Acta Chir Croat 2024; 21: 17-21

THE EFFECT OF CONTINUOUS USE OF INTRAVENOUS ANALGESIA ON THE QUALITY OF POSTOPERATIVE HEALTH CARE

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ABSTRACT

Background: To investigate the effects of continuous administration of intravenous analgesia on the quality of postoperative care, and the impact of analgesia on reducing the length of stay in the intensive care unit.

Material and methods: A cross-sectional study was conducted that included 199 patients who were hospitalized at the Clinic for Anesthesiology, Reanimation, Intensive Medicine and Pain Therapy, Department of Anesthesiology, Postoperative Care and Intensive Medicine for Surgical Patients, University hospital Center Zagreb. For the purpose of the research, a visual analogue pain assessment scale was used. The research was conducted in the period from June 2022 to September 2022.

Results: The average age of the patients is 66 years, 67.8% had abdominal surgery, and 64.8% were male. Trauma patients are significantly younger than abdominal and vascular patients (P=0.001). The largest number of patients after abdominal surgery received continuous + bolus analgesia (P<0.001). Older patients have a lower initial VAS than younger patients (P=0.014). Men (P<0.001), abdominal patients (P=0.010) and patients after continuous (P=0.010), continuous + bolus (P=0.001) and bolus analgesia (P<0.001) had a higher initial VAS value and average VAS value. . Patients with higher initial values on the VAS scale had a higher average VAS value (P<0.001).

Conclusion: The continuous application of analgesia with the use of bolus analgesia has a more favorable effect on pain and affects the quality of patient healthcare during hospitalization in the Intensive Care Unit.

Keywords: Analgesia, pain, postoperative care

INTRODUCTION

As the most common symptom of patients in intensive care units, pain occurs in different intensity and depends on the underlying disease, individual characteristics of the patient and the interventions performed in relation to the assessment [1,2]. The pain of patients in intensive care units is most often the result of surgery, burns, trauma or malignant disease, and is associated with an acute reaction to stress, psychological distress and neuroendocrine secretion [3-6]. Pain is defined as an unpleasant, emotional and sensory experience that is associated with potential or actual tissue damage or is described in terms of said damage, and pain assessment differs in relation to the patient's condition, i.e. the level of communication ability [2,7]. Pain assessment methods can be divided into subjective, objective, and interventions and measurements. Subjective assessment is based on the patient's statements, objective on signs such as painful facial expression, redness, change in color of the affected area, weight loss, performing protective movements and insomnia. Pain assessment based on interventions and measurements refers to the application of pain assessment instruments. For acute pain, which is caused by trauma, surgery, childbirth or acute illness, determining the location, temporal aspects and intensity of pain is necessary to determine the characterization of the pain and to evaluate the effects of treatment of the current condition and the primary cause [8,9]. The most reliable and correct methods for pain assessment are self-assessment scales, according to which the patient's self-assessment of pain is evaluated in relation to reference standards. A visual analogue scale (VAS), a four-point verbal rating scale (VRS4), a five-point verbal rating scale (VRS5) and a numerical scale (English Numerical Rating Scale, NRS) . In patients who do not have the ability to verbalize pain independently, the Behavioral Pain Scale (BPS) and the Critical Care Pain Observation Tool (CPOT) are most often used [10]. Assessment of the intensity of acute pain is most often carried out using the VAS and numerical rating scale, which are equally sensitive in assessment, while the four-point verbal categorical scale is less sensitive than those mentioned [8,9]. After surgery, pain control represents the greatest challenge for the clinician, because postoperative pain causes respiratory effort and reduces lung function, resulting in atelectasis, airway obstruction, and hypoxemia. Postoperative analgesia is a key component in the prevention of chronic postoperative pain syndrome, postoperative complications and in encouraging early patient mobilization [11]. Analgesia can be applied in a

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DOI: *10.5281/zenodo.14009677*

bolus (intravenous administration of a prescribed dose of analgesic at certain intervals) or continuous infusion (continuous infusion of a certain dose of analgesic at a constant rate), and the choice of the method of administration depends on the individual assessment of the patient's needs based on pain assessment using assessment scales [12]. Bolus analgesia refers to the intermittent administration of non-opioid analgesics intravenously, while continuous analgesia is the administration of opioid analgesics intravenously using a perfusor for a certain time, at a certain speed and in a certain dose. Epidural analgesia is a continuous infusion of a combination of local anesthetic and opioid. Table 1 shows the combination of drugs used for bolus and continuous analgesia.

The main goal of the research is to examine the effect of continuous application of analgesia on reducing the length of stay of patients in the intensive care unit and to investigate which type of analgesia has the most favorable effect. It was also investigated which patients (patient characteristics, type of surgery) have the highest VAS value.

