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CASE REPORT

# Bilateral stress fracture of the ulna in an adult weightlifter : A case report

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**Bilateral stress fractures of the ulna are extremely rare and have only been described in non-adults. In this case report we present a young adult weightlifter who reported bilateral stress fractures of both ulnae after increasing his training frequency and load. Stress fractures of the ulnae are examples of bone stress injuries due to repetitive muscle pull. The diagnosis can be made by radiography, isotope bone scan, CT or MRI. Thorough training analysis and adaptation is essential to treat this rare injury. Return to full activity can take up to three months.**

**Keywords** : stress fracture ; ulna ; bilateral ; weightlifting.

## INTRODUCTION

Bilateral stress fractures of the ulna are extremely rare and have only been described in non-adults. Sujino *et al* (*17*) described a 15-year-old male Kendo (Japanese fencing) player who developed stress fractures of both ulnae after his first training camp. McGoldrick *et al* (*9*) reported a bilateral stress fracture of the ulna in a 15-year-old boy who had used crutches incorrectly during rehabilitation after knee surgery. In this case report we present a young adult with bilateral stress fractures of the ulna, which has, to our knowledge, not been previously reported.

## CASE REPORT

A 19-year-old male right-handed recreative weightlifter visited our department of Sports Medicine with left and right mid-forearm pain. The duration of symptoms was four weeks for the right arm and three weeks for the left arm. There was no history of trauma. The pain was localised around the shaft of the ulna. The patient reported no history of erythema or oedema and no night pain. The pain was worsened by performing biceps curls and relieved by taking some rest and by using painkillers.

In the three months prior to the onset of symptoms, the patient had increased his training frequency from twice weekly to daily. He also increased the weight and repetitions in an attempt to increase the

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size of his arms. When he started to have symptoms, bicep curls were performed on a machine which supported the elbows : 3 series of 15 repetitions with 50 kilograms (60% 1-RM) at a frequency of three times a week. Pain in the forearms was noticed while performing the bicep curls and at this point training was stopped for a week. On resuming his biceps exercises the pain recurred and he changed to perform the exercises using an S-bar and reduced the weight to 30 kilograms. Exercises for the triceps were not painful. Despite these measures, the pain worsened and was eventually present at rest while sitting with the forearms on the arm rest of a chair. At this point he consulted our department.

The patient was otherwise healthy and had no significant past medical history. He did not use any medication, drugs, tobacco or alcohol.

Physical examination revealed an athletic male, with a height of 1.86 meters and a weight of 84 kilograms. The body fat percentage was 14.5%, measured using the four points-measurement method with the Harpender skin fold thickness calliper as described by Durnin and Womersly (*4*). Inspection of the upper limbs was unremarkable. Palpation of both ulnae around the junction of the proximal and middle thirds was painful. Active flexion and extension of the elbow was normal and powerful. Active pronation and supination of the forearm was also normal, without any loss of strength. Active and passive range of motion of the shoulders and wrists was normal. None of these examinations provoked pain. There was no axial pain. Performing push ups did not worsen the pain. Neurovascular examination of the upper limbs was normal. Antero-posterior and lateral radiographs of both forearms showed no abnormalities.

Under the working diagnosis of periostitis of the ulnae, Diclofenac, ice applications and one week of complete rest was prescribed. The patient was seen again to assess recovery ; pain had worsened, so a technetium-$99^{m}$ scan was performed. This showed a very intense increase in tracer uptake in both ulnae (fig 1). The diagnosis of bilateral stress fractures of the ulna was made.

An adapted training schedule was prescribed in which back muscles and breast muscles were trained every other day. The patient ignored our advice to take a rest-period without doing the biceps curls. In the initial phase training with the S-bar was not possible because of the pain. Straight bars were used with at first 20 kilograms in one series of 10 repetitions. After three weeks the pain slightly decreased and the patient gradually increased the intensity and frequency of the biceps curls.

At follow-up at ten weeks, radiographs of the ulnae did not show any abnormalities.

