

PIN SITE INFECTION RATE IN LATERAL ENTRY COMPARED WITH MEDIAL AND LATERAL ENTRY PIN FIXATION FOR COMPLETELY DISPLACED SUPRACONDYLAR HUMERAL FRACTURES IN CHILDREN. A RANDOMIZED CLINICAL TRIALRaghvendra Choubey¹, Amit Jain²**HOW TO CITE THIS ARTICLE:**

Raghvendra Choubey, Amit Jain. "Pin Site Infection Rate in Lateral Entry Compared with Medial and Lateral Entry Pin Fixation for Completely Displaced Supracondylar Humeral Fractures in Children. A Randomized Clinical Trial". *Journal of Evolution of Medical and Dental Sciences* 2014; Vol. 3, Issue 38, August 25; Page: 9782-9786, DOI: 10.14260/jemds/2014/3266

ABSTRACT: INTRODUCTION: The supracondylar fracture of the distal humerus is the most common pediatric fracture in the elbow. The purpose of this study was to compare the infection rate of lateral entry pin fixation with that of medial and lateral entry pin fixation for the operative treatment of completely displaced extension supracondylar fractures of the humerus in children. **MATERIAL & METHODS:** Only the 81 patients who were able to follow up to final examination were included in the assessment. The patients were allocated randomly into two groups according to the pin configuration used. Group 1 comprised 40 patients, 30 male and 10 female, with a mean age of 7.5 years (range, 1.5–14 years). After closed reduction, fixation was achieved with K-wires placed from the lateral condyle. Group 2 comprised 41 patients, 28 males and 13 females, with a mean age of 7.8 years (range, 2–13 years). After closed reduction, two cross-wires passed—one from medial and one from lateral. **RESULTS & CONCLUSION:** On statistical evaluation, no significant difference was seen between the two groups. With use of the specific techniques employed in this study, both lateral entry pin fixation and medial and lateral entry pin fixation are effective in the treatment of completely displaced (type-III) extension supracondylar fractures of the humerus in children however percentage wise lateral entry group was associated with pin tract infection more as compared to lateral and medial entry group may be because of small sample size so further studies needed with large sample size.

KEYWORDS: Pin site infection, Supracondylar humerus fracture, Children.

INTRODUCTION: Paediatric supracondylar humeral fractures are the most common fracture, accounting for 50–60% of fractures in the elbow region and 30% of all extremity fractures.¹ In the treatment of non-displaced humeral fractures, conservative methods are used, while in displaced cases, closed or open reduction and percutaneous Kirschner-wire (K-wire) fixation may be used.^{2,10,14}

The most commonly used method for fixation are two cross-wires, one inserted laterally and one through the medial condyle or two parallel wires inserted through the lateral condyle across the fracture and continuing into the medial cortex.^{3,4,5}

Previous studies have reported the most stable configuration to be medio-lateral cross pinning.⁶ However, there is a risk of iatrogenic ulnar nerve damage.^{8,9} But in lateral parallel technique was associated with the incidence of pin tract infection ranging from 5% to 30%.^{10,11} Pin site infection is a critical issue for patients' safety in skeletal fixation using percutaneous pins or wires.

In this study we compared the pin tract infection rate of patients with displaced supracondylar humeral fractures who had been treated with all lateral parallel wire and medio-

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lateral cross-wire fixation techniques. A literature search do not identified clinical trials and observational studies presenting the probability of pin tract infection in different methods of pin fixation associated with closed reduction and either lateral entry or medial/lateral entry pinning of supracondylar fractures in pediatric patients. So this study is presented.

MATERIALS AND METHODS: Eighty-nine paediatric patients who had undergone treatment for supracondylar humeral fracture between 2012 to 2014 were evaluated. Any neurological and vascular injuries were identified before the surgery and excluded from the study. Ipsilateral arm or forearm fractures were excluded from the study. There were three open fractures: one type 1 and two type 2 according to Gustilo-Anderson classification they were also excluded from the study. Patients treated by other methods or whose medical records were incomplete were excluded from the study.

81 patients who were able to attend up to the final examination were included in the assessment. Fractures were classified according to Gartland's system. The patients were operated upon within 24 hours after the trauma. First-generation cephalosporin was administered to all patients for 24 hours only as a prophylactic with first dose just within one hour prior to surgery and second dose after twelve hours of first dose.

