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CASE REPORT / *OLGU SUNUMU*

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Pain Management of a Critically Ill Oldest-old Trauma Patient with Multiple Rib Fractures in Intensive Care Unit

Yoğun Bakım Ünitesinde Multipl Kot Fraktürlü İleri Yaşlı Kritik Travma Hastasının Ağrı Yönetimi

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ABSTRACT Rib fracture due to blunt chest trauma is a painful condition with high morbidity and mortality and it is two times prevalent among the elderly compared to young people. If adequate an analgesic treatment is not administered, respiratory complications, need for mechanical ventilation, and length of stay in intensive care unit may increase. Erector spinal plane (ESP) block is a regional unaesthetic method that can provide effective analgesia in the unilateral thoracic region. In this study, we present ESP block, which is used successfully in pain management of a critically ill old patient with multiple rib fractures.
Keywords: Trauma, rib fracture, oldest-old, erector spinal plane, intensive care unit

ÖZ Künt göğüs travmasına bağlı kot fraktürleri, yaşlılarda gençlere göre iki kat daha fazla morbidite ve mortaliteye sahip ağrılı klinik bir durumdur. Yeterli analjezi tedavisi sağlanmazsa solunum komplikasyonları, mekanik ventilasyon ihtiyacı ve yoğun bakım ünitesinde kalış süresi uzayabilir. Erektör spina alan (ESP) bloğu tek taraflı göğüs bölgesinde etkili analjezi sağlayabilen bölgesel bir anestezi yöntemidir. Burada, yoğun bakım ünitesinde multipl kot fraktürü olan ileri yaşlı kritik bir hastanın ağrı yönetiminde başarıyla kullanılan ESP bloğu sunulmaktadır.
Anahtar Kelimeler: Travma, kot fraktürü, ileri yaşlı, erektör spina alan bloğu, yoğun bakım ünitesi

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Introduction

Rib fractures due to blunt chest trauma is a very painful condition with high morbidity and mortality. Lung ventilation, sputum removal, chest wall compliance and mobilization of patients are restricted because of the pain. Respiratory complications such as atelectasis, pneumonia and hypoxemia are frequently observed. If adequate analgesia treatment is not provided, respiratory complications, the need for mechanical ventilation and the length of stay in intensive care unit (ICU) may increase (1,2).

Respiratory anatomical and physiological changes are observed in the geriatric people. Muscle strength and tissue elasticity of the respiratory muscles decrease. Chest wall and lung compliance are reduced. Senile emphysema is observed due to enlargement of the alveoli. In addition, exposure to more environmental pollution due to its long life also affects the respiratory system (3). The morbidity and mortality is twice as high in the elderly compared to young people. In the elderly patients, for each additional rib fracture, the risk of pneumonia increases by 27% and mortality by 19% (3-6).

Systemic analgesics [such as nonsteroidal anti-inflammatory drugs (NSAIDs), acetaminophen, gabapentinoids, opioids] or regional anesthesia methods

can be used for analgesia of these critically ill patients in ICU (7,8). Erector spinal plane (ESP) block is widely used in neuropathic pain such as rib metastasis and postoperative and posttraumatic pain. Usage of ESP block has become widespread in the treatment of pain due to multiple rib fractures (2,9). This technique can be used safely among ICU patients because of easy sonoanatomy, less invasiveness compared to neuraxial methods, and being away from major vascular structures (10,11).

Here, we present the ESP block, which was successfully used in the pain treatment of a critically ill oldestold patient with multiple rib fractures that followed in ICU.

Case Report

A written informed consent was obtained from the patient's son for the publication of this case report and accompanying images.

A 101-year-old female patient with multiple rib fractures due to fall was admitted to ICU with complaints of right chest pain and respiratory distress. In her medical history, she has hypertension and level 2, according to the American Society of Anesthesiologists. She had right chest tube insertion due to right hemothorax after a fall 2 weeks ago.

Acute physiology and chronic health assessment score was 18 (expected mortality: 29.1%), Sepsis-Related Organ Failure Assessment score was 2 and Glasgow coma scale was 15 at ICU admission. On her physical examination, her respiratory rate was 36/minute. There were widespread ecchymosis, flail chest, tenderness and crepitation in the right hemithorax (between the 9th-12th ribs) on palpation. Respiratory sounds decreased in the middle and lower zones of the right hemithorax and lowe zones of the left hemithorax in lung auscultation. The partial oxygen pressure was 78.6 mmHg, partial carbondioxide pressure: 33.4 mmHg and oxygen saturation was 97% under oxygen with nasal cannula (8-12 L/minute) in her arterial blood gas. Her numerical rating scale (NRS) score was 10 for pain assesment. In her thorax computed tomography, there were multiple displaced rib fractures between 7th and 11th ribs and hemopneumothorax in the right hemithorax (Figure 1).

