Clinical

The management of acute musculoskeletal pain

J Bone, D Beard

Abstract

Musculoskeletal pain is a common presentation in military patients. If not managed effectively it can have a detrimental effect on both the individual and the ship/unit. This article aims to examine how to thoroughly assess a military patient presenting with acute musculoskeletal pain; to provide the practitioner with a framework for effective pain history taking, and to help identify and exclude rare but serious causes of pain - ‘red and yellow flag concepts’. Key management steps and appropriate interventions for managing acute, benign musculoskeletal pain are discussed and related to the varying environments where the patient may be encountered.

Introduction

Musculoskeletal pain is a common primary care presentation that forms a significant aspect of medical workload for Defence Medical Services both in the UK and on deployment (1,2). Due to the physically demanding nature of their work and active involvement in sporting activities, the military population are at significant risk of developing musculoskeletal pain, with anatomical areas most often affected being the back, knees and ankles (3). Prompt and appropriate investigation and management of episodes of pain are required to return the service person to full duty and so minimise the impact to both the individual and the operational capability of ship or unit.

Acute musculoskeletal pain is defined as a short episode, lasting less than 3 months from initial stimulus: during this period healing is expected to occur. The patient may experience recurrent episodes of this pain, and a minority may develop chronic pain problems. Pain itself is defined by the International Association for the Study of Pain (IASP) as ‘an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage’.

The musculoskeletal system is composed of muscles, nerves, bones, cartilage, tendons, ligaments and bursa. Damage, disease or dysfunction of any of these components can cause pain. Tissue injury leads to the activation of nociceptors, free nerve endings of A-delta and C-fibres, which are abundant within the musculoskeletal system. These fibres then carry pain signals to the spinal cord where there is significant processing. This includes A-beta fibre interactions, according to the gate theory, and modulation with descending inhibitory fibres. The pain signals subsequently sent to the brain then travel via spino-thalamic and spino-recticular tracts. Within the brain there is...
significant interaction with emotions and memory to interpret the signals and give the final pain experience. Consequently, the pain perceived by the patient may bear a poor correlation to the degree of tissue damage. Pain should be considered as how it is described by the patient, as both physiological and psycho-social elements can influence pain perception.

Musculoskeletal pain requires careful assessment to identify its cause and determine a management plan. This includes simple interventions, appropriate pharmacology and consideration of the impact of patient psycho-social factors on the pain experience; also, the need for subsequent review to identify those at risk of persistent problems. Prompt identification and management of the cause of musculoskeletal pain will help return the service person to full function sooner and can help reduce the development of chronic symptoms.

Serious causes are rare, so pain often follows a benign history and is self-limiting. There can be a significant variation in the degree of disruption to a patient’s life. Therefore, management needs to exclude serious causes, ensure good analgesia and focus on a return to normal function.

Clinical picture and diagnosis
Musculoskeletal injury and subsequent pain is a frequent presentation in sick bays ashore and afloat, and amongst troops deployed on ground exercise or operations. The living environment on board a ship or submarine presents a risk of musculoskeletal injury due to ladders, trip hazards, lifting and carrying. RM and RN personnel also undertake ground-based roles which involve high mileage walking or running over uneven ground, and heavy load carrying. RM and RN personnel also undertake ground-based training and consider the impact of patient psycho-social stressors that may influence recovery; these factors are often referred to as ‘yellow flags’.

‘Red flag’ features are signs or symptoms that may suggest the presence of a serious condition mandating urgent evaluation. Conditions of this nature include fractures, tumours, infection, neurological conditions or a developing specific pain syndrome such as complex regional pain syndrome (CRPS). ‘Yellow flags’ were originally used in assessment of acute low back pain, and relate to psycho-social stressors that may impact upon a patient’s perception of pain, their coping mechanisms for dealing with it and the potential impact this may have on recovery. In addition to those commonly described, in military patients a negative attitude towards life in the service or to deployment should also be considered. The presence of ‘yellow flags’ is widely deemed to increase a patient’s likelihood of progressing to chronic symptoms. If these factors are identified it may indicate the need for further assessment and a potentially more intensive management plan requiring more frequent review.

