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Efficacy of Nakornping Uterine Compression Suture on Persistent Uterine Atony after Caesarean Section

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ABSTRACT

Objectives: The purpose of the study is to demonstrate the technique of applying Nakornping uterine compression suture after caesarean section and to evaluate the effectiveness of this surgical intervention for management of uterine atony after failed medical treatments.

Materials and Methods: The medical records of 3,949 patients who had caesarean deliveries at Nakornping Hospital from October 2011 to September 2014 were retrospectively analyzed. Uterine atony occurred in 137 caesarean delivering patients. Sixty one patients with persistent uterine atony after receiving bimanual compression, uterine massage and uterotonic medications as per the hospital standard treatment protocol for postpartum hemorrhage management were treated with the placement of the Nakornping uterine compression suture. The mean time to perform the procedure was 2.2 ± 0.4 minutes.

Results: For all sixty one patients receiving Nakornping uterine compression suture, the treatment was successful. Nakornping uterine compression suture was sufficient to stop the bleeding immediately in 100% of the patients. There were no complications observed either during or after the procedure. All sixty one patients had normal lochia post caesarean delivery. The patients were discharged after a median of 4 days hospital stay. When pelvic ultrasound was done on day 3 and day 7 post operations on two patients, the study showed normal uterine contour and no fluid was found in the uterine cavity. Hysterosalpingography was performed on two patients on week 6 after the procedure, the study revealed normal findings. Four patients (6.6%) had subsequent pregnancies with caesarean delivery.

Conclusion: Application of Nakornping uterine compression suture was effective for treating uterine atony after caesarean section. It is a simple and rapid procedure for clinical practice.

Keywords: uterine compression suture, persistent uterine atony

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ประสิทธิภาพของการเย็บ Nakornping uterine compression ในการรักษาภาวะการหดรัดตัวไม่ดีของมดลูกหลังผ่าตัดคลอดบุตร

จิตรา วิทยานุกูล

บทคัดย่อ

วัตถุประสงค์: *การศึกษานี้ต้องการแสดงให้เห็นถึงเทคนิค และประสิทธิภาพของการเย็บ Nakornping uterine compression ในการรักษาภาวะหดรัดตัวไม่ดีของมดลูกหลังผ่าตัดคลอดบุตรที่ไม่ตอบสนองต่อการรักษาที่ใช้อยู่แบบดั้งเดิม*

วิธีการ: *เป็นการศึกษาย้อนหลังจากเวชระเบียนผู้ป่วย 3,949 ราย ที่ได้รับการผ่าตัดคลอดในโรงพยาบาลนครพิงค์ ตั้งแต่เดือนตุลาคม 2554 ถึงเดือน กันยายน 2557 ระหว่างการผ่าตัดคลอด หลังจากได้รับการกระตุ้นการหดรัดตัวของมดลูกด้วยการนวดคลึง และการใช้ยากระตุ้นการหดรัดตัวแล้ว ผู้ป่วย 137 ราย ยังคงมีการหดรัดตัวของมดลูกไม่ดี จำนวนนี้ 61 ราย ได้รับการเย็บ Nakornping uterine compression โดยใช้เวลาเฉลี่ยในการเย็บ 2.18 ± 0.38 นาที*

ผลการศึกษา: *ผู้ป่วยทั้ง 61 ราย ที่ได้รับการเย็บ Nakornping uterine compression ประสบผลสำเร็จสามารถรักษาภาวะการหดรัดตัวไม่ดีของมดลูกได้ทั้งหมด ไม่พบภาวะแทรกซ้อนทั้งในระหว่าง และหลังการเย็บ, มีน้ำคาวปลาปกติหลังคลอด, พักรักษาในโรงพยาบาลเฉลี่ย 4 วัน และเพื่อการศึกษาในผู้ป่วย 2 ราย ได้รับการทำอัลตร้าซาวด์ วันที่ 3, 7 หลังผ่าตัด พบมดลูกลักษณะปกติ ไม่มีของเหลวใดคั่งในโพรงมดลูก และในผู้ป่วยอีก 2 ราย ได้นัดมาทำ Hysterosalpingography เพื่อวางแผนการคลอดครั้งต่อไป พบผลเป็นปกติ ผู้ป่วยอีก 4 ราย (6.6%) มีการตั้งครรภ์ซ้ำ และมาคลอดที่โรงพยาบาลนครพิงค์โดยการผ่าตัดคลอด*

