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## OBSTETRICS

# Using Abdominal Binder for Reducing Postoperative Wound Pain after Cesarean Delivery: A randomized controlled trial

Thanyarat Singhdaeng, M.D.*,
Ussanee Sangkomkamhang, M.D.*,
Thananit Sangkomkamhang, M.D.**

** Department of Obstetrics and Gynecology, Khon Kaen Hospital, Khon Kaen, Thailand*
*** Department of Orthopedics, KhonKaen Hospital, KhonKaen, Thailand*

### ABSTRACT

**Objectives:** To determine the effect of using abdominal binder after cesarean delivery on postoperative wound pain, physical function and analgesic drugs use.

**Materials and Methods:** A randomized controlled trial was conducted between January and April 2018 at KhonKaen Hospital. Fifty women who underwent elective cesarean delivery were randomly allocated to either the abdominal binder group or routine standard care. The primary outcome was postoperative wound pain as measured by a visual analog scale (VAS) scores at 6, 24, and 48 hours after using the binder. The secondary outcomes included physical function as measured by distance 6-minute walk test (6MWT), time to first ambulation, analgesic drugs use and adverse effects.

**Results:** Postoperative wound pain was indicated by a significantly lower VAS score in the binder group with the repeated measures ANOVA ($F= 30.78$, $p < 0.005$). The respective postoperative VAS score at 6, 24, and 48 hours was also significantly lower in the binder group (mean ± SD at 6, 24, and 48 hr. = 4.77 ± 1.97, 3.73 ± 1.48, and 2.51 ± 1.63 vs. standard care 6.85 ± 2.26, 5.49 ± 2.34, and 4.66 ± 2.21; $p < 0.05$). Postoperative opioid drugs use in the binder group was significantly less than in the standard care (5.22 ± 1.20 mg vs. 7.63 ± 2.43 mg; $p < 0.01$). There were no significant differences in the 6MWT and time to first ambulation between the two groups. No serious adverse effects were reported.

**Conclusion:** Using abdominal binder can reduced pain and analgesic drugs used in postoperative cesarean delivery.

**Keywords:** abdominal binder, postoperative cesarean delivery, pain, physical function, analgesic drugs.

***Correspondence to:*** *Thanyarat Singdaeng, M.D., Department of Obstetrics and Gynecology, Khon Kaen Hospital, Khon Kaen, 40000, Thailand, E-mail: saiithanyarats@gmail.com*

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# *การใช้ที่รัดหน้าท้องเพื่อลดการปวดแผลผ่าตัดหลังคลอดบุตร*

***ธัญญารัตน์ สิงห์แดง, อุษณีย์ สังคมกำแหง, ธนนิตย์ สังคมกำแหง***

***บทคัดย่อ***

***วัตถุประสงค์:*** *เพื่อเปรียบเทียบผลการใช้ที่รัดหน้าท้องต่อความปวดแผล ความสามารถในการเคลื่อนไหวและการใช้ยาลดปวดในสตรีตั้งครรภ์หลังผ่าตัดคลอด*

***วัสดุและวิธีการ:*** *สตรีตั้งครรภ์ที่เข้ารับการผ่าตัดคลอดบุตรแบบไม่ฉุกเฉินที่โรงพยาบาลขอนแก่น ระหว่างเดือนมกราคม ถึงเดือนเมษายน พ.ศ.2561 จำนวน 50 ราย ได้รับการสุ่มเป็นกลุ่มที่ได้ใช้ที่รัดหน้าท้องหลังผ่าตัดคลอด และกลุ่มที่ได้รับการดูแลตามมาตรฐานตามปกติ โดยประเมินการปวดแผลผ่าตัดโดยใช้แถบเครื่องมือวัดความปวด (visual analog scale) ทดสอบความสามารถในการเคลื่อนไหวจากระยะทางการเดินโดยใช้แบบทดสอบการเดินใน 6 นาที (6 minutes walk test; 6MWT) เวลาครั้งแรกที่เริ่มขยับตัวหลังผ่าตัด(time to first ambulation) การใช้ยาลดปวดหลังการผ่าตัดคลอดและผลไม่พึงประสงค์จากการใช้ที่รัดหน้าท้อง*

