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Wrist Block on Arrival in Firecracker Burns of Hands

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Abstract: Hands are the most sensitive part of human body and optimal hand function is a crucial component of a high-quality survival after burn injury. Hand burns due to Fire cracker causes pain out of proportion as compared to other thermal flame burns to the hands by virtue of continuous irritation with phosphorus ingredient. Study intends to evaluate merits of Provision of early and rapid Analgesia in immediate post burn period as compared to traditionally administered systemic analgesia orally or intramuscular. We studied 148 patients of isolated hand burns on the eve of deepavali out of which 82 patients had triple nerve wrist block and 66 patients had intramuscular diclofenac injection. Results were encouraging in terms of increased compliance for early hand mobilization, lesser number of debridement, and decreased cumulative dose of analgesia. Procedure is worthwhile as compared to risks involved and hence recommended in mass casualties.
Keywords: Wrist Block, Hand Burn, Fire Cracker, VAS.

INTRODUCTION

The novelty of peripheral nerve block was first reported by French military surgeon Ambroise Pare (1510-1590), by showing the analgesic effect of prolonged nerve compression. The surgeon in chief of Nepoleon's army Dominique Jean Larrey (1766-1842) did limb amputation under the analgesic effect of cold injury to peripheral nerves. The first nerve block by drug was by Crile in 1884 and he used cocaine. Over the years various peripheral nerve block have been described and their techniques have been standardized.

The precision and safety of nerve blocks have further improved by the introduction specific needles and catheters as well localizing modalities like nerve stimulators and ultrasound. But the use of this novel modality of analgesia is still being used only in the peri-operative scenario. Although analgesia is major concern in trauma, peripheral nerve block has been grossly underutilized during the acute phase of trauma. Proper analgesia during the acute phase of trauma is critical in reducing the neuro-endocrine stress response. Moreover absence of sedation allows co-operation of patients during evaluation. Although there are few anecdotal reports of use of peripheral nerve block in trauma, there is no report of use of peripheral nerve blocks in burn. It is understandable that burns usually affect more than one anatomic site hence not possible to provide analgesia by nerve block. But in India during the festival of light "Deepavali" there is very high incidence of isolated hand burns from firecrackers and fireworks. We get over a hundred patients of isolated hand burn in a span of three days during the festival. This yearly event gave us a unique opportunity to employ peripheral nerve block in isolated hand burn as modality of analgesia. This experience was evaluated as an outcome study and the benefits of regional analgesia were compared with usual pharmacological analgesic agents.

MATERIALS AND METHODS

The study was conducted during the festival of lights "Deepavali" in 2015 and 2016. It was a case control study conducted in the departement of Burns & Plastic Surgery. The sample size was of 148 patients of isolated hand burn. All patients of isolated hand burns due to fire crackers above age of 10 years were included in the study. Patient who were under influence of alcohol or with history of positive Lignocaine sensitivity, coagulopathy or on anticoagulants and those not willing to participate in study, were excluded. The patients who had failure of the block were also excluded.

Patients were randomly allocated to two groups, Group 1 who had triple nerve wrist block and Group 2 who had systemic analgesia in the form of Diclofenac Sodium 50 mg IM stat. The study variable that were compared between the two groups were time of onset of analgesia, duration of analgesia, post

block/analgesic pain (as per Visual Analogue Score), pain during dressing and debridement. Other parameters were ease of splinting the hand in functional position, time to commencement of hand mobilization, time to full range of hand movement and total dose of analagesics.

After receiving the patient in the emergency room history was taken regarding mode of injury and allergy to any drugs. The pain status at reception was recorded by VAS score and the patient was allocated the group randomly. The patients who were allocated to Group I were subjected to Lignocaine sensitivity test. If the test was negative, the patient was taken up for triple nerve wrist block. The procedure was performed in the minor operating room under proper aseptic condition. Plain Lignocaine2% 3-5 mg/kg was used. The median nerve was blocked by injecting around it as it courses between the palmaris longus and the flexor carpi radialis tendon at wrist crease.The ulnar nerve was blocked at the wrist at ulnar side of the flexor carpi ulnaris tendon at wrist crease.The radial nerve was blocked by a subcutaneous field block at the level of the radial styloid process. Care was taken so the total dose of Lignocaine did not exceed 5mg/kg. The patients who were allocated Group 2 were administered Diclofenac Sodium by intramuscular route. The dose for adults was 50mg and in children it was 1.25 mg/kg. Following the block and the intramuscular injection the rest of the treatment in the groups was similar. Thorough lavage was done under running tap water for 20 minutes. Dressing was done with Silver Sulfadiazine cream IP 1% with hand in functional position and elevated on a sling. The pain was evaluated every minute till maximum analgesia was reached. The time taken to reach maximum analgesia and the pain at maximum analgesia were recorded. Intensity of pain was recorded during lavage and dressing assessed the compliance for lavage. Ease of putting the hand in functional position during dressing was also noted. Need for analgesics on subsequent days were noted and the total analgesia needed during 7 days post burn was recorded. Time of commencement of active hand movement and time to achieve full range of hand movement were recorded. Any adverse event was recorded. The follow up of the patient was till the complete wound healing and full range of hand movement.

