Nursing care plan in post-thoracotomy pain management. A brief review.

Siopi V[1], Valasiou I[1], Papageorgiou E[1], PhD, Veliki N[1], PhD, Tzinevi M[1], Rallis Th[2], Gogakos A.S[2], Paliouras D[2], PhD, Asteriou Ch[2], PhD, Anisoglou S[1], PhD, Barbetakis N[2], PhD.

ABSTRACT

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The objective of postoperative pain management after thoracotomy is the prevention of postoperative complications, the reduction of the length of hospital stay, the increase of the patient's satisfaction and finally the resumption of the daily living's normal activities.

Thoracic surgery affects postoperative respiratory function, along with a high risk of developing postoperative pulmonary complications. Pain is a subjective experience. Postoperative pain management in thoracic surgery patients should be individually applied, based on a well-organized health care system that emphasizes consistent nursing education regarding proper pain management techniques, with an effective communication between the patient and members of the existing multidisciplinary team, especially the nursing staff.

INTRODUCTION

The negative effect of pain on quality of life emphasizes the importance of pain relief. International health organizations assume pain as a symptom of a disease, and point out its important role in determining prognosis of the disease[1,2].

The objective of postoperative pain management after thoracotomy is to prevent postoperative complications, reduce the length of hospital stay, increase patient satisfaction and finally to help patients to resume the normal activities of daily living. Thoracic surgery im-

[1] **Pain Clinic, Intensive Care Unit, Theagenio Cancer Hospital, Thessaloniki, Greece**
[2]**Thoracic Surgery Department, Theagenio Cancer Hospital, Thessaloniki, Greece**

pairs postoperative respiratory function resulting in a relatively high risk of developing postoperative pulmonary complications. The overall incidence of complications following thoracic surgery varies from 15% to 37.5%, primarily due to the type of pulmonary complications studied, the clinical criteria used in the definition and the type of surgery included[1,2].

The aim of this study is to describe a definite nursing care plan for post-thoracotomy pain management and to assess the role of nursing staff as part of a multidisciplinary team.

REVIEW OF THE LITERATURE

PATHOPHYSIOLOGY OF POST-THORACOTOMY PAIN

In 1968, McCaffery defined pain as "whatever the experiencing person says it is, existing whenever she/he says it does"[3]. He also stated that the patient, not the health care provider, has the authority on the pain and that his or her self-report is the most reliable indicator of pain. According to Melzack's gate control theory, pain is not just a physiological response to tissue damage but also includes behavioural and emotional responses expected and accepted by one cultural group, which may influence the perception of pain[4,5].

After surgery, pain is a common experience for patients in the surgical ward because of the tissue trauma[6,7]. Nerve impulses generated from the site of incision are transmitted to the dorsal horn of the spinal cord that -in return- projects neurons forward toward the cerebral cortex in the brain. The brain interprets the signal, processes information from experiences, knowledge, and cultural associations. The perception of pain is characterized by an unpleasant sensation and negative emotions.

Many theories have been proposed to explain the mechanisms of pain caused by the body tissue trauma or damage of peripheral nerves. Ekman et al suggested that stimulation resulting from nerve and tissue damage activates fibres that project to neuron pools in the spinal cord, in consequence, creating activity that spreads to lateral horn cells and ventral horn cells in the spinal cord, activating the sympathetic nervous system and somatic motor system. As a result, this activation produces vasoconstriction of the blood vessels, increases heart workload and induces muscular spasm, fear and anxiety[6].

Another theory suggested the two components of pain: the perception of pain and the reaction to pain. The perception of pain is a process that has special structural, functional, and perceptual properties and is accomplished by means of simple and primitive neural receptive and conductive mechanisms. In 1953, Noordenbos proposed the sensory interaction theory. This theory proposed that there are two systems involving transmission of pain: a slow

system that involved the unmyelinated and thinly myelinated fibres, and a fast system that involved the large myelinated fibres. The fast-acting fibres inhibit transmission of impulses from the small fibres and prevent summation from occurring[7]. The classic gate control theory of pain was initially described by Melzack and Wall in 1965. According to the theory, a gating mechanism occurs when a pain impulse travels to the dorsal horn of the spinal cord where trigger cells (T-cells) influence the transmission of pain impulses. The pain stimulation of the large-diameter fibres inhibits the transmission of pain, the gate closes and impulses are less likely to be transmitted to the brain. On the other hand, when smaller fibres are stimulated, the gate is opened[8,9].

