East African Scholars Journal of Medicine and Surgery
Abbreviated Key Title: EAS J Med Surg
ISSN: 2663-1857 (Print) & ISSN: 2663-7332 (Online)
Published By East African Scholars Publisher, Kenya

Volume-5 | Issue-8 | Sep-2023 | DOI: 10.36349/easjms.2023.v05i08.002

OPEN ACCESS

Original Research Article

Supracondylar Fractures in Children: A Review of 120 Cases

Mohamed Amine Oukhouya[1*], Mohammed Tazi Charki[2], Hicham Abdellaoui[2], Karima Atarraf[2], Moulay Abderrahmane Afifi[2]

[1]Department of Pediatric Surgery, CHU Sous Massa, Faculty of Medicine and Pharmacy of Agadir, Ibn Zohr University, Agadir, Morocco
[2]Faculty of medicine and pharmacy of Fez, Sidi Mohamed Ben Abdellah University, Fez, Morocco

Article History
Received: 14.08.2023
Accepted: 20.09.2023
Published: 23.09.2023

Journal homepage:
https://www.easpublisher.com

Quick Response Code

Abstract: Supracondylar fractures of the humerus in children are the most common fracture of the elbow. Our work is based on the study of 120 cases of supracondylar humeral fractures collected in the surgery department of the Errachidia Regional Hospital Center between January 2015 and June 2020. The average age of the patients was 6 years old, occurring in 69.1% of cases in boys. The left elbow was most affected (60%), the limb being in flexion in 85.8% of cases. The etiologies were dominated by domestic accidents (70%), with stage III fractures the most frequent (37.5%). Orthopedic treatment was used in 40% of patients and surgery in 60%. Results were satisfactory in 95.9%, poor in 4.1%. The poor results were mainly observed in highly displaced fractures.

Keywords: Fractures, supracondylar, humerus, child.

INTRODUCTION

Supracondylar fracture (SCF) of the humerus is an extra-articular metaphyseal fracture of the lower end of the humerus, with the fracture line passing above the line joining the medial and lateral epicondyles. It is the most common fracture of the elbow in children, with a peak frequency between the ages of 5 and 7 and a predominance of males. It is most often an extension fracture [1].

Our work consists of a retrospective study about 120 cases collected in the pediatric surgery department of the Errachidia Regional Hospital Center between January 2015 and June 2020. The aim of our work is to study the epidemiological particularities, anatomopathological aspects, complications, therapeutic modalities and therapeutic results of supracondylar fractures.

METHODS

Setting and type of study: This is a retrospective study of 120 cases of supracondylar fractures collected in the pediatric surgery department of the MY ALI CHERRIF ERRACHIDIA Regional Hospital Center between January 2015 and June 2020.

Study participants: All cases registered during this period were identified and an evaluation form was drawn up, including the parameters to be analyzed (age, sex, mechanism, type of fracture, complications, treatment used, and anatomical and functional results).

Data design and analysis: These data were recorded in an Excel spreadsheet, with results expressed as numbers, means and percentages. This is a descriptive study that objectively analyzes the various aspects of this pathology.

RESULTS

Supra condylar elbow fractures occur in young children, since the average age of our patients was 6 years, with extremes ranging from 8 months to 15 years. The age range most affected was between 5 and 10 years: 72 patients (60%). This age range corresponds to the school age during when children are more turbulent and their incredible dynamism makes them more prone to falls. In our series, 34 patients were under 5 years of age, representing 28.3%, while 14 patients over 10 years of age accounted for only 11.6%.

This series included 37 girls, equivalent to 30.9% with a male predominance of 83, corresponding to 69.1%. With a sex ratio of 2.2. Extension fractures were the most common, occuring in 103 cases (85.8%), while flexion fractures accounted for 14.2% (17 cases). The cause of the fracture was a domestic accident in 84 cases (70%), followed by falls from a high place in 21

***Corresponding Author:** Mohamed Amine Oukhouya
Department of Pediatric Surgery, CHU Sous Massa, Faculty of Medicine and Pharmacy of Agadir, Ibn Zohr University, Agadir, Morocco

cases (17.5%). Only 7 patients (6%) were involved in road accidents, and 8 patients (6.5%) had fractured during sports activity (6.5%).

