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Short communication

The Hayman technique: a simple method to treat postpartum haemorrhage

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Of the several uterine compression sutures described in more recent years to treat postpartum haemorrhage (PPH), the Hayman suture offers the potential advantages that can be applied faster and easier, avoiding the performance of a lower segment hysterotomy when PPH follows a vaginal delivery. Data on efficacy and safety are limited, and long-term follow-up information are lacking. We report our experience with the Hayman suture in 11 consecutive women with massive PPH. Of these, ten were successfully treated without further interventions. One woman ultimately required a hysterectomy. Postoperative course was uncomplicated in all the cases. The median follow-up time was 11 months (range 1–19). One woman conceived spontaneously 10 months after the procedure. Our results suggest that the Hayman suture is an effective and safe treatment for PPH.

Keywords Compression suture, Hayman suture, postpartum haemorrhage, surgical treatment.

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Introduction

Postpartum haemorrhage (PPH) continues to be a leading cause of maternal mortality and morbidity, accounting for more than 125 000 deaths per year across the world. Prompt diagnosis and effective action are the cornerstones of management and are crucial to prevent fatal maternal haemorrhage.[1]

In recent decades, active attempts have been made to introduce conservative procedures to avoid hysterectomy when uterotonic medications failed to control bleeding in massive PPH. Particularly, within the past years, interest has surged in the surgical compression sutures for treating PPH due to uterine atony, by exerting a mechanical compression of uterine vascular sinus without occluding either the uterine arteries or the uterine cavity. Of the several different techniques, the B-Lynch suture,[2] first reported in 1997, has gained the most popularity, with a number of subsequent publications attesting to its efficacy. In 2002, Hayman *et al.*[3] proposed a simplified approach to uterine compression sutures that involved slight modifications of the B-Lynch technique. The Hayman suture offers the potential advantages that can be applied faster and easier, a key point in an emergency situation, and avoids having to perform a lower segment hysterotomy when PPH follows a vaginal delivery, therefore minimising the trauma to the atonic bleeding uterus. However, theoretical concerns have been raised on the potential risk of occlusion of the uterine cavity and blood entrapment, as the uterus is transfixed from front to back to place the suture.[3,4] Since the technique is relatively new, data on its safety and efficacy are limited to a few case reports.[2,5]

We report our experience in the use of the Hayman suture for the conservative surgical management of massive PPH.

Methods

From January 2004, the Hayman compression suture was introduced in the Labor and Delivery Unit of two academic hospitals as the first-line surgical treatment in every case of uterine atony that resulted in an uncontrollable PPH, either following the vaginal delivery or after the caesarean section. Even in the presence of massive PPH in older women of high parity, an attempt to conserve the uterus by applying the Hayman suture was made before resorting to hysterectomy. Data about the surgical procedures, postpartum course and follow-up evaluations were recorded in research-quality databases by trained residents.

Uniform protocols for the management of obstetric haemorrhage were in use in both institutions. Prophylactic

oxytocics were offered routinely in the management of the third stage of labour. Once PPH has been identified and after vaginal/cervical lacerations or haematoma and retained products of conception have been ruled out, the following measures were used initially to manage the bleeding: infusion of oxytocin (20 iu in 500 ml saline at 125 ml/hour), methilergometrine 0.2 mg intramuscularly, sulproston infusion (0.5 mg in 250 ml of saline) and 800 μg of rectally administered misoprostol. If these pharmacological measures failed to control haemorrhage and if the woman continued to bleed and became haemodynamically unstable, surgical haemostasis was initiated. In all cases, the procedure was performed according to the technique originally described by Hayman *et al.*[2] Briefly, after the uterus was exteriorised, bimanual compression was applied to check whether this stopped the bleeding, before the suture was applied. A number 2 polyglactin suture (Vicryl®; Ethicon Inc., Somerville, MA, USA) on a straight needle was used to transfix the uterus from front to back, just above the reflection of the bladder, and was then tied above the fundus of the uterus, while an assistant applied bimanual compression (Figure 1). The procedure could be performed if one suture on each side of the uterus, or, if the surface in between the two lateral sutures appeared to be in need of further compression, then side-to-side ties were inserted in between the first sutures. If only two sutures were needed, a three-throw technique was used to tie the knots to avoid the sutures sliding off the side of the uterus. In cases of PPH occurring after a caesarean delivery, the lower transverse uterine incision was closed in one layer. Before closing the abdomen, the surgeon ensured that vaginal bleeding was normal.