There are nociceptive and neuropathic elements to post-thoracotomy pain. Nociception relates to an individual's ability to detect a painful stimulus. It is intended to be a protective mechanism, warning the body of harm and alerting it to the need to avoid further injury. Nociceptive pain is classified as somatic and visceral.

Neuropathic pain arises from damage or injury to the nervous system, either centrally or peripherally. It is commonly described as a burning, shooting, numb or electric shock sensation in the dermatome of the affected nerve. After surgery or the insertion of chest drains, patients often complain of neuropathic pain around the wound incision site or along a dermatome where the affected nerve has been injured[9].

POST-THORACOTOMY PAIN NURSING CARE PLAN

A nursing care plan outlines the nursing care to be provided to a patient. It is a set of actions the nurse will implement to resolve nursing problems identified by assessment. The creation of the plan is an intermediate stage of the nursing process. It guides in the ongoing provision of nursing care and assists in the evaluation of that care.

Roper et al proposed a nursing care plan based on twelve activities of daily living[10]: 1) Maintaining safe environment, 2) Communication, 3) Breathing, 4) Eating and Drinking, 5) Elimination, 6) Washing and Dressing, 7) Controlling Temperature, 8) Mobilisation, 9) Working and Playing, 10) Expressing Sexuality, 11) Sleeping, 12) Death and Dying

POST-THORACOTOMY PAIN ASSESSMENT

It has been suggested that the key issue of postoperative pain management strategies is to ‘‘make the pain visible’’. This can be done by accurate pain assessment documentation, as well as monitoring the efficacy of pain treatment and the documentation should also include the patient's satisfaction[11]. The American Pain Society stresses that heath care pro-

fessionals should consider pain as the fifth vital sign[12,13]. Therefore, the patient's pain should be assessed at least as often as vital signs are taken.

There were many suggested assessment tools found in the literature and many scales have been developed to assist the nurse in determining the severity of pain. One of the most commonly suggested standardized tools is the Numeric Rating Scale (NRS) and the Visual Analogue Scale (VAS)[14]. When using the NRS, the patient is asked to rate their pain intensity on a scale of 0 (no pain) to 10 (the worst possible pain). The VAS is a horizontal line, 100 mm in length, anchored by word descriptors at each end. The patient marks on the line the point that represents his current state. The VAS score is determined by measuring in millimetres from the left hand end to the patient's marks.

The issues that the nurse must pay attention when assessing the postoperative pain including the following:

• Assess pain both at rest and on movement.

• Take into consideration patient self-report of pain and implement the proper pain scale, document the intensity, quality, location, timing & duration, aggravating and alleviating factors, and prior pain treatments and their effectiveness.

• Assessing pain before and after every treatment intervention.

• On the surgical ward, evaluate, treat, and re-evaluate regularly (e.g. every 4-8 h) both the pain and the patient's response to treatment.

• Define the maximum pain score above which pain relief is offered.

• Unexpected intense pain, particularly if associated with altered vital signs, (hypotension, tachycardia, or fever), is immediately evaluated.

• New diagnoses, such as wound dehiscence, infection, or deep venous thrombosis, should be considered.

• Family members are involved when appropriate.

• Document the pain assessment carefully.

• Report the results to the pain management team.

Despite the focus on meeting standards of care in the area of postoperative pain management, there is an overwhelming lack of patient reassessment by nurses after the administration of analgesics

POST-THORACOTOMY PAIN MANAGEMENT

Epidural analgesia

Continuous epidural analgesia is used to manage pain after major thoracic, abdominal, and orthopaedic surgery. It works by blocking transmission of pain at the spinal cord and has

been shown to blunt the surgical stress response, improve postop pulmonary function, decrease the incidence of postop thrombosis, and provide better analgesia during walking, coughing, or other activity. The efficacy of epidural analgesia is monitored through regular dynamic pain assessment and by testing the level of sensory and motor blockade.

The level should be checked regularly to ensure the block is:

1) Covering the area of incision and/or site of pain;

2) Not too high (particularly important in high thoracic epidural analgesia);

3) Not too dense, causing unnecessary motor blockade.

