

Chronic exertional compartment syndrome of the forearm musculature with ulnar bone stress in an elite tennis player

Richard Seah and Philip Bell
London, UK

Abstract

Chronic compartment syndromes of the forearm musculature in sport are relatively uncommon and are known to occur in certain sports such as climbing, motocross, rowing, kayaking and wind surfing.

This case report of chronic exertional compartment syndrome in flexor carpi ulnaris with associated ulnar bone stress of the right forearm in a right-hand dominant elite tennis player highlights the characteristic symptomatology, causative factors, and use of dynamic imaging in diagnosis.

Keywords: *compartment syndrome, bone stress, forearm, tennis*

Case Report

A 30-year old, right-hand dominant elite male tennis player who utilised a single-handed backhand, presented with a history of right forearm pain, occurring intermittently for a period of more than twelve months. This pain was localised to the medial and middle third of the right forearm and occurred only during doubles matches when utilising a particular type of serve.

Pain was precipitated when serving from the forehand side of the court out wide (to his opponent's forehand if right-handed or backhand if left-handed). The majority of his pain eased within minutes upon cessation of activity and he was usually completely symptom-free after a rest period of seven days. There were no symptoms of night pain in the affected limb.

He participated regularly in Grand Slam tournament singles events, without symptoms, but had been a first-round loser in several recent events. His commitments extended to doubles events and Davis Cup competitions. It was during the latter that he experienced symptoms.

Clinical examination at rest did not produce any abnormal findings. He was systemically well with normal cervical spine, shoulder, elbow and wrist. There was no evidence of neurological compromise. All resisted muscle-tendon unit testing was pain free. All peripheral pulses were palpable and equal in the upper limb and thoracic outlet provocation tests were normal. Myofascial and bony palpation was also normal.

The player had previously been investigated with a Technetium-99m isotope bone scan. This was apparently reported as 'normal' and subsequent magnetic resonance imaging (MRI) done at rest and pain-free was verbally reported by the player as showing a 'bone spur'. No previous investigation films or reports were available for review.

The history was suggestive of a chronic exertional compartment syndrome. A dynamic MRI study was performed. The player was asked to repeat the serve with his right arm using the technique highlighted previously. He did so until pain was reproduced and was then imaged immediately.

An axial T1-weighted fat-suppressed fast spin-echo MRI scan revealed diffuse peri-tendinous and subcutaneous oedema in the flexor carpi ulnaris muscle with evidence of bone stress in the ulna of the right forearm (figs 1 and 2). These findings were consistent with the diagnosis of chronic exertional compartment syndrome. An intra-compartment pressure study was not performed.

The player, who was nearing the end of his professional career, was not prepared to consider surgical fasciectomy as his symptoms were confined to Davis Cup doubles and one specific serve technique only. He elected to continue with conservative treatment and modification of his serve technique.

Discussion

Chronic exertional compartment syndrome (CECS) is a recurring neuromuscular condition that causes swelling, pain and occasionally disability in affected muscles of the upper or lower limbs. Known also in the literature as chronic compartment syndrome or exercise-induced compartment syndrome, the condition is precipitated by sporting activities that involve repetitive movements. It is postulated that increased compartment pressure obstructs venous outflow and leads to a reduced arteriovenous gradient and a decrease in local blood flow. This results in ischaemia of both muscle tissues and nerves leading to pain and paraesthesia.¹

Acute and chronic compartment syndrome are distinct in aetiology and should be considered as separate conditions.² Although compartment syndromes can occur in several anatomical regions, the most commonly seen in athletes involve the lower limb. CECS of the upper extremity is rare, and only a few cases have been reported in the literature.³ Typing in the keywords 'Compartment Syndrome' and 'Tennis' into the *PubMed* portal which utilises the *Entrez* text-based search and retrieval system revealed only one journal reference on the subject.³

The forearm has three compartments: (a) The volar compartment contains the forearm wrist flexors, pronator tendons, median and ulnar nerves and arteries; (b) The dorsal compartment contains the wrist and finger extensor tendons. (c) The mobile wad is found in the posterior compartment of the forearm and

contains the brachioradialis, extensor carpi radialis brevis and longus muscles.⁴ Any of these compartments can be affected by CECS.

The prevalence of CECS of the forearm in sport is low. The aetiology is strenuous repetitive activity with minimal or no release period, precipitated by poor technique, sudden increase to training load and substandard or defective equipment.

Intra-compartmental pressure measurement in the forearm potentially poses more questions than it answers. Different thresholds and lack of consensus for diagnosing raised compartment pressures, technical difficulties in the introduction of the intracompartment pressure catheter, risk of damage to vital neurovascular structures and risk of potential infection are all issues that need to be considered.^{5,6} Dynamic MRI scanning appears to be a viable alternative for confirming the diagnosis of CECS, although the importance of a detailed history and clinical examination must not be overlooked.^{7,8}

The prevalence of bone stress in the ulna bone is also low. It is associated with upper-limb dominant sports such as golf, tennis, volleyball and baseball.⁹ The aetiology is repetitive stress to the bone associated with repeated muscle contraction and subsequent muscle fatigue.¹⁰ As with CECS, poor technique, sudden increase in training load and substandard or defective equipment can also make the condition worse. MRI scanning is useful for detecting bone marrow and periosteal oedema and cortical breaches associated with bone stress.⁷

What is already known on this topic

- Chronic exertional compartment syndrome (CECS) in the upper limb is uncommon.
- There are very few articles on CECS in elite tennis players.

