

CASE REPORT

**An unusual case of posterior elbow dislocation
with proximal radioulnar translocation[☆]**



J. Gómez Robledo^{a,*}, M.L. Díez Lizuaín^b

^a Servicio de Traumatología y Cirugía Ortopédica, Hospital Sierrallana, Torrelavega, Spain

^b Servicio de Radiodiagnóstico, Hospital Sierrallana, Torrelavega, Spain

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Abstract We present a 9-year-old girl who suffered a posterior dislocation of the right elbow with a proximal translocation between the ulna and the radius. It is a type of exceptional dislocation which in our case was not accompanied by lesions of the joint surfaces of the elbow unlike most cases already published. This article stresses the importance of making an early diagnosis of this variety of dislocation; this is the best way to prevent it from going unnoticed. The use of Computed Tomography (CT) helped this early diagnosis, enabling an immediate closed orthopaedic reduction and achieving a cure without sequelae.

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PALABRAS CLAVE

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Un caso inusual de luxación posterior del codo con translocación radiocubital proximal

Resumen Presentamos el caso de una niña de 9 años que sufrió una luxación posterior del codo derecho con translocación proximal entre el cúbito y el radio. Se trata de un tipo de luxación excepcional que en nuestro caso no se acompañó de lesiones de las superficies articulares del codo, a diferencia de la mayoría de los casos ya publicados. En este artículo se insiste en la importancia de realizar un diagnóstico precoz de esta variedad de luxación, siendo su conocimiento la mejor forma de evitar que pase desapercibida. La utilización de tomografía axial computarizada (TAC) ayudó a ese diagnóstico precoz, permitiendo realizar una reducción ortopédica cerrada inmediata y conseguir una curación sin secuelas.

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* Corresponding author.

E-mail address: jgrobledo@ono.com (J. Gómez Robledo).

Introduction

Elbow dislocation is the most common of all dislocations in children, and is normally associated with bone lesions and varying degrees of capsular and ligament injury.¹ However, elbow dislocation is still a rare paediatric injury because the relative weakness of bones compared with joints, generally causes a supracondylar fracture instead of dislocation. In one broad study of 1579 paediatric injuries to the elbow only 45 dislocations (approximately 3%) were recorded, the majority of which occurred around the age of skeletal maturity.²

Proximal radioulnar translocation with elbow dislocation, also termed convergent dislocation by some authors, is exceptional. In these cases, both the radius and the ulnar dislocate from the humerus and are then transposed in such a way that the radial head appears opposite to the trochlea and the ulnar opposite to the condyle in X-rays. According to Comboreau et al.³ late diagnosis accounts for over half of cases. The biggest challenge regarding this lesion is being able to make an early diagnosis to avoid the appearance of sequelae.⁴

Clinical case

A 9-year old patient presented at the emergency department after suffering an accidental fall from the top of a

slide. Her father stated that to prevent hitting her face she extended her elbows before impacting the ground with both hands. On arrival at the emergency services the girl presented with severe pain and major deformity of the right elbow. The medical emergency department staff requested an X-ray of the elbow in 2 projections, although finally only the lateral projection was performed. The reason for only undertaking a single X-ray projection was the lack of collaboration by the patient due to the intense pain she was suffering. This single X-ray was considered sufficient to make a diagnosis of posterior dislocation of the elbow joint (Fig. 1a).

The patient was then assessed by the on duty orthopaedist, who noted a prominent olecranon in the posterior region in the right elbow, whilst the girl kept her forearm fixed in mid pronation-supination attached to the chest with the help of the other hand. After examination of the lateral X-ray of the elbow it was considered that the patient had a posterior dislocation of this joint, and a reduction procedure took place with the administration of intravenous analgesia in the emergency cubicle. Forearm traction was performed in discreet supination whilst contraction of the arm was maintained and whilst the elbow was moved from 90° to being slightly bent. During this manoeuvre, after hearing a "clunk" the posterior deformity of the elbow disappeared and we had the sensation of having achieved reduction of the dislocation and having



