Review Article

Pain Management in Critical Patient

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Abstract

Pain is a major problem in intensive care and is the primary problem for intensive care patients. The high-quality pain management and pain, palliative treatment should be targeted for every patient. Palliation, evaluation, and monitoring of the pain begin with the use of effective strategies. Pain management includes both pharmacological and nonpharmacological treatments. Analgesia has positive effects on morbidity and prevents pulmonary complications such as atelectasis and pneumonia, and self-extubation after agitation. In this review, assessment, monitoring, results, and method of the pain management in intensive care unit (ICU) were explained.

Keywords: Intensive care unit; Pain management; Sedation

1. Introduction

Pain is one of the biggest problems of patients in the ICU [1,2]. Pain treatment is usually insufficient due to fear of spontaneous breathing may cause depression, opioid addiction and changes in cardiovascular stability [3]. For the past 20 years, researchers have shown that if the pain is not treated well, it may cause anatomical and physiological changes in the Central Nervous System (CNS) [4]. The ability to alter neural tissue in response to repeated stimulation is known as neuroplasticity, which can lead to the development of chronic restrictive pain when acute pain is not treated well [5]. In addition, it leads to pain which developed after surgical stress or trauma, cytokine and release of reactances, catecholamine, cortisol, increased the level of GH, ACTH. Also, it leads to activation of the Renin-Angiotensin-Aldosterone system, to hypercoagulability, and weakening of the immune system [6]. Some studies have shown that insufficient pain treatment results in higher mortality and morbidity. There is a tendency for post-traumatic stress disorder in patients who discharged from ICU with insufficient pain treatment [7, 8].

2. Pain Treatment in Intensive Care

The treatment of acute pain accurately and successfully is based on the following fundamental principles:

1. The pain is a subjective phenomenon.When a patient says "I have pain", it is necessary to believe the patient [9].
2. It is very important to determine the actual cause of the pain before starting treatment.
3. Pharmacological treatment should be based on providing and maintaining the adequate level of medication in the active areas in order to ensure to provide adequate analgesia and anxiolytic.
4. The effectiveness of treatment should be evaluated over and over again.
5. It is important to keep in mind to be able to use regional analgesia techniques (neuroaxial and peripheral nerve blocks). These techniques reduce the need of opioid.

3. Care Plan Arrangement

1. Where is the pain? Is it an acute problem? Is it a chronic pain?

2. What is the severity of the pain? Every patient should be asked the level of the pain by describing it visually, verbally or quantitatively by using the visual analog scale and verbal rating scale (VAS, VRS) [10, 11].

Incubated and sedated patients cannot respond verbally. Sympathetic activation complaints such as uneasiness, sweating, tachycardia, lacrimation, pupil dilation and hypertension can be evaluated to identify the severity of the pain. However, none of these alone is an adequate measurement of the severity of the pain.

4. What kind of pain?

Pain can be classified as nociceptive or neuropathic.

Somatic pain is caused by the epidermis, dermis and nociceptive alerts. Whereas, visceral pain is caused based on the abnormal function of an internal organ or overlying tissue (pleura, pericardium, peritoneal).

Neuropathic pain occurs depending on peripheral nerve and/or CNS injury or its dysfunction. It is thought that it is related to the abnormality of sodium canals of damaged neurons. Neuropathic pain is often described as burning, tingling, numbness [12].

5. Medical Treatment

The ICU patients usually feel the pain because of the current illness, invasive interventions and trauma. Also, it is related to catheters, drains, endotracheal tube, routine nursing care, airway aspiration, physiotherapy, medical dressing change and prolonged immobilization [13]. The affected muscles around the area of pain lead to deterioration of pulmonary function. Especially, in post-op patients, effective analgesia reduce the complications of pulmonary [14].

6. Non-pharmacological Treatments

Even giving appropriate position, stabilization of the fractures and hanging the ventilator circuits are useful precautions for pain relief. Some alternative methods such as TENS and acupuncture could be preferred.

7. Transcutan electrical nerve stimulation (TENS)

It is a method which applied to both sides of the painful area, place of dermatomal spread or through a peripheral nerve trace, to placed electrode to the skin superficially with 50-100 Hz electric current passed the region of the painful area. The transmission of the afferent nociceptive alerts to the spinal cord and brain can be blocked by this way [15]. It should be combined with one of the other acute pain management strategies. It is effective in the pain of appendectomy, cholecystectomy, laminectomy, post-thoracotomy, fractures, burns and angina. In chronic pain, stimulation should be performed for 3 hours duration a day over 4-6 weeks of the period [16].

