STRESS FRACTURES OF THE DISTAL RADIUS IN ADOLESCENT GYMNASTS

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ABSTRACT

Adolescent girl gymnasts sustained stress fractures of the distal end of the radius in the wrist on which a rotational vault was performed. The history and clinical progress were typical of stress fractures.

Spectacular displays of gymnastics, especially on television, have encouraged children to take up this sport. The young age of Olympic gymnasts has encouraged 10 to 14 year old children to train six to seven times a week. Technically complex rotational vaults are being attempted at an even younger age and because it is only by constant repetition that the skill is learnt, the gymnast always rotates in the same direction. Three gymnasts developed stress fractures of the distal radius.

CASE 1

A thirteen year old girl presented with several months history of a painful swollen left wrist, most movements of which were painful. She had started rotational vaults some three months before the symptoms started. Rotation was towards the left. There was no history of injury.

On examination the wrist was tender and slightly swollen over the radial styloid and the anterior aspect of the distal radius for about one inch. The posterior radius was not tender. She had full wrist movements, but extension was painful as was most resisted movement. The radiographs (Fig. 1) showed the stress fracture in the metaphysis of the left radius which healed 10 weeks later (Fig. 2).

CASE 2

A twelve year old girl complained of a painful left wrist particularly over the anterior aspect of the radius and full extension caused pain. She had been doing rotational vaults amongst other gymnastics, and radiographs taken of the left wrist showed a stress fracture in the radius just proximal to the epiphysis (Fig. 3)

Diagram showing forces around the fulcral wrist.

which healed 7 weeks later (Fig. 4). She had a history of having had pain in both wrists some seven months previously but radiographs at that time showed nothing abnormal of note.

CASE 3

A 16 year old girl complained of pain in the right wrist. She had a history of wrist pain 9 months previously when levering into a handstand. She had recently been doing intense practice of twisting vaults, and the wrist

Fig. 1. A referral diagnosis of tenosynovitis had been made.

The fracture shows as a moth eaten appearance of the metaphysis.

Fig. 2. The tractive centrifugal forces of the asymmetrical bar exercises were never curtailed whilst healing occurred.

The moth eaten appearance has settled with some residual slip of the epiphysis.

Fig. 3. This girl was stopped from gymnastics as this was clinically the second episode.

became painful and tender at the lower radius. Radiographs showed a stress fracture involving the epiphysis (Fig. 5). It is likely that the radial styloid was avulsed by muscle violence and was the cause of pain 9 months previously.

Fig. 4. An unusual site for a Type 3 epiphyseal fracture (Salter and Harris, 1963).

The hooked appearance of the fracture has clearly healed leaving a slight beaked effect.

DISCUSSION

These fractures occurred around the growth plate and no sport should be allowed to damage normal development. Training, including bar exercises, was maintained, but rest and removal of any action which caused pain was

The fracture line is seen running through the epiphysis into the joint. The arrow shows the old fractured styloid.

Fig. 5. The healed wrist shown in Fig. 4 (Case 3).

insisted upon for the wrist concerned. Cases 1 and 3 returned to full training in some 8 to 9 weeks but the girl in Case 2 was advised to give up gymnastics. Tumbling and vaulting produce an impact angle of 60 to 90 degrees to the wrist, and twisting vaults add ulnar deviation. A straight "blow counter blow" theory (Lidström, 1959 and Frykman, 1967), even if caused by repeat minor trauma from vaulting should cause a symmetrical lesion, as the initial impact is received equally by both wrists. The twisting vaults produce hyperextension and ulnar deviation of the fulcral wrist (a mechanism that may fracture the radius) (Lidström, 1959 and Frykman, 1967), plus resisted supination and active flexion, from the lumbricals and long flexors of the hand. The other wrist will absorb the initial impact, but will be lifted off the vaulting surface before the fulcral hand, and this movement initiates the twisting (see diagram). In all three reported cases the lesion is confined to the fulcral wrist. The Tsukahara vault requires a twist on to the box. Faulty asymmetrical placement of the hands will exaggerate these above rotational strains, and may be the prime vault causing this stress fracture.

Follow-up X-rays showing healing of the epiphyseal fracture.

Stress fractures of the radius are rare; Devas (1975) in a comprehensive monograph has not described them. A bilateral stress fracture of the radial shaft has been described by M. A. Farquarson-Roberts and Fulford (1980). Ryan and Salcicich (1976) described an acute hyperextension injury in adolescent weight lifters. The distal radius seems an unlikely site for a stress fracture but the hand in gymnastics is a support for the body whilst muscular effort initiates rotational strains. Many young gymnasts get pain in the wrist and it is important that they should be treated seriously and a diagnosis made lest the continued exercise produces a lesion that might damage growth in the radius.

Scintigraphy may be difficult to interpret in the growing wrist, so that anterior radial pain in the fulcral wrist should be treated clinically as a fracture.

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