Original Article

Elbow Floating in Children: About Three Cases and Literature Review

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Abstract

Purpose: The aim of this study was to determine the epidemiological, lesion, treatment and outcome of the 'floating elbow' in children. **Observations:** It was two boys and a girl with a mean age of 7 years. The average consultation time was 3.6 h. In two patients, the trauma had occurred during playful accident with fall from a height. Supracondylar fracture was associated with a fracture epiphyseal separation-type II distal end of the right radius in one case, a fracture of the distal quarter of the bones 2 of the forearm in the second patient and fracture quarter distal radius in the third patient. All fractures of the elbow were treated by osteosynthesis as well as a fracture of the distal radius ¼. The average hospital stay was 5 days. After a mean of 8 months was rated limitation of elbow flexion to 100° in a patient, an externalisation of the pins at the elbow in M3 in one patient and a limitation of elbow extension at 30° in 2 patients. One patient had a varus ulna. The pronosupination was preserved in all patients. **Conclusion:** The 'floating elbow' is unusual in children and usually occurs during a high-energy trauma. His treatment is not yet the subject of consensus. Complications often involve the elbow.

Keywords: 'Floating elbow' child, functional limitation, surgery

Introduction

The floating elbow is the association of a humeral supracondylar fracture and a fracture of one or both bones of the forearm.[1-5] It is rarely encountered in traumatic pathology of the child with an incidence of 3%–13%.[6-8] This disease occurs usually in children over 5 years. It occurs with the waning of a high-energy trauma. The diagnosis is clinical and radiological. Standard radiography can often make an accurate assessment of the lesions.[6,9,10] Treatment is usually surgical,[1,2,4,6,7,9,11,12] but some authors opt for orthopaedic treatment.[10,13] The evolution is usually favourable, but complications related to the fracture of the elbow and that of the forearm type of malunion, stiffness and epiphyseal closure have been reported.[2,6,11,14-17] Non-union is rare in children.[1,9,16,18] In Africa, and particularly in Senegal, few cases are reported in the[2,9,10] child. Thus, we initiated this study to determine the epidemiological, lesion, treatment and outcome of the floating elbow in three children in care in the Paediatric Surgery Department of the Hospital Aristide Le Dantec in Dakar.

Observations

Observation 1

Mr. S. D. is a boy of 8 years, right-handed, schooled, with no particular pathological history. He would be the victim of a firm traumatism of the right elbow occurred 4 h before his admission. He would have fallen from a tree with a reception on the dorsal side of his right elbow flexing hand, at the exit of the school. In the presence of a pain, and an absolute functional impotence of the right upper limb, the parents consult in our service. At admission, the clinical examination found a good general condition, well-coloured mucous membranes, apyrexia and a stable haemodynamic state. At the level of the right upper limb, functional impotence, limb edema, elbow and wrist distortion without vasculonervous disorders were noted. A standard X-ray of the elbow and the forearm, straight from the front and profile, was found: a supracondylar fracture type 3 by Rigault and Lagrange and a type II epiphyseal fracture of the distal end of the radius [Figure 1]. A suspension treatment of the limb with the zenith associated with an analgesic was initiated for 2 days. At day 3 hospitalisation, a blood reduction and a cross-socket with Kirschner pins of 18/10 and 16/10 caliber were performed at the elbow and radius [Figure 2]. Radiography of the elbow and wrist at