At sixmonths follow-up, there were no complaints of pain anymore. The training intensity was increased to sixty percent of the maximum, performing biceps curls with 46 kilograms in 3 series of 10 repetitions. The girdle of the biceps increased with 6 centimeters in eight months. Again physical examination was completely normal.

At one year follow-up, complete recovery was achieved and there were no training limitations.

## DISCUSSION

We have presented the case of a young adult weightlifter who developed bilateral stress fractures of both ulna after increasing his training frequency and load. With an adapted training schedule, in which back muscles and thorax muscles were trained every other day, his symptoms were relieved.

Unilateral stress fractures of the ulna have been described in baseball (*11*) and softball pitchers (*10*), tennis players using a double handed backhand stroke (*2*), volleyball players (*10*), weight-lifters (*6*), a ten-pin bowler (*5*), and a golfer (*7*). In all the reported cases, the patient returned to activity in four to six weeks after a period of rest from the aggravating activity, and after gradual resumption of activity.

Bilateral stress fractures of the ulna have only been described twice before in the English literature. Sujino *et al* (*17*) described a 15-year-old male Kendo (Japanese fencing) player who developed bilateral stress fractures of both ulna after his first training camp. In Kendo, a player uses a special sword (a Sinai), which weights about 500 g and is 115 cm long. During training, the player grasps the sword with both hands and swings it up and down

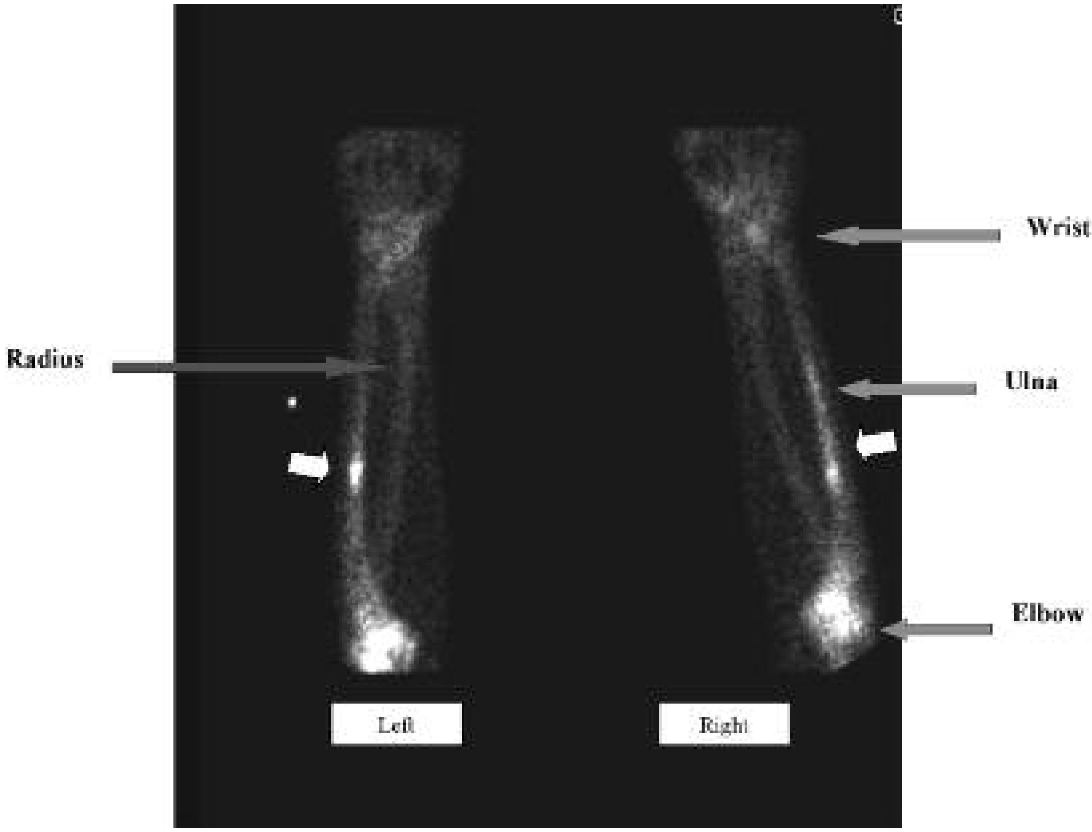


***Fig. 1.*** — 99-Technetium scan in a 19-year-old weightlifter with ulnar pain of six weeks duration after increasing biceps training intensity. Increased tracer uptake is seen in both ulnae (white arrows).

