Original Article

The Effect of Abdominal Massage on Distension and Pain in Intubated Patients Receiving Enteral Nutrition in Neurosurgical Intensive Care Units in the Postoperative Period

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Abstract

Background: Patients who are followed up and treated in intensive care units. experience severe pain. This can cause negative consequences, including serious complications that increase morbidity and mortality.

Aim: This study was conducted to determine the effect of abdominal massage on abdominal distension and pain in intubated patients receiving enteral nutrition in neurosurgical intensive care units in the postoperative period.

Method: This is a quasi-experimental study with a single group pretest–posttest design. Forty two patients who met the inclusion criteria were included in the study sample. The patients were given 15-minute abdominal massage for 2 days. The researcher assessed the patients' abdominal distension and filled the pain scale before the massage, administered abdominal massage for 30 minutes after enteral feeding, and repeated measurement after the massage. Data were collected using an introductory information form, the GCS, the Acute Physiology and Chronic Health Evaluation, and the Critical Care Pain Observation Tool.

Results: Abdominal massage statistically significantly reduced abdominal distension and pain in intubated patients receiving enteral nutrition in neurosurgical intensive care units in all pre- and post-test applications.

Conclusion: This study proves that abdominal massage is effective in reducing abdominal distension and pain in patients in intensive care units.

Key words: Nursing, non-pharmacological methods, patient alleviating, nursing practice, positive consequences, nursing intervention

Introduction

Pain has a generic medical definition, indicating that it is one of the most complex health issues in the human organism. The International Association for the Study of Pain (IASP) taxonomy committee defines pain as "an unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage" (Aslan, 2006; Cocelli, 2008; Yilmaz 2009).

Studies reported that among patients in intensive care units (ICUs), 61% had pain, 33% had persistent pain, and 63% had pain even after discharge from ICU. Therefore, effective detection of pain and its treatment with the most appropriate intervention is of critical importance in this patient group. Patients who are followed up and treated in ICUs experience severe pain.

This can cause negative consequences, including serious complications that increase morbidity and mortality, such as

vasoconstriction, hypercoagulability and tissue ischemia due to adverse effects of pain on respiratory and cardiovascular functions (Summer, 2001; Reardon, 2015; Stanik-Hutt, 1998). Consideration of all these factors together indicates that pain assessment with reliable and effective tools in ICU patients is of vital importance.

Pain is a highly subjective and personal experience, where the most reliable source of information about a patient's pain, that is, the "gold standard", is the patient's self-report (American Pain Society (APS) 2003).

However, as elderly people with severe cognitive impairments or patients who have a serious illness and are intubated cannot express their pain due to their inability to communicate with the external environment, there are significant limitations in management of their pain. Alternative methods such as observational examinations and evaluation of clinical parameters, which are considered to indicate pain, can be used in pain assessment for these patients. In this respect, behavioral changes due to pain, abnormal movements, facial expressions and posture patterns can be examined in these patients (Li, 2004; Yilmaz 2009).

The number of nursing studies on the effect of massage in pain relief has increased rapidly in recent years. Massage is a widely used complementary therapy in nursing (Khorsid, 2005). One study reported that 15 minutes of hand massage applied to intensive care patients who underwent cardiac surgery was effective in reducing the severity of their pain (Martorella et al,. 2014). Gelinas et al,. (2012) have also emphasized that massage is an effective method in reducing the severity of pain in ICU patients. Massage improves blood circulation and increases the pumping power of the heart, solving muscle spasm and allowing the person to relax. Blood flow to the pressed areas with extension in the veins that occurs in the massage area is increased; metabolites collected in the region are removed; and pain can thus be reduced. During massage, mechanical warnings on skin stimulate tangoreceptors, increasing the level of beta endorphins through bodily control mechanisms. The release of beta endorphins increases the threshold of pain, reducing or eliminating the feeling of pain (Jiang & Qin, 2008; Kwekkeboom & Gretarsdottir, 2006).