All these women underwent a follow-up examination 2 weeks after hospital discharge, thereafter every 2 months for the first year and then annually.

Results

Between January 2004 and April 2006, a total of 6857 deliveries occurred in our institutions. The rate of major PPH, defined as postpartum blood loss in excess of 2000 ml, was 0.40% (16/3913) and 0.41% (12/2944) in the obstetric unit of University of Insubria and University of Berne, respectively. During the study period, a total of 11 consecutive women underwent a Hayman compression suture for massive PPH. Information on demographics of patient, intraoperative details and follow-up times is shown in Table 1. Good compression of the uterus was achieved and haemostasis was established in 10 out of 11 (90.9%) women with the Hayman suture, and no further interventions were required. In one case with placenta praevia, a transverse isthmic-cervical compression suture was inserted before the vertical apposition suture, to decrease the blood loss from the lower uterine segment. One woman ultimately required a hysterectomy for intractable haemorrhage and haemodynamic instability. In the latter case, despite the compression suture, haemostasis was still inadequate and hypogastric arteries ligation was performed, which was still ineffective. Histopathologic examination of the uterus showed the presence of placenta accreta, which had not been suspected previously. Intraoperative disseminated intravascular coagulation developed in two cases and was promptly managed with fresh-frozen plasma transfusions.

The postoperative course was uncomplicated in all the cases, and these women were discharged from the hospital in good conditions. All the women undergoing the Hayman suture had normal lochia, and there was no delay in the resumption of normal menstruation following the cessation of breastfeeding. One woman conceived spontaneously 10 months after uterine compression suturing. At the time of

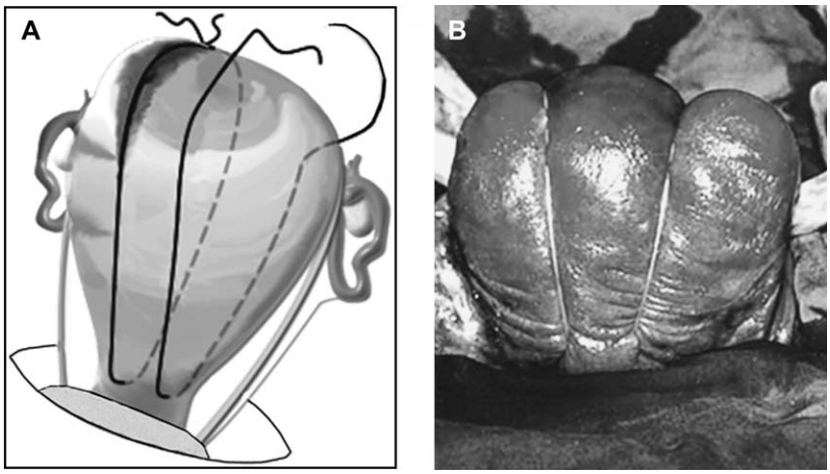

Figure 1. (A) Front view of the uterus, showing where the compression sutures are placed. (B) Intraoperative image showing the compression suture tied.