repeatedly. McGoldrick *et al* (*9*) reported another case in a 15-year-old boy who had used crutches incorrectly during rehabilitation after knee surgery.

The development of a stress fracture of the ulna in weightlifting is thought to be due to a bowing mechanism (*11*). In chronic running injuries, muscles also play an important role in the development of stress fractures (*15*). These are caused by muscle forces which increase the load on bone at specific sites and decrease this load at other sites depending on the anatomical origin and insertion (*15*).

During weightlifting, the biceps and the flexor muscles of the hand generate a supination-flexion movement of the ulna to the humerus. Due to overuse of the biceps muscle, vibrations generated on the ulna during movement will not be absorbed anymore. This non absorbed energy will be transferred to the ulna and can cause limited micro trauma (*1*).

In this case report, complaints were mostly generated during the biceps curls. The origin of the biceps is at the tuberculum supraglenoidale for the long head and at the processus coracoideus for the short head of the biceps. The biceps muscle inserts with a powerful tendon at the tuberosity os the radius. With a flat tendon it also inserts at the ulnar side in the lacertus fibrosus. The fibres of the lacertus fibrosus are a continuation of a part of the short head. This short head causes adduction and, together with the long head, anteversion of the arm. In the elbow joint, the short head will cause supination and flexion, in which the supination-movement will increase during bowing of the elbow.

The biceps can be trained in different ways, for example by barbell curl, concentration curl, lying/incline dumbbell curl, preacher curl, with the usage of a bar or with dumbbells. Wrong position of the hands on the bar or on the dumbbells or a technically wrong exercise will cause extra stress on the ulnae, which may be the origin of a stress fracture.

Diagnosis of a stress fracture requires clinical experience, detailed knowledge and precise musculoskeletal examination.

In many cases, clinical diagnosis of stress fracture is enough. The classic history of exercise-associated bone pain and typical examination findings are highly correlated with diagnosis of stress fracture (*1*). However, if the diagnosis is uncertain, or the case involves the serious or elite athlete who wishes to continue training if at all possible and requires more specific knowledge of his or her condition, various imaging techniques are available for the clinician (*3*).

Investigation starts with plain radiographs with lead-marking, which has a low sensitivity (15-5-%) but a high specificity (50%) for detecting stress fractures (*5*), depending of the onset of the stress fracture. In many cases they may not become evident for up to three months, and in a significant percentage of cases they never become abnormal at all (*13*). Sensitivity will rise up to 50 percent after two to four weeks, depending on the type of bone and the localisation. Radiological signs in cortical bone are different than signs in cancellous bone, in which stress fractures are much more difficult to detect, and vary more with time. Classical signs on radiographs are new periosteal bone formation, sclerosis, the formation of callus, or a clear fracture line (*16*).

In our case with negative bone radiograph, the triple-phase bone scan showed a marked increase in tracer uptake in both ulnae in all three phases. Other bony abnormalities, such as periostitis are only positive on delayed images. Bone scan is nearly 100% sensitive, and this is much more than for plain radiographs (*14*). In several studies, only 10-25% of stress fractures with a positive bone scan had radiographic evidence of stress fracture (*8,12*). Disadvantage of the bone scan is it's lack of specificity in that the fracture itself is not visualised, and it may be difficult to precisely locate the fracture site. Other nontraumatic lesions such as tumour (especially osteoid osteoma), osteomyelitis and bone infarct can also produce localised increased uptake.