Abdominal massage, which has no known side effects reported in the literature and is easily applied, creates a mechanical and reflex effect on the intestines by changing their intra-abdominal pressure and applying pressure to the rectum through efflorescence, petrisis and vibration movements and thus provides a relief for the individual by reducing the feeling of pain and discomfort (McClurg et al., 2011; Emly, 2007).

During mechanical ventilation in ICU patients, Gastro Intestinal System (GIS) motility decreases, bowel sounds decrease, and abdominal distension develops (Uysal, 2007). This is because most of the ICU patients undergo invasive mechanical ventilation, are immobile, and are fed via the enteral route (Tasbakan et al., 2010).

Abdominal massage can be used to prevent GIS symptoms in intubated patients. Preece (2002) concluded that abdominal massage decreases distention and gas issues. Studies determined that an abdominal massage applied in different patient groups for different time periods, from a few days to a few weeks, to prevent constipation and its negative effects, reduced the severity of constipation, prevented abdominal distension, and increased intestinal motility and the frequency of defecation (McClurg et al., 2011; Chung and Choi, 2011; Lamas et al., 2009; Woodward et al., 2010; Uysal et al., 2012).

By reducing abdominal distension, abdominal massage is expected to decrease intra-abdominal pressure and relieve pain through its relaxation effect. There is no study on this subject in the literature; therefore, this is a unique study.

This is a significant study to emphasize independent roles of nurses in intensive care units and contribute to both treatment of ICU patients and the literature. Based on this thought, the study was conducted to determine the effect of abdominal massage on abdominal distension and pain in intubated patients receiving enteral nutrition in neurosurgical intensive care units.

Methods

Study Design: This is semi-experimental study with a single group pre- and post-test design.

Setting: The study was conducted in the Neurosurgical Intensive Care Unit of Ataturk University Health Research and Application Hospital between March and August 2020.

Sample: The population of the study consisted of patients who were intubated and received enteral nutrition in neurosurgical intensive care units. In this study, a priori power analysis was performed to determine the sample size by taking Cohen's standard effect sizes as reference values. The sample size was determined to include 42 patients, ensuring 80% power at 95% confidence interval and a 0.05 significance level (assuming a high effect size). Flow diagram of study participants (Figure 1).

Inclusion and Exclusion Criteria: Study inclusion criteria: Intubated patients who were over the age of 18 years, had received enteral nutrition vial the nasogastric tube, had no tracheostomy and abdominal wounds, had received no radiotherapy, had no bowel obstruction and diarrhea, had an APACHE II score > 16 and GCS > 3, and had no contraindications for abdominal massage were included in the study. Study exclusion criteria: Those whose enteral feeding was discontinued during the study were excluded from the study.

Instruments and Measurements: Data were collected using an introductory information form, the Glaskow Coma Scale (GCS), Acute Physiology and Chronic Health Evaluation (APACHE II), and the Critical Care Pain Observation Tool (CPOT). The introductory information form was prepared by the researcher in line with the literature and consisted of questions about the patients' age, gender, education and chronic disease and status for abdominal distension.

Abdominal distention assessment: The patients' abdominal distention was evaluated by applying pressure to their abdominal wall with the fingers using the palpation method.

APACHE II Scale: This scale is used to evaluate patients' acute physiological and chronic health status; it was developed to provide an objective evaluation of the risk of mortality and the severity of disease in ICU patients. The scale score ranges between 12 and 71. The higher the score, the worse the patient's prognosis.

GCS*:* This scale is used to assess patients' state of consciousness. The scale score ranges from 3 to 15. A higher score indicates a better prognosis.

CPOT: This is a valid and reliable pain assessment scale for internal, surgical and trauma ICU patients. It consists of four subscales, scoring between 0 and 2 points, where the total score varies between 0 and 8. Patients with a score above 2 are considered to have severe pain (Gundogan et al., 2016).

