Clinical

Delay in Diagnosis of Neck of Femur Stress Fracture in a Female Military recruit.


Abstract

We report the delay in diagnosis of a Neck of Femur (NOF) stress fracture in mixed sex basic military training. Stress fractures are common in military training with the incidence reported as ranging between 3.2-31%. NOF stress fractures, whilst only representing around 8% of stress fractures are associated with a high morbidity. It is imperative that medical officers looking after military recruits have a sound knowledge of the potential signs, symptoms and presentation of these injuries. Medical officers should always remain vigilant for stress fractures especially in mixed military training.

Introduction

Stress fractures were first reported in the medical literature in 1855 by Breithaupt(1) with Stechow recording the first imaging of a stress fracture in 1897(2). Stress fractures, also commonly referred to as fatigue fractures, are subacute injuries, which develop through repetitive overuse that overwhelms the intrinsic ability of bone to repair itself(1). The most commonly held theory on aetiology is that the process of remodelling is accelerated and the osteoclastic activity exceeds the osteoblastic activity for some weeks, leading to microfractures, stress reaction and eventually stress fractures(2).

Injuries in military training are common and varied (5,6,7,8), however the incidence of stress fractures in military recruits can be high, ranging from 3.2-31% (9,10,11,12).

Patient: A 27 year old female officer cadet joined the Royal Military Academy Sandhurst (RMAS) in 2011. Her weight was 57Kg with a BMI of 22. Her fitness at this time was of a reasonably high standard and pre-course activities included regularly training at the gym, mountain climbing, and middle distance running.

The military course was progressive in nature with a gradual increase in tempo and intensity of activities including load carrying.

Initial symptoms came on at week seven although it was a further two weeks until the patient presented to the medical centre. Primary complaint was of an intermittent, tight sensation in her right groin in the mornings and after periods of exercise, which was relieved by stretching. The patient described the tightness as something similar to Delayed Onset Muscle Soreness (DOMS). There had been no requirement for analgesia, and the patient was able to complete all lower-limb activities including an eight-mile Combat Fitness test (CFT) without pain. There had been no reports of any night pain or pain at rest after activity.

Over the next four weeks the tightness at times turned into a discomfort and was less responsive to stretch or rest. The discomfort increased when climbing up and down the stairs and began to alter her gait. At this stage whilst doing a CFT carrying a 14kg load including webbing, rifle and helmet there was a sudden increase in pain occurring when running downhill with extended stride length. The focus of pain originated in the right groin with radiation down the medial thigh.

At the 5.5 mile mark the patient was unable to continue the loaded march due to pain and was then referred for orthopaedic opinion with a suspected stress fracture, 4 weeks after initial symptoms and 2 weeks after first presentation. A pelvic X-ray was reviewed by a junior doctor and a diagnosis of muscle sprain was made. The patient was returned to the medical facilities at Sandhurst. She was looked after at the Medical Reception Station ward and discharged after 4 days, partial weight bearing and referred for a MRI. She was the returned to the field to continue a Forward Operating Base exercise on crutches.

The MRI was performed 2 weeks later, and the radiographer noted an abnormality, but no formal report was received until 4 weeks post injury. At this stage it was noted that one leg was shorter than the other on examination. Further x-rays two weeks later, and prior to the completed MRI report, revealed a minimally displaced complete basi-cervical NOF fracture. Immediate treatment was then internal fixation (Dynamic Hip Screw), six weeks non-weight bearing and 6 weeks partial weight-bearing.
At the 16 week point the operating surgeon allowed the patient to start running, and she was referred for an inpatient rehabilitation course at the Regional Rehabilitation Unit (RRU) in Edinburgh. At eight months post surgery the patient is able to speed march with weight, having completed an indoor fitness test and is currently symptom free, there is no leg length discrepancy.

Discussion

There have been interventions to try and reduce the incidence of stress fracture (10) yet despite the introduction of physiological progressive training Ross et al 2002 still demonstrated a 3.8% incidence of stress fractures in their study group (10). In a further British study undertaken on recruits based in Northallerton (2008) (13) it was identified that the femoral fracture rate was 8%, whilst another study on US Marine Corps recruits found the incidence of radiologically diagnosed stress fractures to be 3.7% (12).

The typical clinical presentation of a femoral neck stress fracture is poorly localised groin or anterior thigh pain of insidious onset and related to exertion (14,15). This can become more localized with exercise and is reduced by rest or less forceful activity. The pain can also be referred to the knee. Early signs can include mild pain at the extremes of passive hip motion especially internal rotation, and reproduction of the pain with the hop-test, although this can cause displacement of an un-displaced stress fracture so is not advised. These symptoms and early signs are very non-specific and are hard to differentiate from other conditions including hip flexor or adductor strain, stress fractures in the pubic rami, gluteal cuff tendinopathies, and labral tears. Therefore, a high level of clinical suspicion should be applied to anyone presenting with non-specific groin or anterior thigh pain in the context of military training. An American study of young military recruits found that significant acute weight loss combined with increased physical training could be a significant contributing risk to stress fracture injury (16).

In his paper Talbot et al. (13) advocate a high clinical index of suspicion and supports early referrals for MRI to assist in the diagnosis of stress fractures, especially in patients who are at-risk of developing a stress fracture, which includes all military recruits. The limitations of this approach are demonstrated in this case, as there is often a delay in performing an MRI and on it being reported.