Clinical symptoms of acute musculoskeletal pain can be local or widespread. The key symptoms are pain, tenderness and reduced range of movement but can also include weakness, stiffness, and peripheral nerve irritation. A thorough history should cover the following points (5):

<table>
<thead>
<tr>
<th>RED FLAGS – Clues of serious cause</th>
<th>YELLOW FLAGS – Clues of psycho-social impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Older age at new symptom onset (Paget’s disease, myeloma)</td>
<td>• History of family, work or personal stress</td>
</tr>
<tr>
<td>• History of trauma (Exclusion of fracture)</td>
<td>• Personality or mood disorder</td>
</tr>
<tr>
<td>• Night pain or sweats. Weight loss (Malignant/metastatic cause)</td>
<td>• Emotional instability</td>
</tr>
<tr>
<td>• Fever/Sweats/Systemic symptoms (Infection or malignancy)</td>
<td>• Diagnostic or treatment issues</td>
</tr>
<tr>
<td>• Neurological symptoms e.g. altered tone, altered sensation, abnormal reflexes or weakness (Neurological disease)</td>
<td>• Compensation issues</td>
</tr>
<tr>
<td></td>
<td>• Substance abuse</td>
</tr>
</tbody>
</table>

| Table 3. Alvorado Score (9) |

Site and distribution
It is important to establish the area of maximum pain. In cases of referred pain this may not necessarily be the site of origin. Establish whether the pain began in this location or elsewhere, and ask the patient to describe the region where the pain is experienced, including any radiation. A very useful but often overlooked tool is to ask the patient to simply point to the area of pain. It can also be helpful to ask patients to complete a ‘pain diagram’ at initial encounter. This allows for clear communication of the pain perceived by the patient to the practitioner. It is also a useful tool for reviewing progress at future encounters.

Quality
The patient’s description of the nature of their pain in terms of sharp, aching, throbbing, burning or stabbing may indicate something of the underlying problem and occasionally raise the possibility of a component of neuropathic pain.
Onset and duration
Ask the patient what they were doing at the time of onset of pain. There may be a clear mechanism for the onset of pain identifiable, for example a fall or injury. In some circumstances the cause of onset may not be as obvious. Ask the patient to describe to you the course of symptoms since time of onset. Did the pain begin gradually? Over what time frame did they notice the symptoms developing? The duration and the progression of symptoms since onset will highlight whether the problem is getting worse, slowly improving or static.

Temporal factors
Establish whether the pain is constant or intermittent and enquire about relationships to time, of day and activity. If constant ask whether the intensity varies.

Intensity
As previously discussed the patient’s perception of pain has a relationship to both the degree of nociception and higher processes of mental and emotional processing. The experience of pain intensity is therefore unique to every patient. Despite this subjective element establishing the intensity is important to allow the practitioner to understand the impact of the pain upon the patient.

There are several widely used scales that exist to help the patient communicate the intensity of pain. Recording and comparison of these ratings can help an evaluation of pain progression at follow up. Whilst the 0-10 scale (either verbal or visual) is popular, military hospital in-patients use a 0-3 descriptive scoring system, as in Table 2, which corresponds with the steps of the World Health Organisation (WHO) analgesic ladder.

Impact on activities of daily living and work
It is important to understand the impact that this pain is having on the patient’s life. Ask the patient if there is anything that they used to be able to do that they can no longer do. For the service population it is necessary to understand the nature of their job within the service, and whether they are still able to safely perform the task expected of them, or whether occupational modifications are required.

Associated symptoms
Enquire about any other symptoms that are related to the pain. For example, symptoms of insomnia or low mood may be attributed to the impact of pain and will subsequently worsen the pain experience.

Previous similar symptoms
If the patient has had similar symptoms of this nature, this may be a recurrent problem or there may be underlying pathology, which makes the patient more susceptible to injury or pain.

