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PAIN MANAGEMENT IN POLYTRAUMA PATIENTS

Abstract: Polytrauma is a condition where patients have two or more organ systems or physical regions injuries, with one being life threatening, resulting in cognitive, physical, psychosocial, or psychological functional disability. Polytrauma patients suffer from different types of pains depending on the nature of the traumatic injury they sustain. There are two basic classification of pain: nociceptive and neuropathic pain. Nociceptive pain results from improper functioning of the body's nervous system. Patients suffering from neuropathic pain, (the second type) display characteristics of complete or partial changes in the innervations territories. The viable option for develop a protocol for pain management is to estimate relative safety and efficacy using the number needed to harm (NNH) and the number needed to treat (NNT) approach. There are different forms of therapies for patients suffering from neuropathic pain; various types of therapies that may assist polytraumatic patients to understand the connection of the mind and the body. Anesthesiologic or neurosurgical neurolytic techniques may be effective. Pharmacotherapy and other strategies of pain management depend primarily on the needs and lifestyle of the patient. Studies indicate that patients suffering from neuropathic pain respond positively to a holistic approach.

Key words: polytrauma, nonciceptive pain, neuropathic pain, therapy

Polytrauma is a condition where patients have two or more injuries to organ systems or physical regions, with one being life threatening, resulting in cognitive, physical, psychosocial, or psychological functional disability or impairments. Other definitions of polytrauma include those by US Veteran Health Administration Polytrauma Rehabilitation Center Directive, stating that it is injury to the rain and other body parts resulting from cognitive, physical, psychosocial, or psychological functional disability or impairments.[1] Other definitions state conditions such as trauma with an injury severity scale of more than 15, combination of one upper and

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one lower injury, complex multiple injuries on lower extremes, or complex acetabulum or pelvis fractures. The most significant problem that polytrauma patients experience is chronic pain.

Traumatic Brain Injury (TBI) usually occurs in polytrauma, often in combination with other conditions such spinal cord injury, amputation, and post-traumatic stress disorder, visual or auditory impairments among others. Patients with polytraumatic injuries experience pain that presents various challenges before, during, and after rehabilitation treatment.[2] Typical rehabilitation treatment for reducing pain in these patients, such as administration of oral opioids, potentially interferes with active rehabilitation necessary to restore functional capability. Nonetheless, effective pain management is necessary as part of the polytrauma intensive care management. The problem of pain management in polytrauma patients is that there may numerous sources of pain with unassociated symptoms and signs.

Polytrauma patients suffer from different types of pains depending on the nature of the traumatic injury they sustain[3]. There are two basic classification of pain: nociceptive and neuropathic pain. Nociceptive pain results from improper functioning of the body's nervous system. There is usually a source of pain such a broken bone, a spine problem, or a cut. Consequently, the mechanism through which the body system tells the brain that there is injury begins working. Thus, this information is transmitted to the brain, enabling an individual to become aware of their hurting.

Nociceptive pain comprises of two other classes: radicular and somatic pain. Radicular pain primarily stems from nerve roots irritation such as a disc herniation.[1,3] It follows the leg down to the nerve distribution from the root nerve at the spinal cord. In most scenarios, this class of pain associates with radiculopathy (numbness, weakness, loss of reflexes in nerve distribution). Somatic pain essentially affects the thigh and back. The problem with back pain is that polytrauma patients may not be in a position to provide appropriate history. However, doctors usually provide exact diagnosis in few cases even with appropriate information.

Patients suffering from neuropathic pain display characteristics of complete or partial changes in the innervations territories that correspond to the central nervous or peripheral system pathology. Additionally, there is paradoxical occurrence of hypersensitivity and pain in denervated zones and their surroundings.[4] These nerve problems occur in different conditions and different locations of the nerve lesion. Consequently, there is no single mechanism entirely responsible for maintaining and generating all the signs and symptoms in neuropathic pain. Overall treatment of neuropathic pain remains a problem; even though, clinicians have strong evidences that some groups of drugs show significant relevance in relieving neuropathic pains as well as their side effects.

