Received: 18 May 2020 | Revised: 30 October 2020 | Accepted: 2 November 2020

DOI: 10.1111/nicc.12575

RESEARCH

BACCN Nursing in Critical Care WILEY

Effect of abdominal massage on bowel evacuation in neurosurgical intensive care patients

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Abstract

Background: There are many factors, which affect the bowel evacuation of neurosurgical intensive care unit (NICU) patients, resulting in constipation.

Aim and objectives: The aim of this study was to investigate effect of abdominal massage on bowel evacuation and the risk of constipation in NICU patients.

Design: A prospective, randomized-controlled clinical trial.

Methods: The sample of this study included 80 NICU patients. The patients were randomly assigned to abdominal massage and control groups. The constipation risk of all the patients was assessed with Constipation Risk Assessment Scale (CRAS). The patients in the abdominal massage group received a total of 30 minutes of massage, 15 minutes every morning and evening, until the first defecation. The bowel sounds of all patients in the abdominal massage and control groups were assessed on a daily basis. The days when bowel sounds were heard and the first defecation took place were recorded in a Bowel Evacuation Form.

Results: The risk of constipation was higher in the patients in the abdominal massage (CRAS score 19.02 ± 1.81) and control groups (CRAS score 20.45 ± 2.61). The time of return of bowel sounds and the time of the first defecation were earlier in the abdominal massage group, compared to the control group ($P < .05$). In the control group, there was a weak correlation ($P = .004$) between the CRAS score and the time of return of bowel sounds, while there was a moderate correlation between the CRAS score and the time of the first defecation ($P < .001$).

Conclusion: Our study results show that the risk of constipation is high in NICU patients, and abdominal massage is an effective nursing intervention to shorten the time of return of bowel sounds and the time of the first defecation.

Relevance to clinical practice: Nurses can safely apply abdominal massage to improve bowel evacuation in NICU patients.

KEYWORDS

abdominal massage, bowel evacuation, constipation, intensive care unit, neurosurgical patient, nursing

1 | INTRODUCTION

One of the most serious problems that can develop in neurosurgical intensive care unit (NICU) patients is increased intracranial pressure (ICP). A significant factor, which increases ICP in these patients is the Valsalva manoeuvre, which occurs during constipation-induced straining or enema application, as epiglottis is closed during exhalation during the Valsalva manoeuvre, while intra-abdominal and intrathoracic pressure increase. This increase prevents the venous return from the brain, increases ICP,[1,2] and may even lead to death.[3]

Constipation does not only cause neurological deterioration in NICU patients, but also leads to fatal intestinal obstruction, if clinical symptoms are neglected.[4] Constipation accompanied by intestinal dilatation is associated with an increased intra-abdominal pressure, resulting in limited diaphragmatic movement. It also induces cardiopulmonary problems,[5] leading to prolonged length of stay, failure to feed,[6,7] delay in weaning from mechanical ventilation and bowel obstruction,[7] and increased healthcare expenditures.[8] In addition, it has been shown to be associated with impaired quality of life and patient comfort.[9] Nurses also spend more time for patient care in these patients with constipation.[8] Therefore, prevention of constipation is critical for NICU patients safety.

Opioids, immobilization, and suppression of defecation sensation are the main factors, which may cause inadequate response to defecation stimulation and changes of bowel evacuation in NICU patients.[2,3,10-12] In addition, neurological problems affecting the nerve conduction such as spinal cord injury, spinal tumours or cerebrovascular diseases, and changes in nutrition and movement caused by altered consciousness increase the risk of constipation in intensive care unit (ICU).[11]

The risk of constipation is high in neurosurgical patients,[10] and the rate of constipation ranges from 40.7% to 88.6%.[10,13] It is recommended using laxatives instead of enemas to prevent constipation in NICU patients.[1,14] A meta-analysis revealed that, in critical patients, prophylactic bowel regimen did not reduce the risk of constipation and it also increased the risk of diarrhoea.[15] Researches showed that abdominal massage (AM), an independent nursing intervention that also reduces the use of pharmacological agents without harming the patient, was beneficial in the prevention and treatment of constipation.[9,16-18]

