Original Article

The Effect of Abdominal Binder Used for Keep the Belly Warm after Laparoscopic Gynecological Surgery on Gastrointestinal Functions: A Randomized Controlled Trial

Hatice Yildiz, RN, PhD
Professor, Marmara University Faculty of Health Sciences, Nursing Department, Istanbul, Turkiye

Yeliz Dogan Merih, RN, PhD
Associate Professor, University of Health Sciences, Hamidiye Faculty of Nursing, and Presidency of Turkish Health Institutes (TUSEB), Istanbul, Turkiye

Elif Ozer Ekiz, RN, MSc
Zeynep Kamil Women and Child Diseases Training and Research Hospital, Istanbul, Turkiye

Emine Turkmen, RN, PhD
Professor, Istinye University Faculty of Health Sciences, Nursing Department, Istanbul, Turkiye

Aysegul Samatli Aliogullari, RN, MSc
Presidency of Turkish Health Institutes (TUSEB), Istanbul, Turkiye

Correspondence: Hatice Yıldız, RN, PhD, Marmara University Faculty of Health Sciences Division of Nursing Department of Obstetrics and Gynecology Nursing, Istanbul, Türkiye

e-mail: heryilmaz@marmara.edu.tr hatice.hy@gmail.com

Correspondence: Hatice Yildiz, RN, PhD, Marmara University Faculty of Health Sciences Division of Nursing Department of Obstetrics and Gynecology Nursing, Istanbul, Turkiye
e-mail: heryilmaz@marmara.edu.tr hatice.hy@gmail.com

Abstract
Objective*:* Laparoscopic surgery is commonly used in the gynecological field and can cause postoperative gastrointestinal problems. This study aimed to determine the effect of abdominal binder used for keep the belly warm on the reduction of postoperative distention, gas passage, and related pain.
Methods: This randomized, controlled, and experimental study was conducted in an Obstetrics and Gynecology Research and Training Hospital. Study (SG,n=36) and control group (CG,n=40) cases were randomly selected, and the abdominal binder was applied only to the study group during the post-operative period.
Results: Postoperative peristalsis, oral initiation, and pass gas onset times were shorter in SG cases. Post-op abdominal distention, gas, and related pain problems were also significantly less in the SG cases ($p<0.05$-0.001). The logistic regression showed an increase in all these parameters, OR:3-10 times ($p<0.05$-0.001), when the abdominal binder was not applied. **Conclusion:** Using an abdominal binder prevents postoperative distention, gas, and distention-related pain severity effectively. It shortens the time of the postoperative return of peristalsis and gas passage hour. It can be used in care practices to promote rapid improvement in postoperative gastrointestinal functions.

Keywords: postoperative; abdominal binder; gastrointestinal functions; distention; gas; pain

Introduction

Commonly used in the field of gynecology, laparoscopic surgery has both advantages and disadvantages (Kallen, 2018; Sao et al., 2019) Depending on the pressure caused by medical carbon dioxide, patients commonly complain of gas and distention after surgery, and 80%

of patients reported postoperative pain (Gibbison & Kinsella, 2009; Rothman et al., 2014; Zhu et al., 2013). Pain and distention caused by residual gas in the abdomen after surgery can occur in the first hours, lasting between 24 and 48 hours (Gibbison & Kinsella, 2009). And, postoperative gastrointestinal dysfunction (PGD) being a common postoperative complication (Cao et al., 2018).

The data indicate that patients undergoing laparoscopic surgery receive inadequate pain management in comparison to those who undergo major surgical operations (Gerbershagen et al., 2013), and the level of patient satisfaction with postoperative pain management is low (40-60%) (Lovatsis et al., 2007). Therefore, severe pain and distention observed in patients during the early postoperative period (Ekstein et al., 2006) should be taken into account in terms of quality of care (Turkish MoH, 2021). The Surgical Enhanced Recovery after Surgery (ERAS) protocols and hospital accreditation standards include the effective monitoring and treatment of pain. Pain management practices are also important for prevention of gastrointestinal dysfunctions, early return of bowel function, and the assurance of patient comfort in postoperative patients (Turkish MoH, 2021; ERAS, 2020). Implementation of these protocols and standards are the professional responsibility of both nurses and physicians (ANA, 2015; Rich, 2001). Pain, distention, nausea, and vomiting occurring in postoperative patients may also have an adverse impact on early mobilization,[1] an important evidence-based postoperative care practice (Lee et al., 2018; Yolcu et al., 2016; Bolukbas & Birlikbas, 2019). Therefore, the elimination of postoperative pain and distention complaints should be an important goal in nursing care.