Additionally, there is need for a treatment algorithm based on evidence for treating neuropathic conditions.

A direct comparison of different drugs in both their side effects and efficacy will ideally lead to the best drug for the algorithm. However, the availability of such comparisons is limited. The other viable option is to estimate relative safety and efficacy using the number needed to harm (NNH) and the number needed to treat (NNT) approach. Past research and studies using this approach appraise four pharmacological drug classifications that prove important in the management of neuropathic pain: antidepressants, anticonvulsants, opioids, and NMDA antagonists.[5]

Early trials on anticonvulsants such as carbamazepine did not meet methodological standards such as patient flow, validated outcome measure use, and statistical methods. However, an attempt to compute the NNT gave trigeminal neuralgia NNT combination of 1.7 (1.3–2.2). Another NNT from painful diabetic neuropathy patients was 2.3, compared to the NNT from post-stroke patients of 3.4. Statistics indicate that carbamazepine has a combined NNT of 21.7 in neuropathic pain.[6]

Previous comparison of carbemazepine to oxycarbezipine highlights a considerable analgesic effect, but with fewer side effects while using the latter. However, these trials lack full publication. According to another study, phenytoin displayed considerable pain-relieving effects for patients suffering from acute flare-ups. Other anticonvulsants with positive pain-relieving effects include valproate in post-herpetic and diabetic neuropathy, gabapentin in spinal cord injury, post-herpetic neuralgia, and painful diabetic neuropathy, pregabalin, lamotrigine in trigeminal neuralgia, and topiramate.[7]

Administration of opioids intravenously has had significant effects on patients with peripheral neuropathy pain, mixed neuropathy conditions, and other central components of pain. However, placebo-controlled tests indicate that long-term oral administration of opioids is more appropriate to chronic pain. For instance, earlier trials indicate that morphine has positive effects in patients with phantom limb pains, painful diabetic neuropathy, and post-herpetic neuralgia, with an NNT of 2.6. Other important opioids include oxycodone with an NNT of 2.6 and tramadol with 3.9. Intravenous infusions of NMDA antagonists may considerably relieve neuropathic pain emanating from different origins. Oral NMDA antagonists such as riluzole, memantine, and dextromethorphan in large doses have significant pain-relieving effects on painful diabetic poly-neuropathy.

Empirical evidence from controlled trials indicates that tricyclic antidepressants relieve painful non-diabetic and diabetic poly-neuropathy, post-herpetic neuralgia, post-mastectomy pain syndrome, and central post-stroke pain. However, they have little effects in phantom limb, spinal cord injury pain, HIV-neuropathy pain. The different condition across which the antidepressants provide considerable relieving effects is the NNT range of 2 to 3.[8] Trials in painful poly-neuropathy with mixed serotonin noradrenalin reuptake inhibitors (SNRIs) and selective serotonin reuptake inhibitors (SSRIs) indicates that certain SNRIs NNT sore of four are ineffective in

relieving pain, such as venlafaxine. However, a report from a controlled trial indicates that bupropion, both a dopamine and noradrenalin inhibitor, has considerable pain-relieving properties on painful neuropathy from different etiologies.[9]

The nature of neuropathic pains makes it difficult for a single algorithm management, thus most cases combine administration of pharmacological drugs with therapies to achieve the ideal pain-relieving effects. There are different forms of therapies for patients suffering from neuropathic pain, including topical therapies, physical therapies, and psychological therapies.[10] Moreover, some management algorithms use other techniques such as counter-stimulation and neurolytic techniques.

Topical therapies are especially important to patients with small hyperesthetic areas. Patches incorporating or lacking lidocaine are available for protecting the affected area against friction or impact, and thus reduce sensory inputs from these areas. Capsaicin creams prove effective, but patients are prone to pain (similar to eating a hot pepper) experiences when applying the cream to the site, though the pain experience fades away after a few times of usage.[5] However, the hot pepper sensation returns after the patients stops using the cream regularly, and may require a rebuild of tolerance. Topical therapies are generally short acting remedies and often pose difficulties in application.