สรุป: *การเย็บ Nakornping uterine compression มีประสิทธิภาพในการรักษาภาวการณ์หดรัดตัวไม่ดีของมดลูกหลังผ่าตัดคลอดบุตร เป็นวิธีการที่ง่าย ใช้เวลาน้อย แพทย์ผ่าตัดทุกคนสามารถฝึกทำได้*

Introduction

Post partum hemorrhage (PPH) is an obstetrical emergency. It is a major cause of maternal morbidity (64.7%) and mortality (25-30%) worldwide[1,2]. Over 125,000 women die each year from post partum hemorrhage[3]. It remains the major cause of maternal death in developed countries and accounts for 9% of maternal deaths in the United States and 11% in the United Kingdom[4,5]. PPH occurs approximately 3.7% from vaginal and 6.4% from caesarean delivery[6]. Although the incidence is low, it causes the serious complication such as hypovolemic shock, disseminated intravascular coagulopathy and multi-organ failure.

Postpartum hemorrhage can be caused by many factors such as retained placenta, membranes or blood clots, vaginal or cervical tears, uterine rupture, clotting disorders, uterine inversion and uterine atony. Of all these causes, 75-90% of PPH is resulted from uterine atony[7, 8].

At Nakornping Hospital, there is a guideline for prevention and management of postpartum hemorrhage. This guideline includes the use of bimanual compression, uterine massage and administration of uterotonic drugs such as oxytocin, methylergotamine, and Sulprostone as detailed in appendix A. The question arises of what to do when medical measures failed to control PPH. In 1997, Balogun Lynch Cristopher developed the B-Lynch uterine compression technique based on the principle of compressing the uterus without devascularisation to control bleeding[7]. Since then, various other surgical options have been proposed as an alternative option to manage post partum hemorrhage related to uterine atony. The examples of these surgical managements are the Cho's square[9], the Hayman[10], the Peiera[11], the Quahba'Hour Glass Suture[12] and the Hackethal[13] uterine compression suture. In our hospital, hysterectomy will be performed if the hospital standard approach fails to stop the bleeding. Attempting to find more alternatives for PPH treatment, the author developed a new surgical technique named Nakornping uterine compression suture in 2011. This technique is modified from the B-Lynch uterine compression suture. Application of Nakornping uterine compression suture is similar to the Hayman technique, yet easier to achieve. This is because the surgical notch of the Nakornping suture is to be done only one time. Nakornping uterine compression suture was first introduced as a means to control PPH secondary for atonic uterus in patients with caesarean delivery at Nakornping Hospital in October 2011. The aim of this study is to evaluate the efficacy of the Nakornping uterine compression technique on managing PPH secondary to persistent uterine atony.

Materials and Methods

Retrospective study of the medical records of all 3,949 patients who had caesarean deliveries between October 2011 and September 2014 at Nakornping Hospital was performed. Indication for applying Nakornping uterine compression suture was persistent uterine atony in patients underwent caesarean section who did not respond to bimanual compression, uterine massage and uterotonic medications such as oxytocin, methylergotamine and sulprostone as per the Nakornping hospital standard treatment protocol for prevention and treatment of primary postpartum hemorrhage. According to the criteria, patients with uterine atony who failed to respond to the hospital standard treatment protocol for prevention and treatment of primary postpartum hemorrhage were identified. The total of 137 patients was selected as having atonic uterus with persisting bleeding. Sixty one patients received the Nakornping compression suture to control the bleeding. Seventy six patients were treated with sulprostone, the hospital's special second line uterotonic agent.

