

Distal radial torus fracture in an adult. A new type of occult wrist fracture?

Fractura en rodete distal de radio en adulto. ¿Un nuevo tipo de fractura oculta de muñeca?

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ABSTRACT

Torus or buckle fractures typically affect children who have suffered indirect minor wrist injuries. They are axial compression-type metaphyseal fractures of cortical and cancellous bone, which are stable and their treatment therefore consists in immobilisation of the joint for three to four weeks.

We present an atypical case of distal radius torus fracture in a 19-year-old adult male, which has not been previously reported in adults and can be considered a new type of *occult fracture*. Knowledge of this possibility is mandatory to be able to make a differential diagnosis of wrist sprain in adults, and avoid performing superfluous complementary tests due to the persistence of pain and functional incapacity.

Keywords. Torus fracture. Radius. Adult. Occult fracture.

RESUMEN

Las fracturas en rodete afectan típicamente a niños que sufren un traumatismo leve indirecto en la muñeca. Son fracturas metafisarias por compresión axial del hueso cortical y esponjoso que son estables y que, por tanto, su tratamiento consiste en inmovilizar la articulación durante un período de tres a cuatro semanas.

Presentamos un atípico caso de fractura distal de radio en rodete en un hombre de 19 años, que no ha sido previamente descrita en adultos y puede ser considerada un nuevo tipo de *fractura oculta*. El conocimiento de esta posibilidad es esencial para poder realizar el diagnóstico diferencial con un esguince de muñeca en adultos, y evitar la realización de pruebas complementarias innecesarias ante la persistencia del dolor y de incapacidad funcional.

Palabras clave: Fractura en rodete. Radio. Adultos. Fractura oculta.

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INTRODUCTION

Occult fracture of the wrist is a frequent situation in adult people. Several studies demonstrated that a considerable number of traumatic injuries originally diagnosed as wrist sprain were distal radial fractures, an inaccurate diagnosis that sometimes conceal an type of incomplete fracture. Within this type of fractures, named as *occult fractures*, torus or buckle fracture has not been reported yet because it is typical in the pediatric age but not in adult life.

Torus or buckle fractures are axial compression-type metaphyseal fractures of cortical and cancellous bone; they are stable because cortical bones do not break, thus the periosteum remains intact, and the metaphyseal bone is compact in children. The site of cortical failure is the transition from metaphysis to diaphysis¹. In a torus fracture there is an intact cortex at the side of the fracture which gives more intrinsic stability than in greenstick fractures where one side of the cortex is disrupted.

The purpose of treatment is therefore pain prevention rather than displacement prevention; thus, a plaster cast or brace preventing movement of the wrist should be applied until pain subsides, which usually occurs after three or four weeks.

In the literature reviewed, the only references to this type of fracture in adults were found in ribs^{2,3} and chin area⁴.

We present an atypical case of distal radius torus fracture as a cause of occult fracture of the wrist, highlighting its possible, though rare, manifestation in adults. The knowledge of this possibility is mandatory to diagnose it in adults avoiding to perform other superfluous complementary diagnostic test.

CASE REPORT

A male aged 19 years and 9 months who accidentally felt on his left hand, was diagnosed as wrist sprain at Aid and Emergency, after the X-ray being assessed as normal with suspicion of an occult fracture.

He attended our department two days later with persistent bearable pain in upon wrist movement but being incapable to lift any weight.

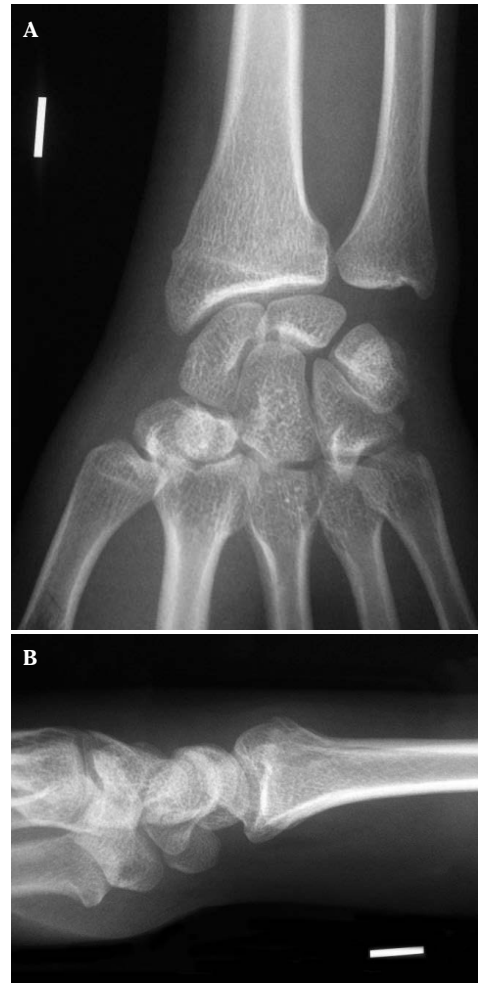


Figure 1. A. AP view of the left wrist depicting torus fracture of the distal metaphyseal radius. B. Lateral view of the same wrist.

Clinical examination revealed tenderness in the radial side of the metaphysis, volar and dorsal aspects of the metaphysis, and just proximal to Lister's tubercle.