Background

The importance of postoperative recovery of gastrointestinal function is gradually increasing. In addition to pharmacological methods used to enhance patient comfort, nonpharmacological methods are also used to prevent postoperative gastrointestinal dysfunction after laparoscopic/abdominal surgery (Cao et al., 2018). Some studies indicated that chewing gum after gynecological operations is one such method (Chuamor & Thongdonjuy, 2014; Husslein et al., 2013; Park & Choi, 2018), abdominal massage also assists in the return of gas passage and bowel movements (Lamas et al., 2009). One meta-analysis study reported that the insufflation of warmed and humidified carbon dioxide during laparoscopic abdominal procedures is effective in reducing postoperative gas pain (Sammour et al., 2008). In their randomized controlled study, Cao et al. (2018) found that a Yikou-Sizi powder hot compress applied after abdominal surgery was also effective in improving gastrointestinal function. In addition, Chen et al. (2015) reported that a hot compress alongside electro-acupuncture treatment is a safe postoperative treatment. Bouvier et al. (2014) systematic review showed that the abdominal binder used for hot application after laparotomy can be effective in reducing pain, indicating a need for further randomized controlled trials. Some studies reported that the abdominal binders improve mobility (Saeed et al., 2019), and significantly reduces postoperative pain and gastrointestinal dysfunction (Ghana et al., 2017; Gustafson et al., 2015; Larson et al., 2009). Studies that evaluate the effectiveness of using hot, application-based materials or abdominal binders for conditions such as pain, gas, and distention management related to gastrointestinal function after abdominal/laparoscopic surgery are limited. In addition, the use of nonpharmacological methods after such surgeries requires further study. The current study aimed to evaluate the effect of abdominal binder used for keep the belly warm on the return of postoperative gastrointestinal function/gas passage and the reduction of distention and pain associated with these factors, thereby contributing to the literature and care practices.

Methods

Study design: This randomized, controlled, and experimental study was conducted in an Obstetrics and Gynecology Research and Training Hospital in Istanbul.

Participants: During sampling, power analysis was performed using the G-power (V3-1.7) program to determine the number of

cases to be included in the study and control groups. The calculation made according to α: 0.05, β=0.20, effect size of (1-β) d=0.80, and significance of $p<0.05$ determined that the minimum number of cases needed in each group was 29. This study included a total of 76 cases—36 in the study group (SG) and 40 in the control group (CG). The study sample criteria included women between the ages of 20 and 60 who had undergone laparoscopic surgery and were hospitalized in the gynecology department of the hospital where the study was conducted, had no language or communication barriers, were able to perceive and answer the questions, and volunteered to participate in the study (*Only two of the women who met the sampling criteria did not want to participate in the study)*. The CONSORT flow diagram for the study is given in Figure 1.

Randomization: Women who met the sample criteria were randomized and included in the study and control groups. The simple randomization method was used, and in the randomization performed according to hospital protocol numbers of those who met the inclusion criteria, participants whose protocol numbers ended with an odd number were assigned to the CG and those whose numbers ended with an even number were assigned to the SG.

Instruments: Data were collected using participant's characteristics and perioperative assessment forms. The first form consisted of ten questions concerning participants' sociodemographic, obstetric, abdominal distention, and gas passage characteristics/ experiences. The second form consisted of 22 questions related to the pre-, intra-, and postoperative periods and the Visual Analog Scale (VAS) was used that to assess participants' levels of postoperative distention, pain, and gas pain level. The VAS measures perceived pain on a 10 cm line (vertical/horizontal), with "no pain" at one end and "worst possible pain" at the other. Individuals are asked to mark a point on the line corresponding to the severity of the pain they experience (Eti Aslan, 2002; Collins et al., 1997). Cronbach's Alpha value was found .798 for the parameters we assessment with VAS.

Ethical considerations: This study was conducted in accordance with the Declaration of Helsinki. There are no conflicts of interest to declare. The study was approved by the Clinical Research Ethics Committee of the Hospital (Decision no: 10.06.2016, Issue:29) and institutional permission was obtained from the hospital. Participants were informed about the study and their legal rights to participate, and then from the volunteers, written consent was obtained.

