

CASE REPORT

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**Open reduction in neglected elbow dislocation
in children: a case series****Komang Agung Irianto*, Raymond Parung**, and William Putera Sukmajaya*******ABSTRACT****BACKGROUND**

Elbow deformity in children due to neglected proper fracture management is a devastating condition. The stiffness and pain complicated the function in daily activity. Successful management of neglected elbow dislocation is a challenging problem for orthopedic surgeons. In this study, we aimed to evaluate results of open reduction for neglected elbow dislocation in children.

CASE DESCRIPTION

This is a case series of 13-14 years old neglected elbow dislocations, for up to 15 months. Open reduction after external distractor and followed by intensive rehabilitation was implemented. Clinical and functional outcome were evaluated within 4-7 years. Initial average elbow flexion was 53,3°, extension was 0°, arc of flexion was 53,3°, arc of pronation-supination was 150° and Mayo Elbow Performance Index (MEPI) was 80. Clinical and functional outcome were evaluated within 4-7 years. At follow-up after open reduction, the improvement in whole range of movement was significant. Average elbow flexion was 118,3°, extension was 36,67°, arc of flexion was 81,67°, arc of pronation-supination was 133°. The average improvement of flexion was 65°, arc of flexion was 31,67°, and arc of pronation-supination was 8,3°. The average loss of flexion was 15,5%, arc of flexion was 44,2%, and arc of pronation-supination was 10,7% compared with uninjured side. The average Mayo Elbow Performance Index (MEPI) was 96,67; all with excellent results.

CONCLUSION

Planned and well execution open reduction in pediatric neglected elbow dislocation may bring back the painless movement within normal daily function.

Keywords: Neglected, elbow dislocation, children, open reduction

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INTRODUCTION

Pediatric elbow deformity mostly caused by unreduced dislocation following neglected proper fracture management.⁽¹⁻³⁾ Fracture around elbow, especially in children, often caused by fall (domestic, school, playground), not by traffic accident;⁽⁴⁻⁶⁾ this is the main reason why usually they were taken to bonesetter and not to hospital.^(7,8) Unfortunately, this type of fracture often associated with elbow dislocation which practically fail to be reduced in incompetent hand.^(9,10)

Neglected elbow dislocation limit the range of motion (ROM) especially the flexion to nearly 0°-50; the patients could not function their hand for simple daily function (comb, button, feed) or fine motoric (writing).⁽¹⁰⁻¹²⁾ Open reduction is a good choice of management even when the unreduced joint was untreated for more than three weeks.^(7,10,11) Several reported cases of several months up to two years elbow neglected dislocation were successfully treated.^(7,8,12) However, in pediatric where the open physes is the issue, the precondition and intense post rehabilitation should be considered. We report three cases of neglected pediatric elbow dislocation treated by external distractor to precondition the soft tissue, open reduction with or without V-Y plasty triceps lengthening, K-wire stabilization, cast, and intense 6 weeks post-surgery rehabilitation.

The Mayo Elbow Performance Index (MEPI)⁽¹³⁾ was used to evaluate the subjective, objective, and functional characteristics prior to the surgery and at follow-up. This scoring system has four parameters: pain, motion, stability, and performance of five activities of daily living (comb, feed, personal hygiene, put on shirt, and shoe (Table 1). Stability of the elbow is rated as stable (no apparent varus/valgus instability), moderate instability (<10° varus/valgus instability), or gross instability (≥10° varus/valgus instability). Depending on the score, the MEPI was classified as excellent (90–100), good (75–89), fair (60–74), or poor (<60).

Table 1. Mayo Elbow Performance Index (MEPI)⁽²⁾

Function	Points	Definition (Points)
Pain	45	None (45)
		Mild (30)
		Moderate (15)
		Severe (0)
Motion	20	Arc > 100° (20)
		Arc 50°-100° (15)
		Arc < 50° (5)
Stability	10	Stable (10)
		Moderate instability (5)
		Gross instability (0)
Function	25	Comb hair (5)
		Feed (5)
		Perform hygiene (5)
		Don shirt (5)
		Don shoe (5)
Total	100	Excellent >90; good: 75-89; fair: 60-74; poor <60

CASE PRESENTATION

The research protocol of this case series was approved by institutional ethics and review board in Dr. Soetomo General Hospital. We report three cases of pediatric neglected elbow dislocation whom underwent open reduction in Dr. Soetomo General Hospital during January 2012- May 2014. The age of patients was 11, 14, and 14 years old. In all cases, the mode of injury was fall with outstretched hand. All patients were presented with the history of bone-setter treatment in the form of massage or manipulation and immobilization for up to fifteen months. Elbow stiffness in extension and pain were the principal indication for surgical treatment. The range of motion of flexion, extension, pronation, and supination were examined with a handheld goniometer. Patient 2 (Figure 1) and patient 3 has associated lateral condyle fracture.

