

## PAIN RELIEF IN POLYTRAUMA PATIENTS

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### ABSTRACT

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#### BACKGROUND

Pain management in Polytrauma is a poorly-addressed concern at the time of active resuscitation. But, very often, pain assessment is also a challenge! Opioids belong to conventional analgesics of choice in any acute pain conditions. But, recently application of regional anaesthesia techniques and subanaesthetic doses of ketamine are satisfactorily employed. A clear understanding of neuropathic element of pain must be made as they require specific therapy. It must be emphasised that effective pain therapy is a multidisciplinary team work with active involvement of pain psychologist.

#### KEYWORDS

Polytrauma, Pain Management, Regional Anaesthesia, Ketamine.

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**HOW TO CITE THIS ARTICLE:** Rajesh MC, Rajan STM. Pain relief in polytrauma patients. J. Evid. Based Med. Healthc. 2016; 3(78), 4249-4252. DOI: 10.18410/jebmh/2016/905

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**INTRODUCTION:** Trauma strikes the victims at an unexpected time! Even more unfortunate is the fact that they are undertreated for pain. This may not be by default as in many times clinicians are focused on resuscitating the victims or in need to elicit important physical signs.<sup>1</sup> But, poorly-prescribed pain therapy adds to the emotional burden of the patient and can worsen the physical insult. Probable under treatment of pain in trauma is believed to be due to the heightened concerns regarding precipitation of adverse events like respiratory depression or addiction. These are purely misplaced concerns and it is to be noted that even hypotension in trauma is almost always due to hypovolaemia and most often not to blame on just infused opioids.<sup>2</sup>

For the treating physicians, there is no readymade prescription for pain in polytrauma. He has to take into consideration the physiology of widely varying patient populations, i.e. from children and young adults to geriatric and pregnant populations. Also, very often, there are patients who are used to substance abuse or of opioid dependent. The aim of treatment is to give prompt and lasting relief from pain, which most often need to be continued till the rehabilitation phase.

Regarding assessment of pain, the physician has to note the constancy, aggravating and relieving factors, and associated motor or sensory disability. It is also important for the treating physician to make a clear distinction between neuropathic and nociceptive pain as effective pain medications in each situations are different.<sup>3</sup> Objective assessments of pain like pulse rate, blood pressure,

respiratory rate are very often unreliable due to physiological changes, which follows trauma or by the drug therapy.

Pain being a subjective phenomenon, the treating physician has to believe the patient when he says that he is having pain!

Following text is an attempt to narrate the different approaches in relieving pain in polytrauma patients without going in detail about the pharmacological aspects.

#### REVIEW LITERATURE:

**Multimodal Analgesia:** The most important concept of managing pain in any patient is the philosophy of multimodal analgesia. This involves administration of two or more drugs that can act by different mechanisms and at different sites in the nervous system.<sup>4</sup> Since, there are multiple receptors and pathways associated with pain, it is reasonable to use drugs at different sites of action for a better pain relief. This can result in additive analgesia with lowered adverse effect from sole administration of individual analgesics.<sup>5</sup> The choice and route of analgesics should be individualised.

Evidence from animal models and human trials favours early multimodal analgesic interventions to improve the quality of pain therapy in postoperative situations.<sup>6</sup> The same theory can be extrapolated to acute trauma situations also. Multimodal analgesia often involves medications like acetaminophen, Nonsteroidal Anti-Inflammatory Agents (NSAIDs), opioids, local anaesthetics or ketamine. This may also involve the use of neural blocks or the use of Transcutaneous Electrical Nerve Stimulation (TENS), adjuvant analgesics like antidepressants or anticonvulsants.

**Opioid:** Opioids remain the pharmacological agent of choice for moderate-to-severe pain especially in acute trauma settings. The term opioids includes both naturally occurring (derived from poppy plant) and synthetic compounds. Their analgesic effect is by acting on the specific opiate receptors; most important among these is the mu receptor.

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*Financial or Other, Competing Interest: None.*

*Submission 07-09-2016, Peer Review 14-09-2016,*

*Acceptance 27-09-2016, Published 29-09-2016.*

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*DOI: 10.18410/jebmh/2016/905*



To be optimally effective, opioids need to be delivered in adequate doses and at proper time intervals. But, very often, opioids use is restricted for fear of side effects to the extent that patient suffer with pain.<sup>7</sup> Once started on opioids, patient must be reviewed frequently to assess the effectiveness of dose. There must be prescription for breakthrough pain as the trauma patients very often mobilised for radiological investigations or for shifting from emergency unit to operation theatre.

