Thai Journal of Obstetrics and Gynaecology
January 2021, Vol. 29, No. 1, pp. 10-16

GYNAECOLOGY

Abdominal Binder for Improving Postoperative Physical Function after Benign Gynecologic Surgery: A randomized controlled trial

Kornsakul Boonploeng, M.D.*,
Somsak Pratipanawatr, M.D.*,
Thumwadee Tangsiriwatthana, M.D.*

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

ABSTRACT

Objectives: To compare physical functions by six-minute walk test (6MWT) between participants using postoperative abdominal binder versus routine postoperative care.

Materials and Methods: Sixty participants undergoing benign gynecologic abdominal surgery were enrolled in a randomized controlled trial. The participants were randomized by a 1:1 ratio by computer-generated randomization using blocks of four to receive abdominal binder 2 hours after operation or received routine postoperative care, then 6MWT was performed on postoperative day 1 and day 2 in both groups. The primary outcome included improving walking distance. Visual analog scale (VAS) was used to measure pain levels at 6, 24 and 48 hours after surgery. Participants' characteristics, postoperative diagnosis and blood loss were assessed by medical record review.

Results: 6MWT following surgery of both groups was statistically significant on day 1 with mean difference of 27.53 meters (95% confidence interval (CI): 0.95-54.11), $p = 0.043$ and day 2 with a mean difference of 71.77 meters (95%CI: 43.11-100.42), $p < 0.001$. In terms of walking distance, the experimental group could walk farther than control group. VAS scores at different time points ($p < 0.001$) and time of first postoperative ambulation were significant lower ($p < 0.001$) in abdominal binder group. There was no adverse event reported.

Conclusion: Using postoperative abdominal binder can improve postoperative ambulation.

Keywords: abdominal binder, abdominal surgery, early ambulation, postoperative care.

Correspondence to: *Kornsakul Boonploeng, M.D., Department of Obstetrics and Gynecology, Khon Kaen Hospital, Sri-Chan Road, Muang district, Khon Kaen 40000, Thailand. Thailand, E-mail: kornkulbp @gmail.com*

Received: 29 September 2019, **Revised:** 31 October 2019, **Accepted:** 7 November 2019

การใช้ที่รัดหน้าท้องเพื่อฟื้นฟูสมรรถภาพและการเคลื่อนไหวหลังการผ่าตัดโรคทางนรีเวชวิทยาผ่านหน้าท้อง:การทดลองแบบสุ่ม

กรสกุล บุญเพลิง, สมศักดิ์ ประฏิภาณวัตร, ทุมวดี ตั้งศิริวัฒนา

บทคัดย่อ

วัตถุประสงค์: *เพื่อศึกษาผลการใช้ที่รัดหน้าท้องเพื่อฟื้นฟูสมรรถภาพและการเคลื่อนไหวหลังการผ่าตัดโรคทางนรีเวชวิทยาผ่านหน้าท้อง*

วัสดุและวิธีการ: *ผู้ป่วยหญิงที่ได้รับการผ่าตัดผ่านหน้าท้องด้วยโรคทางนรีเวชวิทยาทั้งสิ้น 60 ราย ได้รับการสุ่ม เป็น 2 กลุ่ม คือ กลุ่มที่ใช้ที่รัดหน้าท้อง และกลุ่มที่ไม่ได้รับที่รัดหน้าท้อง โดยเปรียบเทียบการเดินระยะทางตรง ภายใน 6 นาที และประเมินความปวดโดยวัดเป็นคะแนนโดยใช้ visual analogue scale ที่เวลา 6, 24 และ 48 ชั่วโมงหลังการผ่าตัดวันที่ 1 และ วันที่ 2 รวมทั้งมีการเก็บรวบรวมข้อมูลลักษณะประชากร, การวินิจฉัยหลังผ่าตัด, เลือดที่ออกขณะผ่าตัดจากเวชระเบียน*

ผลการศึกษา: *พบว่ามีความแตกต่างของค่าเฉลี่ยของระยะทางเดินอย่างมีนัยสำคัญทางสถิติ ในวันที่ 1 คิดเป็น 27 เมตร (95%CI: 0.95-54.11), p = 0.043 และวันที่ 2 คิดเป็น 71.77 เมตร (95%CI: 43.11-100.42), p < 0.001 และกลุ่มที่ใช้ผ้ารัดหน้าท้องเดินได้ระยะทางที่ไกลกว่า ระดับความปวดน้อยกว่า เคลื่อนไหวครั้งแรกได้เร็วกว่ากลุ่มควบคุม อย่างมีนัยสำคัญ และไม่พบเหตุการณ์ที่ไม่พึงประสงค์*