Following the delivery of fetus and placenta, the uterus was exteriorized and closed using atraumatic catgut no. 1 in a single layer. Uterine compression with the Nakornping suture technique began after the closure of the uterus. Materials used for suturing was a 70 mm. straight needle with chromic catgut no.1. Placement of the sutures comprises six steps. The first step was to identify the first suture point. The first suture point to apply the needle was at 2-3 cm below the uterine incision closure site and 2-3 cm from the left lateral border of the uterus. The second step was to insert the

needle at the first suture point identified, starting in the anterior aspect of the uterus, and passing through the uterine cavity to the posterior aspect of the uterus. The third step is to pull the suture crossing over the uterine fundus from the posterior to the anterior aspect of the uterus. The fourth step was to identify the second suture point. The second suture point was at the same level as the first suture point but 2-3cm from the right lateral border of the uterus. The fifth step was to insert the needle at the second suture point penetrating from the anterior aspect of the uterus to the posterior aspect of the uterus. During the insertion of the needle in the second and fifth steps, ensure to avoid bowel injury. The sixth step was to bring together both tails of the suture, one in the anterior and one in the posterior aspect of the uterus, and tie them tightly at the middle of the fundus of the uterus. Uterine massage and manual compression were applied to the uterus to stimulate contraction and to achieve maximum reduction of uterine volume during the suture tying time. While tying the suture, it is very important to tie the notch tightly to prevent it from dislodgement. The completion of placement of the Nakornping compression suture method was shown in Fig. 1. The average time required to complete this procedure was approximately 2 minutes.

Recorded data of patients' demographic and outcomes including age, gestational age, parity, indication for caesarean section, intra and post-operative complications, transfusion requirements, surgical time, need for intensive care, postpartum complications, and length of hospital stay were collected. Results were analyzed and reported in means, standard deviation (SD), range and percentage.

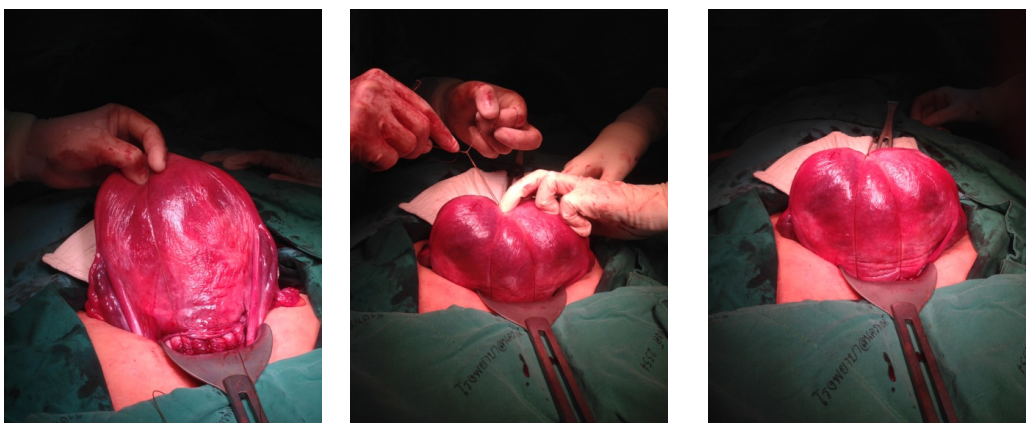


Fig 1. Nakornping uterine compression suture method

Results

During the study period, 3,949 caesarean deliveries occurred at Nakornping Hospital. A total of 61 Nakornping uterine compression suture were applied to the patient who had uterine atony that did not respond to the hospital's medical standard treatment for PPH prevention and management as detailed in appendix A.

Appendix A: Nakornping Hospital's standard protocol for post partum hemorrhage intervention

Standard treatment protocol of Nakornping Hospital for prevention and management of post partum hemorrhage is composed of the following details:

1. Insertion of foley catheter is performed in all patients undergoing caesarean section.

2. Applying bimanual compression, uterine massage.

3. Administration of 10 units of oxytocin

intramuscular along with the infusion of 10 units of oxytocin in 1,000mL of 0.9% normal saline at the rate of 20-40 milliunits per minute for a few minutes.

