Original Article

Percutaneous Pinning In Displaced Supracondylar Fracture of Humerus in Children

La broche percutanée dans une fracture supracondylienne déplacée de l'humérus chez les enfants.

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Abstract

Background: To study the importance of percutaneous pinning for the treatment of displaced supracondylar fracture of humerus in children.

Patients and Methods: This study was conducted at Orthopaedic Unit of Prince Ali Hospital, Alkarak, Jordan from 2000 to 2005. All the children in this study were between 2 and12 years of age, and presented with closed and displaced supracondylar fracture of humerus within 24 hours after fracture. Children with compound fracture or fracture with vascular injury were excluded. All the children had percutaneous pinning of the fractured humerus. Outcome measures were according to Flynn criteria i.e. loss of elbow motion & carrying angle.

Results: A total of 30 patients were studied. There were 21 male (70%) and 9 females (30%).The left side was predominantly involved in 24 (80%) patients and right in 6 (20%). Twenty eight patients (93%) had extension type and 2 (7%) had flexion type of fracture. Our result showed excellent outcome in 20 (67 %), good outcome in 6 (20 %) and poor outcome in 4 (13 %).

Conclusion: Percutaneous pinning is safe, cost effective, time saving and provides greater skeletal stability with excellent results.

Key Words: Percutaneous Pinning, Supracondylar fracture, Humerus fractures.

Resume

Arrière-plan: Etudier l'importance de la broche percutanée pour le traitement de la fracture supracondylienne déplacée de l'humérus chez les enfants. ***Patients et méthodes:*** Cette étude a été conduite à l'unité orthopédique de l'Hôpital Prince Ali, Alkarak, Jordanie de 2000 à 2005. Tous les enfants dans cette étude étaient âgés de 2 à 12 ans, et s'étaient présentés avec une fracture supracondylienne fermée et déplacée de l'humérus dans les 24 heures suivant la fracture. On a exclu les enfants ayant une fracture compliquée ou une fracture entraînant une blessure vasculaire. Tous les enfants ont eu une broche percutanée de l'humérus fracturé. Les retombées étaient conformes aux critères de Flynn, c'est-à-dire l'immobilité du coude et de la jointure. ***Résultats:*** Un total de 30 patients ont été étudiés. Il y avait 21 mâles (70%) et 9 femelles (30%). Le côté gauche était essentiellement impliqué chez 24 (80%) patients et le côté droit chez 6 (20%). Vingt-huit patients (93%) avaient une fracture du type extenseur et 2 (7%) avaient le type flexionnel. Notre résultat a montré un aboutissement excellent chez 20 patients (67 %), un bon aboutissement chez 6 (20 %) et un aboutissement pauvre chez 4 (13 %). ***Conclusion:*** La broche percutanée est sûre, rentable, fait gagner du temps et assure une plus grande stabilité squelettique avec des résultats excellents. ***Mots-clés:*** Broche percutanée, fracture supracondylienne, fractures humérales.

Introduction

Supracondylar fracture of the humerus is the most common fracture in children. There are two types of supracondylar fractures of humerus in children: extension type and flexion type[1]. Ligamental laxity and anatomical structure of humeral shaft to flat transformation at the lower end of humerus makes it a common fracture in the first decade of life[2,3]. The incidence of supracondylar fracture of the humerus decreases with age[4]. The mechanism of injury is hyperextension, abduction or adduction of elbow during fall on dorsiflexed hand and flexed elbow[5].

A proper management for supracondylar fractures is required in order to preserve the joint function[6]. There are various treatment modalities for the management of supracondylar fracture of humerus in children including closed reduction and casting, open reduction and internal fixation (ORIF) and percutaneous pinning (PCP). PCP can be done in emergency theatre under image intensifier preferably within the first 8 to12 hours of injury[7]. Closed reduction and casting for displaced supracondylar fractures in children may lead to loss of reduction and cubitus varus deformity while in case of percutaneous pinning these complications are very low[8].

Open reduction and internal fixation can reduce the fracture anatomically but chances of loss of elbow motion are high[9].

