially measuring the reduction in the hemoglobin level; hematocrit values and evaluating the need for blood transfusions.

The hospital protocol was as follows. Once atonic PPH was identified, various measures were used initially to manage the bleeding, such as intravenous fluid administration, uterine massage, infusion of oxytocin (20 IU in 500ml of saline), and rectal administration of 800mg of misoprostol after ruling out contraindications and arranging for a blood transfusion. If these measures failed to control the hemorrhage, surgical intervention was initiated in the form of uterine devascularization, internal iliac artery ligation, Hayman or B-Lynch uterine compression suture, or hysterectomy. A facility for arterial embolization did not exist at the hospital.

Only 82 women who underwent treatment with the Hayman suture for atonic PPH were included in the study. For this procedure, the abdomen was opened in patients who had undergone vaginal delivery (the abdomen was already open in patients who had undergone caesarean delivery), and the uterus was exteriorized. Before applying the suture, bimanual uterine compression was applied to check whether this stopped the bleeding. A 2-0 chromic catgut suture on a straight needle was used to transfix the uterus from front to back, just above the reflection of the bladder, and while an assistant applied bimanual compression the suture was tied above the fundus of the uterus. One more vertical suture was applied parallel to the first one, and then both ligatures were tied together to prevent slippage of the sutures Figs. (1,2). When PPH occurred after caesarean delivery, the uterine incision was closed first. Before closing the abdomen, the surgeon confirmed that the vaginal bleeding was stopped. If the bleeding did not stop, uterine devascularization (bilateral uterine artery ligation plus bilateral ovarian vessel ligation) was performed. If the bleeding continued after uterine devascularization, bilateral internal iliac artery ligation was performed. Finally, if these measures failed to stop the massive hemorrhage, hysterectomy was performed as the last resort.

After the procedure, the patients were discharged to the Intensive Care Unit. All patients were examined daily by the obstetrician’s team during rounds of the ward. All patients underwent a follow-up examination in the outpatient clinic 1 week after hospital discharge and every 2 months for the first 6 months thereafter. During the follow-up visits, the women were interviewed and examined by obstetricians for any complications or side effects. Ultrasonographic evaluation, hysterosalpingography, and follow-up diagnostic hysteroscopy were performed 6 months later for all patients who were successfully followed-up. No deliberate follow-up was made later than 6 months except that women returning to our institute with subsequent pregnancies were noted.

We reviewed the charts of all patients who fulfilled our inclusion criteria. SPSS version 21 was used for statistical analysis. Sociodemographic data (age, parity, gestational age, and booking status) were analyzed in the form of frequency and percentages. Statistical tests of significance were not applicable for this descriptive study.

**Results**

Throughout the 5-year study period, 26,230 deliveries occurred, 782 (2.98%) of which were associated with PPH severe enough to require a blood transfusion. Of these 782 patients with severe
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PPH, 598 (76.47%) had atonic PPH. Of these 598 women with atonic PPH, 314 (52.50%) underwent surgical intervention, and 82 of these procedures began with the Hayman suture.

The data of these 82 women are shown in (Table 1). Their mean age was 32.5 ± 4.6 years, and nine women (10.9%) were primiparas. Forty-one women (50.0%) developed PPH after vaginal delivery, and 29 (35.3%) developed PPH after lower segment caesarean section. The remaining women developed PPH after assisted vaginal delivery with the use of forceps or a ventouse. In all women, medical management of PPH was performed as described in the methods section but failed to stop the PPH. Among these 82 women, good compression of the uterus was achieved and hemostasis was established in 53 (64.63%) women with the Hayman suture alone, and no further interventions were required. Twenty-five women required secondary procedures to achieve good hemostasis: 9 (10.97%) required uterine devascularization and 16 (19.51%) required bilateral internal iliac artery ligation. Four women (4.87%) continued to bleed after application of the compression suture and required hysterectomy to treat hemodynamic instability Fig. (3). Thus, hysterectomy could be avoided in 64.63% of women with the Hayman suture alone and 95.12% (78 of 82) of women with the Hayman suture plus secondary procedures.

The probable causes of uterine atony are presented in (Table 2). All women who underwent surgical intervention required at least four units of blood during transfusion. The mean blood loss, preoperative and postoperative hemoglobin values, amount of blood transfused, and hospitalization periods of the patients are presented in (Table 3).

The maternal morbidities for all patients are listed in (Table 4). Three (3.6%) of 82 patients died of hypovolemic shock and consumption coagulopathy. The patients died of multiorgan failure, disseminated intravascular coagulation, and acute renal failure during the postoperative period in the Intensive Care Unit. The postoperative course for the remaining patients was uncomplicated, and these women were discharged from the hospital in good condition.