Careful and frequent monitoring will ensure early detection of any serious adverse effects. Excessive motor weakness may indicate a too high rate of epidural infusion or the formation of an epidural abscess or haematoma, which requires anaesthetic review and rapid treatment[15].

Systemic analgesia

Systemic opioids were used in the past as the mainstay of post-thoracotomy analgesia; however, the pain control achieved was often poor. It is now appreciated that for open thoracotomies systemic opioids are best administered as part of a multimodal strategy including nerve blocks. Titration of systemic opioids post-thoracotomy is needed. A more efficient method of intravenous opioid delivery is patient-controlled analgesia (PCA). This has been shown to reduce the incidence of adverse side effects such as nausea and vomiting, respiratory depression and reduced gut motility[16,17]. However, PCA is not suitable for all patients (particularly those who do not understand how to use the handset or who are unable to control it because of disability), as its inappropriate use may lead to either increased side effects or uncontrolled pain. In comparison to IM opioids, IV-PCA systems provide superior analgesia and improve patient satisfaction.

NSAIDs reduce the inflammatory response to surgical trauma; they have a peripheral non-prostaglandin analgesic effect and act centrally in part by inhibiting prostaglandin synthesis in the spinal cord. The side effects of NSAIDs are well known and include gastrointestinal mucosal damage, renal tubular and platelet dysfunction. For more than 25 years, NSAIDs have been used to control post-thoracotomy pain. NSAIDs may be effective in controlling the ipsilateral shoulder pain post-thoracotomy in patients receiving thoracic epidural analgesia, although research in this area has been limited.

COX-2 inhibitors have a lower risk of causing serious upper gastrointestinal side effects and cause less platelet inhibition than the non-selective NSAIDs. There is some evidence that

COX-2 inhibitors may limit the development of acute opioid tolerance. Romero et al reported that a variety of non-cardiac surgical procedures including thoracic surgery did not show an increased incidence of cardiovascular thrombotic events in patients receiving the selective COX-2 inhibitors parecoxib/valdecoxib. The level of cardiovascular risk associated with the short-term peri-operative use of COX-2 and NSAIDs remains controversial. For individual patients, their cardiovascular risk factors and the risks of alternative drugs or analgesic techniques need to be considered[18].

Acetaminophen, probably the safest of the non-opioid analgesic agents, acts centrally by inhibiting prostaglandin synthesis and possibly via the serotoninergic system. Acetaminophen may also have peripheral anti-inflammatory actions. A recent meta-analysis found that after major surgery adding acetaminophen to morphine PCA reduced the morphine consumption by 20% but did not decrease the incidence of morphine-related adverse effects[19].

Gabapentin, 1-(aminomethyl) cyclohexane acetic acid, is an anticonvulsant drug that is effective in treating neuropathic pain and postherpetic neuralgia. Gabapentin may act through a number of mechanisms. The use of gabapentin for acute peri-operative pain is "off-label". There is good evidence that gabapentin reduces early postoperative pain scores and reduces the opioid consumption in the first 24 h for patients undergoing a variety of surgical procedures. Pre-operative gabapentin use should be considered in patients in whom difficulties in controlling post-thoracotomy pain are anticipated, for example patients undergoing thoracotomy in which local anaesthetic blocks are not scheduled, and opioid tolerant patients[20,21].

Paravertebral nerve blocks

Paravertebral block involves injection of local anaesthetic in a space immediately lateral to where the spinal nerves emerge from the intervertebral foramina. This technique is being used increasingly for not only intra-operative and post-operative analgesia but also as a sole anaesthetic technique for carrying out various procedures. A thoracic paravertebral injection of local anaesthetics results in ipsilateral somatic and sympathetic nerve block including the posterior ramus in multiple contiguous thoracic dermatomes[22].

Kotze et al conducted a systematic review and meta-regression on the efficacy and safety of different techniques of paravertebral block for analgesia after thoracotomy. They came to the following conclusions. Higher dose of local anaesthetic was found to offer better analgesia. Continuous infusions were better than intermittent boluses. No single adjunct was found to be superior compared to others[23].

