

EDITORIAL

Regional Anaesthesia, Ballistic Limb Trauma and Acute Compartment Syndrome

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Introduction

Military medical practice differs from standard civilian practice in a multitude of ways. One example is in the injury patterns seen, and as with previous conflicts, the majority of casualties from Iraq and Afghanistan have sustained limb injuries [1,2]. The initial surgical management of these injuries is carried out at the local Role 2/3 facility after which the casualties are repatriated to a Role 4 facility. This period of aeromedical evacuation is another deviation from civilian practice, where it would be highly unusual for polytrauma victims to be removed from the initial treatment facility and moved over such distances, perhaps taking over 24 hours, so soon after injury.

Prior to this transfer the standard physiological parameters of the patients are optimised, and so must the analgesic requirements be. The deleterious effects of unnecessary pain on the patient, their colleagues and family, and on healthcare providers are all well recognised [3]. Thus appropriate pain relief techniques should be in place to minimise its occurrence. Their optimisation before the flight cannot be over stated; regardless of how well provided for, an aeroplane at 35,000ft will not have the diverse medical and nursing capabilities, nor pharmacological and interventional resources available to hand if they have not been instigated initially.

Of the various methods available regional anaesthetic blocks, especially in the form of continuous peripheral nerve blockade, are particularly attractive for the management of isolated limb injuries over these relatively prolonged chains of evacuation. In essence they comprise of a catheter that is placed near a nerve, through which a solution of local anaesthetic is continuously infused. The result is a casualty who has no clouding of consciousness and is thus able to interact with their surroundings, colleagues and healthcare providers. The current alternative is the use of relatively high doses of opiates. This can lead to problems with reduced levels of consciousness, reduced communication, worries about respiratory function, increased sedation, impaired bowel and bladder function together with nausea and vomiting [3]; all of these are undesirable at any time but especially so in a casualty lying supine on a stretcher with reduced access.

However the use of regional blocks following severe limb trauma has been controversial, with concerns that they may mask the signs and/or symptoms of an acute limb compartment syndrome (ACS) [4-7]. ACS can be defined as *"an elevation in interstitial pressure in a closed fascial compartment that results in microvascular compromise. As the duration and magnitude of the pressure increase, myoneural*

function is impaired and necrosis of the soft tissue eventually develops" [8]. Treatment of ACS is by urgent decompression of the compartment. A recent systematic review of ACS has reported that a delay in treatment is associated with an adverse outcome and an increase in complications such as amputation and even death [9], and therefore any concerns that the symptoms of ACS may be masked must be evaluated.

Military casualties are at increased risk of developing an ACS [10] and therefore the use of regional blocks in military casualties must be carefully considered. Although severe pain is considered the cardinal symptom of ACS, there have been reports of it developing in the absence of pain [11]. Thus a high index of suspicion is required, particularly as there may be a delay in presentation [12]. Compartment pressure monitoring can be considered if ACS is anticipated or suspected and accurate clinical examination is not possible, such as with a head injured patient, or an anaesthetic limb [13]. A low threshold for monitoring has also been recommended by the authors who reported the 'silent' compartment syndrome [11], however other authors have reported that pressure monitoring is no more accurate than clinical monitoring [14].

Unfortunately in the military environment there is little place for pressure monitoring even in an unconscious patient due to prolonged evacuation, and the potential difficulties with regular observation and treatment during evacuation. If ACS develops or is diagnosed during the flight rapid surgical decompression is very unlikely to be possible. Given the higher morbidity and mortality associated with a delay in treatment, fasciotomy should be carried out if there is any clinical suspicion of, or even a significant potential for, a compartment syndrome [10]. This should be performed prior to evacuation, and therefore even if the use of regional anaesthesia could conceivably mask the signs of a developing ACS this is not a contraindication for its use during evacuation. Since good analgesia of any kind could potentially mask ACS, to specifically avoid regional blocks on this basis is illogical.

To date the UK military's experience, reflected by the experience of the authors on numerous deployments, is that the vast majority of cases of ACS have been recognised and managed at the appropriate stage during initial management at the Role 2/3 local facilities. A recent review by the Academic Department of Military Surgery & Trauma of over 100 casualties with significant limb injuries only identified 2 casualties who required fasciotomies after evacuation from theatre. In both cases there was a late presentation, and not a 'missed' ACS that had not been identified during the initial management of the casualty (unpublished data).

While the exact techniques used for the placement of catheters for regional anaesthesia is outside the remit of this article we would like to emphasise the importance of sterility and securing the

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catheter; these are both aided by tunnelling the catheter and using glue; this way they can continue to be used in Role 4 and not just for the repatriation process. A full description of suitable techniques can be found at <http://www.arapmi.org/initiatives.html>.

In summary we believe that Role 2/3 clinicians should be encouraged to use regional analgesic techniques. However consideration must always be given to the risk of a possible ACS, and thus regional anaesthetic blocks should only be carried out with the agreement of both the treating surgeon and anaesthesiologist. Patients must be closely monitored clinically and any staff responsible for the on-going care, particularly during evacuation, must receive specific training in their management. In addition we believe that all patients who receive a regional block should be also audited, a process that is already underway in the UK's Role 4 facility.

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