The initial average elbow flexion was 53,3° (90°, 20°, and 50°). The average of arm rotation (arc of pronation-supination) was 150° (130°, 160°, and 160°); pronation being more limited than supination; and average of MEPI was 80 (85, 65, and 90). The deformity itself did not trouble all male patients but the pain in trying to



A patient 14-year-old boy with 4-month-old unreduced complex dislocation of the left elbow: (a) preoperative clinical presentation, (b) Lateral view preoperative showing complex dislocation of the left elbow. (c) Lateral view postoperative at 6-years follow-up (d), (e), and (f) at 6 years follow-up, the patient has optimum range of movement of the left elbow and has no difficulty in performing functional task for activities of daily living

do their daily activity is the main reason to seek for surgical correction. Patient 2 got the complication of ulnar numbness and the MEPI was worst (65) (Table 2).

Prior to surgery all patients were put on external distractor for at least 2 weeks, to stretch the soft tissues slowly to achieve easier reduction during surgery. Elbow distraction was performed until ulno-humeral joint were in the same level, where the triceps contracture were gradually loosen and no longer resist and pin down the joint. Open reduction was performed with or without VY-plasty of triceps lengthening depend on the success perseverance of the distraction. The intraoperative findings of the fibrosis and calcification of the soft tissue determine the further surgical expansion. Patient 1 did not need triceps lengthening. But they all need K-wire stabilization and cast afterward. K-wire was extracted after 2 weeks. Patient 2 need ulnar nerve transposition to release the trapped nerve. The nerve fibrosis was not severe.

Rehabilitation was carried soon after K-wire removal and wound healed. Intensive rehabilitation physiotherapy was maintained for 6 weeks. None of patients got post-surgery skin infection.

Clinical and functional outcome of all three patients (MEPI) were evaluated after 4 years to 6 years. All patients were satisfied and could perform functional range of motion for daily activity (MEPI average 96.67; excellent) although deformity is not fully corrected. All three patients showed none of any sign of instability (score:10), pain free (score: 45), and able in most of five activities of daily living. The average elbow flexion was 118,3° (range 110°–

125°), arc of flexion was 81,67° (range 70°–105°), arc of pronation-supination was 156.67° (range 145°–170°).

The improvement in the whole range of movement was very well. Nonetheless, compared to the uninjured side, the average loss of flexion was still 15,5% (range 10.7%–18.5%), arc of flexion was 44,2% (range, 27.58%–53.3%). Patient 1 regained functional range of movements and two other patients regained optimum range of movements (Table 2). Hypoesthesia of the hand over the ulnar nerve distribution without appreciable motor weakness was still present in patient 2. All patients in this study had no trouble in performing functional task.

DISCUSSION

For the patients, cosmetic is not the major concern, but the limitation of function is. Not only that it is predictable and could be avoided, it also decreases the child's self-esteem and quality of life when they could not function normal in daily activity especially for personal hygiene. Patient 1 came with flexion 0° – 90° after treatment gain almost full flexion into 5° – 110° (105° arc of flexion). He gains a perfect function and good cosmetic as well and he was very satisfied with MEPI score 100. But patient 2 and 3 still deform (flexion 50° and 55°), not a cosmetic but functionally they gain a lot (120° and 125°). The biomechanical study of normal functional elbow motion from Mayo clinic notion 130° flexion as the normal functioning range of motion where a person could reach the occiput, to comb, to feed, doing personal hygiene, and

Table 2. Data before and after open reduction for neglected pediatric elbow dislocation