In the literature, there are studies demonstrating the effects of AM on facilitating bowel evacuation in elderly,[17] and in patients with constipation[18] or orthopaedic conditions,[9] or spinal cord injuries and on preventing gastric complications.[19-21] In a single study, including neurosurgical patients followed in the trauma ICU, less than half of the patients (23/70) underwent cranial surgery and only the frequency of defecation was evaluated, while the constipation risk or the time of the first defecation were not considered.[13] Other studies on neurosurgical patients focused on identifying the risk of constipation[10] before and after surgery.[2] There is a very limited number of studies regarding the effects of AM in this patient population having a risk of constipation.[2,10] In the present study, we therefore, aimed to investigate the effect of AM, a non-pharmacological method, on preventing constipation, which is associated with adverse patient outcomes and to provide evidence-based nursing care in these patients.

What is Known About the Topic

- The risk of constipation is very high in ICU patients.
- Valsalva manoeuvre, which occurs during constipation-induced straining may cause increased ICP in NICU patients.
- Prevention of constipation is critical for NICU patient safety.
- Abdominal massage is an effective nursing intervention to facilitate bowel evacuation.

What this Paper Adds

- This paper explained that the risk of constipation is very high in NICU patients as other ICU patients.
- Abdominal massage is an effective non-pharmacological intervention to shorten the time of bowel evacuation in NICU patients.
- Nurses can safely apply AM to provide early defecation or treat constipation in NICU patients.

2 | BACKGROUND

Nurses have a key role in preventing and early diagnosis of constipation.[3,10,11] Therefore, the nurse should assess previous bowel habits of the individual, listens to bowel sounds, and palpate the abdominal region for signs of distention.[3,10] In addition, nurses should use reliable and validated tools to evaluate constipation and to identify the risk of constipation.[11] Currently, there are many tools in use such as the Gastrointestinal Symptom Rating Scale, Constipation Severity Instrument, Bristol Stool Scale, Patient Assessment of Constipation Quality of Life, and Versions of Rome Criteria (II & III) for the diagnosis and assessment of constipation.[9] However, diagnosis and assessment of constipation and assessment risk of constipation are different concepts. For the assessment risk of constipation, all individual risk factors should be considered. Nurses should use well-structured risk assessment scales, which cover multiple risk factors of constipation.[22] Although none of them are specific for the ICU patients, there is a number of constipation risk assessment scales, which have been developed and evaluated so far.[23-27] The Constipation Risk Assessment Scale (CRAS), which was originally developed by Richmond and Wright for the assessment risk of constipation by nurses, is one of these tools. It has been widely used among nurses for a comprehensive and objective assessment of constipation risk in hospitalized patients.[4,5,10,11,22,28] The reliability coefficient of the original version of this scale is .73 (alpha values were described as relatively high with ≥.70),[23,24] while it has been estimated as .50 in the Turkish version (alpha values were described as acceptable with ≥.45).[29] These alpha

values indicate that this scale can be used by the nurses for the assessment of constipation risk.

3 | AIM

The aim of this study was to investigate the effect of AM (a) on the time of return of bowel sounds, (b) on the time of the first defecation, and (c) the risk of constipation in NICU patients.