Figure 1 a: Lateral X-ray of the right elbow where posterior dislocation of the ulnar and radius is observed without any apparent associated fractures; b and c: AP and lateral X-rays of the elbow after the first reduction where proximal radioulnar translocation and loss of the radiocapitellar line is appreciated; d: 3-D image of the elbow, showing inferior subluxation of the radial head and the good congruency of joint surfaces between the proximal end of the ulnar and the humeral condyle.

obtained a congruency of the joint surfaces. The patient also noticed pain relief, although when specifically asked she referred to the presence of paresthesias in the region of the ulnar nerve. The elbow was immobilised with a plaster cast at 90° and the forearm in mid pronation-supination. In the post-reduction radiological study the proximal cross-linking between the ulnar and the radius was initially undetected in the anteroposterior projection, although in the lateral projection a break in the radiocapitellar line was observed (Fig. 1b and c). A CAT scan of the elbow was immediately requested as the existence of an intra-articular bone fragment or a hidden fracture was initially thought possible. In this last test we observed how the humeral condyle perfectly fitted into the proximal end of the ulnar, whilst the head of the radius was internal after anterior cross-linking with the ulnar, and being situated opposite the trochlear ossification centre (Fig. 1d).

A second attempt at reduction was subsequently made under general anaesthesia. It was specifically observed prior to proceeding with reduction that the pronation-supination of the forearm was blocked. Reduction consisted in traction of the forearm in supination whilst the elbow was slightly extended. Once the reduction manoeuvres has been completed an image intensifier was used to confirm joint stability and the elbow was immobilised at 90° of flexion and extension and the forearm was in mid pronation supination (Fig. 2a and b). Clinically, after the second reduction involvement of the ulnar nerve persisted. Immobilisation was withdrawn after 4 weeks with mobilisation of the elbow without restrictions commencing immediately after this. After 3 months the patient had developed major atrophy of the interosseous muscles in the hand, secondary to ulnar nerve injury and was referred to the physiotherapy service. The electroneurographic study made showed right ulnar nerve involvement at elbow level of axonal type and severe in degree, with signs of active denervation. Ulnar paresis was gradually alleviated from the 5th month until its complete recovery in the 7th month. The radiological study after 11 months showed several major heterotopic ossifications at ulnar tuberosity level which were asymptomatic (Fig. 2c). After 12 months the patient presented with complete movement of the elbow without pain and functionality of the hand was also completely re-established.

Discussion

The first description of this lesion was made by MacSween⁵ in 1979, where proximal translocation was associated with posterior dislocation of the elbow and a minimally displaced fracture of the radial head. This association led several authors to consider this lesion as a variant of Monteggia fracture-dislocation where there would be no fracture of the ulnar, but the reality was later demonstrated that this was a totally different pathological entity.⁶ We have divided dislocations with proximal radioulnar translocation into those where there is associated fracture of osseous stabilisers of the elbow – the majority – and those with pure dislocations without associated fractures of these structures, similar to the present case. These lesions are usually associated with epiphysiolysis or a fracture of the upper radial neck, fracture of the choroid apophysis or even an epitrochlear



Figure 2 a and b: Lateral and AP X-ray of the elbow after second reduction showing the normal congruency of the joint surfaces; c: lateral X-ray with the elbow flexed at 11 months of follow-up where a voluminous heterotopic ossification in the anterior surface of the ulnar is apparent.

fracture.^{1,2,4,5,7-13} Apart from possible osseous lesions of the ligaments which always accompany dislocation, other frequent lesions were neurological, and especially lesion of the ulnar nerve.^{3,9,14} Another nerve which is exceptionally involved is the median nerve, about which 2 cases have been published, one prior to proceeding with surgical reduction of dislocation¹⁰ and the other after reduction surgery. The lesion may therefore have been due to this reduction surgery.⁶

With regard to the dislocation mechanism, for some authors this resulted from a fall with the wrist in extension

and the forearm in supination, whilst the elbow remained extended or partially flexed.^{9,13} However, for the majority of authors the most frequent mechanism was a fall with the elbow extended and the forearm pronated.^{1-3,7,15} Some authors^{10,16} mentioned an iatrogenic origin on using excessive force in forearm pronation in a posterior reduction of elbow dislocation, and reduction manoeuvres should therefore be made with the forearm in supination. However, radiological studies presented by the authors who defend this last hypothesis were not at all conclusive. Harvey and Tchélébi¹⁶ attached some bad quality X-rays before reduction where no real anteroposterior projection was included. Leconte et al.¹⁰ did not even publish the initial X-ray study in their article to find out whether this type of dislocation already existed before the start of treatment.

