

COMPARISON OF OUTCOME ON EARLY AND LATE INITIATION OF OPERATIVE TREATMENT IN CHILDREN WITH LATERAL CONDYLE FRACTURE OF HUMERUS

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Abstract

Background: Lateral condyle fracture of humerus in children is the second most common fracture around elbow occurs less commonly than supracondylar fracture in the range of 15% to 20% that must be treated by operation. To find out the demographic variations, causes, functional movements and complications of late cases of lateral condyle fracture of humerus in children treated by open reduction and internal fixation and also comparison with early cases.

Materials and methods: This prospective interventional study was carried out in the Department of Orthopaedic Surgery, Bangabandhu Sheikh Mujib Medical University and Chittagong Medical College Hospital for the duration of 03 years and 06 months. Total 24 patients of fracture lateral condyle of humerus in children age ranges from 02 to 14 years were selected but due to loss of follow up, 20 children were taken in account for the study. Total patients were divided into two groups- group I: early (Up to 4 weeks) and group II: late (5 to 12 weeks) according to time interval from injury to operative treatment.

Results: In this study, Out of 20 patients, male (85%) were more than female (15%) left side involvement was 60% and right side was 40%. Among causes of injury, 55% was due to sports injury, 30% was fall from height and 15% from RTA. 35% initially treated by plaster cast, 60% by traditionally bone setter. 55% were misdiagnosed, complications were 10% in group I and 30% in

group II. Outcome was satisfactory with 100% in group I and 70% in group II.

Conclusion: Outcome was better in early cases by operative treatment but late cases up to 12 weeks should be treated by operation.

Key words

Late case; Lateral condyle; Milch type; K wire.

Introduction

Fracture of the lateral condyle of humerus is quite common and occurs at approximately age of 06 years and constitutes around 13% - 18% of the elbow injuries^{1,2}. The management of the fresh displaced fractures of less than 3 weeks duration is not controversial as it is generally agreed that it should be treated by osteosynthetic procedures^{3,4}.

Observers have variedly defined the 'delayed', 'neglected' or 'late presentation' of lateral condylar fractures (>3-6 weeks) in children⁵. But recent studies have defined the late presentation as >4 weeks post injury in their series^{6,7}. Although there could be some difference of opinion regarding the approach, fixation method but the consensus remain in favor of operative intervention⁸⁻¹⁰.

The problem arises when the patient presents late due to socioeconomic reasons, lack of awareness, missed diagnosis or improper initial treatment. It has been observed that nonunion of the fractures of the lateral condylar epiphysis of humerus are more commonly result from minimally displaced fractures than from severely displaced and rotated fractures simply because more adequate treatment is administered to the more severe fracture usually^{11,12}.

Late presentation of this fracture is difficult and challenging problems. The fractured surfaces become sclerosed and filled with fibrous tissue, furthermore the muscular attachments become shortened and contracted thus making derotation and anatomical reduction may lead to avascular necrosis of the fragment. Complications such as non union, premature physal closure, lateral condylar overgrowth, stiffness, cubitus valgus/varus, avascular necrosis and tardy ulnar nerve palsy may arise after surgical or conservative treatment^{13,14}.

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Fracture of the lateral condyle of humerus is unstable and tends to become displaced even when immobilized because of pull of forearm extensors. This fracture is also prone to nonunion since the fracture is intra articular and is bathed in synovial fluid^{2,15,16}.

Previously late cases were left alone because of bad result in surgery. Jakob et al reported that results of open reduction more than three weeks after the fracture should be left alone and operative treatment may kill the lateral condylar fragment by damaging its blood supply. But in recent study they considered that delaying greater than 3 weeks still allow anatomical reduction without damaging bony fragment and soft tissue^{8,17,18}.

The aim of present study was to find out the outcome of operative treatment in late cases of fractures lateral humeral condyle in children as late cases are left alone previously with lot of complications in our country and also to compare with early cases.

Materials and methods

This prospective interventional study was carried out in the Department of Orthopaedic Surgery, Bangabandhu Sheikh Mujib Medical University (BSMMU) and Chittagong Medical College Hospital (CMCH) from March 2013 to August 2016 for the duration of 03 years and 06 months. Total 24 patients of fracture lateral condyle of humerus in children were selected but due to loss of follow up, 20 children were taken in account for the study. Purposive type of non-probability sampling technique was used as according to availability of the patients and strictly considering the inclusion and exclusion criteria. Total patients were divided into two groups- group I: early (Up to 4 weeks) and group II: late (5 to 12 weeks) according to time interval from injury to operative treatment. Outcome was evaluated by Modified Aggarwal et al criteria where satisfactory result was considered as excellent and good groups¹⁹. The protocol was approved by the Institutional Review Board of BSMMU, Dhaka, Bangladesh. Regarding inclusion criteria we considered age 2-14 years with both gender and displaced fracture. We excluded open and pathological fractures, multiple fractures/poly trauma, and fracture with neurovascular injury, metabolic bone disease and skeletal dysplasia.

