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Brief Communication

The effect of dimethicone on preventing ileus in patients with pelvic and femoral fractures: A clinical trial☆

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ABSTRACT

Ileus and pseudo-obstruction are clinical syndromes that are among the most common postoperative complications. Identifying an effective treatment approach for these conditions is essential. Therefore, the aim of this study is to investigate the effect of Dimethicone on preventing ileus in patients with pelvic and femoral fractures.

This study was conducted on 120 patients, with 60 individuals in the Dimethicone group and 60 individuals in the control group. After recording demographic information and clinical notes, bowel movements and defecation after surgery were also recorded. The statistical tests of Chi-square, Fisher's exact-test, Mann-Whitney, and independent t-test were utilized to compare the data.

The primary outcome of the study determined the incidence of ileus in the intervention and control groups (intervention group = 1.7 % and control group = 3.3 %) ($P = 0.99$). The secondary outcome involved comparing the time of gas expulsion between the two groups, intervention, and control (intervention group = 21.05 h and control group = 22.03 h) ($P = 0.065$). Although the time of gas and feces expulsion, as well as the initiation of bowel movements and the occurrence of ileus, were lower in the intervention group, there was no statistically significant difference in the postoperative results, particularly regarding the occurrence of ileus and the reduction in the duration of feces and gas expulsion and the initiation of bowel movements in patients receiving Dimethicone compared to the control group.

Considering the lack of statistical significance in the obtained results and the absence of similar studies using Dimethicone, further research and larger sample size studies with Dimethicone or other pharmacological methods are needed to find the most effective treatment approach in reducing the occurrence of ileus after surgery.

Introduction

Ileus and pseudo-obstruction are clinical syndromes that occur due to impaired bowel movement and are characterized by signs and symptoms of bowel obstruction in the absence of any mechanical lesion causing the obstruction [1]. Ileus is a significant morbidity factor in patients and one of the most common causes of delay in their discharge [2]. The most common causes of ileus are surgical procedures, trauma, infections, inflammations, electrolyte disorders, and medications [3]. Reflexes of the sympathetic nervous system resulting from the stress of surgical procedures, the release of inflammatory mediators, and pain-relieving and anesthetic medications are among the factors that can each cause disturbances in bowel motility [4]. The prevalence of ileus in abdominal surgeries is 15 % [5]. However, it can also occur in other surgeries, including orthopedic surgeries, without entering the peritoneal cavity [6]. If the prevalence of ileus in orthopedic surgeries depends on the type of surgical procedure, it ranges from 0.3 % to 8.4 % [7]. In spinal surgeries, the prevalence is higher, ranging from 5 % to 12 % [8]. Clinical manifestations of ileus include nausea, vomiting, abdominal distension, and pain, as well as intolerance to food, which can be distressing for the patient [9]. Ileus can also lead to nutritional stagnation, prolonged bowel paralysis, readmission to the hospital, bowel perforation, and death [10]. If ileus persists for more than 3–5 days or occurs in the absence of abdominal surgery, it is essential to investigate and identify the underlying cause and rule out mechanical obstruction [11]. Furthermore, the medications taken by the patient, including opioids

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and electrolytes (such as sodium, potassium, calcium, and magnesium), should be investigated and assessed [12]. Dimethicone and simethicone are antifoaming medications that lead to the breakdown of gas bubbles in the gastrointestinal tract, making it easier to expel gas from the digestive system [13]. Dimethicone has been used in some cases to reduce infant colic and facilitate the expulsion of gas [14]. Additionally, before simethicone, dimethicone was used in antacid syrups [15]. One of the advantages of this medication is the absence of serious side effects, which are limited to gastrointestinal effects such as diarrhea and nausea [16]. So far, no study has been conducted to investigate the effect of dimethicone in preventing ileus. The closest study conducted was to assess the effect of simethicone on ileus after colorectal surgeries. In studies conducted so far, the use of chewing gum, Alvimopan, acupuncture, and Simo enema has been found to be beneficial in reducing and preventing ileus in certain cases.