For the purpose of pain management, a right sided ESP block was performed with an in-plane technique by 21 gauge, 85 mm insulated needle (Echoplex+® Vygon, Ecouen, France) at the level of 8th thoracic vertebra. It was applied with a high frequency (12-4 MHz) linear-array probe under ultrasonography (USG) (Philips Ultrasound, Inc. Bothell, Washington, USA) in the sitting position. The ultrasound probe was placed in a longitudinal orientation 3-4 cm lateral to the T8 spinous process and moved to medial. The needle was inserted by visualizing the transverse process, in cephalad to caudal direction advanced up to the transverse process. Then following the confirmation of needle tip in erector spinae plane, 25 mL saline solution containing 60 mg bupivacaine and 8 mg dexamethasone was given for the block. Within half an hour, her NRS score was 1, no additional analgesic was used.

Three days after ICU admission, her respiratory distress and need for oxygen support decreased and her NRS score was 1. She was discharged to the ward on the 3rd day of ICU admission and to home on the 7th day of hospitalization.

Discussion

Regional analgesia techniques play an important role in the postoperative period or acute pain management in ICU patients. These techniques minimize the patient's discomfort and reduce psychological stress. Regional analgesia techniques provides opioid protective effect and can increase to improve respiratory function, bowel function, mental state and patient comfort especially in elderly criticaly ill patients. Thus, it may shorten the length of ICU and hospital stay and reduce morbidity and mortality (8).

The most important physiological changes among elderly people are decreased in the elastic recoil of the lung, chest wall compliance and the muscle strength of the respiratory muscles. Lung volume and capacity decrease as a result of changes in lung parenchyma, skeletal muscles and bone structure of thorax. As a result, the partial oxygen pressure reduces progressively. Environmental factors and lifestyle are also associated with decreased respiratory function (3). Our patient had exposed to environmental risk factors for a long time and her respiratory functions regressed due to geriatric physiological changes. Elderly patients with blunt chest trauma and rib fracture had twice morbidity and mortality compared to younger patients who have similar accidents. For each additional rib fracture in the elderly, the risk of pneumonia increases by 27% and mortality by 19% (4-6). Pulmonary complications such as contusion, atelectasis, pneumonia etc. are more common in geriatric patients with rib fractures (12). ESP block was associated with improved inspiratory capacity and analgesic outcomes

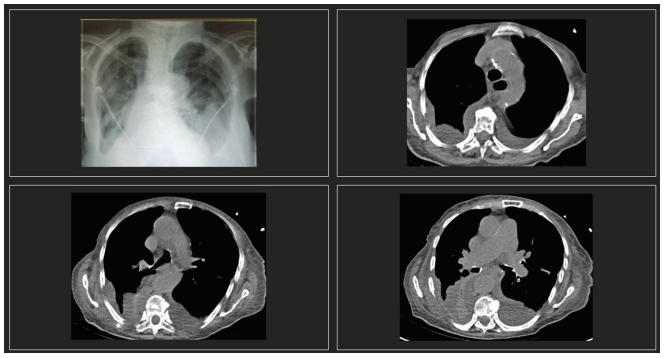

Figure 1. X-ray and computed tomography of the thorax on intensive care unit admission

following rib fracture (9,13). Our patient was an oldestold female. Therefore, she had risk for the geriatric population. She had 5 rib fractures. However, she was lucky in terms of morbidity and mortality, since she had no additional systemic disease other than hypertension. We think fast and effective analgesic management during ICU follow up prevented development of severe respiratory complications in the our patient.

ESP block is a technique first described in 2016 (9,14,15). This technique is widely used in neuropathic pain such as rib metastasis, postoperative and posttraumatic pain (9,14-17). Recently, usage of ESP block has become widespread for the treatment of pain due to multiple rib fractures (10,13). There are various regional methods such as thoracic paravertebral block, interpleural block, intercostal nerve block, and thoracic epidural catheter placement that can be used in multiple rib fractures for pain management (7,8). These methods cause serious resource usage and are time consuming techniques. Since their effectiveness are limited to a single dermatome, they provide incomplete analgesia. These procedures are associated with important complications such as local anesthetic intoxication, vasovagal syncope, hemi diaphragm paresis and pneumothorax (18). ESP block can be used safely in ICU patients because of easy sonoanatomy, less invasiveness compared to neuraxial methods, being away from major vascular structures and fewer complications (2,9,10,19). This technique can be easily performed with USG at the bedside among critically ill patients. For these reasons, we chose this method to provide fast, effective and sufficient analgesia.

