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ORIGINAL ARTICLE
PRACA ORYGINALNA

CHOOSING OF DRUG FOR ANESTHESIA IN INTENSIVE THERAPY OF TRAUMATIC DISEASE FOR GERIATRIC PATIENTS

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ABSTRACT

The aim of the study was to find the most rational approach to postoperative pain relief in the complex of intensive care for the acute and early periods of traumatic disease in elderly patients.

Materials and methods: 132 gerontology patients with multiple trauma were included in the study. Respiratory and cardiovascular systems parameters were assessed, coagulogram and inflammatory response markers, pain severity and analgesia quality were assessed.

Results: According to the data obtained from the evaluation of VAS and Likerts scale, as well as other results, it was found that the use of NSAIDs and mu-opioid antagonists in the acute and early period of traumatic disease reduces significantly the severity of pain at a minimum daily dose (0.15 mg / kg), decreased the period of anaesthesia on demand, minimized negative respiratory and cardiovascular effects. Presence of sedative effect contributes to the improvement of emotional state of these patients.

Conclusions: Age-related changes and concomitant pathology in geriatric patients define the need for the safe pain relief in this patients, in order to decrease possible adverse events. Optimal combination in geriatric patients with perioperative pain syndrome due to polytrauma is NSAIDs with antagonists-agonists. This combination reduce the prevalence and severity of negative respiratory and cardiovascular.

KEY WORDS: pain, multiple trauma, gerontology patients

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INTRODUCTION

Traumatic disease (TD) is known to be a complex pathological process caused by damage to several anatomical areas or segments of the extremities with a pronounced manifestation of the syndrome of mutual aggravation, which includes the simultaneous onset and development of several pathological conditions and is characterized by deep violations of all types of metabolism [1,2]. It is obvious from this definition that one of the leading components of the TD pathogenesis is the body's response to primary damage to the organs' and tissues' integrity at the time of injury, to an operative injury and to the quality of reparative processes in the postoperative period [3]. According to the data of multicenter studies conducted over the past 10 years, the main markers characterizing the course and prognosis of TD are recognized by the markers of the systemic inflammatory response (SIR) (Level II evidence) [4,5]. If we review the sequence of body reactions schematically, it can be noted that at the moment of injury, a local release of the SIR mediators occurs, followed by a small amount of their release into the systemic circulation, followed by a generalization of the inflammatory reaction, resulting in multi-component hypoxia, which is violation of systemic oxygen transport (STO₂) [6].

In turn, the course of TD determines the reactivity of the organism, which depends on the anatomical and

physiological characteristics of each patient [7]. Gerontological patients with polytrauma deserve special attention, in which age-related changes and concomitant somatic pathology impose certain requirements on the conducted complex of intensive therapy [8]. Considering blood loss due to increased oxygen debt, which occurs in elderly patients against the background of a quantitative deficit of "full" red blood cells, as well as pulmonary dysfunction caused by postoperative pain syndrome, hyperactivation of the sympathetic nervous system with a subsequent increase in myocardial oxygen demand and an increase in catecholamine plasma concentration – procoagulation factors, peristaltic activity of the intestine increases the pathological changes in STO₂ and further violates the ventilation nano-perfusion relationships in the organism [9]. There is a point of view that it is precisely with a change in the level of the oxygen regime of the tissues and the development of oxygen debt (the energy equivalent of a structural deficit) that the development of protopathic and visceral pain is associated [10].

The first report that pain arises in violation of tissue respiration was expressed by PK Anohin in 1956 and confirmed in 1975 by N.N. Cassil [11]. According to modern researchers, there are more and more facts confirming that a decrease in the oxygen supply constant of body tissues below a certain level, regardless of its cause, causes the

sensation of pain, makes the pain syndrome multi-component and is one of the main factors in the pathogenesis of TD. This is confirmed by the official definition of the term "pain" according to the International Association for the Study of Pain: "an unpleasant sensation and emotional experience associated with existing or probable tissue damage, or described by a patient in terms describing the condition of such injuries" (IASP, 1992) [12].