Despite numerous studies on identifying factors contributing to the occurrence of ileus and exploring various treatment methods, no standard treatment approach, and importantly, no recommended preventive method have been established for preventing this condition. This indicates the necessity for conducting further and more extensive studies in this regard. Therefore, due to the high prevalence of ileus in patients at the medical center, it was decided to investigate a method for preventing this syndrome.

Methods

Setting and participants

The study type was a Randomized Controlled Trial. The samples were included in the study after obtaining personal consent. Inclusion criteria: All patients with various pelvic and femoral fractures who were hospitalized for a minimum of 3 days and were under treatment at the medical center during the study. Exclusion criteria: Patients who had symptoms of ileus before the surgery or were taking prokinetic medications were excluded from the study.

Interventions

If clinical symptoms of ileus occurred, its presence was confirmed through clinical examination and other relevant information. The study was conducted by administering 40 mg of Dimethicone tablets three times a day to the intervention group and observing the control group.

In the context of the study, background conditions contributing to the occurrence of the disease were investigated and considered as variables, including the following factors: measurement and evaluation of electrolytes such as sodium, potassium, calcium, and magnesium, use of drugs (type and quantity), underlying diseases such as diabetes, duration of hospitalization, and the time of getting out of bed by the patient. The follow-up duration of patients is from the time of admission until discharge. The patients were examined and assessed by the data collection officer every 8 h. Then, the effect of Dimethicone was investigated regarding the primary outcome (determining the occurrence of ileus in patients) and the secondary outcome (comparing the time of gas expulsion between the intervention and control groups). Finally, the information obtained from the patients was collected in a questionnaire and subjected to analysis. The information and variables regarding the type of disease and demographic data are obtained based on the information from the patients' files using a checklist. The status of ileus is determined based on the patients' medical history and examination and according to clinical criteria. Electrolyte variables are determined based on laboratory tests. Supplementary information is completed using imaging methods when necessary.

Samples are selected after obtaining written consent from individuals, and they are randomly divided into two groups, the intervention group and the control group, using 4-digit random numbers. Sampling: Random allocation based on the lack of comparable studies and insufficient information for sample size calculation led to the consideration of expert opinions on the likelihood of ileus occurrence in patients, which was 50 % in the control group and 25 % in the Dimethicone group. With a confidence level of 95 % (B = 20 %) and margin of error (a = %5), the sample size in each group was calculated to be 55 samples. Considering a 10 % dropout rate in each group, 60 samples were considered.

Outcomes and analysis

In data analysis, the normality of the data was initially assessed using the Kolmogorov-Smirnov test with Lilliefors correction. If the data was confirmed to be normally distributed, appropriate parametric tests such as the student's *t*-test were utilized. In case the data was not normally distributed, the Mann-Whitney *U* test was used. For analyzing data with nominal scales, the Chi-square test was employed, and in cases where more than 20 % of the expected frequencies in the contingency tables were less than 5 (Cochran), the Fisher's exact-test was used. The software used in this research was IBM-SPSS version 20, and the significance level for the tests was set at less than 5 %.

IRB statement

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This clinical trial was carried out in Iran at the center of clinical trial registered with a special registration code: (IRCT20200708048064N1).

Results

120 patients (60 patients in the Dimethicone group and 60 patients in the control group) were enrolled in the study. The mean age of the participants was 58.04 ± 14.7 years (Fig. 1).

Among the enrolled individuals, 55 (45.8 %) were male and 65 (54.2 %) were female (Fig. 2).

based on the Table 1, there are no statistically significant differences in the prevalence of underlying diseases (diabetes, hypertension, dyslipidemia, and heart disease) between the Dimethicone group and the Control group. The percentages of patients with these diseases are relatively similar between the two groups.

based on the Table 2, there are no statistically significant differences in the mean sodium and potassium levels between the Dimethicone group and the Control group. The results indicate that the two groups have similar mean levels of sodium and potassium, and any observed differences are not statistically significant at the given *p*-values (0.255 for sodium and 0.192 for potassium).

based on the Table 3, there are no statistically significant differences in the timing of bowel movements, gas discharge, and excretion between the Dimethicone group and the Control group. The results indicate that the two groups have similar timings for these variables, and any observed differences are not statistically significant at the given *p*-values (0.1471 for bowel movements, 0.0651 for gas discharge, and 0.0652 for excretion).