Procedure: There is no study regarding the daily frequency of abdominal massage for ICU patients. ICU patients are more prone to diarrhea due to the drugs, nutritional solutions and infectious agents used in ICUs (Korfalı, 2008). Because of the concern that abdominal massage would stimulate diarrhea in ICU patients, abdominal massage was applied for 15 minutes at 09:30 in the morning and at 21:30 in the evening, twice a day for 2 days. The researcher assessed the patients' abdominal distension and filled the pain scale before the massage, administered abdominal massage 30 minutes after enteral feeding of intubated patients, and repeated abdominal distension measurement and pain assessment after the massage.

Ethical Considerations*:* Before conducting the study, an ethical approval was obtained from Erzurum Ataturk University Faculty of Medicine Ethics Committee and an institutional permission from the Chief Physician of Ataturk University Health Research and Application Hospital (Decision number 2020/B.30.2.ATA.0.01.00/300). ICU patients are generally not able to make decisions because of the underlying disease, intubation, analgesics and sedatives (Schweickert and Hall, 2005). This requires making a decision instead of the patients. In Turkey, the regulation on patient rights (Article 35) and the regulation on clinical trials (Article 9) stipulate that in cases where patients do not have decision-making competence, the right to make a decision on their behalf and, therefore, the right to be informed are given to their representatives

(http://www.titck.gov.tr/PortalAdmin/Uploads/UnitPageAttachment/8be561a562752.pdf). Therefore, verbal consent was obtained from the patients' first-degree relatives to include the patients in the study after the relatives were provided with necessary explanations about the study.

Data Analysis: SPSS version 20 with a significance level of $p < 0.05$ was used. Descriptive statistics were provided as the mean ± standard deviation or number and percentage. Intragroup evaluations were made using Student's t test and McNemar and Wilcoxon Signed Ranks tests.

Results

Of the patients, 52.4% were female, 35.7% had a literate, 57.6% were no chronic disese 54.8%. Their average age was 62.88±12.63 years, their average APACHE score was 23.9±5.22, Their average GCS was 7.5±2.13 (Table 1).

Percentages of abdominal distention in four measurements of the patients are presented in Table 2. There is a statistically significant difference between the first and fourth measurements. In all repeated measurements, the CPOT total mean score measured after the massage was lower than the mean score measured before the massage. The difference between the mean scores was statistically significant and very strong evidence ($p<0.001$).

Similarly, the differences between their mean scores on the CPOT subscales of facial expression, body movements and muscle tension were statistically significant and very strong evidence ($p<0.001$). The change in their mean score on the CPOT subscale of ventilator compliance was significant ($p<0.05$) (Table 3).

Discussion

Undoubtedly, self-report is the most reliable source for pain assessment. However, verbal communication with ICU patients is difficult because of several reasons such as presence of endotracheal tube and tracheostomy, clouding of consciousness, mechanical ventilation, and sedative medication.

Therefore, ICU patients may not be able to express their pain verbally. In such cases, their behaviors gain importance in pain assessment (Badir & Ati Aslan, 2003; Eti Aslan, Badır & Selimen, 2003; Pasero & McCaffery, 2000).

According to the American Pain Society, pain is the fifth major sign, after body temperature, pulse rate, respiration rate, and blood pressure, and their daily and systematic evaluation is of great importance in patient care (Aslan, 2002). Since there are no studies on this subject in the literature, the discussion is supported by the literature knowledge.

As ICU patients are immobile, have mechanical ventilation, and have received enteral nutrition, they may develop abdominal distension (Mentec et al., 2001). Abdominal distension was observed in 95.2% of the patients in the first measurement, and no distension was found in the fourth measurement. The difference between the 1st and fourth measurements was statistically significant (Table 2).

Abdominal massage is expected to increase GIS motility and the frequency of defecation and thus to decrease abdominal distension (McClave et al., 2002).