Interventions- Data collection: After the necessary ethical approval and institutional permissions were obtained, the study was implemented. The abdominal binder was developed by the researchers and was applied to those in the SG during the postoperative period, along with routine care. Participants in the CG received only routine pre- and postoperative care. The participants and the healthcare professionals were not blinded due to the nature of the intervention, clinical setting, and routine clinical practices.

The practice material: The abdominal binder was designed with an innovative approach to a similar traditional practice for keeping the abdominal area warm and used in nursing care. The abdominal binder that is designed as a belly warmer was made of simple polar fleece fabric with a width of 30 cm and in such a way that wrapped around the abdominal area. In order to adjust the length, waist and abdomen measurements were taken of 10 underweight, normal weight, overweight, and obese females. The two ends of the abdominal binder were fixed with a hook and loop fastener. Based on the sketches drawn by the researchers, the hospital tailor-manufactured three different sizes (small, medium, and large) of the abdominal binder. According to the literature, hot application is effective in controlling pain and sedating/relaxing the muscles (Yaban,2019; Ozveren, 2011). The hot belly for postoperative patients prevents drops in body temperature and keeps the abdominal area warm and promote the recovery of gastrointestinal function (Zhu & Hu, 2013). Thus, it has shown to be effective in the management of abdominal distention, gas, and pain relief, as well as in the early return of postoperative gastrointestinal functions.

Abdominal binder application: The abdominal binder was applied to the SG after the first physical assessment by the researcher (a nurse in the clinic) once the patient left the operating room and was admitted to the intermediate care unit (a three-bed unit equipped with tools to perform close patient monitoring and emergency intervention until first mobilization—about four hours) during the postoperative period. Patients continued to wear the abdominal binder until they were discharged. Aside from routine care interventions applied in the clinic, no other interventions were performed on the CG.

Data collection: The participant's characteristics form was completed for both groups before surgery, and patients' medical records and self-reports were used to evaluate the perioperative process. Patients' responses to self-report questions were obtained once they felt well during the postoperative period, and results were recorded in the perioperative assessment form. Post-operative physical examination and the assessment of bowel sounds, abdominal distention, gas, and pain for those in both the control and study groups were performed by the nurse researcher until patient discharge. Using the VAS, the first assessment of abdominal distention levels and distention-related pain was performed during the fourth postoperative hour. The second assessment measured patients' pain levels before the first passing of gas.

Data analysis: Data was evaluated using the Statistical Package for Social Sciences (SPSS) version 22.0. In the comparative analysis, Fisher's χ^2 and the t-test were performed. In order to measure the level of effectiveness of the abdominal binder, a binary logistic regression was applied to the parameters that were significant in the t-test, and the enter method was used. The SG was coded as "0," and the CG was coded as "1." The cut-off was set using the mean and SD scores of the SG for time of postoperative peristalsis, oral intake, and passes of gas, as well as for distention and distention/gas-related pain severity. The level of significance was set at $p<0.05$.

Results

The average age of patients in both groups (N=76) was SG:38.83±11 and CG: 37.85±10.65, the median number of pregnancies (three) and births (two) were similar ($p>0.05$), and there was no significant difference in terms of age, educational status, and obstetric characteristics ($p>0.05$) (Table 1). There was no difference between the groups in terms of bladder and bowel habits before surgery ($p>0.05$), and the operations performed in both groups were similar: laparoscopic hysterectomy, myomectomy, salpingectomy, and cystectomy. The vast majority (SG: 97.2%; CG: 95.0%) of patients had received antibiotic prophylaxis immediately before surgery. There was no difference between the groups in terms of antibiotic prophylaxis and pre-op enema ($p>0.05$). In both groups, all patients fasted before the operation (eight hours), all operations were performed under general anesthesia, and all patients underwent postoperative analgesia.

In both groups, anesthesia durations were over an hour, time of first postoperative mobilization was an average of SG:3.8±1.0/h; CG:4.2±1.2/h±, and there was no difference between the groups ($p>0.05$). Time of postoperative return of peristalsis, oral intake, and gas passage was shorter in participants treated with the abdominal binder. Postoperative abdominal distention and pain levels related to distention and gas were also low. There was a significant difference in terms of these parameters between the groups in favor of SG ($p<0.05$- $p<0.001$) (Table 2).