4. If the uterus remains atonic, methylergotamine 0.2 mg intravenous direct will be given in combination with intravenous drip of oxytocin 20 units diluted in 1,000 mL of 0.9% normal saline at the rate of 20-100 milliunits per minute.

After waiting another ten more minutes if the uterine atony persisted we consider this as failure to respond to hospital standard protocol.

Demographic characteristics of the studied patients were displayed in Table 1. The mean age of the patient was 28.3 ± 6.4, and the mean gestational age of 38.3 ± 1.9. Thirty one patients (51%) were primigravid. The three main indications for caesarean section were cephalopelvic disproportion (37.7%), previous caesarean section (18%) and breech presentation (16.4%). The mean fetal birth weight was 3,069.9 ± 628.0 g. Outcomes of the uterine atony management of the studied patients were depicted in Table 2. The Nakornping uterine compression suture was successfully managed the uterine atony in all 61 patients (100%). There was no failure reported in this study. The mean estimated blood loss was 357.4 ± 92.1 ml. Eigth percent of patients (5 of 61) received a blood transfusion; median transfusion when required was 0 unit. The mean surgical procedure time was 39.0 ± 9.8 minutes. The mean time for applying Nakornping compression suture was 2.2 ± 0.4 minute. No complication was found either during or post operation. All sixty one patients had normal lochia post caesarean delivery. None of the patients was admitted to the intensive care unit. The mean length of hospital stay was 4.4 ± 0.7 days. Pelvic ultrasound performed on two patients on day 3 and day 7 post operations showed normal uterine contour; no fluid was found in the uterine cavity (Graphic 1). Hysterosalpingography which was done on week six on two patients after surgery revealed normal hysterosalpingographic findings (Graphic 2). Four patients (6.6%) had subsequent pregnancies, and all delivered by repeat caesarean delivery.

Table 1. Demographic data and fetal characteristic of the 61 patients having uterine atony during caesarean section and undergoing Nakornping uterine compressions sutures.

Data	Nakornping suture group (n=61)
Age	
- Mean ± SD, years	28.3 ± 6.4
- Range, years	16 - 43
Parity	
- Mean ± SD, years	2.8 ± 1.7
- Range	1 - 6
Gestational age	
- Mean ± SD, weeks	38.3 ± 1.9
- Range, weeks	31 - 41
Indication of caesarean section, number (%)	
- Previous caesarean section	11 (18%)
- CPD	23 (37.7%)
- Fetal distress	8 (13.1%)
- Breech presentation	10 (16.4%)

Table 1. Demographic data and fetal characteristic of the 61 patients having uterine atony during caesarean section and undergoing Nakornping uterine compressions sutures. (Cont.)

Data	Nakornping suture group (n=61)
- Placenta previa	4 (6.6%)
- Twin	5 (8.2%)
Fetal apgar score, Mean ± SD, number	
- 1 min	8.8 ± 0.8
- 5 min	9.8 ± 0.6
- 10 min	9.9 ± 0.3
Fetal body weight	
- mean ± SD, grams	3069.9 ± 628.0
- range, grams	1703 - 4230