The gradual decrease in the patients' abdominal distension was due to the increase in their intestinal peristalsis with abdominal massage. Ayas et al. (2006), who conducted their study on patients with spinal cord injury, and Turan and Atabek Asti (2016), who conducted their study on patients with constipation, determined that abdominal massage reduces distension.

Studies on patients with enteral nutrition have also reported that abdominal massage reduces abdominal distension (Uysal et al., 2012; Kahraman & Ozdemir, 2015). These results are in agreement with Medical interventions applied to ICU patients are among the main causes of the pain they have. Studies conducted on this subject have reported that medical interventions, which cause severe pain in ICU patients, include position change, central venous catheter application, wound care, tracheal aspiration, wound drain and femoral catheter removal (Puntillo et al., 2004).

The pain caused by these interventions, especially in ICU patients who are on mechanical ventilation or cannot communicate verbally, should be adequately

evaluated (Aslan, 2003). It is crucial to correctly evaluate acute postoperative pain in ICU patients, because untreated acute pain may turn into chronic pain in the post-surgery period and have physiological and psychological consequences (Summer & Puntilo, 2001; Reardon et al., 2015).

In this context, we examined the evaluations of the CPOT to make an effective and reliable pain assessment in patients who were intubated and could not report pain verbally and determined that CPOT was a reliable tool for pain assessment in ICU patients.

Pain assessment has positive effects on the duration of mechanical ventilation and ICU stay, recognition of pain, pain intensity, pain incidence, use of analgesic drugs, mortality and reduction in complications (Devlin et al., 2018; Georgiou, Hadjibalassi, Lambrinou, Andreou & Papathanassoglou, 2015; Haslam, Dale, Knechtel & Rose, 2012).

Different studies have reported that facial movements such as facial tension, frown, eye clenching, startle and movements such as clenching fist, contraction, touching the painful area or immobility can be considered as behavioral parameters in cases of pain sensation in patients who are followed up and treated in ICUs (Miller, 2006; Arroyo-Novoa, 2008).

Figure 1. Flow diagram of study participants

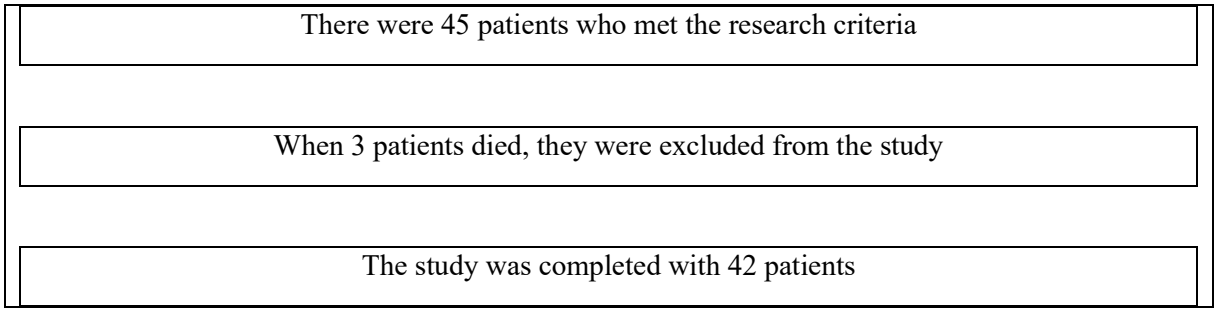

Table 1. Distribution of Introductory Characteristics

		n	%
Gender	**Female**	22	52.4
	Male	20	47.6
Education	**Illiterate**	7	16.7
	Literate	15	35.7
	Secondary education	7	16.7
	Undergraduate and Above	13	31.0
Chronic disease	**Yes**	19	45.2
	No	23	54.8
Total		42	100.0
		$\bar{X} \pm SD$	
Age		62.88 ± 12.63	
APACHE score		23.9 ± 5.22	
GCS		7.5 ± 2.13	

Table 2. Intragroup Comparison of the Number of Patients with Abdominal Distention