สรุป: *การใช้ที่รัดหน้าท้องช่วยเพิ่มสมรรถภาพและการเคลื่อนไหวหลังการผ่าตัดโรคทางนรีเวชวิทยาผ่านหน้าท้อง*

คำสำคัญ: *ที่รัดหน้าท้อง, การผ่าตัดเปิดช่องท้อง, การเคลื่อนไหวหลังผ่าตัด, การดูแลหลังผ่าตัด*

Introduction

One of the most frequent major abdominal surgery is gynecologic surgery. Patients who undergo major abdominal surgery may suffer from postoperative complications[1]. Complications related to major abdominal surgery include atelectasis, pneumonitis, nausea and vomiting, paralytic ileus, urinary infection and wound pain[2]. Most of them are unwilling to undertake postoperative movement and deep breathing. Not only pain but also fear of injury on surgical site makes participants reluctant to ambulate which could result in thrombotic complications and atelectasis[3].

After surgery, participants should support the incision area with a pillow or their hands during mobilization. However, it is not possible to provide constant support all the time, thus, using an abdominal binder is a practical and common application that facilitates mobility and recovery[4]. Moreover, it has been reported that using abdominal binder might decrease the pain following major abdominal surgery by limiting motion and supporting abdominal wall during recovery period[5], compression at surgical site, increases blood flow and reduces inflammation, hence improves rapid tissue repair but not increase intraabdominal pressure[6]. Some studies mentioned that additional benefits of this device including the prevention of herniation[7], wound seroma and hematoma[8].

The purpose of this study, therefore, is to investigate the effects of incision support using an abdominal binder on postoperative physical function (as measured by the 6-minute walk test) following benign gynecologic surgery. The secondary purpose was to investigate the effect of the postoperative course in terms of the pain experience.

This randomized controlled trial tested the hypotheses that the use of an abdominal binder would improve postoperative physical function and reduce postoperative pain.

Materials and Methods

Participants

Female participants, both scheduled and emergency, diagnosed with benign gynecologic conditions which required abdominal approached to surgery between January 2019 and May 2019 at Khon Kaen Hospital were recruited. Individual written informed consent was obtained. The study was approved by Khon Kaen Hospital Institute Review Board in Human

Research and the randomization were generated by computer using block of four. The randomization took place after the participants had undergone surgery. The randomization list was kept in opaque-sealed envelope.

The participants were randomly allocated into two groups, study and control groups. The study group applied an abdominal binder 2 hours after operation while the control group received routine postoperative care. The abdominal binding was administered by nurse in the gynecologic ward. Inclusion criteria were women 18 years of age or older, undergoing abdominal surgery of benign gynecologic conditions and able to understand and follow written and/ or oral instructions in Thai/ English. Exclusion criteria included (1) body mass index > 35 kg/m^2 (2) placement of any postoperative drain or colostomy (3) perioperative organ injury (4) walking disability (5) chronic cough (6) multimodality anesthesia (peripheral nerve or plexus blocks, epidural or spinal anesthesia) (7) skin lesion or skin infection along trunk surface.

Protocol

Demographic information was collected and baseline evaluations were performed at gynecologic ward. Physical function was assessed using the 6MWT at postoperative day 1 and day 2.

Starting on 2 hours postoperative, participants in the intervention group were fitted with a binder size that was applied firmly (binder circumference 5% smaller than the patient' s postoperative abdominal circumference measured at the level of the umbilicus). The elasticized binder was applied over the abdominal surgical incision, with the upper border not higher than the lower margin of the rib cage. They had worn the binder all the time for 2 days after operation then were checked every 4 hours and taken off between 10 PM to 8 AM. Postoperative standard nursing care was provided for both groups[9]. All participants underwent abdominal surgery under general anesthesia and received standard postoperative pain control protocol

of Department of Obstetrics and Gynecology, Khon Kaen Hospital such as intravenous morphine injection every 4 hours around the clock at postoperative day 1, then received 500 mg orally of acetaminophen for pain or fever every 4-6 hour but not exceed 2,000 mg/day or ibuprofen 400 mg every 8 hours not exceed 1,200 mg/day at postoperative day 2.