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This study draws the attention of Orthopaedic Surgeons to PCP in the treatment of displaced supracondylar fracture of humerus in children.

Material and Methods

This study was conducted at Orthopedic unit of Prince Ali Hospital (a medium size hospital that serves about 180000 people at south of Jordan), Alkarak, Jordan from 2000 to 2005. All children included in this study were aged 2-12 years with close and displaced supracondylar fracture of humerus, and presented within 24 hours after fracture. Children with compound fracture or fracture with vascular injury were excluded.

Under general anesthesia the patient was put in supine position. The involved humerus was prepped and draped up to the elbow. Fracture was closely reduced under screen monitor by gentle traction, side to side elbow deformity correction and hyperflexion of elbow and pushing the distal fragment with opposite hand thumb, keeping the forearm in pronation to prevent displacement.

After closed reduction, 2 parallel pins (K- Wires of 1.6 mm thickness[10]) were inserted laterally to avoid the risk of ulnar nerve injury. For lateral pin insertion in posterolateral displacement, the arm was placed in internal rotation on flourscopy plateform. Pin was inserted in the centre of lateral condyle, directed slightly posteriorly at an angle of 35 degrees upward and 10 degrees posterior, avoiding the olecranon fossa while passing through the far cortex. The stability and carrying angle was then checked by extending the elbow.

We avoided putting cross K-wires to avoid risk of ulnar nerve injury. Post operatively the elbow was kept in 90° flexion and protected by above-elbow back slap. Patients were followed for six months, initially at two weeks interval for one month when K wire was removed and then at one monthly interval for next five months. At follow up patients were assessed according to Flynn criteria[11] (table-1), during which the outcome of the procedure was assessed by measuring the carrying angle and range of motion of the elbow joint[12].

Results

There were a total of 30patients, 21 (70%) were males and 9 (30%) were females (M:F= 2.3:1). The age range was between 2 and12 years, with a mean of 6.4 years Twenty eight (93%) patients presented with extension type of supracondylar fracture while 2(7 %) with flexion type. Elbow on left side was involved in 24(80%) patients and right side in 6 (20%) patients. Type II fractures were nine (30%) and type III were twenty one (70%). Ratio of left to right side fracture was 3:1.

According to Flynn criteria, 26 (87%) of our patients had acceptable outcome. Twenty (67%) patients had excellent outcome (loss of elbow motion and loss of carrying angle = 05 degree), 6 (20 %) patients had good out come (loss of elbow motion and loss of carrying angle=610 degree), and 4 (13 %) patients had poor outcome (either loss of elbow motion or loss of carrying angle =/or >15 degree).During the follow up the complications of percutaneous pinning noted are shown in Table 3.

Table 1: Flynn criteria for Reduction Assessment

Results	Cosmetic factor-loss of carrying angle (degree)	Functional factor-loss of motion (degree)
Excellent	0-5	0-5
Good	6-10	6-10
Fair	11-15	11-15
Poor	>15	>15

Table 2: Results (According to Flynn Criteria)

Results	Number of Patients	Percentage
Excellent	20	67%
Good	6	20%
Fair	0	0%
Poor	4	13%

Table 3: Compilation

Compilation	Number of Patients	Percentage
Nerve injury	0	0
Vascular injury	0	0
Pin tract infection	2	7
Elbow stiffness	3	10
Cubitus varus	1	3
Heterotopic ossification	1	3

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Discussion

PCP has become a standard technique for stabilizing displaced supracondylar fractures of the humerus in children, using either two lateral pins or one lateral and one medial pin to penetrate the far cortex. Better stabilization and assessment of carrying angle is easy with full elbow extension[13].

PCP in unstable or irreducible supracondylar fracture is the treatment of choice with elbow in 90° flexion to reduce chances of vascular compromise[14]. There are reports that PCP as compared to ORIF has less chances of elbow stiffness[9]. Since the procedure does not involve suture material or prolonged prophylactic antibiotics coupled with associated short hospital stay, PCP tends to be cost effective. Piron et al[7] reported that PCP when compared to cast immobilization is safe in terms of negligible chances of compartment syndrome and loss of reduction.