Table 1. Characteristics of women, intraoperative details and follow-up time

Case no.	Maternal age	Parity	Gestational age (weeks)	Mode of delivery	Concomitant conditions	Estimated blood loss (ml)	Intraoperative transfusions (units)	Adjunctive procedures	Follow up (months)
1	43	0	36	Caesarean	Placenta praevia	3000	2 PRBC	—	19
2	35	0	42	Vaginal		4500	4 PRBC, 2 FFP, 1 P	Hypogastric arteries ligation; hysterectomy	15
3	36	1	35	Caesarean	Placenta praevia	2300	2 PRBC	—	14 (currently pregnant)
4	35	0	39	Vaginal	DIC	7000	18 PRBC, 10 FFP, 2 P	—	12
5	33	1	39	Caesarean		2200	2 PRBC	—	11
6	31	0	35	Caesarean	Twin pregnancy with IUFD of one twin	3200	4 PRBC, 2 FFP		11
7	39	0	38	Caesarean		5000	10 PRBC, 6 FFP	—	11
8	25	0	38	Caesarean	Twin pregnancy	4000	6 PRBC, 4 FFP	—	8
9	28	0	28	Caesarean	Severe pre-eclampsia; DIC	3200	4 PRBC, 6 FFP	—	6
10	31	0	37	Caesarean	Placenta praevia	2100	2 PRBC, 2 FFP	—	6
11	34	1	28	Caesarean	Placenta praevia	3500	4 PRBC, 2 FFP	—	1

IUFD, intrauterine fetal demise; PRBC, packed red blood cells; FFP, fresh-frozen plasma; P, platelets; DIC, disseminated intravascular coagulation.

writing this report, the pregnancy is still continuing at 15 weeks of gestation without any obvious complication.

Discussion

The results from this case series suggest that the Hayman compression suture is an effective and safe conservative measure for the surgical treatment of major PPH.

B-Lynch *et al.*[2] were the first to propose the innovative principle that a compression suture running through the full thickness of both uterine walls is an effective measure to control bleeding in PPH due to uterine atony. Since the original report, the B-Lynch technique has been widely adopted and has proved to be valuable in the control of massive PPH. At the time of writing, there were more than 50 published cases, with only two failures reported, and one late puerperium complication (uterine necrosis).

Of the several newer suturing technique described in more recent years, including Hayman[3] modification of the B-Lynch procedure, data on efficacy and safety are mainly limited to the small case series reported by the proponents themselves, and long-term follow-up information are still lacking.

Compared with the B-Lynch suture, the Hayman technique is a much simpler procedure, which can easily be mastered by every obstetrician in an emergency situation. Moreover, the Hayman suture is quicker to apply in cases of major PPH following vaginal delivery, as the lower uterine segment is not opened. It has been argued that hysterotomy before placement of compression sutures is warranted to avoid unintended obliteration of the cervical canal and/or the uterine cavity and to confirm that the uterine cavity is completely empty.[4] Moreover, since the Hayman technique involves crossing the uterine cavity to appose the anterior and posterior uterine wall above the bladder reflection, theoretical concerns on the potential risks of cavity occlusion and infections have been raised.[5,6]

These concerns warrant some consideration. First, in case of PPH after vaginal delivery, uterine cavity exploration should be performed as a first step before considering the diagnosis of uterine atony, and it is not necessary to open the uterus for this purpose. Second, the collection of blood clots within the uterine cavity can be averted by applying bimanual compression to both sides of the uterus at the time when the suturing is undertaken. Third, making a hysterotomy incision when one is not already present appears not only unnecessary, but it might be inappropriate as maintaining the integrity of a bleeding, atonic uterus should be a desirable goal. Finally, occlusion of the cervical lumen is a potential complication when additional transverse compression sutures are required, and in these circumstances care should be taken to ensure cervical patency by simply passing a blunt instrument through the canal before tightening the suture. It is noteworthy that the two cases of occlusion of the uterine cavity, one with concomitant pyometra,[7] were

reported following multiple square sutures, in which the uterine cavity is transfixed up to 32 times.

To our knowledge, this is the largest cohort study assessing the efficacy of the Hayman compression suture in the surgical management of massive PPH. Our success rate of 91% in the control of bleeding is in keeping with the outcome reported for the more established B-Lynch technique. Moreover, our results indicate that the Hyman suture is a safe procedure, and that fertility may not be affected.

The current study adds to a growing literature, showing the effectiveness of uterine compression sutures. Since life-threatening PPH involve approximately 1 in 1000 women, individual obstetricians are rarely faced with this situation: a simple, fast technique as the Hayman suture may be a valuable addition to the current armamentarium of conservative treatment of PPH, particularly for those gynaecologists who lack sufficient training and skill for more complex procedures. ■

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