4 | DESIGN AND METHODS

This study was designed as a prospective, parallel, two-arm [1:1], randomized-controlled clinical trial. The trial is registered at ClinicalTrials.gov (NCT04373772).This randomized-controlled trial was conducted in accordance with the Consolidated Standards of Reporting Trials (CONSORT) guidelines.[30]

4.1 | Setting and sample

The study sample consisted of 80 NICU patients of a university hospital of Mersin, Turkey between July 2015 and February 2016. The study centre is a Level III ICU of a tertiary referral hospital with a total of 12 beds, including two isolation beds. The number of nurses per patient is two or three. The size of the study sample was calculated based on the constipation score in Lämås et al.[18] The effect size of the difference between the means of constipation would be at least 3.6 with a two-sided type I error rate of 0.05% and 90% power. The calculations were made using the STATISTICA programme, which showed that each of the groups should have at least 40 individuals and there should be a total of 80 patients (AM group = 40; control group = 40) (Figure 1).

The study included adult patients who volunteered to participate in the study, who were ≥18 years old, and neurosurgical patients who stayed in the ICU for ≥3 days, and who did not have any contraindications of AM (eg, percutaneous endoscopic gastrostomy, abdominal hernia, irritable bowel syndrome, bowel cancer, history of abdominal surgery, or pregnancy).