Thus, it is precisely the pain syndrome that simultaneously with the SIR is recognized as leading in the pathogenesis of the acute and early periods of TD, which affect the course of its late period and the rehabilitation period. Considering the possible consequences of inadequate postoperative analgesia in patients with polytrauma, it is gerontological patients that deserve special attention, since age-related changes and concomitant somatic pathology in them cause certain requirements for the use of painkillers.

THE AIM

The aim of the study was to find the most rational approach to postoperative pain relief in the complex of intensive care for the acute and early periods of traumatic disease in elderly patients, aimed at the most effective struggle with pain syndrome with the lowest possible negative clinical effects. The main objectives of the study were to determine the quality and duration of the analgesic effect, as well as the frequency and nature of the negative effects of the used painkillers.

MATERIALS AND METHODS

We examined 132 patients with polytrauma at the age of 66.16 ± 3.81 years, with a severity of injury according to the ISS scale of 40.3 ± 4.2 points and a condition of severity on the APACHE II scale of 32.2 ± 4.4 points, which amounted to four representative groups, I ($n = 30$), II ($n = 30$), III ($n = 36$), IV ($n = 36$), which did not differ significantly by sex, age, anthropometric data, nature and severity of injuries, the time from injury to admission to hospital. All patients received similar complex of intensive care, except for painkillers. When choosing a complex of drugs for analgesia, we used the so-called accelerated rehabilitation program (Fast-track surgery), which, according to many authors, allowed us to reduce the number of postoperative complications, reduce economic costs and reduce the length of hospital stay for patients [13,14]. This program includes minimally invasive emergency operations, optimal administration of fluids, prevention of intraoperative hypothermia and hypoxia, reduction of postoperative nausea and vomiting, adequate nutritional support, the earliest possible immobilization of patients and balanced analgesia. We also used modern principles of pain treatment according to the WHO [15]: the principle of an individualized approach, the principle of the ladder, the principle of timely input and the principle of the adequacy of the method of administration.

So patients of group I received an inhibitor of cyclooxygenase (COX) + morphine for analgesia, patients in the II group – an inhibitor of COX + adjuvant, patients of III

group – an inhibitor of COX + nalbuphine. These patients received morphine (10 mg) for premedication. Anesthesia with oxybutyrate-ketamine was performed considering the blood loss, age and injury severity. Patients of the IV group received nalbuphine hydrochloride for premedication and COX + nalbuphine hydrochloride inhibitor for postoperative analgesia.

Doses of the drugs were administered according to the present comorbid somatic pathologies and the pain intensity defined by the visual analogue scale (VAS), Likert analgesia quality scale along with the determination of the minimum, average and maximum recorded need for painkillers.

We used similar regimens of NSAIDs in these groups. According to the pain mechanisms in patients with polytrauma, pain impulse is the primary one and causes the release of ERH mediators. So, we used an universal modern COX inhibitor ketoprofen (ketonal), which patient received as a NSAID in the postoperative period (4.7 ± 1.8 mg / kg per day).

Considering all the known negative effects of acute pain, especially in high-risk patients, we have compiled a list of diagnostic measures chosen for statistical comparison of groups of studied patients. Central hemodynamics parameters were assessed at the days 1, 2, 3, 5 using the integral rheography method according to MI Tischenko. Blood pressure, breathing and heart rates, pulsoximetry using Yutas-300, blood gases using BMS-2 MK2 "Radiometer" device, coagulogram, SIR markers – TNF- α , interleukin 1, 6, 8, endothelin-1 using ELISA, pain intensity according to VAS, analgesia quality according to Likert, minimum, average and maximum doses of painkillers along with the assessment of their side effects were assessed at the days 1, 3, 5, 10 and 14.

Clinical effects were evaluated in order to prevent possible expansion of receptor fields and increase the sensitivity of the spinal cord neuronal structures that often leads to the formation of chronic postoperative neuropathic pain syndrome based on plastic changes in the nervous tissue [16]. The frequency of their development directly proportional to the intensity of pain in the early postoperative period and the adequacy of analgesia during the first postoperative week of [17, 18, 19]. Student's t-test with Bonferroni correction was used. to assess the significance of differences.