Previous treatment
There is no benefit in continuing with ineffective treatments. Therefore, if analgesics have been unsuccessful or have produced undesirable side-effects, alternatives should be considered. Conversely, if a previous treatment has been particularly beneficial then it would be sensible to use it again.

Current treatment
The patient may have attempted to self-manage this condition for some time before presenting to the medical system. Establish what management interventions they may have implemented themselves, and how successful those have been, including any analgesics used or physical therapy attempted.

The mnemonic ‘SOCRATES’ can be a useful way of remembering the salient points:

<table>
<thead>
<tr>
<th>S - SITE of pain</th>
<th>O - ONSET: when did it start, what was the patient doing at the time?</th>
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<tr>
<td>C - CHARACTER of the pain</td>
<td>R - RADIATION: does the pain move anywhere else?</td>
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<tr>
<td>A - ALLIEVIATING factors: does anything make the pain better?</td>
<td>T - TIMING</td>
</tr>
<tr>
<td>E - EXACERBATING factors: does anything make the pain worse?</td>
<td>S - SYMPTOMS: any other associated symptoms?</td>
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Aggravating and relieving factors
Establish what factors if any worsen pain, for example particular activities or movements. There may need to be advice about avoiding some of these but sometimes it may be necessary to accept some painful actions to improve function. Establish what factors, if any, reduce or totally alleviate symptoms. Examples include positional or postural changes, medication or exercise.

<table>
<thead>
<tr>
<th>Pain Description</th>
<th>0-3 Score</th>
<th>0-10 Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nil</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mild Pain</td>
<td>1</td>
<td>1-3</td>
</tr>
<tr>
<td>Moderate Pain</td>
<td>2</td>
<td>4-6</td>
</tr>
<tr>
<td>Severe Pain</td>
<td>3</td>
<td>7-10</td>
</tr>
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</table>

Table 2. Verbal Numerical Pain Score examples

Fig 2. Visual Analogue Scale (VAS) example

No pain

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Table 2. Verbal Numerical Pain Score examples

Fig 3. SOCRATES

A full bio-psycho-social history should also explore any other factors that may influence or contribute to pain symptoms or complicate management plans. Psycho-social issues such as family or work stress and financial worries will only serve to exacerbate any painful condition. Enquire about any inter-current medical problems the patient is experiencing, past medical history including psychological issues, and a review
of systems. Never underestimate the importance of sleep and how its deprivation can worsen any issue.

In simple cases this full history and examination is unnecessary, but in more complex scenarios or those in which pain seems to exceed the injury pattern in terms of intensity and duration, it becomes increasingly relevant, especially if there is an occupational impact.

Examination
In addition to the history, relevant clinical examination should be undertaken. This should begin with examination of the area or joint affected. In instances of musculoskeletal pain where a joint is the focus, it is important always to examine the joints above and below the one affected. Examination should focus on signs of pathology, assessment of active and passive movement, colour changes, signs of inflammation, etc. In the case of suspected CRPS there may be altered skin, hair loss, and/or nail changes in the affected area. Altered sensitivity to light touch, pinprick or thermal stimulus may also suggest a neuropathic component to pain. Lower limb pain could be referred from pathology of the lower back. It may therefore be necessary to perform a neurological examination of the limb including examination of tone, reflexes, sensation and power.

A general examination of other systems may be indicated to exclude systemic disease. In the absence of ‘red flags’, the evidence of pathology, or any other concerning factors, there is often little need for any further investigation of acute musculoskeletal pain. Over-investigation of benign musculoskeletal pain increases the economic burden and may cause unnecessary anxiety to the patient. Imaging such as X-Ray, Computerised Tomography (CT) or Magnetic Resonance Imaging (MRI) is generally not indicated or required and is rarely of diagnostic value. It should be reserved for those whose history or examination elicit features that raise concern.

The aim of history, examination and investigation is to exclude the rare but serious causes of pain. In many of the remaining circumstances it may not be possible to diagnose the cause accurately, but this does not necessarily influence the management plan or eventual outcome.