***ผลการวิจัย:*** *การใช้ที่รัดหน้าท้องมีการปวดแผลหลังผ่าตัดที่ 6, 24 และ 48 ชั่วโมง น้อยกว่ากลุ่มที่ได้รับการดูแลตามมาตรฐาน VAS ที่ 6, 24 และ 48 ชั่วโมง (mean ± SD; 4.77 ± 1.97, 3.73 ± 1.48, 2.51 ± 1.63 และ 6.85 ± 2.26, 5.49 ± 2.34, 4.66 ± 2.21; p< 0.05 ) การใช้ปริมาณยาลดปวดกลุ่มน้อยกว่าอย่างมีนัยสำคัญทางสถิติ ในกลุ่มใช้ที่รัดหน้าท้อง 5.22 ± 1.20 มิลลิกรัม และ 7.63 ± 2.43 มิลลิกรัม (p < 0.01) แต่ความสามารถในการเคลื่อนไหวแบบ 6MWT และเวลาครั้งแรกที่เริ่มเคลื่อนไหวไม่แตกต่างกัน และไม่พบภาวะแทรกซ้อนที่รุนแรงของการใช้ที่รัดหน้าท้อง*

***สรุป:*** *การใช้ที่รัดหน้าท้องสามารถลดการปวดแผลผ่าตัด และลดปริมาณการใช้ยาลดปวดหลังผ่าตัดคลอดบุตรได้*

***คำสำคัญ:*** *ที่รัดหน้าท้อง, หลังผ่าตัดคลอดบุตร, ความสามารถในเคลื่อนไหว, การปวดแผล, ยาลดปวด*

## Introduction

One of most frequent major abdominal surgeries is cesarean delivery[1]. In Thailand, the prevalence of cesarean delivery has increased considerably during the past few decades[2]. Complications related to major abdominal surgery include atelectasis, pneumonitis, paralytic ileus, urinary infection and postoperative wound pain[3-4]. Acute pain after cesarean section can cause anxiety and distress to mother, reducing effective breastfeeding, and the time available for mother-infant contact[5]. It is not only pain but also fear of injury at the surgical site that makes patients reluctant to ambulate, raising the risk of thrombotic events and atelectasis[6].

Numerous pharmacological pain control studies have been conducted after cesarean delivery[7] but few investigators have assessed the benefits of nonpharmacological interventions. Even though some narcotics are safe to use during breastfeeding, some women would rather avoid using them because they are concerned that use of narcotics might hinder their ability to care for the newborn or have adverse effects on the neonate[8]. The use of an effective nonpharmacological alternative is thus of interest. Abdominal binders are being used increasingly as a form of alternative medicine[9]. Some studies suggest that the use of an abdominal binder might aid the management of pain following major abdominal surgery by limiting motion and supporting the abdominal wall during recovery[10]. Compression at the surgical site increases blood flow and reduces inflammation thereby aiding tissue repair[11]. The additional benefits of this device beyond pain control are prevention of herniation[11], wound seroma, and hematoma[12].

A systematic review reported that the effect of abdominal binder for pain control after cesarean delivery remains unclear[13], and there is insufficient evidence to support the use of abdominal binders for pain control after cesarean delivery[14]. Therefore, the aims of the present study were to assess whether using abdominal binders mitigate postoperative pain, improve physical activities and reduce analgesic use after cesarean delivery.

## Materials and Methods

Following approval by the Khon Kaen Hospital Ethics Committee on Human Research, this randomized controlled trial enrolled women who had undergone elective cesarean delivery at Khon Kaen Hospital, Khon Kaen, Thailand, between 1 January and 30 April 2018. To be included in the study women (a) had to be 18 years of age or older, (b) had undergone elective low transverse cesarean delivery under spinal anesthesia combined with intrathecal morphine and (c) were able to understand and follow written and oral instructions in Thai. Women were excluded if they had a body mass index (BMI) > 35 kg/m$^2$, any postoperative drainage, walking disability, chronic cough, peri-operative organ injury, or post-cesarean hysterectomy.

Randomization was done by computer generated block of 4. Women were allocated to a group that used either abdominal binder or routine standard care. Group assignments were written down and placed into opaque envelopes. All women eligible to join the study were invited to participate and consent. Demographic data were collected. Since the women and data collectors were aware; they were wearing a binder or not, there was no blinding to the study. Randomization was done after finished the operation. In the intervention group, at 2 hours post operation, standardized postpartum nurse will apply elasticized, adjustable abdominal binder over the abdominal surgical incision at 5% smaller than the women'postoperative abdominal circumference measured at umbilicus. Women wore it for 2 days after operation and checked every 4 hours by standardized training nurse at postpartum ward and was took off between 10 PM. and 8 AM.

