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A prospective study to find the functional outcome of displaced radial neck fracture among children treated with closed reduction internal fixation with intramedullary nailing

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Abstract---Background: Radial neck fracture among children is very common. If fractures not treated early it further leads to malunion. Number of times such malunion are irreversible and may lead to disability for lifetime. The most important set of problems that can happen in this fracture involves the blood supply to the radial head. The radial head is supplied by periosteal vessels in the neck. As a result, any trauma to the proximal end of the radius (with or without a fracture) will produce an aseptic necrosis of the radial neck and head of varying severity. This can precipitate a slight shortening of the proximal end of the radius with a propensity toward slight valgus deviation of the elbow axis. However, the concurrent widening and thickening of the radial head and neck are more significant; in extreme cases, this can restrict pronation and supination. One of the recent advances in treatment of distal radius fractures is the more frequent application of open reduction and internal fixation, especially for intra-articular fractures and other one is treated with treated with closed reduction internal fixation with intramedullary nailing. Aim: To find the functional outcome of displaced radial neck fracture among children those treated with closed reduction internal fixation with intramedullary nailing. Material and methods: present study was a

prospective study carried out at a tertiary care hospital for a period of 2 years among 50 cases of displaced radial neck fracture among children. All cases coming to causality or OPD under Orthopedic department were considered for the study. All data was compiled and statistical analysis was done using Openepi version 2.3.1. Results: Mean age was 11.46 ± 3.4 years, ranging from 5 to 14 years. Majority 55% were in age group of 10 to 14 years, 33% in 5 to 10 years and 12% had age <5 years. Most common cause of injury was fall from height (50%), direct trauma (24%), road traffic accident (14%) and fall from cycle 12%. majority children presented with pain and swelling. Majority 75% had restricted elbow flexion, 71% restricted extension, 65% pronation and in 55% supination was restricted. Conclusion: Fixation of the fracture at a early stage is very important just to avoid further complications. There are various methods for that. We studied about closed reduction internal fixation. Closed reduction caused less soft tissue injury, shorter operating time which ultimately leads to shorter duration of anesthesia and risk related to it. It was also seen than it had a good cosmetic result as well as functional outcome as very good. The patient satisfaction is more important which can be achieved using closed reduction nailing methods.

Keywords---functional outcome, displaced, radial neck fracture, children, closed reduction, internal fixation, intramedullary nailing.

Introduction

Fractures of the neck of the radius in children may cause significant permanent limitation of elbow and forearm movement ⁽¹⁾. Retrospective studies in the past found that open reduction of radial neck fractures generally had poor results and that open reduction with internal fixation was even worse ⁽²⁾.

Conservative treatment in the form of closed reduction and plaster immobilization is unable to reduce severe displacements, resulting in malunion. ⁽³⁾Open reduction of severely displaced radial neck fractures is associated with a high incidence of complications. K wire fixation can lead to stiffness, rotation of head & malunion. ⁽⁴⁾

Percutaneous pinning of displaced fragment has been associated with serious complications like wire breakage and nerve injury and even leads to collateral ligament laxicity and anular ligament (tear) laxicity⁽⁵⁾ In 1980, Metaizeau proposed intramedullary nailing as a surgical option for the treatment of radial neck fractures. The main advantage of intramedullary nailing is that it simultaneously allows accurate and stable reduction without disturbing the blood supply Fracture of the neck disrupts part of the periosteum with its vessels, more so in severely displaced fractures. Open reduction of the fracture can further damage the vascularity of the radial head. ^(6,7)

An attempt at closed reduction is recommended for fractures that are angulated more than 30 degrees. Percutaneous methods of reduction have been developed

in an effort to avoid the higher incidence of complications after open reduction. This technique involves direct pressure on the proximal fragment with a Steinmann pin or K-wire that is introduced percutaneously or through a small stab wound. This technique of percutaneous “joystick” reduction can injure the posterior interosseous nerve. Intramedullary manipulation of the radial head is another method of percutaneous, indirect reduction of the fracture. This method of indirect reduction does not jeopardize further the vascularity of the radial head which can occur in open reduction. Lateral condyle acts as a buffer to prevent overcorrection in long axis whereas tension produced in the lateral intact periosteum prevents medial overcorrection. ⁽⁸⁾

Recent work assessing the follow-up functional results in patients undergoing arthroscopy and fluoroscopy-assisted external fixation with pinning versus only fluoroscopy assisted external fixation with percutaneous pinning has found better wrist range of motion in flexion, extension and supination. DASH scores were comparable in either group in both studies.