Computed tomography (CT) is useful for differentiating between these conditions, and is particularly valuable for imaging fractures when imaging may be important for treatment (*1*). Magnetic resonance imaging (MRI) is increasingly being advocated as the investigation of choice. Its sensitivity is similar to that of isotope bone scan, and it has the added advantage of excellent anatomic visualisation (*1*). On MRI, evidence of a stress fracture is presence of a 'fracture line' that appears as low signal on all sequences.

## CONCLUSIONS

Unilateral stress fractures of the ulna are infrequent but not rare. Bilateral stress fractures of the ulna are much more uncommon and have only been described twice. Stress fractures of the ulnae are examples of bone stress injuries due to repetitive muscle pull. The diagnosis can be made by radiography, isotope bone scan, CT or MRI. Thorough training analysis and adaptation is essential to treat this rare injury. Return to full activity can take up to two to three months.

## REFERENCES


1. **Bennell K, Brukner P.** Preventing and managing stress fractures in athletes. *Phys Ther Sport* 2005 ; 20 : 1-10.
2. **Bollen SR, Robinson DG, Crichton KJ, Cross MJ.** Stress fractures of the ulna in tennis players using a double handed backhand stroke. *Am J Sports Med* 1993 ; 21 : 751-752.
3. **Brukner P, Benell K, Matheson G.** Chapter 4 : Diagnosis of stress fractures. *Stress Fractures*. Blackwell Science Asia Pty Ltd, 1999 ; pp 83-96.
4. **Durnin J, Womersley J.** Body fat assessed from total body density and its estimation from skinfold thickness : measurements on 481 men and women aged from 16 to 72 years. *Br J Nutr*, 1974 ; 32 : 77-97.
5. **Escher SA.** Ulnar diaphyseal stress fracture in a bowler. *Am J Sports Med* 1997 ; 25 : 412-413.
6. **Hamilton KH.** Stress fracture of the diaphysis of the ulna in a body builder. *Am J Sports Med* 1984 ; 12 : 405-406.
7. **Koskinen SK, Mattila KT, Alanen AM, Aro HT.** Stress fracture of the ulnar diaphysis in a recreational golfer. *Clin J Sports Med* 1997 ; 7 : 63-65.
8. **Matheson GO, Clement DB, McKenzie DC *et al.*** Scintigraphy uptake of $^{99m}$Tc at non-painful sites in athletes with stress fractures. The concept of bone strain. *Sports Med* 1987 ; 4 : 65-75.

9. **McGoldrick F, O'Brien TM.** Bilateral stress fractures of the ulna. *Injury* 1988 ; 19 : 360-361.
10. **Mutoh Y, Mori T, Suzuki Y, Sugiura Y.** Stress fractures of the ulna in athletes. *Am J Sports Med* 1982 ; 10 : 365-367.
11. **Pascall MS, Grana WA.** Answer please. Stress fracture of the ulna. *Orthopedics* 1988 ; 11 : 829-832.
12. **Prather JL, Nusynowitz ML, Snowdy HA *et al.*** Scintigraphic findings in stress fractures. *J Bone Joint Surg* 1977 ; 59-A : 869-874.
13. **Reeder, MT, Dick BH, Atkins JH *et al.*** Stress fractures. Current concepts of diagosis and treatment. *Sports Medicine* 1996 ; 22 : 198-212.
14. **Saunders AJ, Elsayed TF, Hilson AJ *et al.*** Stress lesions of the lower leg and foot. *Clinical Radiology* 1979 ; 30 : 649-651.
15. **Scott SH, Winter DA.** Internal forces at chronic running injury sites. *Med Sci Sports Exerc* 1990 ; 22 : 357-369.
16. **Spitz DJ, Newberg AH.** Imaging of stress fractures in the athlete. *Radiol Clin North Am* 2002 ; 40 : 313-331.
17. **Sujino T, Ohe T, Shinozuka M.** Bilateral stress fractures of the ulnae in a Kendo (Japanese fencing) player. *Br J Sports Med* 1998 ; 32 : 340-342.