ORIGINAL ARTICLE

Outcome of paediatric patients with displaced and unstable forearm diaphyseal fractures treated with intramedullary elastic nails, our experience at tertiary care hospital

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Abstract

Objective: To assess prospectively the results of treatment of paediatric patients with displaced and unstable radius and ulna mid shaft fractures using intramedullary elastic nails.

Material & Methods: This prospective observational study was carried out from January 2015 to June 2016 at Liaquat National Hospital and Medical College Karachi. 56 paediatric patients with radius and ulna fractures were registered in study after getting informed consent and all patients were treated with closed reduction and internal fixation using intramedullary titanium elastic nail system. Results were assessed clinically and radiologically in all patients at follow up visits. Final evaluation was made at the 6th month on the basis of Price criteria.

Results: All treated patients had no complain of pain during final evaluation in follow up visit at 6th month, all fractures were healed by the end of fourth months and nails were removed from all patients at 4thmonth. Excellent results were obtained in 46 (82.14%) patients, 9 patients (16.071%) had good results, 1 patient (1.63%) had fair results, no one had poor outcome.

Conclusion: Based on the results, we conclude that flexible intramedullary nailing is a successful and less invasive method of fixing radius and ulna fractures in children. Outstanding results can be obtained by using this device in children with minimum post-operative complications.

Keywords: Forearm fractures, elastic intramedullary nail, outcome

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Introduction:

The fractures of radius and ulna in children are among most common fractures and consisting of 45% of all fractures in children.[1-2] Radius and ulna fractures are common in children from 6-12 years of age.

Conservative treatment by closed reduction and application of cast above elbow is the treatment of choice for stable and undisplaced fractures. The treatment of unstable and displaced fractures becomes more challenging usually in older children. There is high possibility of loss of reduction and displacement of fractured fragments in the children who are managed without any operation. These patients hence require multiple attempts to obtain acceptable reduction and alignment.[4-5] Conservatively managed unstable fractures heal with angular deformity which results in unacceptable functional outcomes.

Now-a-days, there is a raising trend to operate most of these fractures. These can be fixed with extramedullary plate fixation and intramedullary stabilization.[8] Fracture fixation using extramedullary devices like plates has various disadvantages such as large incisions, more soft tissue dissection, more chances of infection and a resurgery of almost similar magnitude for removal of implant. As advised by Shoemaker et al. the ideal fixation mode should maintain alignment, be minimally invasive and should have least complications. This has led to the use of intra-

Table-1: Outcome table

Outcomes	Symptoms	Loss of forearm rotation
Excellent	No complaints with strenuous activity	< 15 degrees
Good	Mild complaints with strenuous activity	15 – 30 degrees
Fair	Mild complaints with daily activity	31 – 90 degrees
Poor	All other results	> 90 degrees

medullary fixation devices. Elastic nail system (Nancy nail) is a minimally invasive procedure that spare physis, provide 3 point fixation and give less trauma to soft tissue.[9-13]

The object of our study is to assess outcome of treatment of children with radius and ulna displaced fracture by using intramedullary elastic titanium nails (Nancy nail).

Material and Methods:

This prospective observational study was conducted from January 2015 to June 2016 at Liaquat National Hospital and Medical College Karachi. 56-patients (children) with fractures of radius and ulna were registered in this study. These patients were admitted in hospital and their radius and ulna fractures were treated by closed reduction and internal fixation and intramedullary elastic nails (Nancy nails) were used. Of these 56 patients (children), 40 were boys and 16 were girls with average age 9.7 years. Thirty three (33) fractures were on left side and 23 fractures were on right side. Patients between age of 5 to 15 years, with diaphyseal fracture of both bone (radius and ulna) of single forearm and presented within one week were included in study. Exclusion criteria include patients those younger than 5-years and older than 15-years, patients with polytrauma, bilateral forearm fractures, pathological fractures, isolated radius or ulna fracture and open fractures.

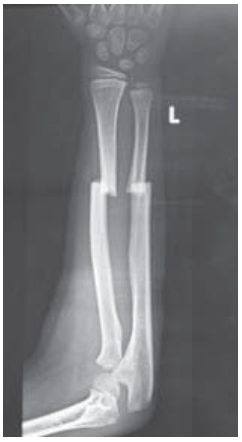
Twenty four patients received their injuries through fall from standing height, tenhad bicycle accidents, thirteen fell while playing games, four fell from swing, five were pedestrians hit by automobiles. All patients had closed fractures of both radius and ulna of same forearm. According to AO classification,[14] there were 40 type 22-A3 fractures, 16 fractures were 22-B3 type.

All patients were operated under general anesthesia in supine position with affected arm on the radiolucent arm table. Image intensifier positioned perpendicular to affected arm coming from foot side. A titanium nail (Synthes) was selected corresponding to approximately one-third the medullary canal diameter. Closed reduction and internal fixation using intramedullary nailwas done in all patients. Entry point for the radius was made through the lister's tubercle (a bony prominence located at the distal end of radius on dorsal side) and entry point for ulna was made through olecranon as described by manual of titanium elastic nail system by Synthes.[15]

Post-operatively patients were given regular doses of Cefuroxime, Paracetamol, Ketorolac and Ibuprofen according to their weight as needed for pain. Above elbow back slab was given to all patients for soft tissue injury and for pain reduction that was removed after four weeks and range of motion was started. On second day of operation dressing was changed and patient discharged.