The primary outcome was postoperative wound pain measured by visual analogue scale (VAS) by standardized training nurse at postpartum ward at postoperative 6, 24, and 48 hours. Women were instructed to place a mark on a 10 cm line corresponding to the severity of pain (0 cm - no pain, 10 cm - worst pain experienced). Secondary outcomes were postoperative mobilization at day 1 and day 2 as measured by distance 6-minute walk test (6MWT) down a straight hospital corridor. Women were asked

to record the time of their first ambulation, the time of first analgesic drug requirement, side effects and adverse effects. The postpartum nurses recorded the amount of analgesic drugs used. Both groups received standard postoperative nursing care (at postoperative day 1 used tramadol 50 mg intravenous prn for VAS pain score 4 every 6 hr. After step diet acetaminophen 500 mg 1-2 tablets per oral was given prn for pain q 4-6 hr. Side effects and adverse effects were recorded.

### *Sample size calculation*

The sample size was calculated from a pilot study included 30 women; 15 cases in each group. We used a formula to test the difference between the two independent proportions with a type I error of 5%, Zβ was set as 1.28 with a power of 90%. The sample size in each group was 25 cases.

### *Statistical analysis*

The data were analyzed on an intention to treat, using repeated measure analysis of variance (ANOVA) for the primary outcome, and the data were presented using descriptive statistics. A $p < 0.05$ was considered statistically significant. Continuous variables were analyzed using the student's t-test and were presented as mean and standard deviation (SD. Categorical variables were assessed using a chi-square or Fisher's exact test and presented as percentages. The survival analysis for the secondary outcomes were time to first ambulation and time to first analgesic drug requirement.

## Results

Of the 70 women initially enrolled in the study, 50 were included in the final analysis (25 in the abdominal binder group, and 25 in the routine standard care) (Fig. 1), The demographic characteristics were similar in both groups (Table 1). Among the 50 women, there were no differences in age, parity, previous cesarean delivery, blood loss, or operative time between groups. Eleven (44%) had a vertical skin incision in the binder group versus 6 (24%) in the routine standard care. 14 women (56%) had a pfannenstiel incision in the binder group versus 19 (76%) in the routine standard care group. There was no significant difference ($p = 0.135$).