Measurements	**Yes**		**No**	
	n	**%**	**n**	**%**
1. Measurement	40	95.2	2	4.8
2. Measurement	24	57.1	18	42.9
3. Measurement	0	0	42	100.0
4. Measurement	0	0	42	100.0
Test * and p Value	**p<0.001****			

* McNemar's Test **Between the 1st and 4th measurement

Table 3. Evaluation of the Changes in Pre- and Post-Test CPOT Assessments of Patients before and after **Abdominal Massage (n = 42)** **CPOT Score**		Pre-Massage Measurement1		Post-Massage Measurement 1			Pre-Massage Measurement 2		Post-Massage Measurement 2			Pre-Massage Measurement 3		Post-Massage Measurement 3			Pre-Massage Measurement4		Post-Massage Measurement 4		
		n	%	n	%	*P*	n	%	n	%	*P*	n	%	n	%	*P*	n	%	n	%	*P*
Face expression	Comfortable	6	14.3	26	61.9	Z=-5295	10	23.8	30	71.4	Z=-5342	17	40.4	40	95.2	Z=-5387	10	23.8	42	100	Z=-5480
	Nervous	22	52.4	14	33.3	**p<0.001**	28	66.7	10	23.8	**p<0.001**	21	50.1	2	4.8	**p<0.001**	28	66.7	0	0	**p<0.001**
	Grimace	14	33.3	2	4.8		4	9.5	2	4.8		4	9.5	0	0		4	9.5	0	0	
Body Movements	No movement or normal position	8	19	28	66.7	Z=-4617	6	14.3	36	85.7	Z=-4903	12	28.6	38	90.5	Z=-5289	9	21.5	40	95.2	Z=-5355
	Protection	14	33.3	10	23.8	**p<0.001**	22	52.4	4	9.5	**p<0.001**	18	42.8	4	9.5	**p<0.001**	22	52.4	2	4.8	**p<0.001**
	Restlessness / Tension	20	47.6	4	9.5		14	33.3	2	4.8		12	28.6.	0	0		11	26.1	0	0	
Muscle Tension	Comfortable	4	9.5	32	76.2	Z=-5216	12	28.6	42	100	Z=-5347	24	57.2	42	100	Z=-5747	12	28.6	42	100	Z=-5203
	Tense/Stiff	26	61.9	10	23.8	**p<0.001**	26	61.9	0	0	**p<0.001**	14	33.3	0	0	**p<0.001**	27	64.3	0	0	**p<0.001**
	Very Tense or Stiff	12	28.6	0	0		4	9.5	0	0		4	9.5	0	0		3	7.1	0	0	
Ventilator Compliance	Tolerating ventilator or movement	16	38.1	28	66.7	Z=-2352	20	47.6	28	66.7	Z=-2456	24	57.6	28	66.7	Z=-2468	25	59.5	29	69	Z=-2517
	Coughing but not tolerating	20	47.6	14	33.3	**p<0.05**	20	47.6	14	33.3	**p<0.05**	16	37.6	14	33.3	**p<0.05**	15	35.7	13	31	**p<0.05**

	Combating ventilator	6	14.3	0	0		2	4.8	0	0		2	4.8	0	0		2	4.8	0	0	
Total Mean Score		Ort	SS	Ort	SS	Z=-5436	Ort	SS	Ort	SS	Z=-5894	Ort	SS	Ort	SS	Z=-6124	Ort	SS	Ort	SS	Z=-6326
		4.4	1.9	1.4	1.5	**p<0.001**	3.4	1.4	0.4	0.6	**p<0.001**	3.4	1.4	0.4	0.6	**p<0.001**	3.4	1.4	0.3	0.5	**p<0.001**

After enteral feeding was stopped between 09^{00}–09^{30} in the morning and 21^{00}–21^{30} in the evening, patients received 15 minutes of abdominal massage twice a day for two days between 09^{45}–10^{00} in the morning and 21^{45}–22^{00} in the evening.