Results of the logistic regression analysis showed that when the abdominal binder was not applied, postoperative return of peristalsis was OR:10.9 times later, oral intake was OR:3.06 times later, and gas passage was OR:7.5 times later. In addition, postoperative distention levels increased OR:4.58 times, level of distention-related pain increased OR: 7.23 times, and level of gas-related pain increased OR:6.85 times when the abdominal binder was not applied ($p<0.05$-0.001) (Table 3).

Discussion

In this study, preoperative enemas were given to both groups, and both abstained from intake of any solid or liquid foods after midnight before the day of surgery; a prophylactic

antibiotic was used in all cases during the intraoperative stage, and analgesia was used during the postoperative stage (Table 2). Such practices are similar to those in ERAS protocols applied in gynecological operations (Kallen, 2018).

It has been shown that abdominal surgery and surgical stress are important risk factors for distention (Kallen, 2018; Tasdemir & Senol Celik, 2010). Due to the use of medical carbon dioxide, postoperative distention, gas, and pain in the early period after laparoscopic surgery are frequently encountered in most patients (Gibbison & Kinsella, 2009; Rothman et al., 2014; Zhu et al., 2013). Laparoscopic surgeries are usually performed under general anesthesia, which increases the incidence of postoperative gastrointestinal dysfunction (Cao et al., 2018). In this study, laparoscopic operations of the cases in both groups were also performed under general anesthesia. In addition, the type of surgery and anesthesia, surgical duration, and perioperative interventions were similar in both groups.

Flow Diagram for the Study.