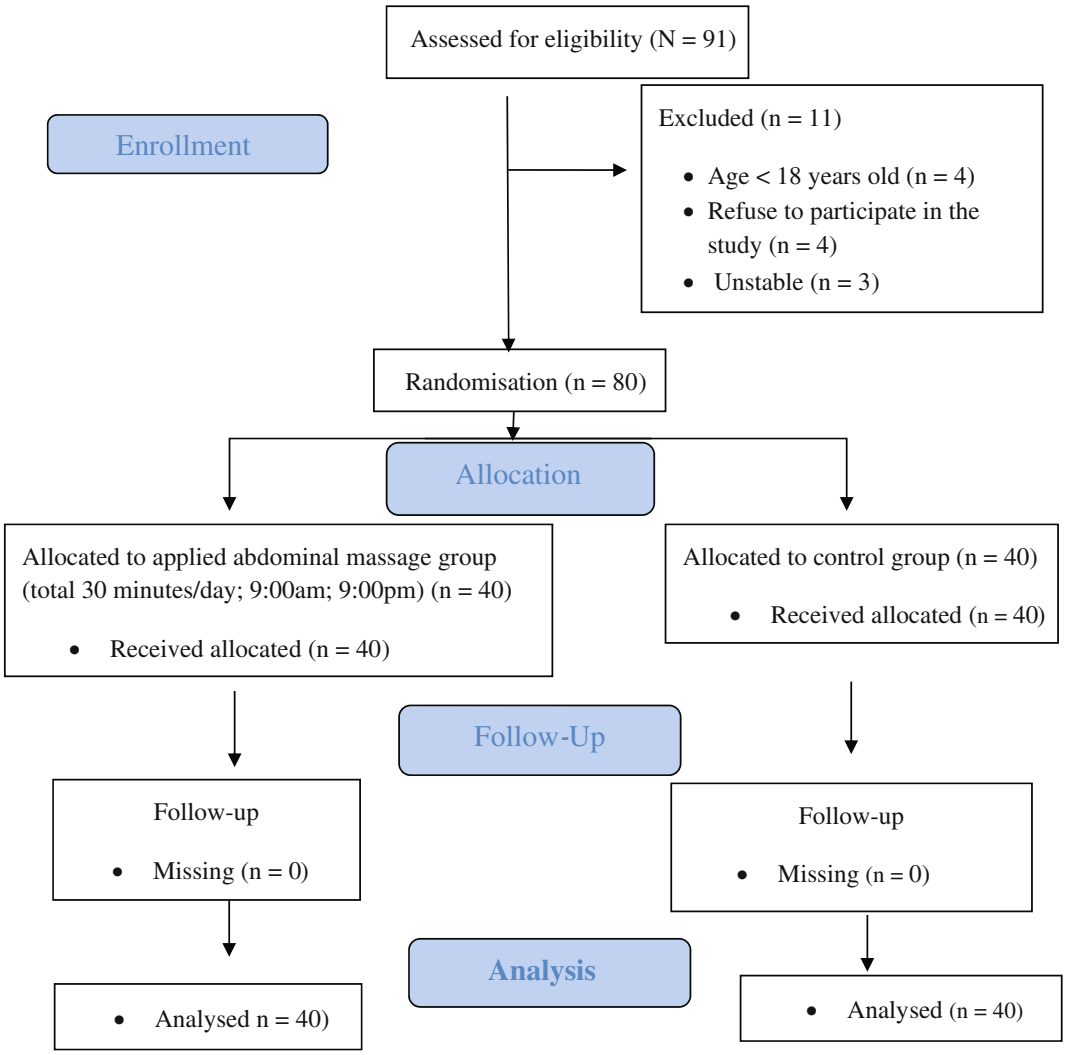

FIGURE 1 CONSORT flow diagram for this trial

4.2 | Randomization and allocation

The eligible patients were randomly assigned to the AM group or the control group according to arrival sequence in blocks of 2 at a ratio of 1:1 using the block randomization method. The randomization sequence was developed using a computer-generated table of random numbers by the biostatistician (B. T.). When the patients were transferred to the ICU after cranial surgery, the nurse researcher (H. D.) who was working in the ICU as a nurse, enrolled the patients who met the inclusion criteria. In this study, due to the nature of the intervention, only the patients were blinded. The researchers (H. D., O. M.) who were involved in the running of the study were not blinded. However, the biostatistician (B. T.) and researches who interpreted the findings (G. A. U., S. Y.) were blinded to the group allocation.

4.3 | Outcome measures and instruments

The primary outcome measure of the study was the effect of AM on the patients' bowel evacuation (on the time of return of bowel sounds and on the time of the first defecation). The secondary outcome measure of the study was to identify the risk of constipation in NICU patients.

Data were collected using a Patient Information Form, CRAS, and a Bowel Evacuation Form.

The *Patient Information Form* consists of demographic information about the patients such as age, gender, marital status, and diagnosis.

The *CRAS* is a measure, which was developed by Richmond and Wright[24] and adapted and tested for validity and reliability for use in Turkish by Kutlu et al[22] and found the reliability coefficient of the adapted version as .50. The scale consists of 33 items and the minimum and maximum scores for the scale are 1 and 63. The scale consists of four sections, including lifestyle (ie, gender, mobility, fibre intake, fluid intake, or personal beliefs), hospital-related factors (ie, use of hospital toilets or commodes/bedpans), physiological and psychological conditions (ie, metabolic disorders, pelvic conditions, neuromuscular disorders, endocrine disorders, colorectal/abdominal disorders, psychiatric illnesses, and learning disabilities/dementia), and drugs, which increase the constipation risk (ie, antiemetics, calcium channel blockers, iron supplements, anticholinergic-containing drugs, analgesics, and cytotoxic chemotherapy).[23,24] All items of the scale, except for the personal beliefs of the lifestyle subscale, were filled by the nurse researchers (H. D., O. M.). The personal beliefs item was filled by the patient him/herself, if he/she was conscious or patient's relatives, if he/she was unconscious. As these item is not scored, it does not affect the total score of the scale.

In the scale, a total score below 10 indicates a low constipation risk, a score between 11 and 15 indicates a moderate risk, and a score above 16 points indicates a high constipation risk.[23,24] In the study, the Cronbach's alpha was calculated as .61 for the CRAS. This value is relatively high than the value of the Turkish version and close to the value of the original version (.73). These alpha values were considered moderate (.61-.65).[29] This finding indicates that, although not high, the CRAS has a moderate validity and reliability in the assessment of risk. The CRAS was used, as it is widely used among nurses for the assessment of constipation risk,[4,5,10,22,28] it can be easily applied in the unconscious NICU patients, and it is a reliable tool containing 33 items to assess constipation risk in ICU patients in detail. In addition, there are no other CRAS,[25-27] which has been tested for validity and reliability for the use in the Turkish population.[31]

The *Bowel Evacuation Form* is a chart where the first time return of bowel sounds and the first defecation of neurosurgical patients in ICU are recorded.