Repeated examination of the previous X-ray revealed a torus or *buckle* fracture of the left distal radius, proximal to the physeal scar of the physeal closure (Fig. 1). The physeal plate was absent in both wrists, as normally occurs in adults. The patient stated that he had stopped growing at 16-17 years of age. An X-ray of the contralateral right wrist was normal (Fig. 2). The patient had no history of metabolic diseases or conditions of any kind.



Figure 2. A. Normal contralateral right wrist without the metaphyseal fracture. B. Lateral view of the right normal wrist.

A removable splint was applied to immobilise the joint so that the skin could be cleaned and moisturised once or twice a day. The splint was removed three weeks later, after confirming that both hand movements and the application of pressure at the fracture site resulted in no pain.

DISCUSSION

Dóczi et al⁵ reviewed 626 wrist injuries diagnosed as wrist sprain, 39 of which were

distal radial fractures discovered only after repeated examinations, so they suggested that to repeat standard four-view X-ray examination and other imaging methods (magnetic resonance imaging, MRI), are necessary to diagnose these occult fractures. Bergh et al⁶ suggested that wrist sprain should be defined as *occult partial or complete soft tissue (ligament, tendon, muscle) or bony injury in relation to a trauma with negative X-ray* and stated that MRI should be considered as a part of an early diagnosis. Jorgsholm et al⁷ only found a 43% sensitivity in the diagnosis of distal radius fractures with only plain radiographs compared with MRI. According to Glickel et al⁸ MRI is indicated if three out of six areas of tenderness (radial side of the metaphysis, ulnar side of the metaphysis, volar and dorsal aspects of the metaphysis, distal radioulnar joint, radial styloid and just proximal to Lister's tubercle) are present. In our patient, three of these areas were painful although the first day plain X-ray were informed as normal.

These studies demonstrated that a considerable number of traumatic injuries originally diagnosed as wrist sprain were undiscovered distal radial fractures. According to Glickel et al⁸, and on the contrary to Bergh et al⁶, MRI is not required if the patient has a slight tenderness of the distal radial metaphysis and is immobilized properly, because the possibility to have an occult fracture is assumed. None of these authors makes any reference to an exceptional type of lesion in adults as the torus or buckle fracture, which is not easily diagnosed on plain X-ray, mainly in adult bone.

Buckle fractures result from an axial injury that is insufficient in force to create a complete discontinuity of bone but buckling of the cortex. This type of fracture occurs in children because their bones are generally more flexible and elastic than those of adults¹ and typically occurs in the distal radius, less commonly in the distal tibia and other bones (radial neck, fibula, distal femur) while no cases in distal radius have been reported in adults.

Buckle fractures of the distal radial metaphysis in children are stable, and do

not require follow-up. Treatment comprises joint immobilisation for comfort using a splint that can be removed by the parents after three weeks⁹. Despite the fracture not being diagnosed, no subsequent complications are anticipated due to the incomplete and stable nature of the fracture. The main purpose of immobilisation is comfort, preventing the pain caused by the injury for around three weeks.

Radiological follow-up is not required as the consolidation of stable compression fractures cannot be confirmed by X-ray due to the lack of callus formation.

Unstable fractures lead to woven bone formation secondary to fibrous tissue, but when fractures are not displaced, cancellous bone in metaphyseal areas may heal with limited callus formation¹⁰. Metaphyseal fractures heal directly through intramembranous repair. Haematoma, osteonecrosis and inflammation do not manifest in the cell proliferation stage, with little loss of vascular function and little distortion of trabecular structure as occurs in torus fractures. Stem cells play an important role in metaphyseal healing, and inflammation is not obvious at the early stages¹¹. Intramembranous ossification involves two different locations: one in the marrow of the fracture site, the other on the surface of pre-existing trabeculae. The whole process consists of four histological stages: cellular activation and differentiation, formation of woven bone and new trabeculae, transformation of woven bone into lamellar bone and further remodelling.

Torus fractures in adults are very rare, and the only reported cases affected the jaw after injury⁴, the ribs after cardiopulmonary resuscitation¹² and chest injuries³. Diagnosis can only be confirmed through a computerized tomography (CT) scan, and post-mortem CT scans have also been reported^{3,12}. This type of incomplete rib fracture may occur in adults aged from 21-76 years², probably due to the greater elasticity of the ribs, which provide protection of the thorax but are in constant motion due to respiration.

As torus fractures typically occur in immature bone, they are not expected to be

found in adults, meaning that they can be easily overlooked (occult fractures) by general practitioners and orthopaedic surgeons inexperienced in treating musculoskeletal injuries in children, as happened in our case. Due to the scarce and well tolerated symptoms besides the benign and short evolution makes not necessary to perform MRI.

Our distal radial torus fracture case in a young adult demonstrates that even after skeletal maturity, cancellous bone may still be compact and resistant enough to sustain injury without complete cortical rupture. This diagnosis explains the patient's three to four week pain symptoms.

The knowledge of this injury modifies the treatment because patients with the occult fractures spend some time without any immobilization (or a simple bandage due to the diagnosis of wrist sprain) and, due to the persistence of the symptoms (pain, slight inflammation), some unnecessary complementary test may be required (blood test, rheumatoid tests, and CT scan, MRI and/or scintigraphy), raising the medical costs.

As a conclusion, we want to highlight the fact that this type of fracture, which typically occurs in children, may also be the cause of pain and temporal functional incapacity in adults, despite not having been reported to date in the literature. It is a new reported type of occult fracture in adults that requires a high degree of suspicion and the awareness that it can also afflict adults to diagnose it. This knowledge is important to avoid carry out superfluous complementary tests.

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