The 6MWT was chosen to evaluate the overall physical function because it has been the most extensively studied of the multiple walk tests available and because it is currently recommended for use in both research and clinical setting[10]. The test was administered according to a standardized protocol as recommended by the American Thoracic Society[11].

To ensure patient safety, blood pressure and heart rate were measured immediately prior to and following walk testing. Participants who had elevate blood pressure >180/100 mmHg before 6MWT have to rest and repeat measurement of blood pressure, if cardiovascular risk detected EKG 12 leads will be performed and administration of antihypertensive drug. After administration of antihypertensive drug if blood pressure reduction to 140/90 mmHg, they were allowed to test. If blood pressure had been persistent high, they would be withdrawn from group and standard treatment would be given.

The secondary outcome measures were pain scores, measured using a visual analog scale (VAS) at 6, 24 and 48 hours after operation. The VAS comprised a line with scores between 0 and 10; zero represented no pain and 10 indicated intolerable pain[12]. First ambulation and distress (discomfort, itching or rash followed by abdominal binder) were evaluated by self-reported questionnaire.

Data were analyzed on an intention-to-treat basis using SPSS version 14 and were presented as descriptive statistics (frequency and percentage). The independent t-test, Fisher exact, Chi-square test, Mann-Whitney U, Friedman were use as appropriated, and $p < 0.05$ was considered significant.

Results

There were 70 participants consented to participate in this study. After exclusion of 10 participants, the total of 60 participants were finally analysis (Fig. 1). Table 1 shows patient demographic data. There was no statistically significant differences in age, BMI, type of surgery, postoperative diagnosis, duration of surgery and estimated blood loss between intervention and control group ($p > 0.05$). All participants underwent surgery under general anesthesia and standard pain control protocol were administered in both groups.

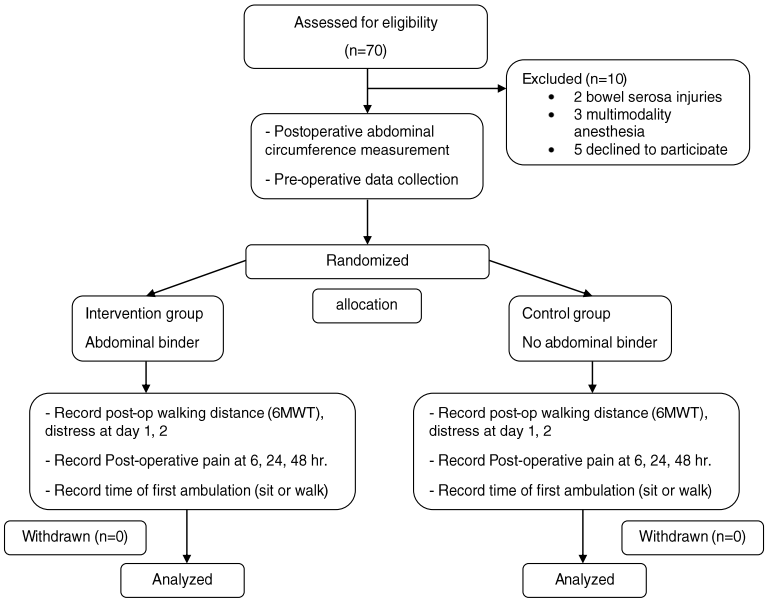

Fig. 1. Study flow.

Table 1. Baseline characteristics of the participants.

Demographic profile	Intervention group (n = 30)	Control group	p value
Age, year (mean ± SD)	41.03 ± 10.83	41.97 ± 10.99	0.742
BMI, kg/m^2 (mean ± SD)	25.28 ± 3.47	23.78 ± 4.57	0.158
Type of surgery, n (%)			0.834
Hysterectomy	3 (10.0)	2 (6.7)	
Adnexal surgery	10 (33.3)	9 (30.0)	
Hysterectomy with adnexal surgery	17 (56.7)	19 (63.3)	
Type of skin incision, n (%)			0.490
Pfannenstiel incision	15 (50.0)	18 (60.0)	
Midline incision	1 (3.3)	0 (0.0)	
Low-midline incision	14 (46.7)	12 (40.0)	
Postoperative diagnosis, n (%)			0.765
Myoma uteri	15 (50.0)	12 (40.0)	
Adenomyosis	4 (13.3)	7 (23.3)	
Ovarian tumor	5 (16.7)	5 (16.7)	
Others	6 (20.0)	6 (20.0)	
Operative time, minutes (median, interquartile range)	82 (67, 97)	89.5 (62, 100)	0.739
Estimated blood loss, ml (median, interquartile range)	52.5 (50, 200)	100 (50, 200)	0.493