Follow-up of the patients is shown in (Table 5). All patients were followed-up for 7 days, 68 patients were followed-up for 6 weeks, and only 35 patients were followed-up for 6 months. The remaining patients stopped coming for follow-up visits and could not be traced; thus, their outcomes were unknown. During the follow-up visits, we confirmed that none of the women had developed complications related to the procedure. An empty uterine cavity was observed upon ultrasonographic evaluation. Follow-up diagnostic hysteroscopy and hysterosalpingography performed 6 months later for all patients who were successfully followed-up showed an empty uterine cavity with a clear view of the uterine ostia. After the cessation of breastfeeding normal menstruation was observed. Importantly, of the 82 initial patients, 6 became pregnant and returned to our hospital, and 3 of these 6 patients subsequently delivered by caesarean section in our hospital. During caesarean sections normal uterine cavities were found. Those women who might have become pregnant and visited other hospitals could not be traced.

Fig. (1): Intraoperative image showing a tied Hayman compression suture.

Fig. (2): Schematic drawings showing placement of the Hayman sutures.
When PPH persists regardless of intensive medical treatment, attention should be given to early surgical intervention. The choice of technique will depend on the amount of hemorrhage, the parity of the woman and her desire for childbearing, and, most importantly, the experience and decision of the surgeon. In most catastrophic situations, hysterectomy is preferred to arrest further blood loss and save the patient’s life [9].

The basic surgical procedures to attain hemostasis include internal iliac artery ligation and caesarean hysterectomy. Hypogastric artery ligation is the most effective way to control hemorrhage while still preserving the uterus. However, this
surgical technique is difficult, requires a high grade of surgical skill and training, and may be associated with ureteric injury [10].

In an emergency, a skillful surgeon may not be available on place to perform the ligation. Selective arterial embolization is another method of conserving the uterus while managing PPH if the woman is hemodynamically stable. However, the accessibility of a trained interventional radiologist and a radiology setup in closeness is essential. The procedure is also accompanied with complications such as post procedural fever, uterine necrosis, vascular perforation, and infection [11].

Thus, to manage severe PPH, we require a simple, safe, cost-effective uterine-preserving procedure that can be done in emergency circumstances even by obstetricians who lack sufficient training and skill for more complex procedures [3-6].

B-Lynch et al., [5] were the leading to suggest the successful measure of a compression suture passing through the whole thickness of both uterine walls to control bleeding in atonic PPH. In 2002, Hayman et al., [6] without performing a hysterotomy, placed two isolated vertical sutures passing through the uterine cavity in three patients with PPH. The technique was effective in preserving the uterus and hence fertility.

By far the most common etiology of PPH is uterine atony, which has also emerged as the most common cause of massive PPH [8]. The incidence of massive PPH in the present study was 2.98% of all booked deliveries, and uterine atony accounted for 76.47% of all cases of PPH. However, this rate is higher than that in population-based studies, in which the incidence of massive PPH was reportedly as high as 1.1% [12].

In a 2010 study by Bateman et al., [13] PPH complicated 2.9% of all deliveries and uterine atony accounted for 79.0% of the cases of PPH. Additionally, Carrol et al., [14] showed in 2008 that the prevalence of severe PPH was approximately 1.86% of all deliveries, with wide variation across geographical regions throughout the world. However, in 2013 Chan et al., [18] showed that the rate of massive PPH was 2.65 per 1000 births. The same year, Kramer et al., [16] analyzed 8,571,209 deliveries and found that 25,906 (3.0 per 1000) were complicated by severe PPH. They also showed that this rate rose from 1.9 to 4.2 per 1000 from 1999 to 2008.

PPH has also shown an increasing trend in the more developed parts of the world, including Australia, Canada, the UK, and the US. These increases have occurred because of an increase in atonic PPH [17,18]. Our series of 82 patients illustrates the usefulness of the Hayman suture in the management of intractable PPH, thus avoiding hysterectomy. To our knowledge, this is the largest study to assess the efficacy of the Hayman compression suture in the surgical management of massive PPH.

Bleeding was successfully controlled with the Hayman suture alone in 64.63% of our patients, with the Hayman suture in conjunction with uterine devascularization in 75.60%, and with the Hayman suture in conjunction with internal iliac artery ligation in 84.14%. Thus, the success rate in conjunction with other surgical procedures was 95.12%. Using the Hayman suture, hysterectomy was therefore avoided in 95.12% (78 of 82) of women with PPH. The overall rate of failure leading to hysterectomy was 4.87%.