Table I : Modified Aggarwal et al Criteria¹⁹.

| S. no | Result | Description |
|-------|-----------|---|
| 1. | Excellent | Union in perfect alignment, full range of elbow movement, no alteration in carrying angle, no premature fusion of physis, no avascular necrosis of epiphysis, no lateral prominence and X-ray showing anatomical reduction. |
| 2. | Good | Union with minimum displacement, limitation of terminal range of movements of not more than 15°, no alteration in carrying angle, no premature fusion of physis, no avascular necrosis of epiphysis, no deformity at local site and X-ray showing step / gap of not more than 2 mm. |
| 3. | Fair | Union with minimum displacement, limitation of terminal range of movements of up to 25°, alteration in carrying angle of up to 10°, premature fusion of the physis, no avascular necrosis of epiphysis, mild deformity at local site and X-ray showing a step / gap of between 2-5 mm. |
| 4. | Poor | Nonunion at fracture site, gross limitations of elbow movements (With limitation more than 30°) change in carrying angle of more than 10°, premature fusion of the physis, avascular necrosis of the fragment, visible deformity at local site and X-ray showing a step/ gap of more than 5 mm. |

Data were processed and analyzed using computer software program SPSS version 24. For all analyses level of significance was set at 0.05 and p-value <0.05 was considered significant.

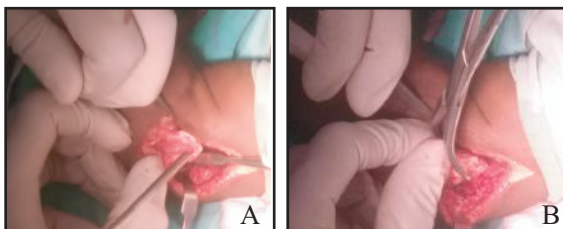


Fig 1 : Per-operative Kocher lateral J approach to elbow joint. A) Capsized fracture fragment of lateral condyle of humerus. B) Reduced fracture fragment of lateral condyle of humerus by towel clip.



Fig 2 : Postoperative implant removal.

- A. Implant in situ.
- B. Closing the skin wound.
- C. Two 1.5 mm K wire.

Results

From table II we found that maximum age incidence was found in 05-07 years age group. The mean age was 7.04 ± 2.63 in group-I and 7.22 ± 2.51 in group-II. Both groups had similar mean age distribution and male with left sided predominance. Regarding causes of injury, sports activities was the prime cause 11(55.0%) in both groups with 13 (65%) were Milch-II fracture type. Most of the children 12(60%) were initially treated by traditional bone setter and misdiagnosis 11(55%) was a major problem.

Table II : Demographic outcomes.

| | Group-I (n=10)% | Group-II (n=10)% | Total | p value |
|------------------|--------------------|---------------------|---------|---------|
| Age (Years) | | | | |
| 02-04 | 01(10%) | 01(10%) | 02(10%) | 0.700 |
| 05-07 | 06(60%) | 05(50%) | 11(55%) | |
| 08-10 | 01(10%) | 03(30%) | 04(20%) | |
| 11-14 | 02(20%) | 01(10%) | 03(15%) | |
| Gender | | | | |
| Male | 08(80%) | 09(90%) | 17(85%) | 0.531 |
| Female | 02(20%) | 01(10%) | 03(15%) | |
| Side | | | | |
| Right | 05(50%) | 07(70%) | 12(60%) | 0.361 |
| Left | 05(50%) | 03(30%) | 08(40%) | |
| Causes of injury | | | | |
| Sports | 05(50%) | 06(60%) | 11(55%) | 0.231 |
| Fall from height | 03(30%) | 03(30%) | 06(30%) | |
| RTA | 02(20%) | 01(10%) | 15(15%) | |

| | | | | |
|---|---------|---------|---------|--------|
| Fracture type distribution | | | | |
| Milch-I | 04(40%) | 03(30%) | 07(35%) | 0.639 |
| Milch-II | 06(60%) | 07(70%) | 13(65%) | |
| History of initial treatments | | | | |
| Plaster cast | 06(60%) | 01(10%) | 07(35%) | 0.022 |
| Traditional bone setter | 03(30%) | 09(90%) | 12(60%) | |
| Both | 01(10%) | 00(00%) | 01(05%) | |
| Initial Diagnosis | | | | |
| Misdiagnosed | 03(30%) | 08(80%) | 11(55%) | 0.025 |
| Proper Diagnosis | 07(70%) | 02(20%) | 09(45%) | |
| Time interval between incidence and operation (Weeks) | | | | |
| 01-02 | 03(30%) | 00(00%) | 03(15%) | 0.0004 |
| 03-04 | 07(70%) | 00(00%) | 07(35%) | |
| 05-07 | 00(00%) | 02(20%) | 02(10%) | |
| 08-10 | 00(00%) | 05(50%) | 05(25%) | |
| 11-12 | 00(00%) | 03(30%) | 03(15%) | |

Regarding postoperative outcome from table III, in group-I, only 01(10%) patient suffered with stitch point infection and in group-II, 02 (20%) patients got pin tract infection and 01(10%) had got alteration of carrying angle less than 10°. Regarding fracture union in group-I, 07 (70%) and in group-II 01(10%) fracture were perfectly united. At the end of 01 year in both groups, full range of motion in 08 (40%) patients, 08 (40%) had less than 15° limitation, 04 (20%) had less than 25° limitation and with only 03 (15%) had got deformity in group-II.