Clinical management
The process of managing acute musculoskeletal pain is likely to begin in the sickbay and primary care environments. Referral to secondary care would only be indicated if concerning features were evident on assessment, or if management within primary care is unsuccessful. The process is one of assessment, management and review with good communication and patient education, non-pharmacological interventions and appropriate pharmacology. Physiotherapy may be particularly relevant for ensuring a return of function. Management requires the formation of a partnership with the patient, with a strong emphasis on communication to achieve success. Management plans should be developed in conjunction with the patient and tailored to their individuals needs. The process of two-way communication begins at the initial assessment where information is gathered from the patient allowing the formulation of a differential diagnosis. The reasons patients present with musculoskeletal pain are to find a cause for their symptoms, to be reassured there is no serious cause and to receive advice on management options (6). They also want a prognosis regarding their return to normal activity and occupation.

The findings of initial assessment and diagnosis should be communicated to the patient: it is advisable to avoid the over-use of medical terminology. Practitioners should ensure that the patient understands their explanation by using clear terms, bearing in mind the patient’s educational and social background. If the patient does not understand the assessment performed, or management plan given, they are very unlikely to participate and succeed. The use of anatomical imaging and models can be useful tools in explaining to the patients the mechanisms of pain, its location and the influence of treatment (6).

Suggested algorithm for the management of acute musculoskeletal pain (4,5)
1. Elicit a holistic pain history as described, and perform relevant clinical examination aiming to:
   • Establish the site/structure involved accurately
   • Define the clinical process causing pain
   • Identify red flags
   • Identify yellow flags
2. Construct a differential diagnosis and communicate this to the patient, providing information and reassurance
3. Discuss the options of management and possible prognosis using both non-pharmacological and pharmacological interventions
4. Develop a management plan with the patient and advise to remain active
5. Review patient, revisit red and yellow flags, and revise management plan if required

Pharmacological interventions are ultimately a key step in the management of musculoskeletal pain, and analgesic use is based upon the widely used ‘WHO Analgesic Ladder’. The MA, GDMO or GP approaching musculoskeletal pain in either the afloat or land-deployed environment will have a more limited analgesic formulary than colleagues in sick bays ashore or those in secondary care.

The WHO ladder was designed for progressive cancer

<table>
<thead>
<tr>
<th>Pain Level</th>
<th>Ladder Step</th>
<th>Analgesia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe Pain</td>
<td>Step 3</td>
<td>‘strong’ opioid + ‘weak’ opioid + paracetamol +/- NSAID</td>
</tr>
<tr>
<td>Moderate Pain</td>
<td>Step 2</td>
<td>‘weak’ opioid + paracetamol +/- NSAID</td>
</tr>
<tr>
<td>Mild Pain</td>
<td>Step 1</td>
<td>Paracetamol +/- NSAID</td>
</tr>
</tbody>
</table>

Table 3. WHO Ladder
pain and therefore starts by using analgesics at Step 1 and progressing sequentially upwards to the next class of analgesics if pain remains uncontrolled. When a mild analgesic fails, change to a stronger analgesic further up the pain ladder. It is not appropriate to change to a drug of a similar potency, as this will not achieve more effective pain control.

However, if it is obvious from initial assessment that Step 1 alone will not adequately control pain an adaptation of the WHO Ladder, ‘the reverse pain ladder’ could be used. This simply involves starting at a higher level appropriate to the patient’s assessed pain and then titrating downwards as healing occurs and pain resolves. This can be useful when used in conjunction with the ‘0-3’ numerical pain description (Table 2) as it can correspond to the levels of the WHO Ladder. Analgesia is more effective if taken in a regular manner rather than a haphazard ‘as and when’ approach.

Paracetamol is effective, generally safe and available in all clinical settings both afloat and ashore. Its mechanism of action is attributed to a central anti-inflammatory effect. It should be considered for mild to moderate pain, but due to its action of improving the efficacy of opioid analgesics it should be used at all levels of pain control. Paracetamol should be used with caution in those with liver dysfunction and patients should be warned to avoid excessive alcohol consumption while taking paracetamol.