4.4 | Data collection

Data were collected by the nurse researchers (H. D., O. M.), who were working in the ICU as nurses and obtained a written informed consent from all the patients or their relatives.

When the patients were transferred to the ICU after cranial surgery, the *Patient Information Form* and *CRAS* were filled out for each patient using the information obtained from the patients/patients' relatives, patient files, and health professionals of the ICU by the nurse researchers (H. D., O. M.). The routine practice of the ICU regarding bowel evacuation is daily recording of patients' defecation status. In addition, the risk of constipation is not normally assessed in the ICU. In routine practice, laxatives are administered to the patients who developed constipation at the discretion of the physician's advice, and no non-pharmacological methods such as AM are used.

4.5 | Interventions

Prior to the study, academician researchers (G. A. U., S. Y., T. I.) developed a checklist, including AM application steps based on the relevant literature.[9,19] The nurse researchers (H. D., O. M.) were instructed about an academician (T. I.) who has an expertise on the principles of nursing practice and applied on a mannequin model. As a pilot study, each researcher applied AM for eight times on the mannequin (10% of the sample). During pilot study, the adherence of the researchers to the AM application steps was checked by the other researcher (G. A. U.) using the checklist.

The patients in the AM group were given a total of 30 minutes of AM by the nurses (H. D., O. M.) every day for 15 minutes in the morning and evening.

During the AM, the neurosurgical patients were placed in the supine position with the head-of-bed elevated at 30° to 45°. Before the patients fed through a nasogastric tube received AM, their feeding was interrupted 30 minutes before AM, and the patients fed orally received AM at least 30 minutes after their meal. In this study, AM including effleurage, strokes, petrissage, and vibration techniques were applied to the patients for 15 minutes in each session at 9:00 AM and 9:00 PM.[9,19]

To ensure consistency in data collection, AM was performed only by two nurse researchers (morning H. D.; evening O. M.). The AM was

initiated, when the neurosurgical patients were transferred to the ICU after cranial surgery and continued until the time of first defecation. All bowel sounds were taken by the two clinical nurses (H. D. and O. M.) who had more than 10 years of professional experience. In addition, these two nurses were trained one-day theoretical, half-day practice at the physical examination course, and trained about auscultation of bowel sounds. Prior to the study initiation, the nurses were tested about their use of recommended auscultation techniques for the correct bowel sounds.[32,33] Inter-rater reliability was assessed using the kappa coefficient at ICU based on the presence of bowel sounds (present/absent) in the morning and evening on first day. High reliability with an intraclass coefficient of .66 was achieved only with the well-defined bowel sounds ($P < .001$).[34]

Bowel sounds of all the patients were listened to in the morning (9:30 AM) and evening (9:30 PM). In the ICU, the first time of return of the bowel sounds and the time of the first defecation were recorded.

4.6 | Data analysis

Statistical analysis was performed using the STATA/MP version 11.0 software (StataCorp LLC., College Station, Texas). Data were presented in mean ± SD, median (min-max) or number, and percentage, where applicable. The continuous variables of the AM and control groups were compared using the independent samples *t* test, while the categorical variables were compared using the χ^2 test. The linear association between two continuous variables was assessed using the Pearson's correlation. In the correlation, an *r*-value of <0.20 was considered no/very weak relationship, an *r*-value of .20-.39 was considered a weak relationship, an *r*-value of .40-.59 was considered a moderate relationship, an *r*-value of .60-.79 was considered a strong relationship, and an *r*-value of .80-1.00 was considered a very strong relationship.[35] A *P*-value of .05 was considered statistically significant.