When we attempt to reduce a posterior dislocation of the elbow with proximal translocation of the forearm bones pseudoreduction or false reduction may occur. This is evident with the disappearance of the elbow deformity, the presence of a *clunk* sound of the bone fitting back and the sensation that the elbow is totally stable. In pseudoreduction the flexoextension of the elbow improves but not the pronation supination which is blocked or there is a fixed forearm in pronation.¹³⁻¹⁵ In the radiological study the posterior dislocation of the elbow disappears but translocation persists between the ulnar and the radius. This event has already been published by different authors, but was not sufficiently assessed or submitted to discussion in their articles.^{5,13,14,17} In our review of the literature we found that this had occurred in up to 40% of published cases. Carey⁷ also coined this term, but in his case pseudoreduction was only achieved when the forearm was tractioned, although it disappeared when this manoeuvre was stopped, with the posterior dislocation reappearing.

Regardless of the variety of dislocation of the elbow which we are treating we believe it is useful to carry out pronation-supination manoeuvres after reduction as part of the examination in assessing post-reduction joint stability. The blocking of pronation and supination should alert us to any need to review the previously performed X-rays more exhaustively in search of a possible proximal translocation of forearm bones.

In addition to accurate clinical assessment, an appropriate radiological study becomes essential, in a similar light to other types of trauma injuries. A good quality X-ray of the elbow should be performed in 2 projections before and after reduction dislocation. The most normal errors found were non-existence of an initial appropriate radiological study, over confidence in diagnosis on consideration that this is a simple elbow dislocation or because standard radiology was replaced by direct viewing in radioscopy.^{12,15-17} These errors committed in the interpretation of initial radiological images have in many cases led to late treatment with the consequent morbidity in the patients.^{3,10,18}

In the assessment of radiological studies we believe in the case of pseudoreductions, lateral projection of the elbow is more sensitive than anteroposterior projections. In lateral radiology there is always a change in the radiocapitellar line which is indicative of a dislocation of the radius that requires examination.^{6,18} The anteroposterior view of the

elbow is diagnostic in itself if we think of a proximal translocation, but its interpretation is often insufficient.¹⁰ This may be due to a lack of familiarisation in viewing the ossification nuclei of the elbow in children. Other factors involved in confusion of interpretation of images in this projection are that of keeping the forearm highly pronated when performing radiology or not managing to see the radioulnar proximal cross-linking due to insufficient radiological visual field. Unlike us, other authors such as Roberts et al.¹¹ would attach greater validity to the anteroposterior projection than to the lateral projection but for different reasons. In 3 cases which these authors published there was a radial head fracture which itself would alter the radiocapitellar line, and therefore make the lateral projection of little value. The case we present is the second where CAT imaging is used for an early diagnosis. In our case this test confirmed a radioulnar translocation without lesions of the elbow joint surfaces. Self criticism later took place with regards to this, since diagnosis and treatment should have been carried out with regards to standard radiological study. Neither is the increased risk of radiation for the patient from its use negligible, as commented by several authors.¹⁴ In the case published by Wodecki et al.¹² it is possible that the CAT scan was not necessary either. In this case in the first plain X-ray study after reduction it was highly evident that the radial head was clearly dislocated, whilst the ulnar fitted into its anatomical space. However, the CAT served to diagnose a divided fracture of the radial head which had gone unnoticed in the standard radiological study. We do not agree with these authors who considered the CAT useful for preventing difficulties in reduction and the most probable need for surgery as occurred in their case. However, we do believe it is useful to perform radiological studies in search of hidden fractures, similarly to any other type of elbow dislocation.

