Stress fracture of the clavicle in a young female gymnast

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Abstract
Stress fractures of the clavicle are rare. This is the report of one such fracture in a 10 year old female gymnast, who presented with a six week history of medial clavicular pain. Radiographs and a computed tomography scan showed an undisplaced fracture through the medial third of the clavicle extending inferiorly to the rhomboid fossa in the inferior aspect of the clavicle. Pathological fracture was excluded by magnetic resonance imaging. The patient was treated conservatively and was able to return to full training eight weeks later.

Stress fractures of the clavicle are rare. No cases were mentioned in two reviews. They have been described following radical neck dissection, and as a complication of coracoclavicular ligament reconstruction with a Dacron loop, but in relation to sport only two reports of cases may be found in the literature. The first reports a stress fracture of the lateral part of the right clavicle in a 25 year old male javelin thrower, and the second, a stress fracture of the left mid-clavicle in a 20 year old male diver. This is the first report of a clavicular stress fracture in a female athlete.

Case report
A 10 year old, subelite female gymnast presented with a six week history of right medial clavicular pain. The onset of pain was not associated with a traumatic episode, and there had been no sudden changes in training in the period leading up to the onset of pain. The pain had increased several days before consultation, after sudden abduction of the right arm during a ballet class, and was exacerbated by hanging by the arm during bar work and hyperflexion of the shoulder. Minor pain was also felt in the middle section of the right upper trapezius. There was no past history of clavicular injury.

Clinical examination showed normal shoulder function, with clavicular pain related to abduction, hyperflexion, and hyperextension. Mild tenderness was noted to the right of the fourth cervical vertebra and in the upper trapezius. There was appreciable swelling and considerable tenderness at the medial end of the clavicle.

A standard radiograph (fig 1) and a computed tomography scan (fig 2) showed an undisplaced fracture through the medial third of the clavicle extending inferiorly to the rhomboid fossa in the inferior aspect of the clavicle. The bony ends were reported to be expanded, and, as the fracture line had sclerotic edges, suggestion was made of evolving non-union and pseudo-arthritis formation.

Surgical consultation was arranged. In view of the unusual nature of the fracture, a magnetic resonance imaging scan was performed to exclude pathological fracture into a cystic lesion in the clavicle, which was suggested by the initial radiographs, but it was confirmed that the fracture had occurred through a deep rhomboid fossa. This was reported as a normal variant and was of similar dimensions in the left clavicle.

Treatment was restriction of training involving the upper limbs. Four weeks after the initial...
presentation, significant callus and minimal tenderness were palpable at the fracture site and no pain was felt throughout the full range of motion of the shoulder. Radiographs obtained one week later (fig 3) showed bridging callus at the superior aspect of the clavicle, blurring of the inferior margin of the fracture, and relative sclerosis of the middle third of the clavicle consistent with a stress response.

The patient returned to full training eight weeks after her initial presentation.

Discussion
This case report describes a rare stress fracture with several unique features. The case is unusual in that the fracture line was clearly visible on standard radiographs, the fracture was in the medial half of the clavicle, and the patient was a 10 year old girl. In addition, the fracture line ran through the area of a large fossa, the presence of which may have led to an area of relative weakness.

The mechanism of this injury has not been well researched. In the case of the diver noted above, it was suggested that the fracture was due to stress, resulting from striking the water, radiating up the arm to the clavicle. In the case of the javelin thrower, pull of the clavicular portions of the deltoide and pectoralis major were suggested as causes. The sternocleidomastoid and pectoralis major muscles insert into the medial section of the clavicle, and pull of these muscles in association with a large rhomboid fossa may have contributed to stress fracture in this young gymnast.

CONCLUSION
In almost all sports, repetitive actions are components of training and competition. When acute trauma has been excluded and bony injury is suspected, stress fracture should be considered even if the symptoms and signs appear to arise from an unusual site. Although an underlying bony abnormality was not found in this case, the possibility of a pathological fracture should always be entertained in cases of unusual stress fracture.

Take home message
If acute trauma has been excluded and clinical examination suggests bony injury, stress fracture should be considered even when the symptoms and signs appear to arise from an unusual site.

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