OPIS PRZYPADKU/CASE REPORT
Wpłynęło/Submitted: 23.09.2011 • Zaakceptowano/Accepted: 02.12.2011

Protective analgesia after total knee arthroplasty Post-surgical neuropathic pain - case report

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Abstract

Case report. We described a patient with post-surgical neuropathic pain after total knee replacement. He received multimodal analgesia during of the perioperative period. Paresis of peroneus nerve began on 2nd day and post-surgical neuropathic pain appeared just on 8th day after surgery. Pregabalin did not prevent hyperalgesia and allodynia. However multimodal analgesia with pregabalin, amitriptyline, morphine and subsequently tramadol allowed treating the neuropathic pain during three months period. *Anestezjologia i Ratownictwo 2011; 5: 425-430.*

Keywords: total knee arthroplasty, post-surgical neuropathic pain, multimodal analgesia

Introduction

Rheumatoid arthritis (RA) is a chronic autoimmune, systemic disease of the connective tissue that consists of inflammation of symmetrical joints, extra-articular lesions and organs damage [1]. Ankylosing spondylitis induces inflammation of mainly vertebral column and sacroilitis. This disease contains organs damage as well [2].

Every fourth patient with RA requires large joint endoprosthesis implantation. Patients scheduled for surgery, despite their age, often have ASA physical status III due to many coexistence diseases included: circulatory, respiratory, gastrointerstinal, renal and metabolic associated with high risk of thromboembolic complications, vertebral column lesions and peripheral neuritis [3].

Good pain control after surgery is important to prevent negative outcomes such as cardiorespiratory events included tachycardia, hypertension, myocardial ischemia, decrease in alveolar ventilation [4]. Moreover, poor wound healing and ineffective rehabilitation also may occur due to ineffective acute pain analgesia.

Pain is an unpleasant sensation that originates from ongoing or impending tissue damage. Postoperative incisional pain is unique and common with the acute pain. Recent studies demonstrate that about 50-70% of patients experience moderate to severe pain after surgery indicating that postoperative pain remains to be poorly treated [5].

The traumatic lesion during surgical interventions often turn into the persistent pain. The pain persists in the area of surgical intervention for a long time, beyond the usual course of natural healing and it is different from the one suffered preoperatively.

Chronic pain after total knee arthroplasty (TKA) is associated with lesions of the peripheral nervous system and is described as burning, tingling or electric shock-like. It can be continuous or paroxysmal**,** often associated with paraesthesia, hiperalgesia and allodynia. If there are not indications for surgical intervention**,** the treatment of post-surgical neuropathic pain is based on drugs such as: antidepressants, antiepileptics, antagonist of NMDA receptors, topical anaesthetics, opioids, mexiletine and capsaicine. Unfortunately, the post-surgical neuropathic pain is often resistant to pharmacologic treatment [6].

Spinal cord stimulation might be an option from

management of refractory knee pain following TKA [6,7].

The incidence of post-surgical neuropathic pain in the Pain Units is approximately 20% of patients admitted to hospital. Therefore it is necessary to pay a greater attention to the postoperative analgesia, adopting appropriate surgical techniques in other to avoid the onset of the post-surgical neuropathic pain [6].

Case report

A 44 year-old patient with coexisted rheumatoid arthritis (RA) and ankylosing spondylitis (ASAIII) was scheduled for left knee arthroplasty using the AGC-DA endoprosthesis. Surgeons performed reconstruction of bones lesions too. Patient suffered from substantial deformations in motion apparatus and had traumatic tracheal intubation of the high risk. We did not affirm any organs damage during observation. TKA was performed under the spinal anaesthesia with 20 mg isobaric bupivacaine administered via L_3-L_4 vertebral interspace. Perioperative analgesia was conducted according to following pattern (Table 1.).

We administered pregabalin 75 mg twice daily for twenty days. Postoperative analgesia involved the direct postoperative period was opinioned by patient as satisfied. The first symptom of pain occurred 5 hours after LIA with the intensity of 4 according to 11 points VAS score. The spinal anesthesia also lasted 5 hrs. Intensity of pain achieved values between 1-7 points on the 1th day, 2 points on the 2nd, and 4points on the 3rd day after surgery. Patient received only single dose of morphine on 3th day, after first mobilization of knee joint on the CPM (continuous passive motion) rail. The angle of knee flexion carried out 80 degrees.

During observation were no shown the problems with cardio-respiratory and renal system. We did not observe the vomiting, nausea and incidents of deep somnolence. Only the first dose of pregabalin seemed to be caused the symptoms of deeper sedation without respiratory depression. Furthermore, patient also received midazolam at that time.

On the 1th day we observed symptoms of nervous peroneus communis paresis. Ultrasonography scan showed hematoma around this nervous without any damage. Postoperative neuropathic pain symptoms occurred on the 8th day after surgery. Intensity of this pain achieved 8 points in the VAS score. Patient received pregabalin in this time, and additionally, we applied him morphine 2 x 10 mg s.c with amitriptyline in two doses; 10 mg in the morning and 25mg in the evening. He was discharged from the hospital and carried to the rehabilitation center on the 12th day after surgery.