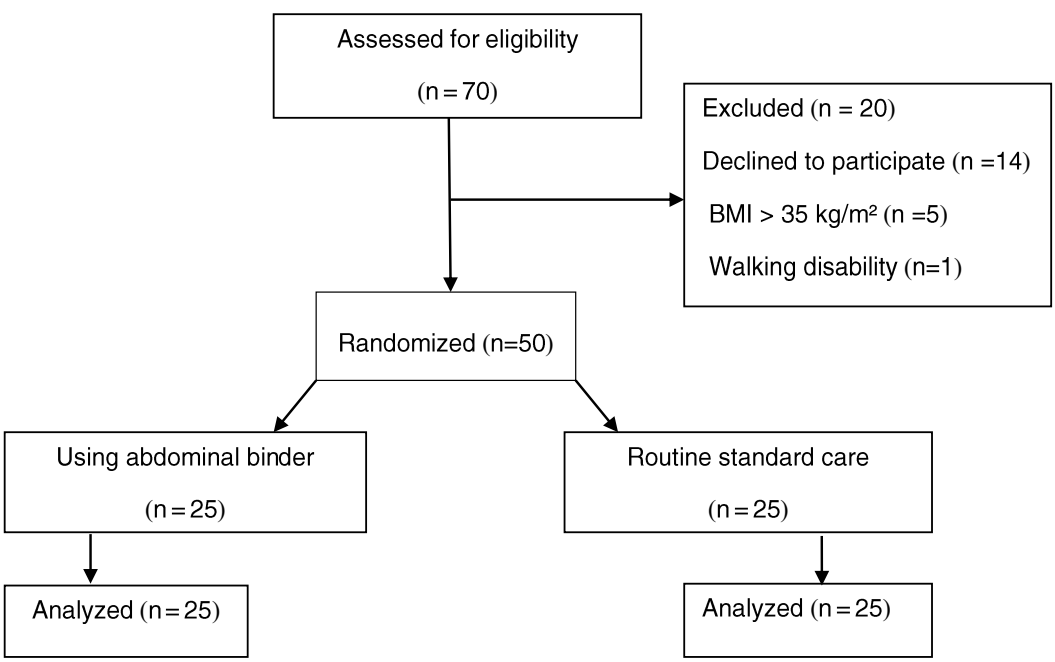



**Fig. 1.** Study flow diagram.

**Table 1.** Demographic characteristics.

| | Abdominal binder (n=25) mean ± SD or n (%) | Routine standard care (n=25) mean ± SD or n (%) |
|---|---|---|
| Age (years) | 27.16 ± 4.92 | 28.68 ± 4.44 |
| Parity | | |
| Nulliparous | 5 (20) | 6 (24) |
| Multiparous | 20 (80) | 19 (76) |
| Previous cesarean delivery | | |
| Yes | 18 (72) | 14 (56) |
| No | 7 (28) | 11 (44) |
| BMI (kg/m$^2$) | 25.13 ± 3.87 | 22.06 ± 3.57 |
| Skin incision | | |
| Vertical | 11 (44) | 6 (24) |
| Pfannenstiel | 14 (56) | 19 (76) |
| Operative time (min) | 44.04 ± 14.68 | 41.16 ±14.46 |
| Blood loss (ml) | 335.52 ± 170.87 | 310 ± 96.82 |

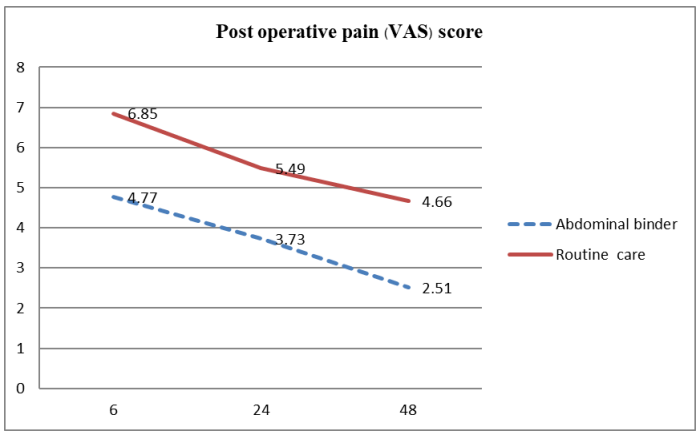
SD: standard deviation, BMI: body mass index

The main outcome was shown in Table 2. A repeated ANOVA was run to determine if there were any differences in VAS between groups at 6, 24, and 48 hours postoperatively. The results revealed that using an abdominal binder resulted in statistically significant differences in mean VAS over its time course ($F = 30.78$, $p < 0.01$). Among the 25 cases using the abdominal binder, the respective mean VAS at 6, 24, and 48 hours postoperatively were 4.77 ± 1.97, 3.73 ± 1.48, and 2.51 ± 1.63, which was significantly different from the routine standard care group (6.85 ± 2.26, 5.49 ± 2.34, and 4.66 ± 2.21; $p < 0.01$, $p < 0.01$, and $p < 0.01$) (Fig. 2).

**Table 2.** Postoperative pain (VAS) score.

| Postoperative pain (VAS) score | Abdominal binder (n=25) mean ± SD | Routine standard care (n=25) mean ± SD | p value |
|---|---|---|---|
| 6 hours | 4.77 ± 1.97 | 6.85 ± 2.26 | < 0.01 |
| 24 hours | 3.73 ± 1.48 | 5.49 ± 2.34 | < 0.01 |
| 48 hours | 2.51 ± 1.63 | 4.66 ± 2.21 | < 0.01 |

SD: standard deviation, VAS: visual analogue scale




X = postoperative time (hr.), Y = postoperative pain score by VAS (mean)

**Fig. 2.** Postoperative pain score by visual analogue scale (VAS) between abdominal binder group and routine standard care group.

The other results were shown in Table 3. No statistically significant differences between group were detected in (a) 6MWT at postoperative day 1 or 2 (p = 0.42, 0.48); (b) amount of acetaminophen used on postoperative day 1 or 2 (p= 0.21, 0.07); (c) time to first ambulation (p = 0.31); (d) time to first intravenous analgesic drug requirement (p = 0.35); or time to first oral analgesic drug requirement (p = 0.10). The amount of opioid used on postoperative day 1 in the binder group was, however, significantly less than in the routine standard care group (p < 0.01). Compliance wearing the binder and doing 6MWT was 100%. Itching was found in 3 women in the binder group. There was no serious adverse effect in the current study.