These above mentioned studies focused only on single technique of fixation followed by arthroscopic assessment. No recent work demonstrates the role of arthroscopy in different types of reduction and fixation techniques and its comparative results in either. The differential role of arthroscopy in various fixation techniques has not been probed yet. ⁽⁹⁾ Thus present study was carried out to find the functional outcome of fracture treated with closed reduction internal fixation with intramedullary nailing.

Aim

To find the functional outcome of displaced radial neck fracture among children those treated with closed reduction internal fixation with intramedullary nailing.

Material and Methods

Present study was a prospective study carried out at a tertiary care hospital for a period of 2 years among 50 cases of displaced radial neck fracture among children. All cases coming to causality or OPD under Orthopedic department were considered for the study. The detail history of the patient was taken regarding personal data history, mode of injury, pre-injury ambulatory status, preexisting local and systemic condition that may affect recovery. Full clinical examination was done to assess the general condition of the neighboring joints and any associated injuries. Prior to start of study written informed consent was taken from parent/ guardian of the child. Preoperative Xray were taken. Patient having age >14 years, distal neurovascular deficit, infection or wound at site of operation were excluded from the study. All data was compiled and statistical analysis was done using Openepi version 2.3.1.

Results

Mean age was 11.46 ± 3.4 years, ranging from 5 to 14 years. Majority 55% were in age group of 10 to 14 years, 33% in 5 to 10 years and 12% had age <5 years. Male preponderance was more, m:f was 3:1

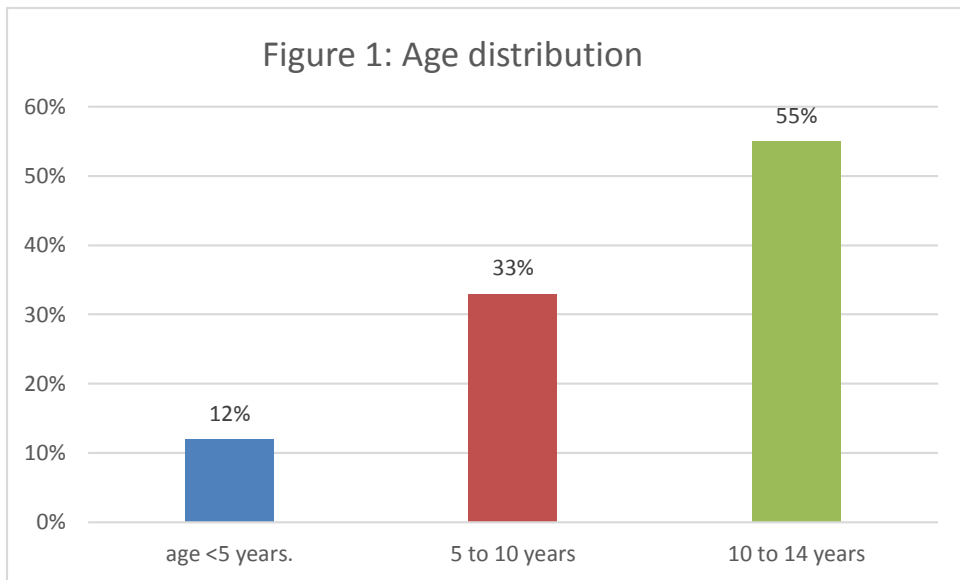
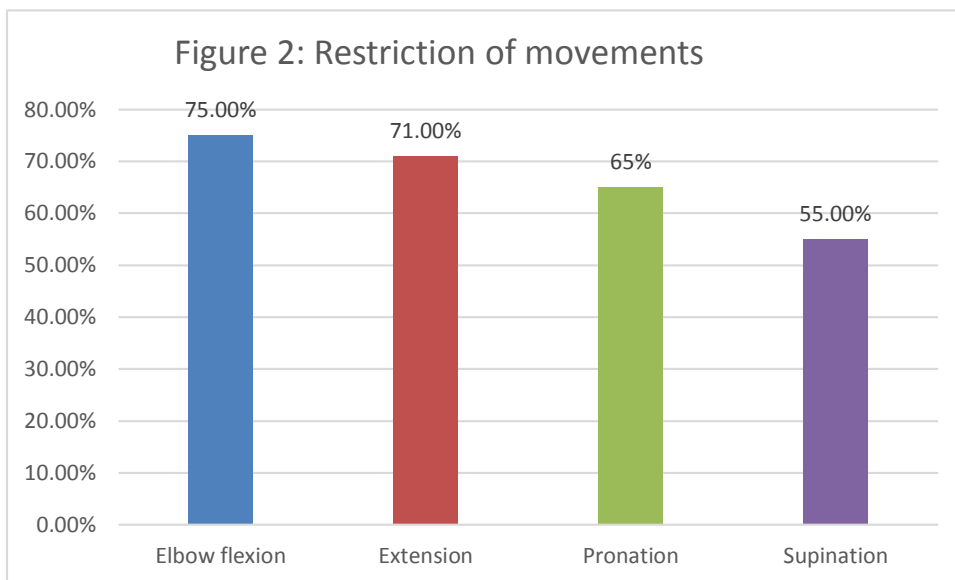