Table 1. Protective analgesia in reported patient after TKA

Preemptive analgesia
Day before surgery
Meloxicam - 1 x 7,5 mg p.o. in the evening
Day of surgery
Protective premedication Pregabalin - 150 mg, methylprednisolone - 6 mg
Operative theater before anaesthsia i.v.: 1 g acetaminophen - ***protective analgesia***, 100 mg hydrocortison
Intraoperative analgesia
- *Intraoperative drop infusion* i.v. – 500 ml 0,9% NaCl + 0,3 μg/kg/min ketamine + 1 g magnesium sulfuricum
- *intrathecal analgesia* – 20 mg 0,5% isobaric bupiwacaine
- *Local infiltration analgesia - LIA* was performed solution about the following composition: 10 ml 0,5% bupivacaine with adrenaline + 10 mg morphini sulfas + 39 ml 0,9% NaCl; it was performed by surgeon after implantation of endoprosthesis
Postoperative analgesia
- *Phamacotherapy i.v.* with nonopiod analgesics: 1 g acetaminophen – 3 x per day, 100 mg ketoprofen – 2 x per day (1th medicament dose we administered out after surgery)
- *Continuous infusion i.v.* with ketamine in dose 1,5 μg/kg/min, we continued from the end of surgical operation up to 8th o'clock of the next day
- *Continuous infusion i.v.* with opioids - fentanyl – 25 μg/h was started after patient suffered the first pain
Second and third day after surgery
Postoperative analgesia
Steroids p.o. as previously, and other drugs, hydrocortisonum i.v. diminishing doses according to current standards of rheumatoid arthritis treatment
Pregabalin 2 x 75 mg p.o.
Ketoprofen 2 x 100 mg i.v.
Acetaminophen 3 x 1 g i.v.
Morphine 10 mg s. c. every 4-6 hours when intensity of pain in VAS score was 4 or > than 4 points.

We recommended him following treatment: pregabalin 1x 75 mg p.o. for 14 next days in connection with amitriptyline – in the same dose as above and trama-

dol retard 2 x 100 mg. He was receiving this complex treatment less than three months and notified gradual decrease of allodynia and hyperalgesia.

He stopped using tramadol and pregabaline in two weeks after discharge from the hospital and received subsequently amitriptyline 2 x 10 mg for one month. Neurophatic pain disappeared in this period. Next month he still received amitriptyline dose – 10 mg in the evening and subsequently he stopped using this drug medicament. Neuropathic pain did not recurrence. Paresis of peroneus nerve remained. However patient is satisfied with surgical results and he decided for operation of the second knee.

Discussion

Management of different types of pain is the most frequent issue encountered by clinicians and pharmacological therapy and seems to be the first line of approach for the treatment of pain [8].

Recently, much attention has been directed towards the effect of opioid- sparing strategies on postoperative morbidity and hospitalization and on different nociceptive mechanisms involved in various postoperative pain states and surgical procedures [9].

Exacerbations of acute pain can lead to neural sensitization and release of mediators both peripherally and centrally [4].

Moreover Capdevila et al. showed that the intravenous opioids did not provide for the suitable level of analgesia during rehabilitation after the TKA [10], and the transduction of nervous signals can stimulate above this [11]**.** The separate problem also makes up the phenomenon so-called opioid hyperalgesia [3], which one can be conquer through the application of the inhibitors of receptors NMDA. Ketamine is the most well-known drug medicine from this group, applied for years in the treatment of symptoms of the growing opioid tolerance, particularly during the therapy of the chronic pain [12].

Developing advanced molecular mechanisms of multimodal analgesia lets the new pharmaceutical products to treat postoperative pain [4]. The new pharmacological products include analgesic adjuvants such as pregabalin, ketamine or magnesium sulphuricum.

Protective analgesia is a strategy that grew out of the same need as to give drugs before injury so as to reduce pain experienced afterwards.

The idea that analgesia given before the injury would be more effective than the same analgesia given after the injury was named pre-emptive analgesia [13].

Antiepileptic drugs have been used in pain management since the 1960s [14]**.**

Pregabalin is a recently discovered gabapentinoid compound, which has been alleged to possess anxiolytic, analgesic, and anticonvulsant properties [15]. These adjuvants inhibit Ca(2+) currents via high-voltage-activated channels containing the alpha-2 delta-1 subunit, reducing neurotransmitter release and attenuating the postsynaptic excitability [16]. In addition pregabaline inhibits $Na_v1,8$ and $Na_v1,9$ channels similarly as local analgesics [17].

Pregabalin was shown to decrease central sensitization in experimental pain paradigm, and the same antihyperalgesic effect of pregabaline may occur during and immediately after surgery. Single dose of 300 mg of pregabalin orally administered 1 hr before TKA reached sufficient drug concentration in central nervous system suggesting that postoperative pain hypersensitivity can be reduced. Decreasing this acute brain or spinal cord excitability may prevent chronic pain from developing after surgery [18].