Discussion

Now, there is no clinical trial investigating the long-term effects of Dimethicone on the ileus. However, previous experiments on a similar drug group containing Simethicone (also known as active Dimethicone, a combination of silica gel and Dimethicone) were beneficial in women. In a previous controlled trial, 50 women who underwent abdominal surgery were given 40 mg of Simethicone after the operation. These patients experienced faster passage of gas, less abdominal pain/discomfort, and fewer needs for enema compared to those who did not receive Simethicone [17].

They did not have any significant difference in the time of the first

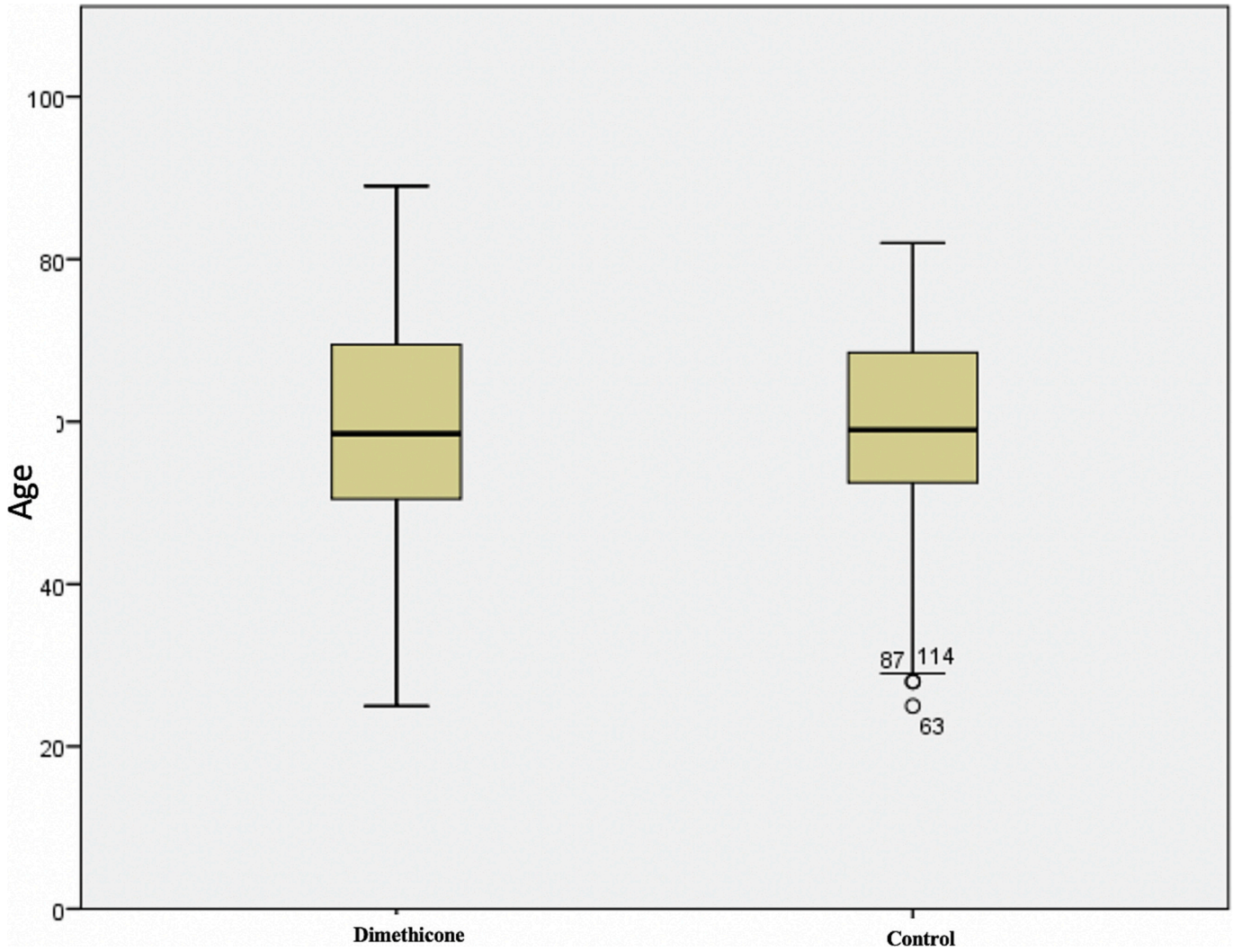

Fig. 1. Mean and standard deviation of age in patients of two study groups.

bowel movement, and the hospitalization period was not recorded. In a larger double-blind study, Gibbshtyn and colleagues evaluated the effect of Simethicone on 200 non-randomized women undergoing abdominal hysterectomy or cesarean section. The patients received Simethicone (80 mg every 4 h from the night of the surgery, totaling 14 doses), and the analysis showed a significant reduction in abdominal gas, gas pain intensity, and an increase in the spontaneous passage of gas and stool. Furthermore, they observed a reduction in the number of laxative treatments and a decrease in the need for enema or reported side effects [18].

While these studies have demonstrated beneficial effects, the surgical procedure used in those studies was different from our study, as it involved women undergoing intestinal surgery where ileus could occur during the surgery, and it's possible that Dimethicone may not have similar effects. The current study only evaluates patients undergoing orthopedic surgeries, where the occurrence of ileus is generally lower, reported around 2 to 5 %. Additionally, the stronger design of the current study with a larger sample size makes the results more reliable and applicable to the orthopedic surgical population.