MATERIAL AND METHODS

A cross-sectional study was conducted. 199 patients, who are of legal age, were included in the research, with a signed and explained consent to participate in the research, which also specified analgesia. The approval of the Ethics Committee of the Zagreb Clinical Hospital Center was obtained. Data collection was carried out in strict compliance with the General Data Protection Regulation, and a numerical pain assessment scale was used for the purpose of the research. The research was conducted in the period from June to September 2022 at the Clinic for Anesthesiology, Reanimation, Intensive Care Medicine and Pain Therapy, Department of Anesthesiology, Postoperative Care and Intensive Medicine for Surgical Patients, KBC Zagreb. The intensity of pain in the patients was assessed immediately after the operation (VAS initial value) and 24 hours after (VAS average value) while monitoring the type of analgesia that was applied. The scale used is a scoring system that requires patient cooperation and describes the level of pain according to a rating scale from zero to ten (0-10).

Statistical analyses

The demographic data of the respondents were presented with descriptive statistics (median, range, interquartile range – IQR, minimal and maximal value), and the normality of the distribution of continuous numerical variables was tested with the D'Agostino-Pearson test. Continuous variables were analyzed using ANOVA, Mann-Whitney test, or rank correlation: Categorical variable were analyzed using χ2-test. All statistical analyses were performed using MedCalc 20.305 (MedCalc Software Ltd, Ostend, Belgium). P values less than 0.05 were considered statistically significant.

RESULTS

In the research participated 199 patients. The structure of the examined sample according to age and sex, type of surgery and analgesia is shown in table 2.

Considering the irregular age distribution, no significant differences were observed in relation to age (P=0.221), but trauma patients were significantly younger compared to patients who had abdominal or peripheral vascular surgery. The largest number of patients had abdominal surgery (135), while a smaller number of patients had vascular (39) and trauma (25) surgery (Table 1). The median age of patients with abdominal surgery was 65 years (range 22-93; IQR 19), with vascular 70 years (range 45-93; IQR: 14), and with trauma surgery 51 years (range 22-93, IQR: 41).

In relation to gender, there are no significant differences in the type of operation (P=0.312, X2-test). However, trauma patients are significantly younger than abdominal and vascular patients (P=0.001, ANOVA).

According to the research results, 12 patients (men 7, women 5) received continuous analgesia, 125 patients (men 82, women 43) received continuous + bolus analgesia, and 62 patients (men 82, women 22) received bolus analgesia (Table) 2.). No significant differences were observed in relation to the type of analgesia and gender (P=0.879, X2 test).

Significant differences were observed in relation to analgesia and type of surgery (Table 3): only continuous analgesia was received by 11 patients after abdominal surgery, 1 patient after vascular surgery and none after trauma surgery. Continuous + bolus analgesia was received by 101 patients after abdominal, 17 after vascular and 7 after trauma surgery, while only bolus was received by 23 patients after abdominal, 21 after vascular and 18 after trauma surgery (P<0.001, X2-test).

Older patients have a lower initial VAS (P=0.014. In contrast, patients who had a higher initial VAS also have a higher average VAS (P<0.001). Men who have a higher initial VAS also have a higher average VAS (P<0.001), and abdominal patients who had a higher initial VAS have a higher average VAS (P=0.010).

Also, significant differences were observed in relation to the type of analgesia. In patients who received only continuous analgesia, a strong correlation between the initial VAS value and the average VAS value was observed in such a way that those who had a higher initial VAS value also had a higher average VAS value (Spearmn's rho coefficient: 0.4709, 95 %, CI: 0.228 to 0.912 P=0.010), a weak association was observed in patients who received continuous + bolus analgesia (Spearmn's rho coefficient: 0.291, 95 %, CI: 0.121 to

0.444, P=0.001), and a medium strong association in patients who received only bolus analgesia (Spearmn's rho coefficient: 0.502, 95 %, CI: 0.288 to 0.668)P<0.001).

The results show that the number of days in JIM was not correlated with age (P=0.275, Spearman's rho 0.078, 95% CI: -0.062 to 0.215), type of operation P=0.854, ANOVA), type of analgesia (P=0.723, ANOVA), by initial VAS assessment (P=0.913, Spearman's rho 0.008, 95% CI: -0.132 to 0.147) and mean VAS assessment (P=0.333, Spearman's rho 0.069, 95% CI: -0.071 to 0.207).

DISCUSSION

Most surgical patients, regardless of the type of operation, require the use of different combinations of drugs that are applied according to algorithms for control and monitoring in real time and for the purpose of highly effective pain control [13]. This research was conducted with the aim of examining the effect of continuous administration of iv analgesia on the impact on shortening the stay of patients in the intensive care unit.

In the total investigated patient sample, the largest number of patients had abdominal surgery and received continuous + bolus analgesia. It is observed that older patients had a significantly lower result of the initial VAS value. The above can be associated with cognitive and motor changes that accompany the aging process, which can affect a person's ability to correctly assess the intensity of pain according to a given scale [14]. Also, these results can be explained by the loss of pain receptors in old age and increased tolerance to acute pain in old age [15]. Younger patients had trauma surgery more often, which is explained by the fact that the largest number of trauma patients were hospitalized after polytrauma, which resulted from traffic accidents.