The dose 300mg of pregabalin administered before TKA and 14 days after TKA (150-50 mg twice daily) reduces the incidence of chronic neuropathic pain after TKA but it is associated with a higher risk of early postoperative sedation and confusion, dizziness, headache, dry mouth, peripheral edema and diplopia. Therefore, lower pregabalin doses should be considered in future studies to minimize such side effects, and hopefully, maintaining therapeutic efficacy [19].

Ittichaikulthol W. et al. showed that a 300 mg pregabalin administered 1 hr before abdominal hysterectomy with/without salphingo-oophorectomy significantly reduced morphine consumption, the pain score (VNRS) and improved satisfaction score at 24 hr post operatively without any significant differences in side effects [20]. In another study Peach MJ. et al. found that a single, preoperative dose of pregabalin 100 mg gave similar pain relief with increasing of side effects than placebo in patients scheduled for day case gynecological surgery [21].

He does not also have unique recommendation relate dosage of the medicine before-and after orthopaedic operations (TKA), and after surgical operations (hernitomy-IHR). In this investigation Chelly J. et al. confirms, that they did not prove effectiveness pregabalin in doses both 75 mg and 150 mg, but they affir-

med her profitable influence on passive rehabilitation, decreased demand on the opioids and interruption of the dream dependent from the occurrence of the pain, and also on the frequency of the occurrence of the nausea and vomiting [22].

Our patient received the same doses of pregabalin, and these doses did not protect him from neuropathic pain. Although, the antiallodynic and antihyperalgesic properties of pregabalin are useful for treating neuropathic pain. These properties may also be beneficial in acute postoperative pain [23,16]. However pregabalin is not licensed for use as protective premedication in postoperative pain management [13].

Although, the neuropathic pain appeared at our patient we still applied pregabalin in connection with tramadol and amitriptyline, receiving good effects.

Ketamine and magnesium sulfuricum have other mechanisms of action. These drugs are antagonists of NMDA receptors [24,12]. Ketamine was found to have a preventive role in animal neuropathic pain models [25].

Horlocker TT et al. showed that intravenously ketamine applied in small doses reduces the demand on opioides and it has the profitable influence on the flexion of operated knee [26].

Adam F. et al. suggested that an intravenous ketamine in connection with the continuous blockade of the femoral nerve might reduce the demand on morphine and improved the results of early rehabilitation near the small frequency of the side effects. They did not affirm the occurrence of the sleepiness, hallucination, also nightmarish dreams [27].

The sulphate of magnesium in the opinion of Fong YY. et al. establishes the next promising element of protective analgesia. However it requires further clinical opinion [28], additional advantage resulting from its applying is a decrease of the incidents of shivers [29]. He does not also settled directive intravenous and intrathecal dosages [25]. Taking under consideration possibility of magnesium shortage resulting in pain increase, we administered it's in a small dose.

Neuropathic pain is due to lesion or dysfunction of the peripheral or central nervous system. Tricyclic antidepressants and anticonvulsants have long been the mainstay treatment of this type of pain.

Tricyclic antidepressants may relieve neuropathic pain by their unique ability to inhibit presynaptic reuptake of the biogenic aminas serotonin and noradrenaline, but other mechanisms such as N-methyl-D-aspartate receptor and ion channel blockade probably also play a role in their pain-relieving effect [30]. Ho KY. et al. evaluated perioperative administration of selective serotonin and norepinephrine reuptake inhibitor. Duloxetine reduces morphine requirements in patients after TKA, and has demonstrated efficacy in chronic pain conditions such as painful diabetic neuropathy and post- herpetic neuralgia [31].

Our patient received amitriptyline in the treatment of post-surgical neuropathic pain with a very good result.

Opioids such as tramadol are drugs class for which there is the best evidence for a clinical relevant effect. Despite a 66% increase in published trials, only a limited improvement of neuropathic pain while treatment has been obtained.

A large proportion of patients with neuropathic pain complained of insufficient pain relief. This fact calls for other treatment options to target chronic neuropathic pain [32].

However, on the example of our case report we should always administer treatment of well-known medicines.

It is known that patients with neuropathic pain frequently present complex histories, making direct application of this evidence problematic.

Treatment of neuropathic pain needs to be individualized according to the cause of the pain, concomitant diseases, medications, and other individual factors [33].

Therefore, in the future, other studies of protective premedication and protective analgesia seems to be are necessary.

Conclusion

1. Small dose of pregabalin used as protective premedication did not always prevent appearance of post-surgical neuropathic pain after TKA.
2. Multimodal treatment may cause positive results in overcome post-surgical neuropathic pain symptoms.
3. Amitriptyline in connection with tramadol and pregabalin may be effective in reduction of allodynia and hiperalgesia after TKA.

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Konflikt interesów / Conflict of interest
Brak/None

Piśmiennictwo

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