Physical therapy is integral in neuropathic pain management as research shows that active people adapt and heal faster. Muscle spasms may significantly increase the level of pain, thus it is important to keep the muscles loose and active. A common trigger point of muscles in spasm or tight muscles will significantly improve a patient's functionality level.[9] Moreover, patients need to support and maintain muscle tone as loss of muscle support and tone may lead to problems such as painful and tight joints, and back instability. Nonetheless, patients may require more pharmacological drugs as they begin to increase and improve activities. Indeed, the requirement of more pain-relieving medication by a patient indicates that that treatment and management strategy is successful.

Psychological therapy should be the foundation of pain management in patients suffering from neuropathy. This is because patients suffering from neuropathic pains may have severe psychological distress that will result to depression if not addressed.[10] Therefore, neurologists have to address psychological issues resulting from the condition of the patient as well as be prepared to make relevant referrals for the patients to psychological services. Patients need the reassurance that their pain in not imaginational or an overreaction, and the encouragement that the caregiver understands the difficulty situation they are experiencing. Moreover, patients need the encouragement to seek appropriate assistance from relevant specialists.

There are various types of therapies that may assist polytraumatic patients to understand the connection of the mind and the body, enabling them to control the pain rather than the other way. They include yoga, imagery, hypnosis, biofeedback, acu-

puncture, relaxation techniques, and other meditative options.[11] Evidence from brain imaging studies indicate that such therapies provide positive psychological effects as well as increase the level of endogenous endorphin and the brain's system of pain control. Similar to pharmaco-therapeutic strategies, the type of therapy depends on the needs and lifestyle of patients.

Anesthesiologic or neurosurgical neurolytic techniques may be ineffective to patients with a life expectancy of less than one year as the pain usually returns. Pain has a resilient nature: it always finds a way around blocks imposed externally. Therefore, it is important to note that the dorsal root ganglion of the peripheral sensory nerves hosts the nerve cell body. Theoretically, the surgery process may result to a cut in a peripheral nerve. Consequently, the central pain system proceeds with its functions and adapts to lack of signal from the cut nerve.[8] Ultimately, this may cause increase in sensitivity to such a point that when any signal comes in; there is an acute response. Research from studies prove that nerves may grow back after sever injury, but in an aberrant manner in most cases, such as neuromas. Another possibility is that there occurs an aberrant cross-stimulation between such neurons, thus resulting to pain.

Counter-stimulation techniques include spinal cord stimulators, peripheral nerve stimulators, and transcutaneous electrical nerve stimulators. Generally, spinal cord stimulators are inserted using an epidural needle positioned in the spinal canal, and causes counter-irritation in affected areas. Research indicates that the non-noxious stimulus input to the nervous system considerably reduces the noxious input levels. This stimulation technique is very effective in unilateral limb diseases, though other areas of the body and bilateral use are still effective. The peripheral nerve stimulation may require a peripheral nerve specialist to examine and open the severed nerve.[12] Patients with dramatic and well-defined mono-neuropathies record a higher success with peripheral nerve stimulators than spinal cord stimulators. However, only about half the successful cases enjoy long-term relief. Transcutaneous electrical nerve stimulation incorporates application of relatively small levels of electrical stimulation on the surface of the skin. However, these techniques have not been overwhelmingly successful because the electrodes are in contact with nerve endings rather than a direct connection.

In conclusion, it is vitally important to note that there is no single algorithm or strategy for managing neuropathic pain in polytrauma patients because of the etiological nature of the condition. Pharmacotherapy and other strategies of pain management depend primarily on the needs and lifestyle of the patient. However, the most essential clinical intervention for polytrauma patients suffering from neuropathic pain is to offer ongoing support, empathy, and hope. This fact cannot be overemphasized. In majority of the scenarios, neuropathic pains impose emotional and sensory burdens, and these must be addressed adequately. Most studies indicate that patients suffering from neuropathic pain respond positively to a holistic approach of physicians' treatment.[13]

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