According to the results, patients who had abdominal surgery had a higher initial VAS value regardless of the type of analgesia and a higher average VAS value. Abdominal operations are significantly more difficult than vascular and trauma operations and are characterized by a longer recovery time compared to other procedures [16,17]. Patients with abdominal surgery due to a large and painful incision have compromised respiratory function and compromised coughing [11]. According to research, pain after abdominal surgery is greater and lasts longer than pain during other procedures and requires a proper approach, because otherwise the risk of complications from prolonged lying down increases [16]. In contrast to our results, research in Germany, which included 115,775 patients (a total of 50,199 patients were taken into account in the comparison of results) showed that the pain rating was the highest after orthopedic and traumatological operations, and that patients after abdominal operations had pain scored relatively low, which contradicts our results [19].

According to the results obtained in patients who received continuous + bolus analgesia, the most favorable effect on pain was observed according to the assessment of the initial and average VAS values. By searching the literature, there are no studies on the connection between the method of administering analgesia and the effect on the quality of postoperative health care, which includes the types of drugs and the method of administration, therefore this research can be considered significant. The obtained results showed that the number of days spent in the ICU was not correlated with age, type of surgery, type of analgesia, initial VAS assessment and mean VAS assessment. Research conducted in the United States of America shows that adequate postoperative care and a proper approach to pain management significantly reduce the length of hospitalization and the risk of complications, especially when talking about abdominal surgical procedures [16], which is not in accordance with our results that show that the treatment of postoperative pain does not affect the number of days spent in the ICU. In the same study, it was shown that postoperative pain is poorly controlled in almost 80% of cases, while according to the results of our study, pain control is effective [16].

CONCLUSION

Patients after vascular surgery have a lower VAS value than patients who have abdominal procedures, while younger patients, regardless of the type of procedure, have a higher VAS than older patients. The continuous application of analgesia with the use of bolus analgesia has a more favorable effect on pain and affects the increase in the quality of patient health care during hospitalization in the Intensive Care Unit.

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CONFLICT OF INTEREST:

The authors declare that there is no conflict of interest.

TABLES

Agent /Combination of agents	No. of patients
None	1
Paracetamol	11
+ Metamizole	14
+ Tramadol	13
+ Ketoprofen	3
+ Metamizole + Tramadol	6
+ Metamizole + Ketoprofen	1
+ Tramadol+ Ketoprofen	3
Metamizole	1
+ Tramadol	1
+ Tramadol+ Ketoprofen	1
Tramadol	1
Ketoprofen	0
Sufentanil	9
+ Paracetamol	21
+ Metamizole	6
+ Tramadol	2
+ Ketoprofen	1
+ Morphine	1

Agent /Combination of agents	No. of patients
+ Paracetamol + Metamizole	42
+ Paracetamol + Tramadol	17
+ Paracetamol + Ketoprofen	14
+ Metamizole + Tramadol	2
+ Metamizole + Ketoprofen	1
+ Paracetamol + Metamizole + Tramadol	7
+ Paracetamol + Metamizole + Ketoprofen	2
+ Paracetamol + Metamizole + Morphine	2
+ Paracetamol + Tramadol+ Ketoprofen	2
+ Metamizole + Tramadol+ Ketoprofen	2
+ Paracetamol + Metamizole + Tramadol + Morphine	2
Morphine	1
+ Paracetamol	4
+ Paracetamol + Metamizole	1
+ Paracetamol + Metamizole + Tramadol	1
Epiduralna analgezija	3
+ Paracetamol	2

Table 1. Combinations of drugs for bolus and continuous analgesia

Patients' characteristics	
Age, years	median (range, ICR)
Male	66 (22-93, 19)
Female	66 (22-93, 21)
Gender	
Male	129 (64,8)
Female	70 (35,2)
Type of surgery	
Abdomen	135 (67,8)
Vascular	39 (19,6)
Traumatological	25 (12,6)
Type of analgesia	
Continuous	12 (6)
Bolus	62 (31,2)
+ Paracetamol + Metamizole + Tramadol	1
Epiduralna analgezija	3
+ Paracetamol	2

Table 2. Structure of the examined sample

	Patients' characteristics		
	Continuous	Continuous + intermitent boluses	Intermitetn boluses
No. of patients (male + female)	7 + 5	83 + 52	82 + 22
Type of surgery			
Abdominal	11	101	23
Vascular	1	17	21
Traumatological	0	7	18
Continuous	12 (6)	12 (6)	12 (6)
Bolus	62 (31,2)	62 (31,2)	62 (31,2)
+ Paracetamol + Metamizole + Tramadol	1	1	1
Epiduralna analgezija	3	3	3
+ Paracetamol	2	2	2

Table 3. Frequency of application of different types of analgesia