For associated lesions, we found 5 cases of cutaneous openings (4.1%), including one stage III, and 4 stage I of the Cauchoix and Duparc classification, 2 cases of nerve complications (1.6%). These involved paralysis of the anterior interosseous nerve, with a favorable outcome after 9 months in a 6-year-old girl with a stage IV extension fracture and an 8-year-old boy, no vascular lesion was found, and 2 cases of associated trauma, involving wrist and shoulder trauma.

All patients underwent X-ray of the elbow in front and in profile. Radiological analysis was based on the LAGRANGE and RIGAULT classification, which classifies the fractures according to the mechanism in extension or flexion. For fractures in extension 34.9% were stage 3, followed by stage 4 with 25.3%.

Treatment was surgical in the majority of cases, due to the delay in admission, with patients consulting us once oedema had set in. Thus, in our series, orthopedic treatment using the Blount method was performed in only 3 cases (2.5%): three stage II fractures, and cast immobilization was reserved essentially for stage I fractures in 28 cases and stage II fractures in 17 cases after orthopedic reduction.

For surgical treatment, the Judet technique (percutaneous pinning) was used in 56 patients (Figure 1), with 36 cases of stage 3 fractures and 20 cases of stage 4 fractures. Open surgery was performed in 16 cases.

The evolution was marked by superficial infection opposite the pins in 12 cases (10%), with a favourable outcome, and two cases of elbow arthritis (1.6%), both of which were pin infections. There was also one case of cubitus varus, which was initially treated for its fracture orthopedically and corrected by valgus osteotomy. We also noted four cases of elbow stiffness which evolved favorably after rehabilitation.

At the end of our study, we assessed functional results according to the Marion-Lagrange criteria, which classify results according to elbow mobility, muscular strength, motor or sensory neurological disorders, and the existence of an aesthetic deformation. Results were analyzed according to admission time, treatment adopted (Table 1 and Table 2), and fracture stage (Table 3).

Table 1: Results by type of treatment

Result	Treatment orthopedic	Technical by Judet	Surgery To open sky	Total
Perfect	44	37	10	91
Good	2	17	5	24
Poor	-	2	1	3
Bad	2	-	-	2
Total	48	56	16	120

Table 2: Distribution of therapeutic means according to the stage of the fracture

Treatment	Stage I	Stage II	Stage III	Stage IV
Orthopedic	28	20	0	0
Judet	0	0	36	20
Reduction surgical	0	0	9	7
Total	28	20	45	27

Table 3: Results by stage

Result	I	II	III	IV	Total
Perfect	**28**	**14**	**40**	**9**	**91**
Good	**-**	**6**	**2**	**16**	**24**
Poor	**-**	**-**	**1**	**2**	**3**
Bad	**-**	**-**	**2**	**-**	**2**
Total	**28**	**20**	**45**	**27**	**120**