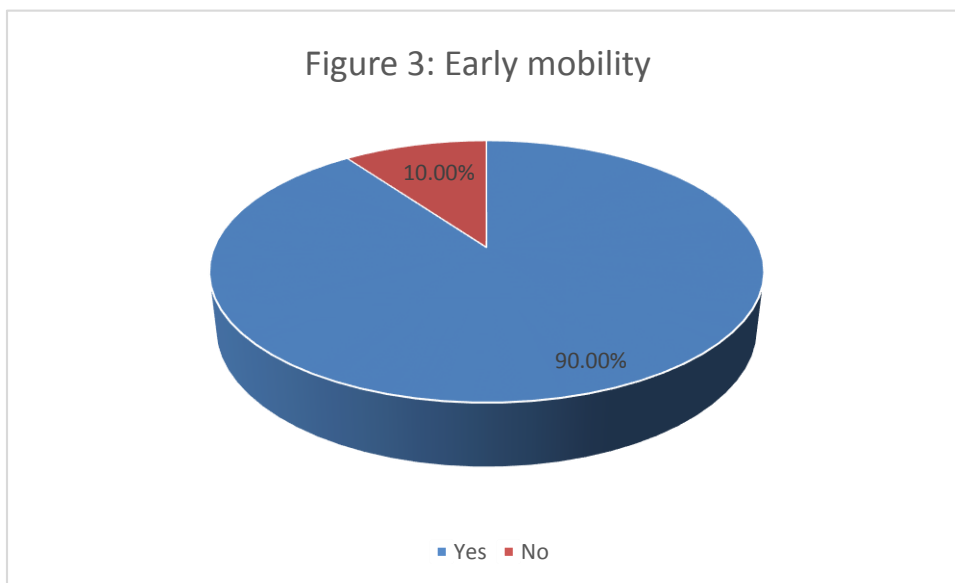
Table 1
Cause of injury

Cause of injury	Frequency	Percentage
Fall from height	25	50%
Direct trauma	12	24%
Road traffic accident	7	14%
Fall from cycle	6	12%
Total	30	100%

Most common cause of injury was fall from height (50%), direct trauma (24%), road traffic accident (14%) and fall from cycle (12%). majority children presented with pain and swelling.



Majority 75% had restricted elbow flexion, 71% restricted extension, 65% pronation and in 55% supination was restricted.



After reduction, majority 90% had early mobility.