However, in a study conducted by Jeremy E. Springer and colleagues in 2018, the aim was to investigate the effect of Simethicone on postoperative ileus. The patients were randomly assigned to receive either a five-day course of oral Simethicone (58 individuals) or a placebo (60 individuals). The primary outcome was the time of the first bowel movement. The secondary outcomes included the time of the first passage of gas, the duration of postoperative hospital stay, and postoperative pain. The mean time for the first passage of stool in the Simethicone group was 25.2 h, while it was 26.7 h in the control group ($P = 0.98$). There was no statistically significant difference in the time of the first bowel movement (Simethicone = 41.1 h vs. control = 42.9 h, $P = 0.91$) or the average duration of hospital stay (Simethicone = 4.5 days vs. control = 4.0 days, $P = 0.63$). This study couldn't identify any meaningful difference in the postoperative gastrointestinal motility recovery among patients receiving Simethicone after major bowel surgery. Postoperative ileus remains a significant clinical and economic burden, necessitating further research to identify safe and effective treatment strategies [19].

Although the patients studied in the mentioned research were not similar to our study, in that study, patients undergoing bowel surgery were included, but similar to our study, this drug group did not show any effect on reducing the occurrence of ileus and the time of bowel movement after surgery. Additionally, the sample size in that study is similar to the sample size in our study.

Recently, there have been advances in other pharmacological agents for the treatment of ileus. It is worth mentioning that Alvimopan is a peripheral mu-opioid receptor antagonist and has been demonstrated in several recent trials to reduce the incidence of postoperative ileus [20–23].