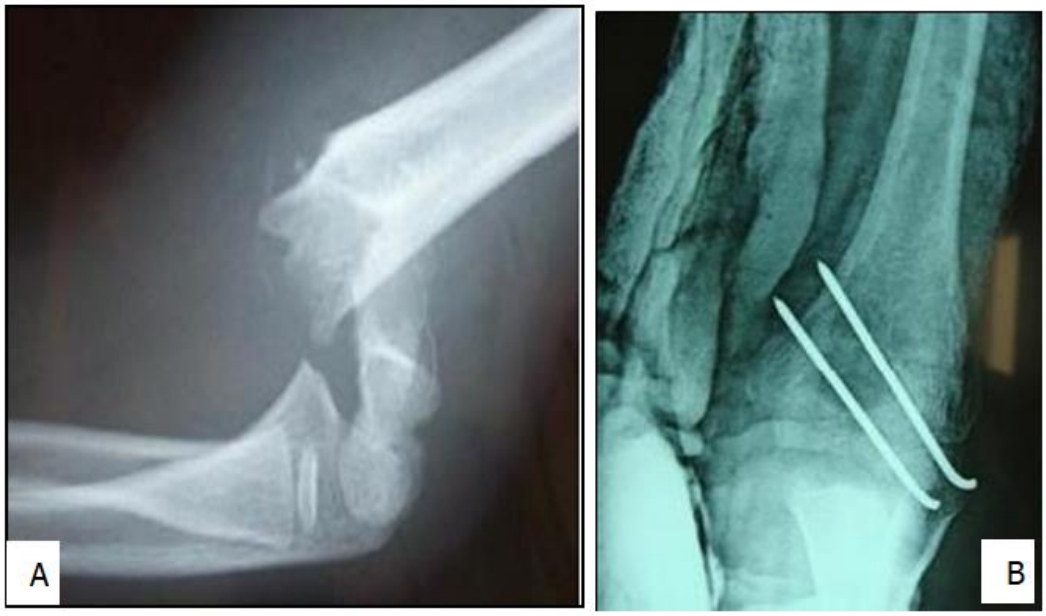

Figure 1: Stage 4 supracondylar fracture (A) with percutaneous Judet pinning (B)

DISCUSSION

These fractures usually occur between 5 and 10 years of age, with a peak frequency at 6 and ½ years. In our series, the average age was 6 years. The same result is reported in the majority of series. The predominance of the 5-10 age group can be explained explained by two characteristics of the child's elbow: according to Mazeau and Diméglio, these are the physiological ligament laxity of the elbow, which favours hyper-extension and the fragility of the supracondylar region between 5 and 10 years of age, due to the significant remodeling it undergoes as a result of growth. Authors agree that SCF is predominantly male, affecting boys in 54% to 73% of cases. In our series 69.1% of patients were boys. This finding may be explained by the high turbulence of boys, especially at school age, with the discovery of fun and sporting activities.

There are two forms of SCF corresponding to two distinct mechanisms: The most common form is the extension fracture, with posterior tilting of the lower fragment, it occurs following a fall with landing on the hand, the elbow being locked in extension, so the mechanism is indirect [2].

Supracondylar fractures in flexion are much rarer than fractures supra condylar fractures in extension. These fractures result in forward displacement of the pallet. They result from a direct posterior impact on a flexed elbow. In our series, 85.8% of SCFs were the result of an indirect mechanism in elbow extension. Only 17 of our patients (14.2%) presented with SCF in flexion.

All authors insist on the interest of prompt surgery for supracondylar fractures. Some of our patients consulted us late after the trauma, despite the urgent nature of these fractures. In our context, this may be explained by the patient´s remoteness from a hospital structure, or by the practice of certain traditional methods (JBIRA) which is still widespread. This delay can lead to serious complications such as Volkmann's syndrome, sometimes with the risk of limb amputation.

Gupta *et al*., [3] found no relationship between delay in patient management and increased risk of complications or recourse to surgery, while PJ Walmsley et al [4] found a correlation between admission delay and operative time. In our series, the delay in admission and management exceeded 24 hours in all of our patients, this is due to our socio-cultural environment, especially in rural areas, where certain traditional methods are still used.