Table III : Postoperative outcomes.

| | Group-I (n=10)% | Group-II (n=10)% | Total | p value |
|--|--------------------|---------------------|---------|---------|
| Postoperative hospital stay (Days) | | | | |
| 01-06 | 06(60%) | 05(50%) | 11(55%) | 0.524 |
| 07-10 | 03(30%) | 02(20%) | 05(25%) | |
| 11-14 | 01(10%) | 03(30%) | 04(20%) | |
| Postoperative complications | | | | |
| No complications | 09(90%) | 07(70%) | 16(80%) | 0.236 |
| Stitch point infection | 01(10%) | 00(00%) | 01(05%) | |
| Pin tract infection | 00(00%) | 02(10%) | 02(20%) | |
| Carrying angle <10° | 00(00%) | 01(10%) | 01(05%) | |
| Union at fracture site (Radiological) | | | | |
| In perfect alignment and anatomical reduction | 07(70%) | 01(10%) | 08(40%) | 0.014 |
| Minimum displacement and step/gap not more than 2mm. | 03(30%) | 06(60%) | 09(45%) | |
| Minimum displacement and step/gap of between 2-5mm. | 00(00%) | 03(30%) | 03(15%) | |

| | | | | |
|---|----------|---------|---------|-------|
| Limitation of terminal range of motion at the elbow joint | | | | |
| Full range of motion | 07(70%) | 01(10%) | 08(40%) | 0.011 |
| Not more than 15° | 03(30%) | 05(50%) | 08(40%) | |
| Not more than 25° | 00(00%) | 04(40%) | 04(20%) | |
| Deformity at fracture site | | | | |
| Deformed | 00(00%) | 03(30%) | 03(15%) | 0.060 |
| Not deformed | 10(100%) | 07(70%) | 17(85%) | |
| Functional outcome | | | | |
| Excellent | 07(70%) | 01(10%) | 08(40%) | 0.014 |
| Good | 03(30%) | 06(60%) | 09(45%) | |
| Fair | 00(00%) | 03(30%) | 03(15%) | |
| Poor | 00(00%) | 00(00%) | 05(25%) | |

Discussion

In 1883, Stimson first described the fracture patterns in lateral condyle fracture in his book 'Treatise on Fractures'. In 1955, Milch recognized the significance of these fracture patterns as they related to elbow stability. Thus the fracture patterns of the lateral condyle bear his name and are classified as either Milch I or Milch II fracture²⁰.

6.5 to 8 years old children suffered more in this type of fracture with boys (66.66-83.3%) were more victimized than girls. It was interesting that injury was predominantly left sided (60%) although most of the children were right handed predominant that matched with other studies 56-59%^{6,19,21,22}. Sports injury (55%) was main cause for this fracture in Bangladesh while in one study by Pant et al. showed that most common cause was fall from height (55%) rather than sports injury (27.7%)¹³.

Most of the children (60%) in our country were maltreated and misdiagnosed (55%) before definitive treatment which were 32-61.11% and 27.27% respectively in other developing country too. So proper diagnosis and treatment by attending doctor have a great value in fracture lateral condyle in Humerus in children. The time interval from incidence to definite treatment, number became progressively increased as time passed by in this subcontinent. Perfect union at fracture site (Radiological) was more in early cases (70%) which also common in other studies^{6,19,21,22}. Although full range of motion was more in early cases but acceptable range of motion (Limitation of motion not more than 15°) was found in late cases too (50%) where Sial showed that in 5-12 weeks full range of motion were 4.54%, not more than 15° were 13.63%²².

In this study after one year of final follow up with Modified Aggarwal et al criteria, outcome was satisfactory with 100% in group I and 70% in group II that matched with other study^{19,2}.

Limitation

- The follow up period was short in comparable to other series. So we could not evaluate very late post-operative complications
- Small sample size
- Sample size not representing whole country scenario
- Some patients could not come for follow up timely.

Conclusion

Outcome was better in early cases by operative treatment but late cases up to 12 weeks should be treated by operation to prevent complications.

Recommendations

- Specialized training programs for general practitioner at rural areas for early diagnosis, initial management and referral system for better and complications free treatment
- Adequate counseling of the guardian about operative treatment protocol
- Good anatomical and radiological knowledge around children elbow
- Need to improved facilities and expertise for both early and late cases
- Long term follow up.

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Contribution of authors

MAR - Conception, design, acquisition of data, manuscript writing & final approval.

MMRC - Acquisition of data, data analysis, manuscript writing & final approval.

AIS - Interpretation of data, critical revision & final approval.

KMNF - Data analysis, Interpretation of data, critical revision & final approval.

Disclosure

All the authors declared no competing interests.

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