Table 2
Functional Outcome

Outcome	Frequency	Percentage
Excellent	28	56%
Good	15	30%
Fair	5	10%

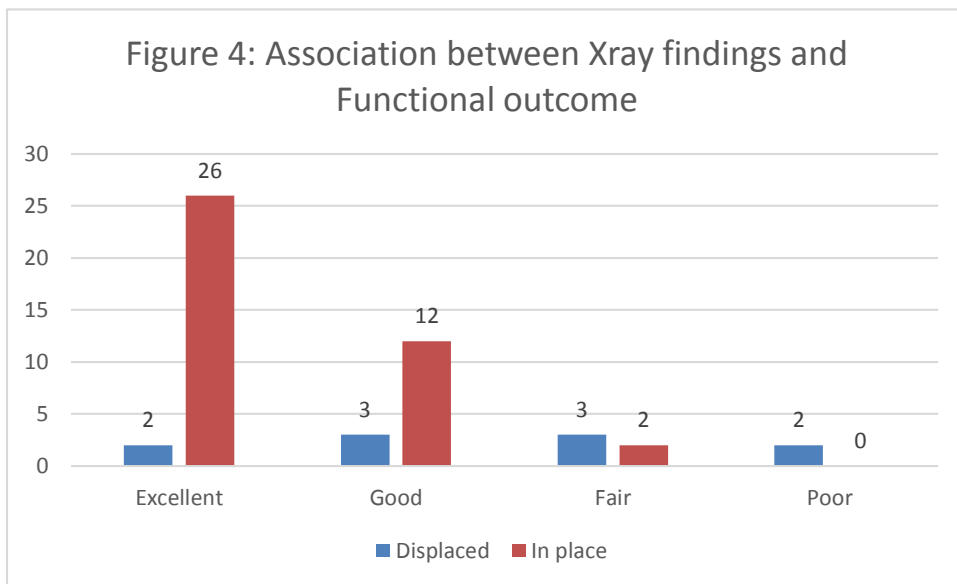
Poor	2	4%
Total	50	100%

On outcome, 56% had excellent, 30% had well, 10% had fair and 4% had poor outcome.

Table 3
Association between X-ray findings and Functional outcome

Functional Outcome	X-ray finding		Total
	Displaced	In place	
Excellent	2	26	28
Good	3	12	15
Fair	3	2	5
Poor	2	0	2
Total	10	40	50

Applying chi square test, p value =0.001, as p value <0.05 shows statistical significance.



Discussion

In present study mean age was 11.46 ± 3.4 years, ranging from 5 to 14 years. Majority 55% were in age group of 10 to 14 years, 33% in 5 to 10 years and 12% had age <5 years. AhmetKöse et al ⁽¹⁰⁾ found 11 (64.7%) were male and 6 (35.3%) were female and age range between 0-23 years.

In present study most common cause of injury was fall from height (50%), direct trauma (24%), road traffic accident (14%) and fall from cycle 12%. AhmetKöse et al ⁽¹⁰⁾ found 70% had fall history as mode of injury.

In present study majority children presented with pain and swelling. Majority 75% had restricted elbow flexion, 71% restricted extension, 65% pronation and in 55% supination was restricted. Study by Antuna SA et al ⁽¹¹⁾ found most common clinical presentation as elbow pain. Similar finding were seen in study by Sun J et al ⁽¹²⁾ In present study after reduction, majority 90% had early mobility, study by Sun J et al ⁽¹²⁾ showed that majority had early mobility and no further re-displacement.

In present study on functional outcome, 56% had excellent, 30% had well, 10% had fair and 4% had poor outcome. Association between Xray findings and Functional outcome Applying chi square test, p value =0.001, as p value <0.05 shows statistical significance. Study by AhmetKöse et al ⁽¹⁰⁾ showed that results were excellent in 16 (94%) and good in 1 (6%) patient. Visna et al.⁽¹³⁾ reported 88% excellent and good results, and Lee et al. ⁽¹⁴⁾ 81% excellent, 11% good, and 8% acceptable results. In the present study, 16 (94%) cases were categorized as excellent and 1 (6%) was categorized as good.

Conclusion

Fixation of the fracture at an early stage is very important just to avoid further complications. There are various methods for that. We studied about closed reduction internal fixation. Closed reduction caused less soft tissue injury, shorter operating time which ultimately leads to shorter duration of anesthesia and risk related to it. It was also seen than it had a good cosmetic result as well as functional outcome as very good. The patient satisfaction is more important which can be achieved using closed reduction nailing methods.

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