The clinical examination is of particular interest in the search for associated lesions, opening of the fracture site is rare, found in 3 to 4% of cases, and is seen in fractures with very large displacements, we found 5 cases (4.1%) of Cauchoix and Duparc stage I skin opening. All nerves passing through the elbow should be examined, that is to say, the ulnar, radial and median nerve. We noted 2 cases of nerve complication (1.6%), involving paralysis of the anterior interosseous nerve, with a favorable outcome after 9 months. In the literature: Ayadi [5] studied 1180 cases of supracondylar humeral fractures. He found 55 cases of fractures with nerve damage (4.5%). The radial nerve was involved in 50.9% of neurological lesions, followed by the median nerve in 14, 5% of cases. Among these median nerve lesions, the anterior interosseous nerve was affected in 4 cases (7.2%). The ulnar nerve was affected in 12.6% of cases. Vascular complications are rare in SCF of the humerus in children. They occur in 5% of cases, and are mainly

confined to stage IV fractures. Their diagnosis must be clinical, and the examination prior to any therapeutic procedure includes assessment of the color of the integuments and palpation of the pulse, particularly in the case of large displacement FSC [6], There was no vascular lesion in our series.

A front and side X-ray of the elbow is often sufficient for diagnosis and management. Above all, it is important to obtain good quality images with good incidences, despite the difficulties associated with the nature of the emergency and the child´s lack of cooperation. Displaced fractures do not pose a problem for radiographic diagnosis, but the displacement must be carefully analyzed to guide reduction, particularly on a profile view. On an epiphysis in strict profile, if the metaphysis has a concave anterior border and a convex posterior border, the distal fragment is displaced in internal rotation. If, on the other hand, it has a concave anterior and posterior border, the distal fragment is displaced in external rotation. Non-displaced fractures can be more difficult to detect, especially if the child is young and the epiphysis is still very cartilaginous, in this case, indirect signs such as hematoma displacing the periepiphyseal fatty clearness should be used [7]. X-rays have a number of advantages: firstly, they can be used to diagnose the fracture and classify it according to the LAGRANGE and RIGAULT classification based on the extent of displacement, secondly, they can be used therapeutically to search for associated fractures, monitor the post-operative result, identify secondary displacement by checking on the eighth day, and late diagnosis of vicious elbow calluses by studying elbow angles.

Treatment of supracondylar fractures should be as minimally invasive as possible, with fewer complications and functional and aesthetic restoration of the limb[8]. The principle of orthopedic treatment for supracondylar fractures in children is to immobilize the elbow to prevent flexion-extension movement, and also to avoid rotational stresses transmitted by the shoulder joint. This method is indicated for non-displaced fractures: stage I, or slightly displaced fractures: stage II after orthopedic reduction. The Blount method described in 1954 by Blount consists in immobilizing the elbow in flexion, using the continuity of the posterolateral periosteum of the humeral pallet as a means of stabilization once the fracture has been reduced [9]. In our series, 3 patients (2.5%) benefited from external reduction followed by stabilization using the Blount method.

Surgical treatment is based essentially on the Judet technique and open surgery. In our series, 56 patients (46.7%) underwent Judet pinning. The surgical approach, which only works when other methods have failed, does not stiffen the elbow, contrary to what has long been claimed. In our series, this method was applied to 16 patients (13.3%), either immediately or after failure of orthopedic treatment.

The evolution can be marked by axis deviations which are always linked to a malunion. They have no progressive nature or tendency to improve with growth, unlike most childhood fractures [10].

CONCLUSION

Supracondylar fracture is the most common elbow fracture in children, accounting for 45% to 70% of cases, depending on the series. This fracture results from a hyperextension mechanism in 85.8% of cases, with peak frequency between 5 and 10 years of age and a male predominance in 69.1% of cases. As in the French literature, we adopted the classification of LAGRANGE and RIGAULT, based on the extent of displacement. Displaced fractures predominated, notably stage III fractures in 37.5% of cases. The extent of displacement will condition the clinical presentation of patients, with cutaneous opening present in 4.1% of cases. The prognosis is mainly linked to vascular complications, which were absent in our series. With regard to nerve complications, all 3 nerves may be affected, depending on the direction of displacement. In our series, there were 2 cases (1.6%).