One of the concerns with the use of opioid drugs is the problem with Opioid-Induced Hyperalgesia (OIH) wherein patients on opioids therapy become more sensitive to subsequent painful stimuli. This is a well-established entity with chronic opioids use.<sup>8</sup> But, in the context of acute pain settings, there is mixed reviews from the literature to establish OIH.<sup>9</sup>

Patients who are on chronic opioids use or opioids abuse patients occasionally can present in emergency following trauma. Assessing these patients analgesic requirement is of great challenge. In general, these patients require greater doses of drug than opiate naive population. If not provided with adequate doses of drug, they will start complaining of pain with a likely hostile behaviour labelled as pseudoaddiction.<sup>10</sup> Here, patients response is misinterpreted as drug-seeking behaviour seen in opioid abusers, but in fact is an appropriate response to pain.

**Ketamine:** Ketamine is an attractive option as an analgesic for the trauma physician. It was introduced into clinical practice as an anaesthetic agent, but soon its analgesic potential became a matter of interest. In addition to its action on NMDA receptors, ketamine has got action on opioids, nicotinic and serotonergic receptors. Probably, the action on these receptors contribute to the analgesic potential of ketamine. At subanaesthetic doses (0.1-0.5 mg/kg) it is a good analgesic and can be used as a sole agent or in combination with other analgesics without losing airway patency.<sup>11</sup> When used in combination with opioids, it can reduce the requirement of later.<sup>12</sup> The anaesthetic effect of ketamine is short lived and lasts for about 10 to 15 minutes. But, the analgesic effect can persist even after awakening because of its active metabolites norketamine and hydroxynorketamine having an elimination half live of 180 minutes.<sup>13</sup> A major concern with the use of ketamine is in head injury patients wherein it can further increase intracranial pressure especially in presence of hypercapnea.<sup>14</sup> But, it has been further clarified that in presence of normocapnia, it won't be further increasing intracranial pressure.<sup>15</sup> Even though, a direct myocardial depressant, the sympathomimetic effects of the drug is useful in preserving haemodynamic stability. Some undesirable side effects noted includes delirium and hallucinations, which can be minimised with concomitant administration of benzodiazepines. Patients can also exhibit nystagmus, which needs to be explained and reassured to caregivers.

Ketamine has a role in prehospital trauma care also where it can be used safely as an analgesic with effects

similar to morphine.<sup>16</sup> There is but slight risk of agitation that can be minimised with benzodiazepine pretreatment.<sup>17</sup> Ketamine being an anaesthetic, it is essential that while administering, there should be someone who has the competence and confidence in managing airway. So, also pulse oximetry, a working suction apparatus be ready while administering ketamine.

**Regional Anaesthesia:** Regional anaesthesia in the form of peripheral nerve block techniques are extensively used in the perioperative settings. Now, the benefit is extended to trauma victims wherein patients with polytrauma can have nerve blocks immediately after the primary survey. The technique can be easily mastered, but very often underutilised. Once the respective nerve or bundle is effectively blocked, it gives excellent analgesia and blunts stress response to injury.<sup>18</sup> This high-quality targeted analgesia will help mobilise patients for minor procedures, radiological investigations or even to operation suits. With the help of a catheter that is inserted in the plexus sheath, the analgesia can be extended throughout the perioperative period if need arises. This will be useful in reimplantation and microvascular procedures.<sup>19</sup> Brachial plexus, femoral, sciatic, radial, median and ulnar nerves can be effectively blocked in the emergency area of hospital. With the advent of ultrasound blockade of individual nerves outside the brachial plexus is also possible. Use of peripheral nerve stimulators and ultrasound-guided nerve blocks has increased the accuracy of drug deposit around the nerve bundle. Brachial plexus can be approached at the level of trunk (supraclavicular), cord (infraclavicular) and at the terminal nerve level (axillary). Analgesia for upper tibia and fibula fractures can be provided by a combination of sciatic and femoral nerve blocks. Patients with tibial fractures are very prone to compartmental syndrome.<sup>20</sup> A patient on continuous catheter and with pain more or less under control, suddenly complaints of severe pain. The possibility of a developing compartmental syndrome has to be strongly suspected.