5 | ETHICAL AND RESEARCH APPROVALS

This study was approved by the Clinical Research Ethics Committee (No: 78017789/050.01.04/222) and the hospital management (No: 55450541-605-193). Written informed consent was obtained from each patient and/or his/her relatives. The study was conducted in accordance with the principles of the Declaration of Helsinki.[36]

6 | RESULTS

The mean age was 49.80 ± 17.27 years in the AM group and 53.97 ± 20.68 years in the control group. A total of 67.5% of the AM group and 62.5% of the control group were males. The diagnosis was an intracranial tumour in 67.5% and 55% of the AM and control groups, respectively. There was no statistically significant difference in the age, gender, and diagnosis and other demographic and clinical characteristics between the groups ($P > .05$) (Table 1).

None of the patients had AM-related problem such as abdominal tenderness, pain, or allergy. Compared to the control group, however, the patients in the AM group had an earlier time of return of their first bowel sounds and time of their first defecation (primary outcomes) ($P < .001$) with a lower CRAS score (secondary outcome) ($P = .006$) (Table 2).

There was no significant correlation between the CRAS scores of the patients in the AM group and the time of return of first bowel sounds and the first defecation time ($P > .05$). However, in the control

TABLE 1 Characteristics of patients

Characteristics	Abdominal massage group (n = 40) Mean (SD)	Control group (n = 40) Mean (SD)	*t* test[a]/*P*-value
Age	49.80 (17.27)	53.97 (20.68)	−0.979/.330
Gender	n (%)	n (%)	χ^{2b}/*P* value
Female	13 (32.5)	15 (37.5)	0.469/.639
Male	27 (67.5)	25 (62.5)	
Marital status			
Married	31 (77.5)	32 (80.0)	0.273/.785
Single	9 (22.5)	8 (20.0)	
Diagnosis			
Intracranial tumour	27 (67.5)	22 (55.0)	2.158/.340
Subdural hematoma	10 (25.0)	11 (27.5)	
Subarachnoid haemorrhage	3 (7.5)	7 (17.5)	

[a]Independent-sample *t* test.
[b]χ^2 test.

TABLE 2 Comparison of patients' bowel evacuation and constipation risk in the intensive care unit (ICU)

	Abdominal massage group (n = 40)	Control group (n = 40)	
Bowel evacuation	**Mean (SD)**	**Mean (SD)**	***t* test[a]/*P*-value**
First bowel sounds return time/day in ICU	1.37 (0.54)	4.88 (1.65)	−12.787/<.001
First defecate time/day in ICU	5.01 (0.90)	7.80 (1.63)	−9.477/<.001
Constipation Risk Assessment Scale	19.02 (1.81)	20.45 (2.61)	−2.847/.006

[a]Independent-sample *t* test.

TABLE 3 Relationship between patients' bowel evacuation and constipation risk in the intensive care unit (ICU)

	Constipation Risk Assessment Scale			
	Abdominal massage group (n = 40)		Control group (n = 40)	
Bowel evacuation	r_p	***P***	r_p	***P***
First bowel sounds return time/day in ICU	0.251	.118	0.447	.004
First defecate time/day in ICU	0.226	.160	0.532	<.001

Note: r_p, Pearson correlation coefficient.

group, there was a weak correlation between the CRAS scores and the time of return of first bowel sounds ($P = .004$) and a moderate correlation between the CRAS scores and the first defecation time ($P < .001$) (Table 3).

7 | DISCUSSION

In the current study, we investigated the effect of AM on bowel evacuation and the risk of constipation in NICU patients. The study results showed that the risk of constipation was high in NICU patients, and AM was an effective nursing intervention to shorten the time of return of bowel sounds and the time of the first defecation.