Discussion contin.

This study examined the effect of abdominal massage on pain in ICU patients. In all pre- and post-test repeated measurements performed to determine the efficacy of abdominal massage on pain in ICU patients, the CPOT total mean scores measured after the massage were lower than those measured before the massage, and the difference between them was statistically significant ($p<0.001$).

In this study, the CPOT mean scores were above 2 before the massage and below 2 after the massage, and there was a significant difference between the scores in all measurements. This indicates that abdominal massage is effective on pain. A statistically significant difference was also found between the patients' mean scores on CPOT subscales, including facial expression, body movements and muscle tension, known as behavioral parameters of CPOT ($p<0.001$). The change in patients' mean score on the CPOT subscale of ventilator compliance was significant ($p<0.05$) (Table 3). Facial expression assessment is considered the most important component of pain assessment in all behavioral pain scales (Gelinas et al., 2009; Rahu et al., 2013).

The statistical significance in facial expression, body movements and muscle tension suggests that abdominal massage reduces hypoxia by relaxing muscle spasm and causes the release of substances such as endorphins and serotonin that increase the threshold of pain by stimulating the nervous system, thus relieving pain (Konvicta et al., 2008; Immaura et al., 2008; Dunning & James, 2001).

Abdominal massage also stimulates oxytocin release through its analgesic and anxiolytic effects (Filshie, 2005). Ventilator compliance was statistically significant. However, there was statistically strong evidence for facial expression, body movements and muscle tension while ventilator compliance was statistically significant. This may be because ventilator compliance is affected by many different parameters. We can suggest that abdominal massage decreases intra-abdominal pressure by reducing abdominal distension and provides relaxation in the muscles through its therapeutic effect, thus reducing the feeling of pain in ICU patients.

Piotrowski et al., (2003) found that 10 minutes of back massage twice a day after sternotomy and abdominal surgery was effective in reducing pain in the experimental group compared to the control group, but the difference between the groups was not statistically significant. However, the researchers suggested that massage could be a useful application in reducing postoperative pain.

Cutshall et al., (2010) stated that a 20-minute massage applied on the second and fifth days after surgery on 58 patients who underwent cardiovascular surgery decreased their pain level and suggested that postoperative massage therapy could accelerate patient recover.

Wang and Keck (2004) reported that a 20-minute foot and hand massage (5 minutes to each extremity) was effective in reducing pain in postoperative patients. The results of the present study are in agreement with those of the aforementioned studies suggesting that massage reduces pain.

The study indicates that massage, which nurses can apply relying on their independent professional roles, is effective in reducing abdominal distention and pain in ICU patients.

Limitations of The Study: The limitation of this study is that it is not a randomized controlled study.

Conclusion: This study determined that abdominal massage reduced abdominal distension and pain in ICU patients in all pre- and post-test measurements, and differences between these measurements were statistically significant.

The Implications of this Paper: Nurses can play an active role in evaluating the pain of ICU patients and reducing it by applying an abdominal massage, a non-pharmacological nursing practice. By applying the abdominal massage, which is a kind of nursing intervention, nurses can contribute to accelerating recovery by minimizing the negative effects of pain.Further studies are required on this subject to strengthen the value of the evidence for abdominal massage

What This Paper Adds: It is important use non-pharmacological methods. Abdominal massage effective for alleviating pain issues in ICU patient. Abdominal massage effective for alleviating abdominal distension issues in ICU patient

What is already known about this topic: Since patients in intensive care units may be unable to report their pain, pain is a crucial parameter that they frequently experience and is generally not assessed by healthcare personnel. This can have negative consequences, including serious complications that increase morbidity and mortality, such as vasoconstriction, hypercoagulability and tissue ischemia due to adverse effects of pain on respiratory and cardiovascular functions. Abdominal massage is an effective non-pharmacological nursing intervention to prevent pain.

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