**Table 3.** Secondary outcomes.

| | **Abdominal binder (n=25) mean ± SD** | **Routine standard care (n=25) mean ± SD** | **p value** |
|---|---|---|---|
| Postoperative 6MWT (m) | | | |
| Day 1 | 151 ± 57.48 | 136.30 ± 76.71 | 0.42 |
| Day 2 | 159.20 ± 63.88 | 144.12 ± 82.87 | 0.48 |
| Postoperative analgesic drugs used (mg) | | | |
| Tramadol day 1 | 5.22 ± 1.20 | 7.63 ± 2.43 | < 0.01 |
| Acetaminophen day 1 | 113.24 ± 248.27 | 107.54 ± 458.03 | 0.21 |
| Acetaminophen day 2 | 145.83 ± 275.01 | 524 ± 600.19 | 0.07 |
| First post op ambulation (hrs) | 11.34 ± 6.99 | 13.33 ± 6.75 | 0.31 |
| First analgesics requirement (hrs) | | | |
| Intravenous | 2.49 ± 5.75 | 3.75 ± 3.27 | 0.35 |
| Oral | 11.45 ± 11.94 | 6.27 ± 10.00 | 0.10 |

SD: standard deviation, 6MWT: 6-minute walk test

## Discussion

This randomized controlled trial investigated the effect of abdominal binders in women who had undergone elective cesarean delivery with respect to pain, physical function and analgesic drug requirement. We found that use of an abdominal binder reduced pain 6, 24, and 48 hours postoperatively and reduced the amount of opioid used on postoperative day 1. Physical function and the amount of analgesic drug used were unaffected by use of an abdominal binder.

The findings of the current study agreed with Ghana et al[5] who evaluated post- cesarean delivery pain scores when wearing a binder to reduce waist circumference 5% between 08:00 and 22:00. They reported that the binder group had significantly lower pain scores than the non binder group. By contrast, Giller et al[14] reported that the pain scores among women who wore an abdominal binder both day and night were not significantly different from the control group.

The mechanism of how an abdominal binder controls postoperative pain is multifactorial[15], the binder reduces shear forces at the incision interface resulting in less discomfort while ambulating and less pain as the binder disperses direct pressure away from incision.

It is known that early mobilization postoperatively prevents many surgical complications. The current study used 6MWT to evaluate the rate of mobilization and found that 6MWT on postoperative day 1 and 2 and time to first ambulation were not different in the binder versus the non binder group. Cheifetz et al[16] used an abdominal binder to reduce abdominal circumference by 10-20%. It was worn at the first mobilization and at all times when out of bed. The 6 MWT distance between postoperative day 1, 3, and 5 were compared. They found that 6MWT on day 5 in the binder group was better than the control group. Arici et al[17] similarly used an abdominal binder to reduce abdominal circumference by 10-20%; it was worn at first mobilization and at all times when out of bed. They compared 6 MWT distance at postoperative day 1, 4, and 7 and found that an abdominal binder increased patient mobility at day 4 and 7 after surgery because it (a) reduced postoperative pain, (b) made the patients feel safe and (c) encouraged ambulation. The abdominal binder may thus improve physical function from day 4 after surgery. Giller et al[14] found that the respective amount of analgesic drugs (ibuprofen, acetaminophen, morphine, ketorolac) used on postpartum day 1 and 2 was not different between groups. By contrast, in our study, the amount of intravenous analgesic drug used in the binder group at postoperative day 1 was less than the control group; evidenced by an overall lower pain score. Decreasing opioid use in the breastfeeding woman can reduce side effects to the neonate caused by opioid transmission through the breastmilk (e.g., sedation, constipation and respiratory depression).

The adverse effect found in the current study was itching (3 women in the binder group). Compliance wearing the binder and doing 6MWT was 100%. No serious adverse effect was found in this study.

We found that using an abdominal binder can reduce pain and the amount of analgesic drug used among women who have undergone a cesarean delivery. According to the current study, an abdominal binder can be used as an easy to use, nonpharmacological method for treating acute postoperative pain.

Strengths of the current study were all of the population had no loss to follow-up and used a simple intervention.

Limitation of the current study were the same type of operation and anesthesia in both groups. For further research, we suggest the effects of abdominal binder used should be tested on different type of operation and anesthesia.

## Conclusion

This research indicated that abdominal binder usage after cesarean delivery decreased postoperative pain and amount of analgesic drug used albeit there was no clinical benefit on postoperative physical function. Abdominal binder usage was thus an easy to use, nonpharmacological method for reducing pain and opioid use after cesarean delivery.

## Potential conflicts of interest

The authors declare no conflict of interest.

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