BMI: body mass index

The primary outcomes were presented in Table 2. The 6MWT was significant higher in intervention group than in control group (197.60 ± 48.32 versus 170.07 ± 54.36 meters) at day 1 with mean difference of 27.53 meters (95%CI: 0.95-54.11), p = 0.043 and 256.70 ± 60.99 versus 184.93 ± 49.26 meters at postoperative day 2 with mean difference of 71.77 meters (95%CI: 43.11-100.42), p < 0.001. All the participants in intervention group significantly improved their walking distances compared to control group (73.3%), p = 0.002.

Table 2. Primary outcomes.

Outcomes	Intervention group (n = 30)	Control group (n = 30)	mean difference	95%CI	p value
6 MWT, meters					
- Postoperative day 1 (mean ± SD)	197.60 ± 48.32	170.07 ± 54.36	27.53	0.95 to 54.11	0.043
- Postoperative day 2 (mean ± SD)	256.70 ± 60.99	184.93 ± 49.26	71.77	43.11 to 100.42	<0.001
Different distance (mean ± SD)	-59.10 ± 36.56	-14.87 ± 36.50	-36.98	-47.97 to -25.99	<0.001
Improve walk distance day 1/ day 2, n (%)	30 (100)	22 (73.3)	-	-	0.002

6MWT, 6-minutes walk test; CI, confidence interval; SD, standard deviation

There was a statistically significant difference in the pain scores of each group at different time points ($p < 0.001$) and time of first postoperative ambulation were significant lower in intervention group ($p < 0.001$) (Table 3). The changes in pain scores are shown in Fig. 2.

Table 3. Secondary outcomes.

Measure	Intervention group (n = 30)	Control group (n = 30)	p value
Pain scores (median, interquartile range)			< 0.001
Postoperative 6 hr.	76.00 (46.75, 87.50)	84.00 (70.25, 90.50)	
Postoperative 24 hr.	48.50 (30.00, 64.50)	58.50 (47.25, 66.75)	
Postoperative 48 hr.	14.50 (6.00, 20.00)	28.50 (8.75, 42.50)	
Time of first post-op ambulation, hour (median, interquartile range)	20 (17, 22)	24 (22, 29)	< 0.001

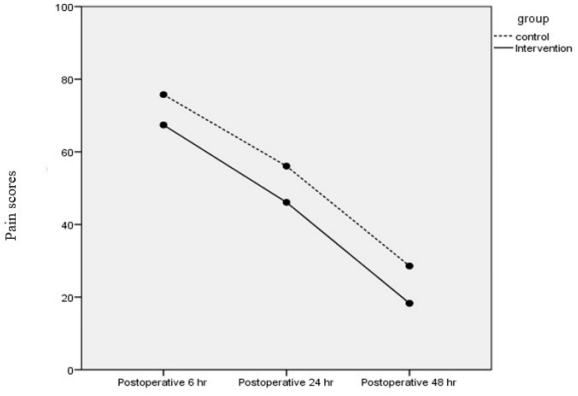

Fig. 2. The changes in pain scores at hour 6, 24 and 48.

Discussion

This randomized controlled trial investigated the abdominal binder for improving postoperative physical function after benign gynecologic surgery. We found that abdominal binder could improve physical function and reduce in pain postoperative.

The present study confirmed the similar results of Chiefetz et al[4] and Arici et al[13] revealed enhancing recovery of walk performance but difference in time point. This study showed earlier improve in physical function (postoperative day 1) than previous trials and early ambulation than control group. Possible reason might be the difference in type of operations, operative time and anesthetic methods.

However, Szender et al[14] assessed postoperative ambulation in participants at high risk for thromboembolic diseases and pneumonia, they found positive clinical outcomes but without statistical significance.

The findings of our study agreed with data reported by Ghana et al[15] that wearing a binder between 08:00 am and 10:00 pm had lesser pain scores than the non-binder group. By contrast, Giller et al[16] reported that the pain score among participants who wore an abdominal binder both day and night were not significantly different from the control group. Finally,

there was no significant difference in serious side effects between intervention group.