Gastrointestinal (GI) problems and constipation are common problems in patients treated in the ICU.[13,15,37-40] Kaya et al[10] conducted a study with neurosurgical patients and found that the risk of constipation was high on the third day (mean CRAS score: 9.96 ± 3.04) and at discharge (mean CRAS score: 9.43 ± 3.17) after cranial surgery. The authors also reported that the risk of constipation was higher in women, those with a sedentary lifestyle, those who used laxatives previously, those who did not exercise regularly, and those who used analgesics. The risk also tended to increase with increasing age, body mass index, and duration of hospital stay.[10] However, in the current study, the risk of constipation on the day that all the neurosurgical patients were admitted to the ICU was significantly higher than the aforementioned study. The discrepancy between the studies may have resulted from the fact that the study by Kaya et al[10] included hospitalized patients in a neurosurgical unit, the risk of constipation was assessed on Day 3 after cranial surgery, when the patients' mobility increased, and that all the patients were fed orally. In the current study, although factors affecting the constipation risk of patients were not assessed, factors such as high mean age of the patients, absolute bed rest in the ICU first day, and not starting the oral or enteral feeding immediately may have been effective in the high risk of constipation.

In the present study, the return of first bowel sounds was observed within approximately one to two days in the patients receiving AM application, but within about five days in the control group. Previous studies showed that bowel movements were delayed in 80% of patients who remained immobile for the first 72 hours after admission to the ICU[12] and 58% to 72% of them had absent or abnormal bowel sounds.[39,41] In a study including surgical ICU patients, bowel sounds were reported to return approximately on the fifth day of hospitalization in patients with (58%) and without laxatives (46%).[42] In the early postoperative period, bowel sounds were found to return within 4.6 days on average in enterally fed patients in the ICU.[36] In our study, the time of return of the first bowel sounds of the patients in the control group was similar to those reported in the previous studies. In the AM group, however, this period was shorter, indicating that AM accelerates bowel movements in the ICU setting.

In the current study, the time of first defecation was about five days in patients receiving AM and about eight days in the control group. Previous studies demonstrated that the first defecation in patients hospitalized in the ICU was observed after 4.8 days on average of after hospitalization,[39] and this time was extended to approximately six days with the support of mechanical ventilators.[41] Fukuda et al[38] also showed that starting feeding late (≥2 days) in the ICU patients, the use of sedatives, and type of surgery (majority of the surgery were neurosurgical such as traumatic brain injury, stroke, subarachnoid haemorrhage, and brain herniation) were independent risk factors of delayed defecation. In addition, drugs used in pain control after craniotomy may cause constipation in more than half of patients (66%),[43] opioid use,[37,40] and pharmacological drugs to prevent constipation may also lead to impaired GI transit,[40] and starting feeding late[38] or enteral nutrition compared to oral nutrition[37] is associated with constipation. In the present study, in addition to other risk

factors (eg, immobility) in the ICU, in all the neurosurgical patients, pharmacological agents were used for the postoperative pain control, and the patients did not receive any oral intake in the early postoperative period. These factors may have caused the delayed defecation in our patients.

Furthermore, the bowel evacuation of the patients who received AM was earlier than that of the control group in our study. Similarly, a previous study showed that AM shortened defecation times and decreased constipation prevalence in patients who were hospitalized in a trauma ICU, were fed enterally, and were given mechanical ventilator support.[13] In a study with multiple sclerosis patients, AM was shown to be effective in the treatment of neurogenic bowel dysfunction (constipation or faecal incontinence).[44] Similarly, AM was found to reduce constipation symptoms and shorten the time to defecation in orthopaedic patients.[9] Lämås et al[18] also found that AM reduced constipation symptoms and increased bowel movements. In neurology and neurosurgical patients fed enterally with a nasogastric tube, AM was shown to reduce GI complications such as high gastric residual volume, abdominal distension, and vomiting.[19] Several studies also demonstrated that AM reduced gastric residual volume in ICU patients.[13,20,21] It has been documented that AM stimulates the parasympathetic nervous system by increasing the movement of muscles and the release of digestive enzymes and relax sphincters in the GI tract.[18] In addition, AM creates a mechanical and reflex effect in the intestines by intra-abdominal pressure change, and this effect increases peristalsis.[13,18,19,21] Increasing peristalsis accelerates the passage of nutrients through the GI tract. Thus, stool staying time in the large intestine is shortened and bowel movements increase.[9,13,19,20] In the current study, the time to first defecation was significantly longer in the control group without AM, suggesting that AM accelerates bowel movements and reduces defecation time in NICU patients. However, the constipation risk of the patients in the control group was statistically significantly higher than that of the AM group, and the risk of constipation (CRAS) was associated with the time of return of first bowel sounds and the time of the first defecation. This may have caused delayed bowel evacuation in the control group. Although the difference in the constipation risk was statistically significant between the groups, it was not of clinical relevance, since the constipation risk was already high in both groups. Nevertheless, this does not change the fact that AM is effective in facilitating bowel evacuation.