Diagnosis is generally easy on X-rays of the elbow in front and in profile. If treatment is carried out urgently, it is easier to reduce the elbow and a percutaneous procedure is possible. Once reduction has been achieved, the aim of treatment is to stabilize the elbow, avoiding flexion/extension and rotation movements which can lead to poor results.

Current knowledge on the subject

- Supracondylar fractures are a frequent reason for consultation in children;
- The very satisfactory results of Judet's technique despite late admission.

Contribution of our study to knowledge: Evaluate the impact of the delay in admission on the therapeutic results.

Conflict of interests: The authors declare no conflict of interest.

Contribution of the authors

All authors participated in the development and implementation of this work. They have read and approved the final version of the manuscript.

REFERENCES

1. Abe, M., Ishizu, T., Nagaoka, T., & Onomura, T. (1995). Epiphyseal separation of the distal end of the humeral epiphysis: a follow-up note. *Journal of pediatric orthopedics*, *15*(4), 426-434.
2. Özçelik, A., Tekcan, A., & Ömeroglu, H. (2006).

Correlation between iatrogenic ulnar nerve injury and angular insertion of the medial pin in supracondylar humerus fractures. *Journal of Pediatric Orthopaedics B*, *15*(1), 58-61.

3. Kinkpe, C. V. A., Dansokho, A. V., Niane, M. M., Chau, E., de Gauzy, J. S., Clement, J. L., & Seye, S. I. L. (2010). Children distal humerus supracondylar fractures: The Blount Method experience. *Orthopaedics & Traumatology: Surgery & Research*, *96*(3), 276-282.
4. Walmsley, P. J., Kelly, M. B., Robb, J. E., Annan, I. H., & Porter, D. E. (2006). Delay increases the need for open reduction of type-III supracondylar fractures of the humerus. *The Journal of Bone & Joint Surgery British Volume*, *88*(4), 528-530.
5. Ayadi, K., Trigui, M., Tounsi, N., Ellouze, Z., Bahloul, L., Triki, F. E., & Keskes, H. (2006). Nerve damage in supracondylar fractures of the humerus in children. *Journal of Orthopedic and Reconstructive Surgery of the Motor Apparatus*, *92*(7), 651-656.
6. Konstantiniuk, P., Fritz, G., Ott, T., Weiglhofer, U., Schweiger, S., & Cohnert, T. (2011). Long-term follow-up of vascular reconstructions after supracondylar humerus fracture with vascular lesion in childhood. *European Journal of Vascular and Endovascular Surgery*, *42*(5), 684-688.
7. Ziv, N., Litwin, A., Katz, K., Merlob, P., & Grunebaum, M. (1996). Definitive diagnosis of fracture-separation of the distal humeral epiphysis in neonates by ultrasonography. *Pediatric radiology*, *26*, 493-496.
8. Eberhardt, O., Fernandez, F., Ilchmann, T., & Parsch, K. (2007). Cross pinning of supracondylar fractures from a lateral approach. Stabilization achieved with safety. *Journal of children's orthopaedics*, *1*(2), 127-133.
9. Cekanauskas, E., Degliute, R., & Kalesinskas, R. J. (2003). Treatment of supracondylar humerus fractures in children, according to Gartland classification. *Medicina (Kaunas)*, *39*(4), 379-383. https://medicina.lsmuni.lt/med/0304/0304-07e.pdf
10. Takagi, T., Takayama, S., Nakamura, T., Horiuchi, Y., Toyama, Y., & Ikegami, H. (2010). Supracondylar osteotomy of the humerus to correct cubitus varus: do both internal rotation and extension deformities need to be corrected? *JBJS*, *92*(7), 1619-1626.

Cite This Article: Mohamed Amine Oukhouya, Mohammed Tazi Charki, Hicham Abdellaoui, Karima Atarraf, Moulay Abderrahmane Afifi (2023). Supracondylar Fractures in Children: A Review of 120 Cases. *East African Scholars J Med Surg*, *5*(8), 133-137.