8. Pharmacological Treatments

NSAİDs may not be enough alone to care for the critically ill patient. The combination with opioids is a good choice. The side effects of it such as peptic ulcers and inhibition of platelet function should be taken into account. They may lead severe bronchospasm if there is an allergy to asthma, nasal polyposis and aspirin. Ketorolac is most often preferred, ketorolac and other NSAİDs are contraindicated in acute renal failure and chronic renal failure. Should not be given more than 5 days successively. If NSAİD is contraindicated, paracetamol may be a good preference. It affects prostaglandins that cause hyperalgesia. It limits the entry of pain from the nociceptors. Salicylates pyrazolones, aniline, anthranilic acid and indol circuits could be seen as members of this group. The most commonly used are salicylates. It has some side effects like gastrointestinal system (GIS) irritation and hypotension. They can affect kidney functions [17].

9. Opioids

They are most fundamental pharmacological agent for ICU patients. The requested characteristic of good opioid include to show its effect quickly, easily titrable, unaccumulated of the drug or metabolites, and cheap. Fentanyl should be preferred commonly. The effect of fentanyl starts quickly and it has short impact duration. It causes minor hemodynamics changes. It does not change the cardiac inotropic power. It discharged via elimination rather than redistribution of fat tissue, when given via infusion continuously (when infusion exceeds 4 hours) or in high doses (400 mcg/day). Once it became addicted to elimination, the drugs can be accumulated and its effect duration may extend [18].

The effect of morphine starts slowly and it is long-acting. Depending upon vasodilatation, the release of histamine can cause secondary hypotension. In the case of renal insufficiency, active metabolite morphine-6-glucuronide can be accumulated and it may lead to sedation [19]. Hydromorphone is an opioid which is 5-10 times more potent

semi-synthetic than morphine. Its duration of effect is similar to morphine, the hemodynamic impact is minimal, there is no active metabolite, histamine release does not exist or is too little [20].

It is opioids and its features which deliverable via methadone, enteral and parenteral are similar to the morphine effect duration is longer than morphine [19].

There is no lots of study about ICU patients in relation to remifentanil. It needs continue infusion due to its short impact duration. Once the infusion stopped, it may lead to pain in high incidence. Its short effect duration is useful for particular patients who undergo neurological examination by leaving the analgesic medication [20].

10. The Side Effects of Opioids

It may cause respiratory depression, hemodynamic instability, ileus, intestinal hypomotility and gastric retention. In the case of traumatic brain injury, it may lead to intracranial pressure increase syndrome. The opioid addiction is not very often. In a study of 1.882 samples, it identified addiction in just 4 samples. High-dose methadone can lead to an extension in QTc intervale in during ECG, may lead Torsade de points type arrhythmia [21].

11. Opioids Administration Routes

The continue infusion or intermittent bolus should be preferred for ICU patients. The drugs should not be ordered in the case of "when required " or " when necessary ". In this way, never steady-state plasma concentration unobtainable and effective analgesia unobtainable. Patient-controlled Analgesia (PCA) devices can be chosen. These devices can be used for nurse-controlled analgesia [22].Transdermal fentanyl may be preferred in patients who hemodynamically stable and also it may lead respiratory depression, so it should be given at the lowest dose, then the dose can be increased gradually [23].

Ketamine is not preferred for ICU patients with routine use. However, it can be preferred for the intercostal drain exchange, medical dressing in burned patients, debridement, bedhead small surgical procedures [24].

Anticonvulsants, antidepressants, myorelaxants, benzodiazepines, barbiturates, propofol, phenothiazines and butyrophenones could be implemented along with opioids. These medications are for amnesia,sedation,and anxiolysis. They do not have analgesic effects [25, 26].

12. Regional Techniques

It is very useful for appropriate indication. Attention should be paid to asepsis and antisepsis rules. If catheter implemented via tunnelisation, the medical dressing should be carried out. It will provide effective analgesia if the right medication, right catheter, and right concentration provided. Intercostal nerve blocks, paravertebral block, upper and lower extremity peripheral nerve blocks and epidural analgesia could be used. During blocks performed,

the chances of success will be increased. The existing studies showed that the use of regional techniques reduces the dose of opioid usage [27, 28].