RESULTS

The total number of patients recruited in the study was 148 out of which 82 had wrist block (GroupI) and 66 had intramuscular Diclofenac sodium injection (Group II). The VAS score of pain at arrival was similar in both the groups and was 8.2 and 8.52 in group I and II respectively. The patients with wrist block attained pain relief in 5.5 minutes compared to the patients with Diclofenac injection who had analgesia in 39.64 minutes. The duration of analgesia was also longer in the former (5.06hrs) than the later (4.49hrs). The level of analgesia was higher in block patients. At maximum analgesia the VAS score of Group I was 2.89 and in Group II was 4.55. In Group II the average VAS score of pain increased during dressing and debridement by about 1.1 but in Group I the increase was less than 0.4. The need for multiple debridements was more in Group II (61/66) and in Group I most of the patients (20/82) single debridement sufficed. Hands of majority of the Group I patients could be splinted in functional position (73/82). On the contrary only 11 patients in Group II could be splinted in functional position. All the patients with block could commence active finger movement by day 1 but it was possible in the other group by day 5. The average day by which full range of had movement was achieved in group I was 7 and in Group II was 10.5.

Table-1: Comparison of Various Parameters in Two Groups

Study groups	Pain score on arrival	Onset of analgesia (in minutes)	Max analgesia level	Duration of analgesia (hours)	Pain Score during debridement and dressing	Dressing in functional position	Need for multiple debridement	Commencement of active finger movement (days)	Achievement of full range of movement (days)
Group I	8.2	5.5	2.89	5.06	3.29	73	20	1	7
Group II	8.52	39.64	4.55	4.49	5.65	11	61	5	10.5

DISCUSSION

In India during the festival of “Deepavali” there is a high incidence of isolated hand burns from firecrackers. Most of the injuries occurred were due to mishandling of the cracker like picking up a dead cracker which blasts in hand and trying light cracker by holding it. The preponderance of male and young patients in this study is in agreement with the study by Rojas *et al*.[1].

Among all types of firecrackers flower pot or “*Anar”* is the most common offending agent. It is an earthen pot packed with explosive and is prone to bursting. In a study by Puri *et al*. from Mumbai also reported that flower pot was most common (39%) cause of firecracker injury [2]. Pain is the major symptom in burns. It is more pronounced in firecracker injuries as chemical are driven into the tissues due to the explosion. In addition the pain gets aggravated during examination, irrigation, debridement and dressing. Pain

not only limits debridement, irrigation and positioning during dressings but is also a major determinant in resumption of normal hand function. Moreover, the amount of pain experienced during the acute injuries is associated with long-term post-traumatic stress and general emotional distress. Hence an early and effective pain relief is important for proper wound management and rehabilitation of hand burns.

The pioneers of percutaneous nerve block were Hirschel and Kuflenkampf [3, 4]. Since then there had been numerous advances in nerve blocks and regional anesthesia like special needles, catheters, medications and guidance modalities like ultrasound and nerve stimulators. These advances have improved the accuracy and safety of peripheral nerve blocks and have extended their indications beyond the operating room [5]. Nerve blocks and regional anesthesia offer excellent pain relief, decreased general anesthesia requirement, hasten recovery, lessen hospital stay and reduce neuroendocrine stress response [6]. Despite these advantages peripheral nerve blocks have seldom been used for acute trauma settings [7]. But there had been anecdotal reports of use of supraclavicular blocks as field analgesia modality in soldiers in pre-hospital phase in battlefield situations [5, 8, 9]. Benefits of peripheral nerve block and regional anesthesia like spinal and epidural as a modality of initial analgesia has been analyzed in outcome studies involving lower limb trauma in emergency room situation [10-12]. All the studies have elaborated that peripheral nerve blocks and regional anesthesia reduce intravenous opioid analgesic requirement and its dose related complications[6]. The additional advantages reported are reduced stress response and a comfortable patient requiring less attention [11]. Although peripheral nerve blocks have been used in acute trauma for primary analgesia in pre-hospital setting, regional anesthesia like spinal and epidural anesthesia is used only emergency room and operating rooms of hospitals [13]. Femoral nerve and sciatic nerve block in cases of femur fractures and brachial plexus block in upper extremity injury has been successfully used as primary analgesia in pre-operative period [12, 14, 15, 16]. In the upper limb all forms of blocks supraclavicular, axillary, wrist and digital blocks have been used in trauma settings [17-22]. In spite of these merits peripheral nerve blocks are fraught with complications like nerve injury, intravenous injection and local anesthetic medication toxicity [23]. Moreover these techniques require expertise and have a reasonable learning curve [13]. Although there are reports of use of peripheral nerve blocks in trauma there is no report of being used in burn injury. The prime reason of not being used for burns is that it involves heterogeneous anatomical areas and generally not covered by any specific nerve block, although axillary blocks and fascia iliaca compartment blocks have been used for analgesia in skin graft donor site in burns. Pedersen *et al*. in an experimental study studied the effect of preemptive nerve block on inflammation and hyperalgesia in burns in human subjects [24]. They evaluated the effect of saphenous nerve block on experimental burns on thigh. They observed that nerve block reduced central hyper-excitability of peripheral receptors and neurogenic inflammatory response. The study concluded that there was possibility of reduction of post burn hyperalgesia [24]. In our study the rapid onset and better quality of analgesia with wrist block allowed better debridement and subsequent management. This ultimately led to better and earlier hand function in patients who had block on arrival. Wrist block on arrival has the promise of being utilized as the primary modality in hand burns at admission.

CONCLUSION

To conclude, we recommend the routine use of wrist block in acute settings of burns and hand trauma to achieve immediate pain relief, improving patient compliance and ultimate functional outcome. It also helps to ease out the casuality in an efficient way.

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