Choice and dose of anaesthetic agent is selected so that to have preferential sensory block. Various modes of administration like bolus, continuous or patient controlled are described.<sup>21</sup> Continuous blocks are attractive options and useful in reducing opioids consumption. With the use of ultrasound, there is reduction in incidence of vascular puncture and time necessary for placement of perineural catheter.<sup>22</sup> A direct nerve injury during placement of continuous catheter is extremely rare.<sup>23</sup> Often whatever neurological impairment noted is transient.<sup>23</sup> Patients neurological status in terms of any regional nerve injury must be meticulously assessed and noted before performing the block. But, more frequently encountered problems are inadequate pain control and failure to maintain the catheter in place for the intended period of time. There are few case reports of catheter site infections.<sup>24</sup> It is important for the physician performing nerve blocks to ensure strict aseptic conditions.

Ropivacaine with less cardiotoxicity compared to bupivacaine is now the drug used most often. With the increasing availability of ultrasound, the scope of regional block for acute pain relief in trauma has expanded from conventional operation theatre to even combat field.<sup>24</sup>

There are even relatively low cost, portable machines designed for outside hospital use in both civilian and military practice.<sup>25</sup>

Use of central neuraxial techniques like epidurals is most often employed in polytrauma settings for multiple rib fractures. A properly placed epidural catheter in this context will facilitate the pulmonary clearance and will help to achieve better pulmonary functions. Use of thoracic epidural is limited by coagulopathy as well as by any coexisting hypovolaemia/hypotension. Hypotension, spinal or head injury, coagulopathy is common in polytrauma victims, which limits the extensive use of epidurals in acute trauma situations. Paravertebral blockade provide comparable analgesia to thoracic epidural for fracture ribs.<sup>26</sup> Intercostal nerve blocks are often used for pain associated with chest tube drain insertion.

**Neuropathic Pain Medications:** Neuropathic pain is frequently encountered in Polytrauma patients due to specific peripheral nerve or plexus injury. Probing the nature of pain experienced by patients will lead to a clue into the diagnosis of neuropathic element. Usual description of neuropathic pain by patients is burning, shooting, electrical or stabbing sensations. Understanding neuropathic element of pain is important since medications for nociceptive pain will act poorly in this context. Non-opioid analgesics often described as adjuvant analgesics like antidepressants, anticonvulsants and antiarrhythmic group of drugs are effective for neuropathic pain.

Classically, the antidepressant drug amitriptyline has been extensively used for neuropathic pains. Nortriptyline is an alternative with better tolerance. Even though, these antidepressants has a proved role in neuropathic pain conditions, there is insufficient data to support the extensive use of these agents in all trauma situations. Recently, gabapentin has replaced other drugs as the first line therapy for neuropathic pains.<sup>27</sup> Gabapentin is a generally well-tolerated drug. Occasional side effects include somnolence, dizziness, ataxia and fatigue.<sup>28</sup> But, beginning with low dose and gradual escalation will help to reduce the impact of these side effects and improves acceptance. Fortunately, major adverse effects are a rarity with the agent. Gabapentin has to be given at 8 hours interval because of relatively short half-life. McCormick et al in a recent systemic neuroanatomical based review of pharmacological treatment found the usefulness of gabapentin in the reduction of phantom limb pain immediately following amputation.<sup>29</sup> Another systemic review by Guy S et al established efficacy of gabapentin and pregabalin to be useful agents in neuropathic pain following spinal cord injury.<sup>30</sup>

**Psychological Interventions:** A comprehensive pain management protocol would address emotional issues of the patient. So, adjunctive psychological interventions will greatly help in reducing pain and maximising patient's involvement in rehabilitation phase. Unattended emotional issues may lead to Post-traumatic Stress Disorders (PTSD) and chronic depression. Psychological assessment will evaluate and address not only physical, but also emotional elements of pain. Psychological support will help the victim with self-management of pain, i.e. reduce pain-related emotional distress and teaching coping skills.<sup>4</sup> This is expected to supplement ongoing medical and rehabilitation efforts. Psychological assessments and interventions are often beyond the domain of conventional pain therapist or anaesthesiologist. This involves a committed pain psychologist who is expected to be an integral element in the multidisciplinary trauma rehabilitation team.

**SUMMARY:** Assessment of pain during acute pain in polytrauma is often a difficult task, but is an essential element in emergency Polytrauma management. By default, multimodal pain therapy is the most effective and acceptable approach. A differentiation between nociceptive and neuropathic element of pain is important. Judicious use of opioids, regional blocks and subanaesthetic doses of ketamine all of which have a role in nociceptive pain whereas neuropathic pain require specific agents. Low side effect profile of gabapentin makes it an attractive option to use as a first line therapy in neuropathic pain. Emotional support is often a neglected, but integral component in rehabilitating phase and a must to prevent stress disorders.

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