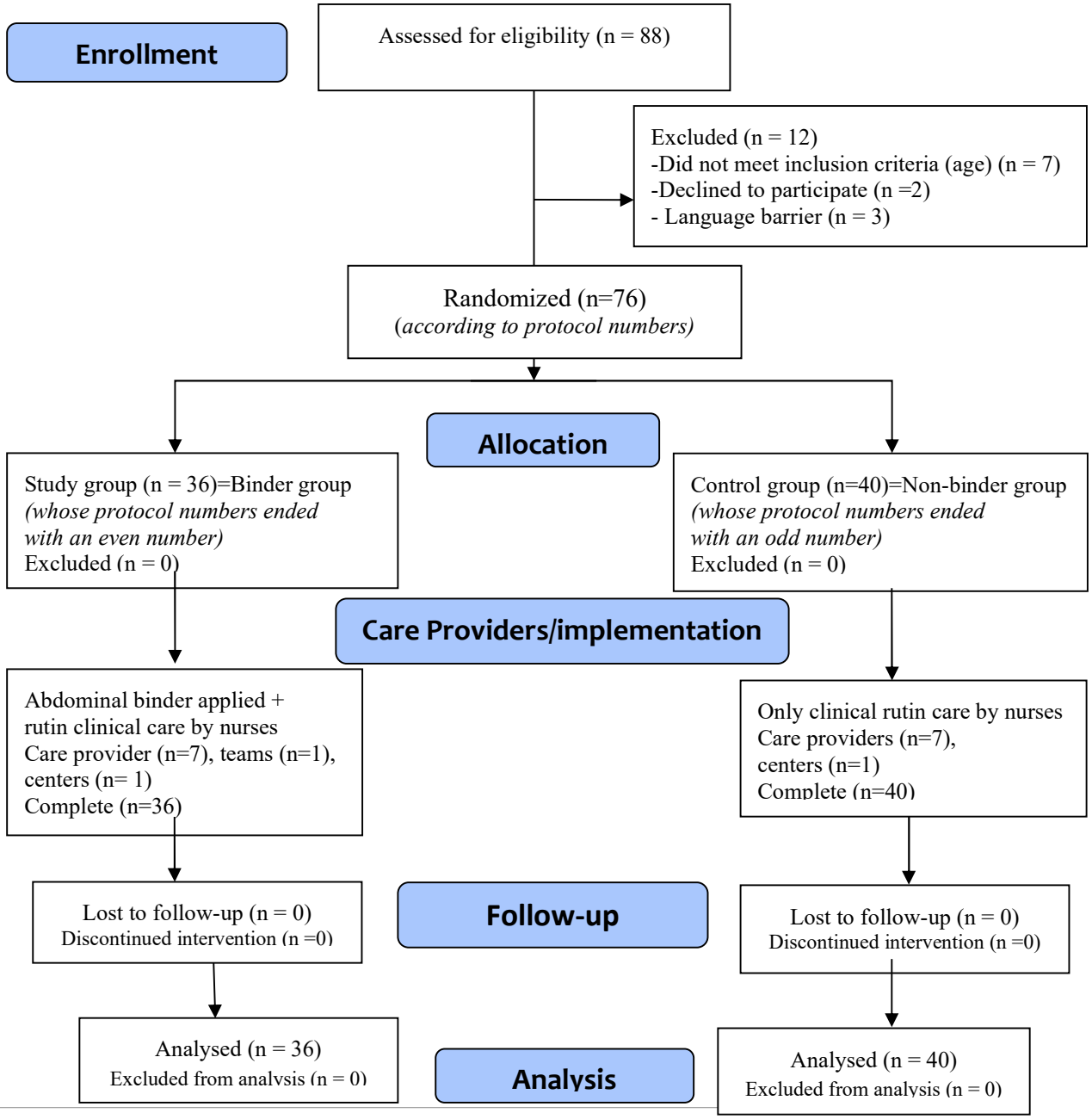

Table 1. Sociodemographic and obstetric characteristics

N=76					
Characteristics	**Study Group (SG) (n= 36) n (%)**		**Control Group (CG) (n= 40) n (%)**		**χ^2 / t, p**
Education					
<5 years *(Literate)*	2 (5.6)		8 (20.0)		χ^2=6.37,
Primary	14 (38.9)		16 (40.0)		p= .17
Secondary	6 (16.7)		3 (7.5)		
High school	5 (13.9)		8 (20.0)		
University	9 (25.0)		5 (12.5)		
Pregnancy experience					
Yes	26 (72.2)		25 (62.5)		χ^2 =.81
No	10 (27.8)		15 (37.5)		p= .36
Birth experience					
Yes	20 (55.6)		23 (57.5)		χ^2=.02
No	16 (44.4)		17 (42.5)		P=. 86
Types of birth					
Normal vaginal birth	13 (36.1)		16 (40.0)		χ^2=.13
Caesarean section	7 (19.4)		7 (17.5)		P=. 93
Nulliparity	16 (44.4)		17 (42.5)		
	Mean±SD	**Median**	**Mean±SD**	**Median**	
Age	38.83±11.40	36	37.85±10.65	36	t=-.38 p=.69
Gravidity	3.85±1.93	3	3.40±1.80	3	t=-.85 p=.39
parity	2.70±1.92	2	2.48±1.47	2	t=-.42 p=.67

Table 2. Results of postoperative mobilization, peristalsis, distention, and gas passage

Variables	Study Group (n= 36)	Control Group (n= 40)	t, p
Postop abdominal disturbing distension	**n(%)**	**n(%)**	
Yes	0 (0.0)	20 (50.0)	χ^2 =32.0
No	36 (100.0)	20 (50.0)	P= .000
	Mean±SD)	**Mean±SD)**	
Post-op first mobilization time^{hour}	3.8±1.0 (Min.2–Max.6)	4.2±1.2 (Min.2–Max.8)	t= 1.50 P= .13
Post-op peristalsis start time^{hour}	6.2±3.0 (Min.1–Max.13)	13.9±7.1 (Min.1–Max.24)	t= 6.02 **p= .000**
Post-op gas passage hour	8.0±2.7 (Min.3–Max.16)	13.4±7.4 (Min.4–Max.24)	t= 4.12 **p= .000**
Post-op distention level	2.0±1.9 (Min.1–Max.8)	3.5±3.0 (Min.1–Max.10)	t= 2.58 **p= .01**
Post-op pain level	1.4±0.6 (Min.1–Max.3)	3.2±2.7 (Min.1–Max.10)	t= 3.91 **p= .000**
Post-op gas pain level	3.0±1.3 (Min.1–Max.6)	4.3±2.4 (Min.1–Max.10)	t= 2.98 **p= .004**
Post-op oral intake start time	4.1±1.2 (Min.2–Max.8)	5.4±3.2 (Min.2–Max.23)	t= 2.06 **p= .04**

Note: *The level of distention and pain levels dependent on post-op distention and gas were evaluated with a numeric scale ranging from 0 to 10 (0: none at all; 10: very severe)*