When paracetamol is ineffective alone it can be combined with a Non-Steroidal Anti-Inflammatory Drug (NSAID), if not contraindicated. NSAIDs are also considered effective for mild to moderate pain, particularly musculoskeletal pain. Ibuprofen, diclofenac and naproxen preparations are all available in sick bays afloat. They act by inhibiting the cyclo-oxygenase enzymes I and II to varying degrees. This inhibits production of prostaglandins, prostacyclins and thromboxane A2, all of which are mediators that act to increase nociceptor stimulation and therefore transmission of the pain signal. NSAIDs are associated with several side effects and may not be suitable for all patient groups.

Due to the effect of non-selective prostaglandin inhibition NSAIDs can disrupt the protective function of prostaglandins on the gastric mucosa resulting in gastrointestinal erosion and ulceration. For this reason the concurrent use of a gastro-protective agent such as a proton pump inhibitor can be considered when prescribing a course of NSAIDs. Patients with asthma will be rarely encountered in the military patient population: however, it should be considered that in up to 20% of asthmatics NSAIDs can exacerbate symptoms and therefore may not be appropriate. NSAIDs can also impair renal perfusion and precipitate renal failure. They should be avoided in those with known renal impairment. Recent studies have also demonstrated a potential increased cardiovascular risk (7). Despite not being suitable for some patients, with appropriate use NSAIDs remain very useful for the management of musculoskeletal pain at all levels of the analgesic ladder due to their anti-inflammatory effect. Naproxen is becoming the NSAID of choice in primary care as it carries the lowest risk of cardiovascular events in longer-term use.

Opioid analgesics act on opioid receptors both within the Central Nervous System (CNS) and peripherally. ‘Weak’ opioids such as codeine can be used for the management of moderate pain. Unfortunately due to variation in individual’s ability to metabolise codeine some patients may get no analgesic benefit from codeine: also, it can often be highly constipating. It is available on board as the combined 30/500 co-codamol preparation, containing 30mg of codeine and 500mg of paracetamol per tablet. Other ‘weak’ opioids such as tramadol will be available to those prescribing ashore. Tramadol can be highly effective in those who tolerate it. It has multimodal action as it is a weak μ-opioid receptor agonist and inhibits the re-uptake of serotonin and epinephrine.

‘Strong’ opioids are reserved for the management of severe pain. Morphine is available on board ships in both ampoule form for use by the medical practitioner and also in the auto-injector form commonly supplied to and used by ground forces. The use of morphine auto-injectors forms a part of military first aid algorithms and battlefield casualty drills. Side effects include constipation, nausea and vomiting, sedation and respiratory depression. Titration of medication to best effect optimises response and minimises side effects. The use of IV opiate would be appropriate in the scenario of acute severe musculoskeletal pain. In persisting severe musculoskeletal pain that fails to respond to Steps 1 and 2 of the analgesic ladder, then regular prescription of short acting oral morphine or modified release tablet preparations could be used if prescribing ashore. Prescriptions of this nature should be kept to the minimal required duration and on-going opiate requirements should be addressed at patient review. Addiction is rarely a problem when opioids are used correctly in the acute setting. However, chronic opioid use is a growing concern. The decision to use opioids is one that should involve Senior Medical Officer input, and requires regular review to ensure that doses are reducing appropriately.

The use of benzodiazepines as muscle relaxant agents is sometimes considered for a short duration in pain associated with severe muscle spasm, but there are concerns about side effects (drowsiness) and dependence. Their routine use in acute musculoskeletal pain is not likely to be appropriate. Anticonvulsants such as pregabalin or gabapentin and low dose tricyclic antidepressants have been used in the management of chronic pain scenarios. There is presently no compelling clinical evidence to support their use in acute musculoskeletal pain unless there is also neuropathic pain. In the scenario of neuropathic pain, or where chronic musculoskeletal pain is responding poorly to traditional agents, then referral to or discussion with Secondary Care Pain Specialists would be an appropriate step to guide prescription of such agents.