Closed reduction has been successful only in a few cases and provided that early diagnosis is performed, but it is ineffective in cases of late diagnosis.^{1,6,15,18} The main cause for non reduction would be the soft-tissue interposition or the presence of secondary osseous lesions which would act as interposition.^{1,2,4,6,17} The need for surgery has also been frequent for carrying out osteosynthesis of the associated fractures.^{8,9} To produce this injury there should be a major rupture of the ligaments and soft tissues around the upper radioulnar joint, and especially the annular ligament. For translocation of the radial head several authors^{3,7,12,13} suggest that the insertion of the anterior brachial tendon has to be broken, with this lesion evidenced in the form of heterotopic ossifications a few weeks after the trauma. We have also considered that most ossifications usually have a defined morphological pattern with a greater longitudinal axis parallel to the epiphysis and radius neck of the anterior surface of the ulnar. It is possible that we have underestimated its real size due to the lack of late radiological studies or that the ossifications be confused with normal bone as they are superimposed with this in standard radiological projections. Apart from the possible influence of the loss of movement in the medium to long term neither do we know whether they may be the cause of other dysfunctions in the elbow long term, due to the lack of follow-up of these patients.

In children the avulsion of the brachial tendon is not usually diagnosed in initial X-rays because there is incomplete ossification of the coronoid apophysis or because the avulsed fragment is very small. The tendon is frequently interposed between the proximal radius and the ulnar, impeding its reduction, as has been substantiated in some patients who underwent surgery.⁷ Yoon and Seo¹³ published the only case which is documented by magnetic resonance images where incarceration of the fractured radial head was expressed between the injured anterior brachial tendon and the coronoid apophysis.

After reduction of dislocation there is no agreement regarding the way in which the elbow should be immobilised and for how long. Some authors keep the elbow at 90° in a neutral position of the forearm for 3 weeks^{3,7,9,18} but other authors prefer to keep it for 4 weeks with supination of the forearm,^{5,12-14,17} or even for 5 weeks, adopting different degrees of elbow flexion.⁶ Extreme cases have existed where the elbow was immobilised for 2 months.³ This disparity of criteria is partly due to lack of familiarity with this condition and that in many cases surgery was required to reduce the dislocation or to treat the fractures, compared with other cases where simple closed reduction was all that was required. Furthermore, in cases of late diagnosis on many occasions, liberation from adhesences and pre-surgical stiffness was insufficient. In these cases sometimes extraordinary procedures have been necessary so as not to have an unstable elbow, such as the reconstruction of the annular ligament^{3,15} or the radiocapitellar fixation with Kirschner wires.^{9,18}

Among the complications of this lesion are changes in growth, non-union and avascular necrosis when dislocation is accompanied by radial head fractures.^{3,11,13,16} The most common sequelae were the loss of movement in the elbow, especially pronation-supination to which anterior heterotopic ossifications in the elbow contributed.^{3,15} The main determining factor of this loss of movement is failure in the early diagnosis of this type of dislocation.^{4,8} In reviewed articles neurological lesions were reversible over the months and did not lead to sequelae.

Conclusion

Posterior elbow dislocation with proximal radioulnar translocation is an exceptional dislocation which mainly occurs in children. On many occasions it initially goes unnoticed with inappropriate treatments being given that leads to the appearance of new lesions or future sequelae. The best way to avoid possible complications is the orthopaedist's familiarity with this condition or even that of other medical professionals involved in trauma emergencies. In all cases a correct clinical examination and the demand for precise radiological projections are required for correct diagnosis, both prior to dislocation and once it has been reduced.

Level of evidence

Level of evidence v.

Ethical liabilities

Protection of people and animals. The authors declare that for this research no experiments have been carried out on humans or animals.

Data confidentiality. The authors declare that they have adhered to the protocols of their centre of work on the publication of patient data.

Right to privacy and informed consent. The authors declare that no patient data appear in this article.

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