This success rate is lower than that reported in the literature. Baskett [19] achieved an 82.00% success rate in 2007, Nanda and Singhal [3] achieved a 93.75% success rate in 2011, and Al Riyami et al., [3,19,20] achieved a 92.00% success rate in 2011.

In 2011, Kayem et al., [21] reported that there were no significant differences in failure rates among B-Lynch sutures, modified B-Lynch sutures, and other suture techniques. Additionally, they found that a prolonged delay of 2 to 6 hours between delivery and application of the uterine compression suture was independently associated with a four-fold increase in the odds of hysterectomy [21]. According to these statistics cautious assessment of blood loss after delivery is necessary to avoid any prolonged delay in recognition of bleeding.

In our study, neither hematometra nor pyometra occurred because the parallel vertical suture technique avoids dead space. In 2008, Akoury and Sherman [22] described a case in which compression sutures to control PPH were complicated by subsequent myometrial necrosis. In 2014, Jamard et al., [23] followed 19 patients who underwent uterine compression sutures with diagnostic hysteroscopy and found that 13 (68%) had a normal uterine cavity, 3 (16%) had uterine synechiae, and 3 (16%) placental retention. Synechiae and retention were successfully removed by operative hysteroscopy [23].

During follow-up of the patients, after withdrawal of breastfeeding, normal menstrual cycles occurred regularly without delay. Six women con-
ceived spontaneously within 12 months after uterine compression suturing, four returned for regular antenatal care, and three underwent caesarean section. During caesarean section, the uterine cavities were found to be normal.

These results are in agreement with those of Nanda and Singhal [3]. Additionally, in 2010 Fotopoulos and Dudenhausen [24] reported no negative impact on fertility and that uncomplicated future pregnancies occur within a range of 1 to 3 years. Finally, in 2011 Amorim-Costa et al., [25] concluded that routine follow-up by both hysteroscopy and imaging seems valuable.

The main limitation of our study is that it was a retrospective/descriptive study without a control group. Another limitation is that 54 (65.8%) patients were referred either from other hospitals or maternity clinics. These patients were referred to our hospital in a moribund condition, and we were unable to ascertain the blood loss before and after the procedure. Additionally, of all 82 women, only 35 were followed-up for 6 months. The remaining patients stopped coming for follow-up visits and could not be traced; hence, their outcomes were unknown. Thus, loss to follow-up was quite high, and outcomes related to long-term complications and fertility could not be traced in these patients. Finally, the results of this study were obtained from a single center.

In conclusion, our results indicate that the Hayman suture is a safe, effective procedure that preserves future reproductive potential and may not affect fertility. This suture technique should be considered to treat severe PPH prior to definitive measures such as hysterectomy. Patients should be told about the probable complications of the use of compression sutures and the need to undergo postoperative follow-up to check uterine wall integrity.

Disclosure:

The authors have no conflict of interest in this work.

References


المستند العربي

هدف الدراسة: تم إجراء هذه الدراسة لتقديم قيمة خياطة ضغط الرحم هايامان في المرضى الذين يعانون من نزيف ما بعد الولادة بسبب أليل الرحم (نزيف ما بعد الولادة الناجم عن ارتفاع عضلة الرحم).

المؤلفين: جريت هذه الدراسة بارت رجية انتظارا من يناير 2010 إلى ديسمبر 2014 في مستشفى سولان الجامعي في محدودية قطرية في نزيف نضيج الرحم بعد الولادة. تم جمع البيانات من السجلات الطبية للمرضى الذين خضعوا لخياطة ضغط الرحم هايامان. وتم استخدام هذه الخياطة لتطبيق ضغط ميكانيكي على جدار الأوعية الدموية الرحم دون الإبطاق على شرايين الرحم أو تجويف الرحم. وتم تسجيل التفاصيل بشأن عوامل الخطر، وطرق العلاج، والنتائج.

نتائج الدراسة: باستخدام خياطة هايامان وحدها تم تحقيق ضغط جيد للرحم في 23 مريضة (74.6%)، ولم يكن هناك أي تدخلات أخرى. بينما كان خمسة وعشرون مريدة بحاجة لإجراءات ثانوية لتفريق النزيف. من بينهم 9 مرضى (30.9%) تم نقل الرحم بواسطة الدوامة المغنية للرحم، والمريرة (19.5%). كان نتائج لاسيير الشريحة الورقية الداخلية أربعة نساء (8.7%) فينها بعد تطبيق خياطة ضغط الرحم. وتم استخدام الرحم لحفرة استقرار الدورة الدموية، وفاز، فأن استخدام خياطة ضغط الرحم هايامان، تم تجنب استئصال الرحم في 22.6% (78/352) من الحالات الأخرى لتفريق نزيف ما بعد الولادة الناجم عن ارتفاع عضلة الرحم.