8 | LIMITATIONS

This study has some limitations. First, there is no risk assessment tool for constipation specific for the NICU patients or having validity and reliability studies in the Turkish population, we used CRAS with a moderate reliability coefficient. This highlights the unmet need for more reliable and valid tools in this patient population. Second, the risk of constipation was assessed only on the day of admission to the ICU. The fact that the patients were at bed rest and they did not usually start oral intake on the first day of admission may have caused the risk of constipation to be assessed as high in the current study. Therefore, the risk of constipation of the patients should have been assessed daily during their ICU stay. Finally, this study has a single-centre design, which precludes the generalization of the results to the overall NICU patients. Further large-scale, multi-centre, prospective, randomized-controlled studies are required to investigate the effectiveness of AM in the management of constipation, to enhance the current evidence, and to develop treatment protocols.

9 | IMPLICATIONS AND RECOMMENDATIONS FOR PRACTICE

The current study provides evidence-based implications suggesting that AM, an independent nursing intervention in NICU patients, can provide early defecation (defined as defecation at ≤5 days after ICU admission)[38] or treat constipation, which may lead to the Valsalva manoeuvre resulting in an increased ICP. The AM is recommended as an adjunct therapy to standard care for early defecation and constipation management in the ICU setting. Future research to be conducted in multiple centres can investigate the effect of AM on reducing enema or laxative needs or on increasing the efficacy of these drugs.

10 | CONCLUSION

This study results show that the risk of constipation is high in the NICU patients and AM can shorten the time of return of bowel sounds and the time of the first defecation. In our study, the CRAS score of the patients in the control group was statistically significantly higher than that of the AM group, and the risk of constipation was associated with the time of return of first bowel sounds and the time of the first defecation. However, there was no significant correlation between the CRAS score of the patients in the AM group and the time of return of first bowel sounds and the first defecation time. Based on these findings, we can speculate that AM is a useful nursing intervention as an adjunct therapy, which can be safely performed to provide early defecation or treat constipation in NICU patients.

ACKNOWLEDGEMENTS

We thank all the nurses of the Intensive Care Unit for their collaboration.

AUTHOR CONTRIBUTIONS

Gulay Altun Ugras: concept and design of research; analysis and interpretation of data; writing an article; search of the literature; critical article analysis; approval of the final version of the article. **Serpil Yüksel**: concept and design of research; analysis and interpretation of data; writing an article; critical article analysis; approval of the final version of the article. **Meryem Turkan Isik**: concept and design of research; approval of the final version of the article. **Bahar Tasdelen**: statistical analysis; approval of the final version of the article. **Havva**

Dogan: collection and/or compilation of data. **Ozum Mutluay**: collection and/or compilation of data.

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How to cite this article: Altun Ugras G, Yüksel S, Isik MT, Tasdelen B, Dogan H, Mutluay O. Effect of abdominal massage on bowel evacuation in neurosurgical intensive care patients. *Nurs Crit Care*. 2022;27:558–566. https://doi.org/10.1111/nicc.12575