What this study adds

- Concurrent bone stress should be considered in patients who suffer from CECS since several similar aetiologies can be identified in both conditions.
- Dynamic magnetic resonance scanning is a useful tool for diagnosing both conditions.

Acknowledgements

We wish to thank Dr Simon Blease for his radiology expertise in interpreting the magnetic resonance images.

Competing interests: None.

Patient consent has been obtained for publication of the images.

Authors

Richard Seah MSc MFSEM DipSEM(GB&I)
Specialist Registrar in Sports & Exercise Medicine
(Corresponding Author);

Philip Bell FFSEM FISEM DipSportsMed
Orthopaedic & Sports Physician

Musculoskeletal Medicine Services,
BUPA Wellness Barbican,
3 White Lyon Court,
The Barbican,
London EC2Y 8EA, UK
r.seah@doctors.net.uk

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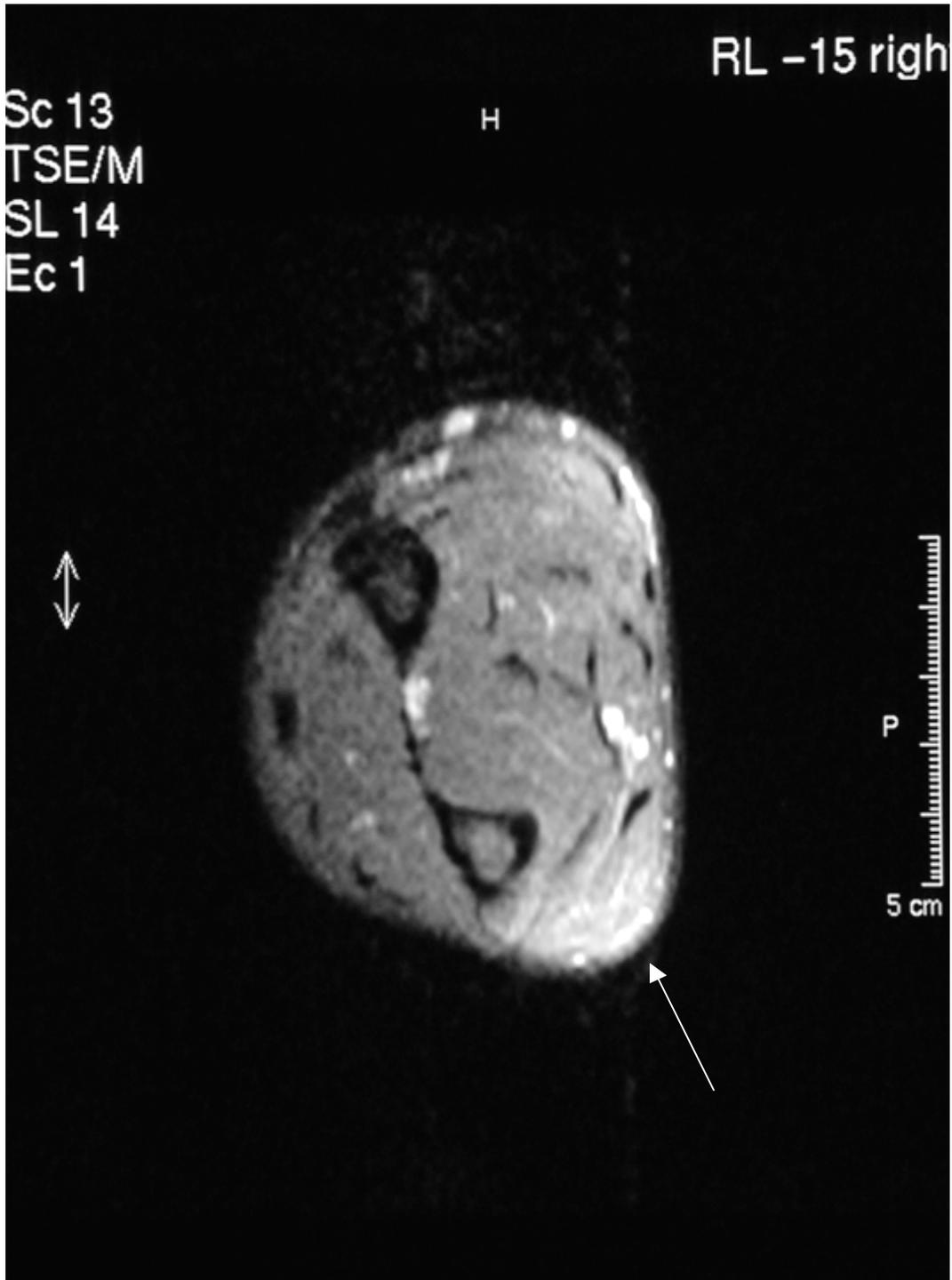


Figure 1- Magnetic Resonance Scan: T1 fat-suppressed image showing increased signal within the Flexor Carpi Ulnaris muscle, indicative of oedema, There is also increased signal in the marrow of the ulna compared to the radius.



Figure 2- Magnetic Resonance Scan: STIR fat-suppressed coronal study demonstrating marrow oedema along the interosseus border of the ulna, indicative of acute bone stress.