All patients were reviewed initially on weekly interval for wound inspection and to ensure satisfactory position of nail and fracture. Patients were assessed clinically and radiologicallyon total seven follow up visitssubsequently at 1st, 2nd, 3rd, 4th, 6th, 12th and 24th weeks. Clinically range of motion at pronation and supination was assessed, final clinical outcome measured on 6th month. Radiologically patients were assessed on x-ray radius /ulna anteroposterior and lateral views. All demographic values and results were analyzed by using SPSS version 20.0.

Outcome was classified into three groups as excellent, good and poor on the basis of Price Ct et al criteria.[16] Price divided patients in to four groups on the basis of final results. Excellent, Good, Fair, Poor, Patients with other results like, delayed union and malunion were classified as poor table No.1.



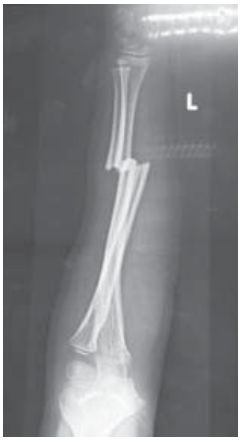
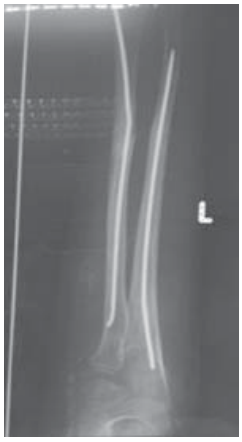


Figure 1: Pre-operative x-rays raduis/ulna of skeletally immature boy



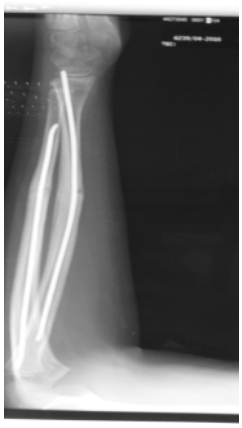


Figure 2: Post-coperative x-rays raduis/ulna at 12th week follow-up

Results:

All patients were pain free on final evaluation conducted at 6th post-operative month. By the end of 4th post-operative month all fractures were united and implants were removed from all patients. As per Price CT et al, criteria, 46 patients (82.14%) had excellent results, 9 patients (16.07%) had good results, 1 patient (01.78%) had fair results, no patient had poor outcome.

No significant complication like deep infection, malunion, non-union, nerve palsy, re-fracture, and nail migration was observed. Pin site infection was noticed in 3(4.91%) patients whowere treated with antibiotics.

Discussions:

Fractures of radius and ulna in children have been treated by closed reduction and application of POP cast since long time but these fractures are usually displaced after their closed reduction. Fractures which are not closely reduced and those which are displaced after closed reduction are usually operated and fixed with open reduction and plate fixation. There are possibilities of unavoidable complications like soft tissue damage during procedure, re-fracture after plate, removal of plate and unsightly scar when open reduction and internal fixation is done.

Over the past few years there has been a marked increase in the use of intramedullary fixation in the management of long bone fractures in children. Elastic intramedullary nails are now frequently used for management of radius and ulna fractures in children. By using intramedullary nails the biology of fracture hematoma is preserved which is essential for bone healing and potential complications like soft tissue trauma during opening fracture, second operation for removal of implant and unsightly scar can be avoided.

As mentioned in literature angular deformity > 10 degrees and complete displacement account for unacceptable reduction.[17] Also younger children tend to tolerate greater deformity much better than older ones due to better remodeling potential.[18-19] In the present study majority of children were in age group of 9-12 years with mean age of 9.7 years. Similar observation was also made by Qidwai SA (11 years) and Garg NK et al (11.8 years).[20-21]

In present study, there were 56 patients with simple (closed) fractures. Kang SN et al., also mentioned in their study that 9% of their patients had open fracture and remaining (91%) were closed. This can be due to fact that injuries in children are low energy injuries.[22]

We achieved closed reduction and intramedullary fixation in all patients under image intensifier guidance. This is in accordance to study conducted by Mohammed H et al., on 21 children with forearm fractures in which 4 patients (19%) had required open reduction and intramedullary fixation with elastic stable intramedullary nailing (ESIN) and 19 patients were managed with closed reduction internal fixation.[23]

All 56 patients had excellent results in term of fracture union. We had 46 patients (82.14%) with excellent results and 9(16.07%) with good results and 1-patient (1.78%) had poor results according to price criteria. The final result is in accordance with study conducted by Parajuli NP et al., in which 94% patients had excellent results and 6% had good results[24] and study conducted by Kapila et al., in which they had 46-patients (92%) with excellent results and 4-patients (8%) with good results.[25]

Conclusion:

Forearm fractures in children are quite common. Management of unstable and displaced fracture become difficult due to high incidence of re-displacement hence they demand internal fixation. Internal fixation with plate needs open reduction, soft tissue damage, second procedure for removal of implant and unsightly scar. Titanium elastic nail system is a modality which aids in the maintenance of redial bow and interosseous space between forearm bones while sparing the physis, thus achieving good functional results in term of forearm movement. Based on the results, we conclude that flexible intramedullary nailing is an effective and minimally invasive way of fixation with excellent results in term of bony union and functional outcomes with minimal complications in diaphyseal forearm fractures in skeletally immature patients.

Conflict of interest: None

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Role and contribution of authors:

Dr. Saifullah Soomro, conceive the idea and did the initial write up

Dr. Imran Khan Mangi, helped in collecting the data and references and also helped in introduction writing

Dr. Osama Bin Zia, helped in collected the data and also helped in discussion writing

Dr. Mohammad Zoha Farooq, critically review the article and made the final draft.

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