In addition to pharmacological intervention, measures including the resumption of normal activity at the earliest opportunity should be encouraged to minimise the risk of chronic symptoms. In acute muscular sprains and strains the simple interventions of Rest, Ice, Compression and Elevation (RICE) can normally be implemented in the majority of
### Analgesic Preparation NNT (if available)

<table>
<thead>
<tr>
<th>Analgesic</th>
<th>Preparation</th>
<th>NNT (if available)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PARACETAMOL</td>
<td>TABLETS 500 MG 10MG/ML SOLUTION FOR IV INFUSION 1000MG/100ML VIAL</td>
<td>Dose of 1g = 3.8</td>
</tr>
<tr>
<td>CO-CODAMOL</td>
<td>30/500 TABLET (CODEINE PHOSPHATE 30MG/PARACETAMOL 500MG)</td>
<td>2.2</td>
</tr>
<tr>
<td></td>
<td>30/500MG EFFERVESCENT TABLET</td>
<td></td>
</tr>
<tr>
<td>NAPROXEN</td>
<td>250MG TABLETS</td>
<td>3.4</td>
</tr>
<tr>
<td>IBUPROFEN</td>
<td>200MG TABLETS 400MG TABLETS</td>
<td>2.7 2.5</td>
</tr>
<tr>
<td>DICLOFENAC SODIUM</td>
<td>25MG/ML INJECTION SUPPOSITORY 100MG</td>
<td>Not available</td>
</tr>
<tr>
<td>MORPHINE SULPHATE 10MG/0.7ML AUTOINJECTOR SYRINGE WITH NEEDLE 1 X EACH (USP) <em>CD</em> <em>SG POLICY</em></td>
<td>Not available</td>
<td></td>
</tr>
</tbody>
</table>

**Table 4. Analgesic preparations of use for musculoskeletal pain in Medical Equipment Table for RN Services Afloat (METSA) (8,9)**

Numbers needed to treat (NNT) are calculated for the proportion of patients with at least 50% pain relief over 4-6 hours compared with placebo in randomised, double-blind, single-dose studies in patients with moderate to severe pain. The lower the NNT, the more effective the drug.

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### Clinical and Operational Scenarios

**Occupational considerations**

The impact of musculoskeletal pain and its underlying cause may well impact on an individual’s ability to function in their Service role. Lower limb injuries may prohibit weight-bearing exercise or make ascending and descending ladders at sea unsafe, as can upper limb injuries. Depending on the nature of the painful condition and its expected duration, a period of light duties or medical downgrade may be required. This will require the input of appropriately qualified physicians with an understanding of the relevant occupational considerations.

### Conclusions

Musculoskeletal pain is a common presentation amongst military patients. Investigation focuses on thorough assessment including a full history and clinical examination. The aim of this is to exclude concerning features based on the ‘red and yellow flag’ concept. Management involves the development of a practitioner-patient partnership to aid communication and ensure that the patient takes responsibility for their involvement in the management plan.

Pharmacological intervention should be based around the principles of the WHO analgesic ladder. Patient review is required to adapt the management plan as required, and to continue to ensure that there are no concerning features evident that would require further investigation. Return to normal function is the primary aim and pain should improve as part of the natural course of healing. Never underestimate the importance of physiotherapy in that respect.

Regular patient review to monitor progress also allows the military practitioner to make relevant decisions regarding medical downgrading and to ensure reduction and cessation of any opioids used. Prompt and effective management of musculoskeletal pain helps reduce the impact upon the service person and the operational ability of their ship or unit.

### References

8. METSA 13.1.1 May 2013, Royal Naval Medical Service

### Authors

Surgeon Lieutenant J Bone RN, Foundation Year 2 Doctor, MDHU Portsmouth, Queen Alexandra Hospital, Portsmouth

Surgeon Commander D Beard RN, Consultant in Anaesthesia and Pain Medicine, RCDM, Queen Elizabeth Hospital, Birmingham