13. Nerve blocks

Most commonly used blocks are intercostal, paravertebral and intrapleural. In addition to these, the brachial plexus block, the femoral block, coeliac plexus blocks are also used [21, 29]. Intercostal block; after the thorax injuries and surgery, intercostal neuralgia and pleurisy also used commonly. By this technic, sympathetic blocs will not occur. It decreases the muscle spasm and pain. The sedation or respiratory depression will not occur. However, there is a risk of systemic toxic reactions depending on an obligation to repeat, pneumothorax and local anesthesia. It should not be applied to anticoagulant areas because of the risk of haematoma. The block should be applied to the injured segment and the upper segment. If the block is to be made once, it should be started with a systemic analgesics. In recent years, the continue technique has been started to be applied by placed the plastic into the intercostal distance. 0.5-2% lidocaine and 0,25-0.5% of bupivacaine should be given 5 ml of each intercostal distance [30-32]. Intrapleural block; It is applied for the purpose of renal surgery and breast surgery, cholecystectomy, eusophagectomy, pancreatitis, pancreatic cancer, liver metastasis, thoracic injuries, and post-thoracotomy. It is called intrapleural block due to the injection is made between visceral and parietal pleura leaves. It can be applied continuously by placing the catheter, and intercostal nerves are blocked superficially. Patients with thoracic tube can be given from the inside of the tube. Pneumothorax, pleural fibrosis, intrapleural distance, there is a risk of blood and fluid accumulated and infection and toxicity of local anesthetics. The 10-30 ml of the 0,25%-0,5 bupivacaine will be sufficient [33].

14. Paravertebral block

Single injection or continuous can be applied to the several levels. The level of pain in the area of thoracic or lumbar in the medulla spinalis is determined according to the dermatomal spread and applied to the paravertebral region [34]. Thoracic and abdominal surgeries are effective in neuralgia, coxalgia, and thoracic injuries. There is a risk of pneumothorax, epidural block, and toxic reactions. The 10 ml of the % 2 lidocaine or 15 ml of the 0,375% bupivacaine is used.

15. Epidural and intrathecal block

In these block shapes, afferent nociceptive information is blocked at the central level. Even usually using the local anesthetics, after the discovery of the existence of the opiate receptors in the dorsal root, the usage of the opioid in epidural and intrathecal has become a current issue [35, 36]. They can be used as combined. It can be applied in the form of a single injection or continue infusion [37]. The intrathecal application is preferable to more surgical purpose in the treatment of pain such as epidural technique postoperative analgesia, the treatment of cancer pain, bladder spasm, decubitis pain [38]. To placed epidural catheter is the most appropriate method for the treatment of chronic pain. Some methods like placed port under the skin and pomp which are usable by patients were developed

in order to reduce the dependency of the hospital. If local anesthetics are used in these block shapes, there are complications such as hypotension, bradycardia, urinary retention, headache, back pain, nausea, vomiting, neurological complications, meningitis, whereas when using opioids, problems such as respiratory depression, itching, urinary retention, nausea-vomiting, sedation, tolerance can be encountered. In the intrathecal application is generally recommended in the form of acute pain and a single application. In this way, 1-2 mg of morphine, 0.01-0.02 µg/kg of fentanyl, 0.02 mg/kg of alfentanyl is given. If the infusion is desired, 100 µg bolus fentanyl initially given and then proceed with the infusion of 0.02 µg/kg/min. It can be combined with 1% lidocaine or % 0,25-0,5 bupivacaine if needed. The epidural application is preferred for chronic pain and prolonged treatments. In the 10-15 ml normal saline solution, morphine 2-6 mg, fentanyl 1,5 µg/kg, 25-50 mg dolantin are given in the form of bolus or fentanyl 1,5 µg/kg/hour is given [39].

As a result; invasive initiatives in intensive care patients, during some operations like intubation, tracheal aspiration, medical dressing, and position exchange, a sedative and an analgesic may be required. A wide range of these medicines can cause some negativeness such as prolonged stay periods of intensive care and immunosuppression. Therefore, it should be sensitive regarding the selection of the drug and its dosage [40]. The pain management in the critical patients decreases stress response, reduces mortality and morbidity. The treatment plan should be prepared according to the patient's clinical condition. Multimodal analgesia techniques can be used; both pharmacological and non-pharmacological methods can be selected to the same patient. In evaluating the effectiveness of the treatment method, the patient must be followed commonly.

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