This substance neutralizes the bowel motility-inhibiting effects of opioids without affecting their pain-relieving effects. Wolf and

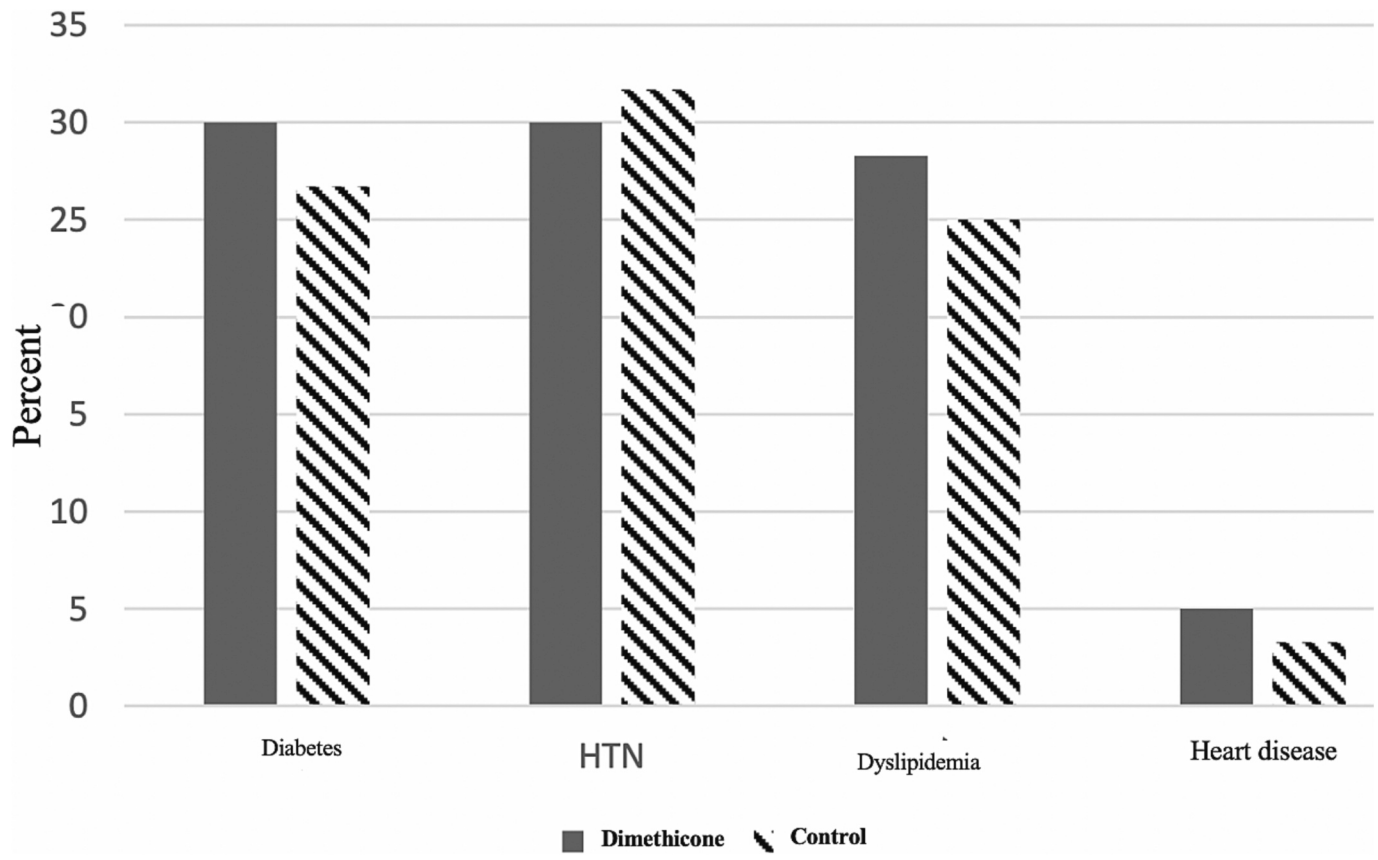

Fig. 2. Frequency of gender in patients of two study groups.

Table 1
Frequency of underlying disease in patients of two study groups.

Illness group		Dimethicone	Control	Total	P-value
Diabetes	Number	18	16	34	0.685
	Percent	30.0 %	26.7 %	28.3 %	
HTN	Number	18	19	37	0.843
	Percent	30.0 %	31.7 %	30.8 %	
Dyslipidemia	Number	17	17	32	0.68
	Percent	28.3 %	28.3 %	26.7 %	
Hear disease	Number	3	2	5	0.99
	Percent	5.0 %	3.3 %	4.2 %	

Table 2
Mean and standard deviation of sodium and potassium in patients of two study groups.