The strength of this study was a randomized controlled trial. An abdominal binder can be generally purchased and convenient to apply. Limitation of this study was that we studied only in specific type of surgery as well as only in benign gynecologic diseases. Therefore, for further research, the study in difference population such as in gynecologic cancer patient or in case of laparoscopic surgery should be considered. And more observation of the late onset of complications such as surgical wound infection or dehiscence, thromboembolic events[17] can be emphasized quality of intervention.

The implication for practice of this study was abdominal binder might be useful in improving physical function and reduce postoperative pain.

Conclusion

Abdominal binder can improve physical function and reduce postoperative pain.

Potential conflicts of interest

The authors declare no conflict of interest.

References

1. Diaz V, Newman J. Surgical site infection and prevention guidelines: a primer for Certified Registered Nurse Anesthetists. AANA J 2015;83:63-8.
2. Izveren OA, Dal U. The early period complications in the patients who were performed abdominal surgery intervention and the nursing practice for these complications. J Nurs Health Sci 2011;18:36-46.
3. Havey R, Herriman E, O'Brien D. Guarding the gut: early mobility after abdominal surgery. Crit Care Nurs Q 2013;36:63-72.
4. Cheifetz O, Lucy SD, Overend TJ, Crowe J. The effect of abdominal support on functional outcomes in patients following major abdominal surgery: a randomized controlled trial. Physiother Can 2010;62:243-53.
5. Larson CM, Ratzer ER, Davis-Merritt D, Clark JR. The effect of abdominal binder on postoperative pulmonary function. Am Surg 2009;75:169-71.
6. Zhang HY, Liu D, Tang H, Sun SJ, Ai SM, Yang WQ, et al. The effect of abdominal binders on intra-abdominal pressure. Saudi J Med Med Sci 2016;37:66-72.
7. Leblanc KA. Laparoscopic incisional and ventral hernia repair: complications-how to avoid and handle. Hernia 2004;8:323-31.
8. Mustafa G, Al Mamun A, Ahmad N, Alam S, Khan M, Alam K. Percutaneous liver biopsy: technique and safety. Hepatogastroenterology 2011;58:529-31.
9. Barber EL, Van Le L. Enhanced recovery pathways in gynecology and gynecologic oncology. Obstet Gynecol Surv 2015;70:780-921.
10. Solway S, Brooks D, Lacasse Y, Thomas S. A Qualitative Systematic Overview of the Measurement Properties of Functional Walk Tests Used in the Cardiorespiratory Domain. Chest 2001;119:256-70.
11. American Thoracic Society, ATS committee on Proficiency Standard for Clinical Pulmonary Function Laboratories. ATS statement: guidelines for the six-minute walk test. Am J Respir Crit Care Med 2002;166:111-7.
12. Hawker GA, Mian S, Kendzerska T, French M. Measures of adult pain: Visual Analog Scale for Pain (VAS Pain), Numeric Rating Scale for Pain (NRS Pain), McGill Pain Questionnaire (MPQ), Short-Form McGill Pain Questionnaire (SF-MPQ), Chronic Pain Grade Scale (CPGS), Short Form-36 Bodily Pain Scale (SF-36BPS),and measure of intermittent and constant osteoarthritis pain (ICOAP). Arthritis Care Res (Hoboken) 2011;63:240-52.
13. Arici E, Tastan S, Can MF. The effect of using an abdominal binder on postoperative gastrointestinal function, mobilization, pulmonary function and pain in patients undergoing major abdominal surgery: A randomized controlled trial. Int J Nurs Stud 2016;62:108-17.
14. Szender JB, Hall KL, Kost ER. A randomized clinical trial examining a neoprene abdominal binder in gynecologic surgery patient. Clin Exp Obstet Gynecol 2014;41:525-9.
15. Ghana S, Hakimi S, MirghafourvandM , Abbasalizadeh F, Behnampour N. Randomized controlled trial of abdominal binders for postoperative pain, distress and blood loss after cesarean delivery. Int J Gynaecol Obstet 2017;137:271-6.
16. Giller CM, Sparks JR, Kriner R, Anasti JN. A randomized controlled trial of abdominal binders for management of postoperative pain and distress after cesarean delivery. Int J Gynaecol Obstet 2016;133:188-91.
17. Pearse EO, Caldwell BF, Lockwood RJ, Hollard J. Early mobilization after conventional knee replacement may reduce the risk of postoperative venous thromboembolism. J Bone Joint Surg Br 2007;89: 316-22.