The Defence Medical Services Director of Defence Rehabilitation ‘Best Practice Guideline’ on the management of exertional leg pain (17) recommends the use of MRI as first line imaging when the clinical suspicion of Stress Fracture is high. We would suggest that if there is going to be a delay in patients getting an MRI the patient should be sent for an urgent x-ray and protected from weight bearing until x-rays can be obtained. It is important to note that x-ray is not the gold standard for excluding a stress fracture (17,18) and in patients who have a negative x-ray for a stress fracture, but for whom there still remains a high level of clinical suspicion, it would be reasonable to keep them protected weight bearing until an MRI can be obtained and reported.

In previous studies the majority of femoral stress fractures have been documented between weeks 4-7 of training (19) and weeks 13-16 (10). In the prospective study by Milgrom et al it was identified that fractures can occur as early as week one and soldiers were still presenting a the end of the study at week 14 (11), and therefore we believe that the stage of recruit training should not be used as a red flag, not least because it is impossible to standardise the amount of physical training recruits have done prior to starting military training.

It is important to identify femoral stress fractures, as it is possible for initially un-displaced fractures to displace and the results of this can be catastrophic for the patient with complication rates quoted as high as 63% even when these fractures are treated to a gold standard of care (20).

Due to the nature of professional qualified officer courses it is common for the British military to conduct mixed sex physical training and route marches. There has been evidence previously presented that mixed sex route marching may contribute towards the incidence of stress fractures in US Naval Recruits (21). Whilst this paper focused upon pelvic stress fractures, we would suggest that caution should be applied when conducting mixed sex training as this may increase the incidence of stress fractures (21,22) and careful monitoring of the incidence of female stress fractures should be conducted by medical centers overseeing mixed training.

In our case study the rehabilitation time to full fitness was in excess of eight months, and previous internal Royal Marine studies estimate that a femoral stress fracture takes around 25 weeks to return to training at a military establishment (10), which further illustrates the severity of this injury and the impact it can have on trainees passing basic military training.
Conclusion
Doctors treating military personnel with hip pain in the training environment should have a high index of suspicion for femoral neck stress fractures. These injuries can have significant morbidity and prolonged recovery times. MRI is the gold standard for diagnosing stress fractures. When there may be a delay in obtaining prompt MRI results, patients should have immediate plain x-rays and steps taken to protect the femur from further insult including avoidance of weight bearing. Continual monitoring of the incidence of female stress fractures should be conducted in units conducting mixed sex military training.

Reference
General

Hyperbaric Medicine Unit, Past, Present and Future

M Glover

Introduction

Following cessation of clinical activity on the site of Royal Hospital Haslar in July 2009, the Hyperbaric Medicine Unit relocated to St Richard’s Hospital in Chichester and re-opened for treatment of MOD diving casualties in January 2010. After two years in operation, the new unit has established itself favourably with local clinicians and emergency services, treating civilian and military personnel with a range of acute and chronic conditions.

Roles

The primary role of the Hyperbaric Medicine Unit is to provide treatment for any casualties that arise from military diving training at the Defence Diving School. Fortunately such casualties are infrequent but, since inexperience is associated with likelihood of a diving accident, the natural choice of location for a fixed facility is close to the diving training establishment.

Another important role of the unit is to allow the diving medical officers at the Institute of Naval Medicine and the Submarine Escape Training Tank to acquire and to maintain competence in treatment of diving accidents.

Although the hyperbaric medicine unit’s priority is treatment of diving disorders, the greater proportion of treatments administered are for a range of other urgent and elective disorders, typically selected from those approved by the Undersea and Hyperbaric Medical Society (1) and listed below:

- Air or Gas Embolism
- Carbon Monoxide Poisoning
- Carbon Monoxide Poisoning Complicated By Cyanide Poisoning
- Clostridial Myositis and Myonecrosis (Gas Gangrene)
- Crush Injury, Compartment Syndrome and Other Acute Traumatic Ischaemias
- Decompression Illness
- Arterial Insufficiencies:
- Central Retinal Artery Occlusion
- Enhancement of Healing In Selected Problem Wounds
- Severe Anaemia
- Intracranial Abscess
- Necrotizing Soft Tissue Infections
- Osteomyelitis (Refractory)
- Delayed Radiation Injury (Soft Tissue and Bony Necrosis)
- Compromised Grafts and Flaps
- Acute Thermal Burn Injury
- Idiopathic Sudden Sensorineural Hearing Loss

In addition to providing a 24 hour on-call service, the hyperbaric unit offers treatments on weekdays for elective patients.

Development of the hyperbaric service to present day

Diving casualties were originally treated in the recompression chambers in HMS Vernon when it was the home of the Royal Navy Diving School. The Royal Naval Physiological Laboratory research facility in Alverstoke had provided the recompression service during Royal Navy leave periods and, when HMS Vernon faced closure, RNPL took on full-time responsibility for the service.

Hyperbaric oxygen therapy has been used for treatment of a range of non-diving emergencies such as carbon monoxide poisoning and gas gangrene. Anaesthetists from Royal Hospital Haslar provided care for the critically-ill patients in the chambers but the logistic and medical shortcomings made this arrangement unsatisfactory. As a result, the hyperbaric medicine unit was opened at Haslar in 1996.

The gradual withdrawal of acute medical services from Haslar, beginning with the closure of the intensive care unit in 1999, made treatment of acutely ill patients increasingly difficult so a portable Type B chamber, loaned from the Royal Navy, was installed at Queen Alexandra Hospital in Cosham. This allowed hyperbaric treatment of critically ill and emergency patients.

In July 2001 MOD passed ownership of a wide range of assets related to military maritime support to the newly-vested QinetiQ. This included the chamber and its staff. These assets are now made available to MOD through the Maritime Strategic Capability Agreement. This contract provided funding for the transfer of the...