Analgesic effect of ESP blocks can last up to 24-72 hours (9,17,20), especially when done with long-acting local anesthetics such as, bupivacaine or ropivacaine. During regional anesthesia, dexamethasone can be used to prolong the duration of analgesia (21). The combination of local anesthetic and dexamethasone has been successfully used to provide long-term analgesia during ESP block (22-25). We also performed ESP block with a combination of long acting local anesthetic and dexamethasone in our case. We think, this prolonged analgesic efficacy is due to this combination. In fact, we did not expect the effect of the block to last this long. Initially, we made the block with the thought that we might need to renew it again. Fortunately, there was no need.

Studies in which a long-term analgesic effect can be observed with a single dose of ESP block are known to be used especially for the treatment of pain (such as neuropathic pain, herpes zoster, acute pancreatitis and breast cancer surgery) (9,25-27). A single dose ESP block was performed on 3 fresh cadavers by Adhikary et al. (28). They found that radiocontrast dye mixture produces epidural and neural foraminal spread which may have clinical effects similar to thoracic paravertebral blockade, and intercostal spread.

In addition, pain may be underreported in the geriatric population for a number of reasons. Many patients hold the misconception that pain is an expected and natural consequence of aging. Patient regarding the side effects of opioids, including respiratory depression, addiction and falls, often create a barrier to indicated therapies. Because of the multitude of medications typically used by the elderly in treating a variety of other medical conditions, there is concern about drug-drug interactions and polypharmacy. The patient often underreports pain because of the fear that it may represent impending death, loss of autonomy or require further treatment or testing (29,30). For one or all of these reasons, our patient may incorrectly have stated that she had no pain after the ESP block.

ESP block may be an alternative to epidural or thoracic paravertebral block for providing analgesia in patients with multiple rib fractures. It provides pain relief, allows the patients to cough and helps in weaning off mechanical ventilation with a negligible risk (19). It provide a simple alternative to providing surgical and trauma analgesia when neuraxial techniques are contraindicated (11). ESP block when combined with mild sedoanalgesia, provides adequate and safe anesthesia in high-risk and advanced-age patients undergoing hip surgery (31). Our patient was an advanced-age woman with traumatic multiple rib fractures.

NSAIDs, acetaminophen, gabapentinoids, opioids and regional methods can be used in the analgesia management

of critically ill patients in ICU (7,10,14,32). NSAIDs have disadvantages such as gastric damage, platelet inhibition, and kidney injury. Opioids are depressants and can suppress cough and increase respiratory complications such as atelectasis (33). But, regional methods have various advantages and disadvantages. They cannot be performed in cases of coagulopathy, sepsis and severe hemodynamic instability. However, they have advantages such as providing effective analgesia and reducing usage of opioids. Thus, it improves respiratory functions, enables early mobilization, reduces the frequency of deep vein thrombosis, shortens the length of hospital stay and decreases mortality -morbidity (7,8). We preferred regional methods because we were afraid of respiratory complications due to elderly age and trauma in our patient.

Pain is a subjective and personal experience. Therefore, it is difficult to assess pain among patients difficult to communicate with, such as those with impaired cognitive functions and dementia. There are many tools and scales for pain assessment. A scale should be chosen individually according to the patient. But, in the elderly patients, NRS and the verbal rating scale are the most suitable tools for assessment of pain intensity due to their high validity, reliability and preference. There are a lack of understanding and a high error rate in the visual analogue scale. Therefore, it is the least suitable scale for scoring pain intensity in elderly patients (34,35). Our patient was conscious, cooperative and had good cognitive functions. So, we used NRS for the assessment of pain intensity.

Elderly patients followed in ICU may have inadequate pain control due to traumatic rib fractures that may increase the risk of pulmonary complications. Therefore, the use of regional methods in pain management of patients in ICU is increasing over time. It should be kept in mind that ESP block can be used effectively, safely and easily among geriatric patients with multiple rib fractures.

Ethics

Informed Consent: A written informed consent was obtained from the patient's son for the publication of this case report and accompanying images.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: Ç.Y., F.İ.Y., H.Ş., C.A., P.Z., Concept: C.A., P.Z., Design: C.A., P.Z., Data Collection and/or Processing: Ç.Y., F.İ.Y., Analysis and/or Interpretation: H.Ş., C.A., P.Z., Literature Search: Ç.Y., F.İ.Y., H.Ş., Writing: Ç.Y., F.İ.Y., H.Ş.

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