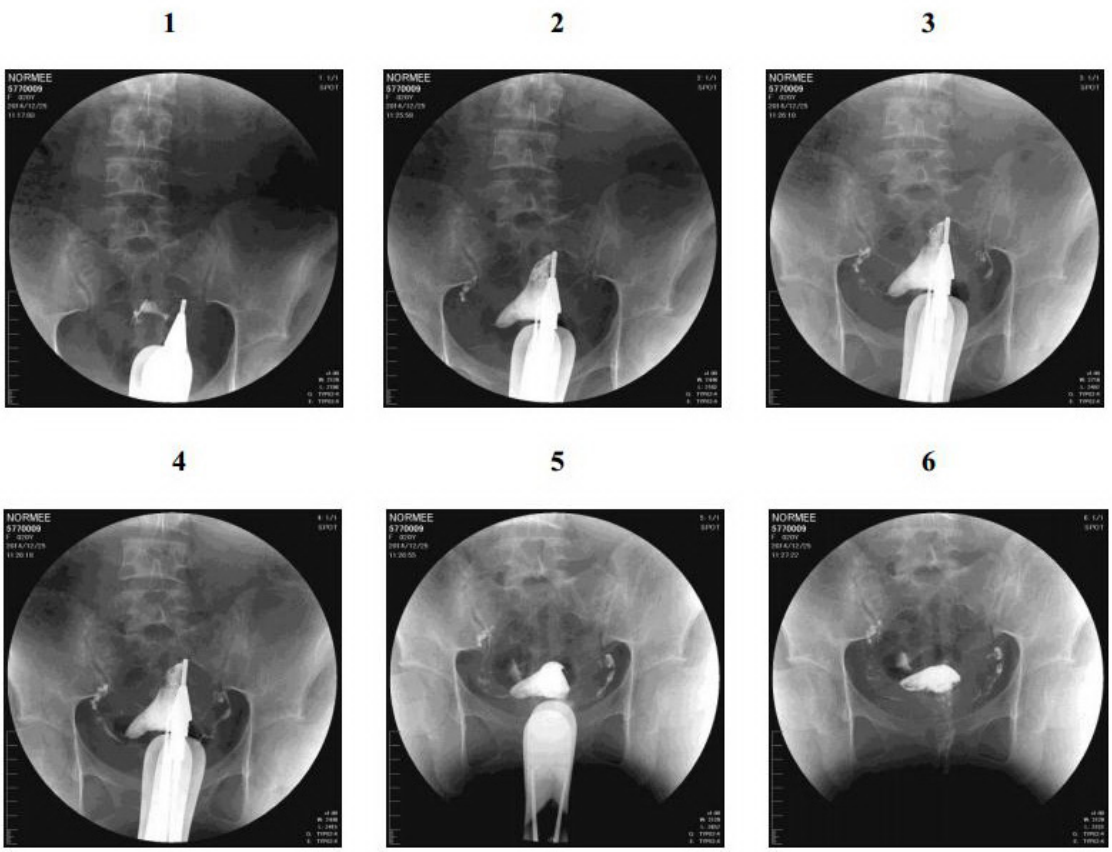
Table 2. Clinical outcomes of the 61 patients receiving Nakornping uterine compression sutures to manage persistent atonic uterus.

Outcomes	Nakornping suture group (n = 61)
- PPPH was controlled completety (%)	61 (100%)
- Relaparotomy	0
- Blood loss	
- Mean ± SD, milliliter	357.4 ± 92.1
- Range , milliliter	300 - 600
- Blood transfusion	
- Median , milliliter	0
- Range , milliliter	0 - 600
- Length of stay in hospital	
- Mean ± SD, (days)	4.4 ± 0.7
- Range, days	4-7
- Surgical time	
- Mean ± SD, minutes	39.0 ± 9.8
- Range, minutes	20 - 80
- Nakornping suture time	
- Mean ± SD, minutes	2.2 ± 0.4
- Range, minutes	1.8 - 3.5
- Total costs	
- Mean ± SD, baht	13716.9 ± 2676.1
- Range, baht	10582 - 23618

Graphic 1. Pelvis ultrasound findings on two patients on day 3 and day 7 after post operation.

Day 3 **Day 7**

Graphic 2. Hysterosalpingography findings on two patients on week 6 after operation to evaluate their fertility.



Discussion

Postpartum hemorrhage remains the world leading cause of maternal morbidity and mortality. Uterine atony has been identified as primary major cause. Varieties of treatments both medical and surgical treatments have been proposed to prevent and manage this obstetric emergency situation. Nakornping hospital has standard protocol for prevention and treatment of postpartum hemorrhage which includes giving mechanical uterine compression and bimanual massage, uterotonic medications such as oxytocin and methylergotamine and sulprostone respectively (appendix A). If the hospital guidelines fail to control the bleeding, hysterectomy will be done. This surgical procedure, however, is complicated and is a high risk procedure that requires highly trained and skilled surgeons.