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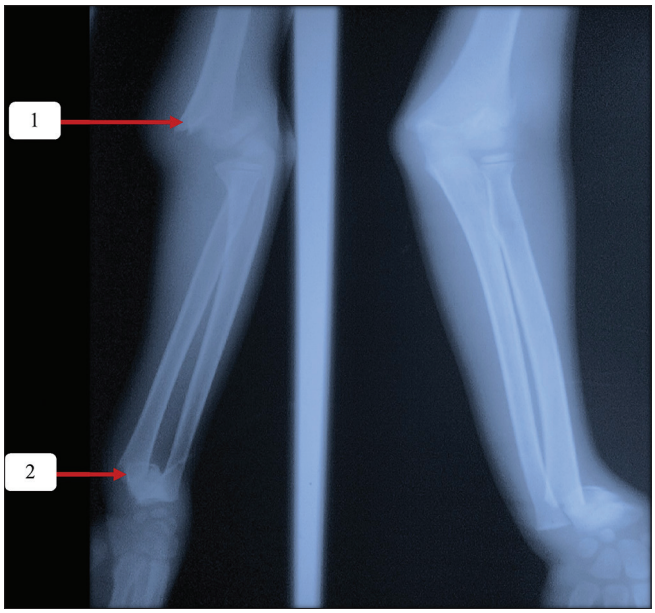


Figure 1: Radiography of the arm Face/Profile taking the elbow and the wrist: - (1) supracondylar fracture type 3 Rigault and Lagrange - (2) delamination fracture type II -épiphysaire the distal end of the radius

D1 postoperative showed a reduction deemed acceptable. The discharge from the hospital was authorised on day 4 postoperatively under a BABP splint and analgesics. Wound healing was noted at post-operative day 20, and removal of the splint was performed. The measurement of the Baumann angle was 71° to M6 postoperative. Removal of osteosynthesis equipment and mobilisation of the elbow were performed at M6 postoperatively under general anaesthesia, and self-rehabilitation was advocated at home under the supervision of parents. The activities of everyday life (meals, baths and dressing) are done without help. The clinical examination performed at M7 post-operatively found a flexion limited to 100° [Figure 3], a complete extension of the elbow, a normal prognosis without deviation of axis.

Observation no. 2

L. D. is a 7-year-old right-handed boy, enrolled in the course of initiation, without any particular pathological history. The accident occurred 3 h before his visit to the surgical emergency unit of the HALD's paediatric surgery department. It would have made a fall of a wall about 5 m of height with reception on the palm of the right hand elbow in extension. The examination at admission found a good general condition, well-coloured mucous membranes and a temperature at 36.5°C. Physical examination noted deformity, swelling of the right elbow, deformity and exquisite pain in palpation of the forearms without vasculonervous disorders. The standard radiographs of the elbow and forearm of the face/profile showed: a supracondylian fracture type 4 by Rigault and Lagrange, A fracture of the distal quarter of the transverse radius with an overlap of about 1 cm, and a green wooden fracture of the distal quarter of the right ulna with angulation. Waiting treatment by suspension of the limb at the zenith, and analgesic was

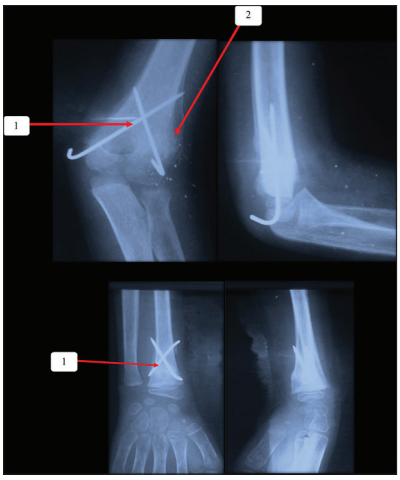


Figure 2: X-ray elbow and wrist M6 postoperatively, calluses formed (1), pins (2) in place