Intrapleural local anaesthetics

Once a local anaesthetic is injected into the pleural cavity, it makes direct contact with the exposed tissue, thus enabling long-lasting analgesia without risk for pneumothorax or intravascular anaesthetic injection. This technique, which is referred to as intrapleural block, was firstly published in 1986 using bupivacaine as a local anaesthetic for surgeries on the upper abdominal surgeries, and it has also been recently used in thoracic sympathectomy.

Today, ropivacaine represents the safest local anaesthetic for performing pleural block. Ropivacaine is more lipophilic and, therefore, less toxic than other more potent local anaesthetics, such as bupivacaine and levobupivacaine. It is also less neurotoxic than bupivacaine, and propensity to convulsion after levobupivacaine and ropivacaine administration is 1.5- and 2.5-fold lower, respectively, as compared to that of bupivacaine[24].

Cryoanalgesia

Cryoanalgesia is the application of a -600ºC probe to the exposed intercostal nerves intraoperatively produces an intercostal block that can persist for up to six months. This can be moderately efficient to decrease postoperative pain, but is associated with an incidence of chronic neuralgia that has lead many centres to abandon the technique[24,25].

On discontinuing 'high-tech' modes of analgesia, the use of regular paracetamol with a weak opioid, such as codeine or tramadol, is recommended until the patient is able to step down to paracetamol alone. As the patient's advocate, the nurse plays a crucial role in postoperative pain management. A successful pain management plan involves implementing a balanced analgesic regimen that is patient-focused and that meets the changing needs of the individual throughout the immediate postoperative period and ongoing recovery[25,26].

NURSING CARE PLAN FOR POST-THORACOTOMY PAIN TREATMENT

According to the guidelines of the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) and the American Pain Society (APS) practice guidelines [16-22,27], there are basic pain management principles that have been agreed upon.

The patient has the authority on his or her own pain.

The health professional should always believe the patient's assessment of his own pain.

Pain is best treated before reaching a severe level. This can be detected by routine frequent assessments of pain, and not to rely on vital signs to determine its severity.

The use of intravenous medications for treating acute POP, and to avoid intramuscular medications. Acute POP should be treated with

opioids, as the initial choice of analgesic, and to be administered on a scheduled basis rather than on an as needed basis.

Physical dependence differs from addiction. Addiction is primarily a psychological problem and is extremely rare. Less than 1% of patients develop addiction.

Patients experiencing continued pain may exhibit anxiety and drug-seeking behaviour. These behaviours disappear once the pain is relieved.

Patients who have used opioids regularly for approximately 7 days or more are considered opioid-tolerant and will require higher doses for acute POP control.

There is no maximum or ceiling dose for analgesia with opioids. Administration of Naloxone should only be used in emergency situations and for unresponsive patients.

It is advisable to use equianalgesics to change from one opioid to another or from one route of administration to another. Side effects of opioids should be managed rather than discontinue using the analgesics in a patient with severe pain.

Commitment to the ethical issues related to the care for patients with POP. These include: assuring patients' personal privacy, respect their belief system, attending to their needs, believe them when they report pain, provide timely and appropriate interventions to relieve pain[20].

A placebo use in POP is unethical and may destroy the trust relationship between the health care provider and the patient[21,22].

A suitable calm environment for the patient should be provided.

Elimination of other sources of discomfort, such as full bladder and infiltration of IV is encouraged.

Repositioning the patient regularly to eliminate pressure sores and enhance circulation is advised.

Encouraging patient is of vital importance in order to move extremities while in bed, because activity decreases muscle spasm and booster circulation.

CONCLUSIONS

Pain is a subjective experience and its management should be individually tailored in the thoracic surgical patient using a 'holistic' approach. Effective communication between the patient and members of the multidisciplinary team, especially nurses, is also important. Postoperative pain management should be based on a well-organized health care system that emphasizes consistent nursing education regarding proper pain management techniques. Education to support nurses with knowledge should be included in the hospitals' quality improvement programs.

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Author Disclosures:

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Corresponding author:

Nikolaos Barbetakis MD,PhD

Alexandrou Symeonidi 2,

Thoracic Surgery Department,

Theagenio Cancer Hospital, 54007,Thessaloniki, Greece.

Tel: 30 2310898311, +30 697 2039345

E-mail: nibarbet@yahoo.gr