By Flynn criteria[11] we had excellent results in 20(67 %) patients which is compatible with the results of Ababneh et al[15] and Umer et al[16] who recorded 87% and 100% excellent prognosis respectively. Other studies[17,19] reported similar encouraging results with pinning of fractured humerus.

The present study agrees with the study by Cekanauska et al[20], that extension injury is the most common cause of supracondylar fracture in children. In this study extension type of fracture occurred in 28 (93%) while only 2 (7%) patients had flexion injury, while in the study by Cekanauska et al,[20] 90 (96.7%) patients had extension injury and 3 (3.3%) had flexion injury.

Thus after comparing our results with national and international study, our results are encouraging. Closed reduction of displaced supracondylar fracture of humerus with 2 parallel percutaneous pinning in children gives stable fixation with excellent results. It is possible to achieve 100% excellent results with careful manipulation and pinning of displaced closed supracondylar fracture of humerus under fluoroscope in children.

References

1. McIntyre W. Supracondylar fracture of humerus. In: Eltts RM (ed) Management of paediatric fractures. New York: Churchill Livingstone, 1994: 167-191.
2. Eliason EL. Dressing for supracondylar fracture of humerus. JAMA 1924; 82: 1934-1935.
3. Wilson PD. Fractures and dislocation in the region of elbow. Surg Gynecol Obstet 1933; 56: 335-359.
4. Abraham E, Powers T-Vitt. Excremental hyper extension of supracondylar fracture in monkeys. Clin Orthop 1982; 171: 309-318.
5. Cotton FJ. Elbow fractures in children. Ann Surg 1902; 35: 252-269.
6. Gillingham BL, Rang M. Advances in children elbow fractures (editorial). J Pediatr Orthop 1995; 15: 419-421.
7. Piron AM, Gronam HK, Kraj Bich JI. Management of displaced extension type of supracondylar fracture of humerus in children. J Bone Joint Surg 1988;70-A: 641-650.
8. Green NE. Overnight delay in the reduction of supracondylar fractures of the humerus in children. J Bone Joint Surg 2001; 83: 321-322.
9. Sandegard E fracture of lower end of humerus in children. Treatment and end results. Act Chir Scand 1944;89:116-9
10. O'Hara LJ, Barlow JW, Clarke NM. Displaced supracondylar fractures of the humerus in children. Audit changes practice. J Bone Joint Surg Br 2000; 82: 204-210.
11. Flynn JC, Mattews JG, Beriot RL. BUCD pinning of displaced supracondylar fracture of humerus in children. J Bone Joint Surg 1974: 56-A: 263-272.
12. Minkowitz B, Busch MT. Supracondylar fracture of humerus, current trends and controversies. Orthop Clin North Am 1994; 25: 581-594.
13. Mostafavi HR, Spero C. Crossed pin fixation of displaced supracondylar humerus fractures in children. Clin Orthop 2000; 376: 56-61.
14. Rejholec M. Supracondylar fractures of the humerus in children closed pinning. Sb Lek 1999;100:279-286.
15. Ababneh M, Shannak A, Agabi S, Hadadi S. The treatment of displaced supracondylar fractures of the humerus in children. A comparison of three methods. Int Orthop 1998; 22: 263-265.
16. Umar M, D Sousa OP. Supracondylar fracture of humerus in children. An analysis of different treatment modalities at the Agha Khan University Hospital Karachi, Pakistan. Pakistan J Surg 1991; 7: 16-22.
17. Din SU, Ahmad I. Percutaneous crossed pin fixation of supracondylar Humeral fracture in children. J Postgrad Med Inst Jun 2003;17:184-188.
18. Iqbal J. Supracondylar Fracture of humerus in children- An experience of closed reduction and percutaneous pinning. Ann King Edward Med Coll Dec 2001; 7:278-280
19. Gartland JJ. Management of supracondylar fracture of humerus in children. Surg: Gynecol Obstet 1959;109:145-154.
20. Cekanauskas E ,Degliute R, Kalesinskas RJ. Treatment of supracondylar fracture in children according to Gartland classification. Medicina (Kaunas) 2003;39:379-383.

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