initiated. At day 3 of hospitalisation, a reduction under general anaesthesia and under a shining amplifier and a restraint according to Blount was carried out with immobilisation by plaster cuff at the level of the forearm. Blount's contention was accidentally defeated during the control radiography which showed a secondary displacement. A bleeding reduction with X-racking at the elbow was performed at post-traumatic J6, supplemented by a BABP fenestrated plaster at the elbow. The discharge from the hospital was authorised on D4. Wound healing of the operative wound occurred postoperatively, and a plaster cuff was performed post-operatively. The patient is lost to sight for 3 months. Subsequently, we noticed an issue of the pins through the skin, a stiffness of the elbow and deterioration of the plaster. After a control radiography showing the formation of a callus, we removed the pins and plaster and self-rehabilitated. The postoperative M7 clinical examination returned to the interrogation: A resumption of everyday activities (baths, meals and dressing) that are normally performed without help. On the other hand, the physical examination noted a limitation of the extension of the elbow to 30°. We carried out a mobilisation of the elbow under general anaesthesia with sessions of self-re-education at home. At post-traumatic M10, the clinical examination found a limitation of the extension to 15° without any notion of discomfort in the activities of the daily life (baths, dressing and meals). The measurement of the Baumann angle on the control radiograph was 74°.

Observations no. 3

A. C. Is a 6-year-old girl with no previous history, right-handed, not educated. She was referred by a health centre for multiple trauma 4 h after an accident on the public highway. She was allegedly hit by a public bus called 'fast' when crossing the roadway without any notion of loss of initial knowledge or vomiting. The general examination found a good general condition, a clear consciousness, pale mucous membranes and a temperature of 36.6°C. Physical examination noted an absolute functional impotence with painful swelling and right



Figure 3: Limitation of elbow flexion in a patient

leg dermabrasion, left elbow deformity and swelling across the front left arm elsewhere. The radiographs of the left elbow and the left wrist of the face/profile showed a supracondylar fracture type 5 of the left elbow and a fracture of the distal quarter of the radius with non-displaced transverse line. The standard X-ray of the right leg of the face and profile revealed a medodiaphyseal fracture of the non-displaced tibia treated orthopaedically with a cruro-pedic plaster. The diagnosis of left floating elbow associated with a fracture of the left tibia was laid. Waiting treatment with a zenith member suspension and an analgesic treatment were performed. A reduction of the left elbow was made, and a brachio-antebrachio-palmar splint was performed at post-traumatic J3. The discharge from the hospital was authorised on day 7 after surgery after the removal of the drain of Redon. Cicatrisation occurred on day 25 after surgical wound suppuration with daily dressings and fucloxacillin antibiotic therapy after swabbing and bacteriological examination. At the post-operative stage, we removed the BABP splint. We noted a secondary displacement of the fracture at M1 postoperatively. Clinical examination of the patient noted a stiffness of the elbow with a limitation of the extension to 30° and an axis deviation to varus ulna at M7 postoperative. The X-ray of the elbow of control resumed a consolidation of the fracture. The ablation of the material is performed at post-traumatic M10 with the impossibility of removing the steel wire deeply anchored in the bone. The measurement of Baumann's angle was 84°.

Discussion

The floating elbow in children is rarely reported in the literature.[1,2,6,9,10] Indeed, our literature review allowed us to regain some cases.[2,6,9,15,16] The largest series was reported by Ring[19] 16 patients with 9 years. In our study, we report three cases a year. A predominance of floating elbow in boys is emphasised in the literature,[1,19] as we noted in our study. In general, paediatric trauma boys are more affected than girls because of their turbulence. In the literature the age varies between 5 and 15 years with a peak in frequency at 8 years.[1,2,6,9,12,16,18] This is what we found in our study with the age limits of 7–8 years. Most patients were received on the same day of the trauma with an average of 3.6 h of consultation. This is the amount of deformation and absolute lameness motivates consultation immediate posttraumatic period in hospital. According to Templeton,[6] floating elbow followed in most cases a high-energy trauma and injury mechanism requires a fall with reception on the palm of the hand, forearm pronation and elbow extended. In our study, the mechanism is a fall from a great height in two of our patients. Occurrence of the circumstances are dominated by domestic and recreational accidents.[1,6,10,15,16] The affected side is variable according to[16,19] mechanism. Conventionally, when the falls is not the dominant member who is most often affected[20] contrary to what we found in our study. Associated lesions are based on impact severity and circumstances of occurrence. The existence of an associated fracture is widely described in the literature[9,18,21,22] as well as neurovascular and skin lesions.[6,16] It is the existence of these complications are the seriousness of the management of floating elbow. In our practice, only the standard radiograph is requested. We have in our series, at the supracondylar fractures of the elbow extended to 3-4-5 type according to the classification of Rigault and Lagrange. At the forearm fractures are located at the distal quarter. In two of our patients, only the radius is affected, with specific fractures in the child type greenstick fracture; in of butter and a case of type II epiphyseal décollement. Closed or open supracondylar fractures are the most common types of injury in children[5]; on the other hand, diaphyseal fractures are found in adolescents as is the case in the study of El Ibrahimi[5] with 3 cases involving adolescents of 16 and 17 years. Some authors describe the type of Galeazzi fractures and Monteggia[15] associated with supracondylar fractures. Achieving a scanner can make a comprehensive assessment of the lesions more on cartilage damage. In our study, we have not found it necessary to make the scanner to the types of fractures seen on plain radiographs. Faced with the risk of vascular lesions, some authors as Ring perform a Doppler examination in the preoperative assessment before very displaced fractures.[19]