Bringing the patient's safety, availability of the resources and cost effectiveness into consideration, the surgical option that we have in place does not seem to be the option of choice. Also, Nakornping hospital is a referral centre institution; we receive patients who reside in Chiang-Mai as well as the ones referred from other hospitals. Some patients are referred to us from remote areas in Meahongsorn or Lampoon which can take up to 4 hours transportation. This long referral processing time causes delay in receiving treatment of the patient which, in return, can result in increased risk of severe postpartum hemorrhage, higher complications or even life of the patient. Attempting to find a solution for this, the Nakornping uterine compression suture was developed and introduced to use in 2011. This technique, however, was offered only in caesarean delivery patients.

Nakornping uterine compression suture is modified from the B-Lynch technique. The principle of the Nakornping suture is similar to that of the manual uterine compression which is to compress the uterus. The objective of the Nakornping uterine compression suture is to manage primary postpartum hemorrhage (PPH). The Nakornping technique provides many advantages in term of managing PPH. First, it is a simple and quick procedure to perform compared with the more complicated and multi-steps of the B-Lynch technique. The Nakornping suture takes approximately 2-3 minutes to complete. Second, it is inexpensive. This compression suture needs only a 70 mm. straight needle and a chromic catgut no.1 for suturing which is available in any operating rooms. Third, the Nakornping suture procedure is highly effective. This study shows that Nakornping suture is sufficient to stop the bleeding immediately in all sixty one (100%) patients. Fourth, the procedure is safe. Unlike the B-Lynch technique which is done before closing the uterus, the Nakornping suture begins after the closure of the uterine cavity, the risk for bleeding from raw surface of the opened uterine cavity, therefore, is decreased. The risk of infection is as well reduced because the Nakornping suture placement is applied to lower segment of uterus with less suture materials penetrating into the endometrial of the uterine cavity compared with the B-Lynch's. In this study, there is no complication reported either during or after the procedure. None of the studied patients require intensive care. No readmission from complications related to the procedure. Fifth, the Nakornping compression suture can help preserve the uterus and the fertility function of the patient.

As Nakornping uterine compression suture is applied to lower segment of uterus, it is unlikely to interfere with fetal conception or cause abnormal placentation during a subsequent pregnancy. All sixty one patients in the study group reported normal lochia post caesarean delivery. Upon our follow up examinations, we found that the Nakornping suture method did not have a negative impact on the change of the uterine cavity, the contour of uterus or on the fertility outcomes of the patient. Pelvic ultrasound done on two patients revealed normal uterine contour, and hysterosalpingography performed on another two patients on week six post operation showed normal findings. Four patients had subsequent pregnancies with successful caesarean delivery. Last but not least, in the aspect of training, the simplicity of the procedure makes it easy for the novice obstetricians to understand and is practical for practice. Training the obstetricians

both in our hospital and more importantly in the referring hospitals with the knowledge and skills to perform the Nakornping suture is crucial. The patient may not need to be transferred to our referral site if the obstetricians in the remote areas hospitals are able to perform the Nakornping suture technique. Therefore, the result would be decreased maternal morbidity and mortality. With all the benefits the Nakornping suture can possible offer, the technique can be a key to better prevent and manage postpartum hemorrhage secondary to persistent uterine atony. The weakness of the study is in the follow up area. As mentioned that Nakornping hospital is the referral centre institution, the patient's records, therefore, can be traced only on patients who returned for follow up or readmitted to our hospital or the referring hospitals. During the follow up, only 42 patients (68.9%) turn up for their appointment. Nineteen patients (31.1%) did not return for on appointment. Of these, 14 patients (23%) are immigrant workers without addresses. Thus, the follow up data were inconclusive. As the Nakornping uterine compression suture has been used to manage postpartum hemorrhage merely in caesarean delivery patients, further study of the effectiveness of the suture in vaginal delivery patients is suggested.

Conclusion

Our study shows that Nakornping uterine compression suture is a simple, safe, effective, low costs and practical alternative to treat atonic uterus and to avoid hysterectomy. The subsequent pregnancy outcomes also reassure that the procedure can preserve the fertility function of the patient.

Potential conflcts of interest

The authors declare no conflct of interest.

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