Variable	Group	Number	Mean	SD	P-value
Na (mEq/L)	Dimethicone	60	138.95	4.451	0.255
	Control	60	139.93	4.246	
K (mEq/L)	Dimethicone	60	4.25	0.635	0.192
	Control	60	4.38	0.615	

colleagues evaluated 510 patients undergoing laparotomy in a randomized, controlled, double-blind trial with placebo and demonstrated that Alvimopan accelerates the recovery of gastrointestinal function and shortens the time to discharge.

Similarly, Viscusi and colleagues evaluated the effects of Alvimopan on 418 patients undergoing bowel or uterine surgery in a randomized, controlled, double-blind trial and demonstrated that the drug significantly accelerates the recovery of gastrointestinal function.

Finally, Delaney and colleagues conducted a similar randomized trial and demonstrated that when Alvimopan is administered before and after large bowel surgery, it improves gastrointestinal function and reduces the time of discharge from the hospital compared to the placebo.

Table 3
Mean and standard deviation of bowel movements and gas and stool excretion in patients of two study groups.

Variable	Group	Number	Mean	SD	P-value
Start of bowel movements (hours)	Dimethicone	60	14.87	3.255	0.147[a]
	Control	60	15.78	3.445	
Discharge of gas (hours)	Dimethicone	59	21.05	2.776	0.065[a]
	Control	58	22.03	3.372	
Excretion (hours)	Dimethicone	59	28.76	4.001	0.065[b]
	Control	58	30.14	3.984	

[a] Mann-Whitney *U* test.
[b] Independent *t* test.

In the cost-effectiveness analysis of the four Alvimopan trials in the United States, Bell and colleagues found that the average cost per patient for receiving Alvimopan was approximately $930.00, but this cost was offset by a reduction in hospital readmissions. Therefore, further investigation of other drugs should be considered in subsequent studies as alternative methods may be more effective in reducing ileus compared to Dimethicone.

Postoperative ileus remains a significant complication following surgical procedures and has a significant correlation with postoperative complications, increased hospital stay, and healthcare costs [24–26]. Over the past two to three decades, considerable efforts have been made to improve or reduce the incidence of postoperative ileus; however, this issue remains largely unresolved. Despite our advancements in postoperative management and the use of laparoscopy, ileus continues to challenge surgeons. It is evident that ileus leads to increased hospitalization duration, healthcare costs, and postoperative complications [27].

Conclusions

This double-blind, placebo-controlled randomized trial could not demonstrate any difference in gastrointestinal motility recovery in patients who received Dimethicone following orthopedic surgery. Further studies are needed to investigate potential pharmacological options for reducing ileus, which remains a significant clinical and economic burden for healthcare systems.

This study has several limitations, with the major limitation being the relatively small sample size. Although the trial was initially designed as a pilot study, it was adequate for our primary outcome, and therefore, the current study has sufficient statistical power to detect a clinically relevant difference in post-treatment ileus between Dimethicone and placebo. Among other limitations, participant dropout, nausea and vomiting, and limitations in oral intake were also encountered during the study.

Ethical approval

All procedures performed in this study involving human participants were in accordance with the ethical standards of the Alborz University of Medical Sciences and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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Consent to participate

Written consent was obtained from all the patients.

Consent for publication

Not applicable.

CRediT authorship contribution statement

Haleh Pak: Visualization, Validation, Supervision, Methodology, Investigation, Conceptualization. **Leila Haji Maghsoudi:** Visualization, Validation, Supervision, Methodology, Investigation, Conceptualization. **Shayan Shahsavary Alavijeh:** Visualization, Validation, Supervision, Methodology, Investigation, Conceptualization.

Declaration of competing interest

The authors deny any conflict of interest in any terms or by any means during the study.

Data availability

Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

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