In children, the therapeutic methods remain floating elbow surgery for the vast majority of authors by reduction and pinning closed hearth.[1,6,9,11,23] Templeton[6] recommends priority the reduction and stabilisation of two outbreaks of fractures plug for quick remission of pain and edema, as well as careful management of neurovascular lesions. He believes that the conservative treatment has no place in the treatment of floating elbow as often displaced fractures, moving toward the ulna varus deformity. Harrington[16] recommends the reduction and the first surgical stabilisation of humeral supracondylar fracture due to the potential risk of associated complications. Once the lesion stabilised elbow, the treatment of fracture of the forearm is made, either by closed reduction followed a plaster cast or by a reduction and stabilisation by pinning. Ring[19] considers the stabilisation by pinning of

humeral supracondylar fracture and fracture of the forearm, provides sufficient stability. By cons, some authors[10,13] opt for orthopaedic treatment by performing a reduction and containment as Blount plastered with cuff at the forearm. This cast immobilisation is controversial in the literature due to a high risk of occurrence of compartment syndrome with plaster.[6,12,18,24,25] Suresh,[12] the stabilisation of the reduction with plaster is only a problem in bending increases the risk of compression, in extension reduction is not controlled. We performed a suspension as the zenith waiting processing to melt the edema in all patients. In developed countries, patients are seen early, with a medical transport before installation of edema, unlike our country where patients go around structures before being supported. In our study, we have supported the elbow in priority to the severity of lesions. At the forearm, our therapeutic strategy is based on the types of lesions with orthopaedic treatment for fractures little or no displaced. Orthopaedic treatment keeps his place in paediatric fractures because the latter quickly consolidate without risk usually go.

In our study, one patient developed post-operative complications immediate type of secondary displacement and curbed infection with antibiotics. We have no neurovascular complications or compartment syndrome. Infectious complications are widely described in the case of open fractures[2,3,5,17] and after open surgery which is the case of our third patient. Suppuration is responsible for secondary displacement seen late 1 month. The elbow is a hinge which stiffens rapidly with a risk of malunion described in the literature.[2,13,23] Non-union is rarely found in children.[1] Two of our patients had good results, and we noted a cubitus varus in our third patient. Mobilisation under general anaesthesia and self-rehabilitation enabled us to fight against stiff elbow. Ulna varus is related to the secondary displacement. Fractures of both forearm bones are consolidated on time, and we did not notice any complications. Unlike the distal end of the front-arm, bone remodelling seat can correct the defect correction, the elbow is a very fertile area where the importance of proper anatomical reduction. Despite limiting the mobility of the elbow, the essential function of the elbow is kept for autonomy in daily activities such as eating, bathing and dressing.

Conclusion

The 'floating elbow' is unusual in children and usually occurs during a high-energy trauma. His treatment is not yet the subject of consensus. Complications often involve the elbow.

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Conflicts of interest

There are no conflicts of interest.

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