	Patient 1	Patient 2	Patient 3
Gender	male	male	male
Age (years)	14	14	11
Mode of injury	Fall	Fall	Fall
Injured side	Left	Left	Right
First treatment at	Bonesetter	Bonesetter	Bonesetter
Time of neglected	5 months	4 months	15 months
Associated fracture	None	Lateral condyle	Lateral condyle
Associated lesion	none	Ulnar palsy	none
Treatment:			
Elbow distraction	Yes	Yes	Yes
Open reduction	Yes	Yes	Yes
K-wire stabilization	Yes	Yes	Yes
Ulnar transposition	No	Yes	No
Triceps lengthening	No	No	Yes
Cast	Yes	Yes	Yes
Rehabilitation	Yes	Yes	Yes
Surgery complication	None	None	None
Follow-up time	4 years	6 years	5 years
Uninjured elbow:			
Flexion	145 ⁰ (-10 ⁰ - 135 ⁰)	145 ⁰ (0 ⁰ -145 ⁰)	150 ⁰ (-10 ⁰ - 140 ⁰)
Pronation/supination	170 ⁰ (85 ⁰ - 85 ⁰)	180 ⁰ (90 ⁰ -90 ⁰)	165 ⁰ (75 ⁰ - 90 ⁰)
Injured elbow; before:			
Flexion	90 ⁰ (0 ⁰ -90 ⁰)	20 ⁰ (0 ⁰ -20 ⁰)	50 ⁰ (0 ⁰ -50 ⁰)
Pronation/supination	130 ⁰ (50 ⁰ -80 ⁰)	160 ⁰ (80 ⁰ -80 ⁰)	160 ⁰ (75 ⁰ -85 ⁰)
Injured elbow; on follow-up			
Flexion	105 ⁰ (5 ⁰ -110 ⁰)	70 ⁰ (50 ⁰ -120 ⁰)	70 ⁰ (55 ⁰ -125 ⁰)
Pronation/supination	145 ⁰ (60 ⁰ -85 ⁰)	170 ⁰ (85 ⁰ -85 ⁰)	155 ⁰ (70 ⁰ -85 ⁰)
MEPI before / after	85/100	65/95	90/95

tie his shoe.⁽¹⁰⁾ Some of the activities need less flexion arc since there are compensatory motion of adjacent joints. For example, while tying the shoe, they flex the hip.

Regardless duration of neglected, regardless the age of the patient, open reduction offers better motion, better stabilisation for function. Case reports and new surgical approach showed good to excellent result.⁽¹⁴⁾ But if there are associated fracture around the elbow, the outcome of the open reduction is not satisfying.^(9,15,16) In our cases, patient 2 and 3 with associated lateral condyle fracture, complicating the soft tissue fibrosis, not the alignment of fracture healing. That is the reason for VY plasty triceps muscle lengthening.

The contracture of the triceps muscle locks the joint and limit the motion, conversely triceps muscle need to be loosen. More than three decades ago when surgeon reluctant to operate neglected elbow dislocation especially in children, conservative external fixator (hinged

elbow distraction device) were applied for 6-8 weeks to gradually reconstruct. This technique was not advocate anymore owe to high failure outcome.⁽⁸⁾ In our protocol of treatment, we use external distractor for 2 weeks to gradually distract the soft tissue responsible for the contracture. We used the device as adjunct to open reduction. Other reports the similar way prior to surgical reduction either with or without triceps muscle lengthening.^(9,12-14) Anderson et al.⁽⁹⁾ develop new technique of triceps lengthening without VY plasty, by repeated piercing the tendon percutaneous with 18 G needle, only for selected case for simple dislocation and without associated fracture.

Kirschner wire was placed to stabilized and the cast was applied for 2 weeks to allow early rehabilitation which is very important to maintain the reduced joint and avoid further contraction.^(12,15,16) The two weeks period was also the reason to prevent skin infection. In our report, none of the patients have skin infection. The

other technique to stabilize the reduced joint was reported in India by Garg et al.⁽¹⁷⁾ by adding cruciate ligament like from semitendinous autologous graft. Excellent MEPI result was achieved.

Almost all authors in the last decades advice an earlier rehabilitation for excellent result disregarding the period of unreduced elbow.^(4,18,19) Although all our patients accomplished similar intense rehabilitation, only patient 1 without VY plasty triceps muscle avoid futher contracture (excellent result). Patient 2 and 3 managed to benefit enough ROM for functional goal and that goal is enough for the patient render the poor cosmetic.

CONCLUSIONS

Open reduction is a necessity for neglected elbow dislocation in children regardless of the time of the injury. The outcome of the treatment is to gain enough ROM for useful hand to achieve painless daily activity.


CONFLICT OF INTEREST

The authors declared no competing and conflict of interests.

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CONTRIBUTORS

KAP contributed to study concept, design and drafting manuscript. RP contributed to acquisition of data. WPS contributed to critical revision of the manuscript. All authors have read and approved the final manuscript. 

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