RESULTS AND DISCUSSION

When studying hemodynamics in patients of group II, a significant ($p < 0.05$) increase in total vascular resistance was determined at 1, 2, 3, and 5 days of hospital stay when compared with other patients (Table 1).

When conducting a comparative analysis of the respiratory rate, a tendency was found for its increase in patients of group I as compared with groups III and IV, in patients of the II group also in comparison with groups III and IV, and in patients of the II group compared with group I. A similar dynamics was observed when assessing the oxygen saturation index. When conducting a comparative analysis of the parameters of the vascular-platelet hemostasis in the

Table 1. Dynamics of indicators of hemodynamics in the studied patients

Indicator	group	1 day	2 day	3 day	5 day
HR	I (n=30)	101,8±6,2	100,2±6,8	91,3±8,1	95,1±5,3
	II (n=30)	99,1±6,7	97,5±7,7	90,6±9,7	97,2±8,5
	III (n=36)	100,4±4,8	95,2±4,1	92,1±3,8	89,4±4,2
	IV (n=36)	98,1±4,5	95,5±5,7	91,6±4,1	90,1±3,6
SV, ml	I (n=30)	48,7±7,2	58,4±6,2	58,5±2,7	66,1±7,1
	II (n=30)	51,4±5,6	58,1±3,1	62,7±3,2	65,4±8,5
	III (n=36)	52,1±4,7	59,6±3,1	61,3±2,9	64,1±8,3
	IV (n=36)	50,8±6,4	59,3±2,8	62,6±3,3	65,2±6,4
Total peripheral vascular resistance, $\text{din} / (\text{cm} \cdot \text{cm}^{-5})$	I (n=30)	1325,1±68,3	1301,2±49,3	1260,3±35,8	1221,6±22,2
	II (n=30)	1569,6±58,6*	1698,5±72,1*	1542,3±39,8*	1427,4±79,3*
	III (n=36)	1241,4±42,6	1338,7±39,2	1229,2±28,4	1205,1±21,4
	IV (n=36)	1308,7±41,6	1285,5±62,3	1231,7±33,8	1185,9±34,1

* $p < 0,05$

affected group of II, a significant increase in coagulation ($p < 0.05$) at 3, 5 and 10 days of the study was determined.

Statistical analysis of the dynamics of SIR markers did not reveal significant differences between the indicators of patients of the studied groups.

According to the data obtained from the evaluation of VAS and Likerts scale, as well as other results, it was found that the use of NSAIDs and mu-opioid antagonists in the acute and early period of traumatic disease reduces significantly the severity of pain at a minimum daily dose (0.15 mg / kg), decreased the period of anaesthesia on demand, minimized negative respiratory and cardiovascular effects. Presence of sedative effect contributes to the improvement of emotional state of these patients.

The data obtained in our study is confirmed by the data of foreign researchers who established the synergism of the analgesic effect of opioids and NSAIDs. It should also be noted that there is no difference in the course of anesthesia in patients of groups III and IV, which makes it possible to completely eliminate the use of morphine and to avoid individual selection of the dose of antagonist-agonists in the postoperative period. Thus, it should be noted that there is no optimal method of postoperative pain relief. Most of the known methods, along with certain advantages, have a number of disadvantages, the main ones being the secondary nature of postoperative analgesia regarding the developed pain syndrome and the absence of a pathogenetic approach depending on the etiology of pain. In turn, according to the results of our study, it can be argued that for gerontological patients with polytrauma, the combination of NSAIDs and antagonist agonists, optimal for dealing with perioperative pain, is confirmed by their pronounced synergistic effect.

CONCLUSIONS

1. Age-related changes and concomitant pathology in geriatric patients define the need for the safe pain relief in this patients, in order to decrease possible adverse events.

2. Optimal combination in geriatric patients with perioperative pain syndrome due to polytrauma is NSAIDs with antagonists-agonists.
3. This combination reduce the prevalence and severity of negative respiratory and cardiovascular effects, as well as improved the emotional state of the patient.

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