Table 3. Results of logistic regression

Variables	OP *Overall Percentage*	B	SE	Wald	Exp(B) (OR)	95% CI	p
Post-op peristalsis start time^{hour}	76.3%	2.39	0.55	18.88	10.92	[3.71-32.11]	**.000**
Post-op oral intake start time	68.4%	1.11	0.52	4.47	3.06	[1.08-8.63]	**.034**
Post-op gas passage hour	71.1%	2.01	0.55	13.34	7.50	[2.54-22.10]	**.000**
Post-op distention level	71.1%	1.52	0.57	6.92	4.58	[1.47-14.23]	**.008**
Post-op distention pain level	69.7%	1.97	0.61	10.27	7.23	[2.15-24.28]	**.001**
Post-op gas pain level	68.4%	1.92	0.57	11.14	6.85	[2.21-21.21]	**.001**

While none of the cases given the abdominal binder reported disturbing distention, half of those in the control group did (Table 2), suggesting that the abdominal binder is effective in preventing abdominal distention. In addition, time of postoperative return of peristalsis, level of distention, distention and gas-related pain, and gas passage/oral intake times were significantly lower in the SG ($p<0.05$-0.001) (Table 2). Considering the various parameters of postoperative gastrointestinal functions, results favored the use of the abdominal binder.

Logistic regression results showed that when the abdominal binder was not applied, post-op peristalsis and oral initiation time, as well as first gas passage time, were later, and the level of post-op distention and distention/gas-related pain distention increased ($p<0.05$-0.001) (Table 3).

Tasdemir & Celik (2010) reported that the occurrence of postoperative distention is significantly less in cases where pre-op enemas were performed. In our study, preoperative enemas were given to almost all cases in both groups. The fact that cases in the SG did not report disturbing distention or ranked the level of distention as 2.0±1.9 ("none or close to none") shows that the abdominal binder helps prevent and/or reduce distention after laparoscopic surgery. The fact that the level of postoperative distention increased by 4.58 times and the level of distention-related pain distention increased by 7.23 times for those not given the abdominal binder distention also reinforces this conclusion.

Tasdemir & Celik (2010) have shown that early postoperative oral intake reduces distention. In our study's cases given the abdominal binder, the time of postoperative return of peristalsis and oral intake were significantly shorter (Table 2). When the abdominal binder was not applied, post-op peristalsis start time was 10.9 times later, and oral intake time was 3.06 times later (Table 3), indicating that the abdominal binder is effective in treating gastrointestinal symptoms and therefore reducing distention. Tasdemir & Celik (2010) reported that the time of gas passage of patients who underwent surgery under general anesthesia was an average of 21.8h (min. 2, max.144 hours). In current study, time of gas passage in cases given the abdominal binder was 8.0±2.7/h shorter, while taking much longer for the control group (13.4±7.4/h). These results also showed that the abdominal binder was significantly effective in postoperative gas passage.

Although studies indicate that the use of an abdominal binder or similar applications (Cao et al., 2018; Sammour et al., 2008; Chen et al., 2015) after abdominal surgery (whether laparoscopic or not) (Bouvier et al., 2014), are effective in reducing postoperative pain and gastrointestinal dysfunction (Saeed et al., 2019; Ghana et al., 2017; Cheifetz et al., 2010), one study indicate that there is weak evidence for its effect on pain severity (Rothman et al., 2014). It is also noted that warmed CO_2 insufflation during laparoscopic surgery can reduce gas-related pain (Sao et al., 2019). Our study's results suggest that abdominal binder application is an important nursing care intervention that can be used to apply Surgical ERAS protocols, particularly those positively influencing gastrointestinal functions, reducing the occurrence of postoperative gastrointestinal dysfunction, and thus improving postoperative recovery.

Limitations: This study was conducted in a single clinic and only included laparoscopic gynecological cases. Therefore, further multicenter research conducted in different areas of laparoscopic surgery is needed.

Based on the results: This study's results indicated that keeping the belly warm with an abdominal binder effectively prevents postoperative distention; shortens the time of postoperative return of peristalsis, gas passage, and oral intake; and reduces distention- and gas-related pain severity. Considered a simple and low-cost care initiative to be applied after laparoscopic gynecological surgery, use of the abdominal binder can contribute to patient satisfaction and healthcare services since it promotes rapid improvement in postoperative gastrointestinal symptoms and decreases pain

associated with these symptoms while also reducing analgesia usage. The practice also does not pose any postoperative complications. Therefore, we recommend the use of abdominal binders in the clinical field. Clinics can potentially provide abdominal binders to patients or encourage patients to keep the abdominal area warm, to promote rapid improvement in postoperative gastrointestinal symptoms.

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