The patients were allocated randomly into one of the two groups according to the pin configuration to be used (medio-lateral crossed or lateral parallel pin fixation). Group 1 after closed reduction, fixation was achieved with lateral parallel pin fixation technique K-wires placed from the lateral condyle towards the medial epicondyle. (Fig. 1) Group 2 In this group after closed reduction Two cross-wires passed—one from medial and one from lateral. (Fig. 2)

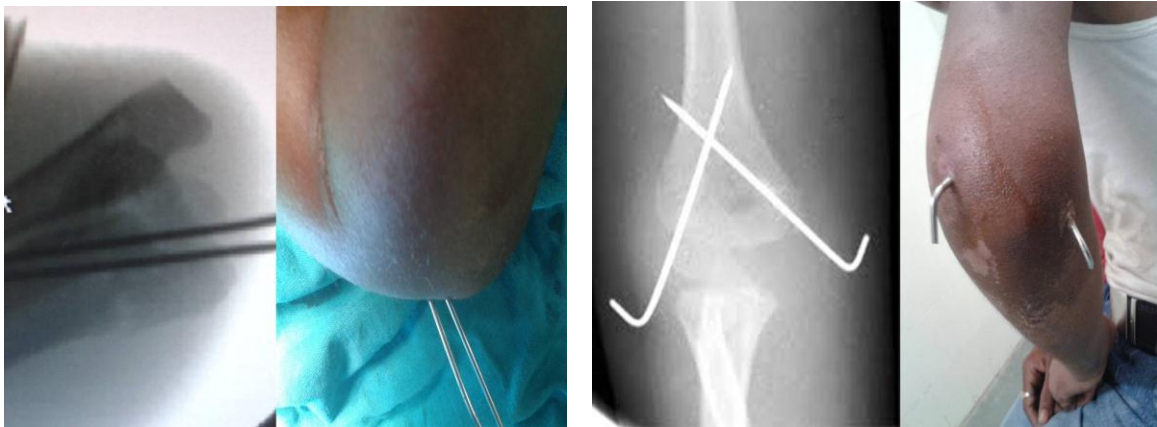


Fig-1

Fig-2

Closed reduction was performed on all patients, the adequacy of which was assessed by C-arm fluoroscopy. Then pin fixation was done with all aseptic precaution. After fixation K-wires were bent and left out of the skin for subsequent removal beneath a cast. There was immediate postoperative neurological assessment for ulnar, radial and median nerves. The patients were discharged after twenty four hours after completion of surgery.

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Patients were followed on third, tenth, and twenty one day after the surgery. At the third week, elbow radiographs were taken and examined, K-wires were removed after which time the elbow was mobilized for a further two to four weeks. When healing was seen on radiographs, patients were allowed full use of the extremity without restriction. The results obtained were statistically analyzed and compared.

OBSERVATION AND RESULTS: All patients were followed-up until the primary end point. The causes of injury were as follows: a fall from height in 48 cases (59%), bicycle and game accidents in 30 (37%) and motor vehicle accidents in 3 (4%). All cases were Gartland type 3 extension type of fractures

None of the patient developed a deep infection with septic arthritis and osteomyelitis. Superficial pin site infection was seen in 8 (10%) of 80 pins in group 1 and in 7 (8.53%) of 82 pins in group 2. There was no statistically significant difference between the two groups ($p > 0.05$).

DISCUSSION: Supracondylar fractures of the humerus are the commonest types of elbow fractures in children and adolescents accounting for 50–70% of all elbow fractures and are seen most frequently in children between the age of 3 and 10 years.¹ Some of the methods used in the treatment of paediatric humerus supracondylar fractures are traction, closed reduction and plaster fixation, closed reduction and crossed K-wire osteosynthesis, and open reduction and fixation with K-wires.

There has been no uniformity of opinion concerning the ideal method of treatment of displaced supracondylar fractures. While excellent results may be obtained with conservative treatments in Gartland type 1 and 2 fractures, adequate treatment is not achievable by conservative methods in type 3 fractures. In these fractures, long-term immobilization is required, and vascular and neural complications are encountered, and therefore surgery is recommended. Currently, the technique of choice is closed reduction and percutaneous K-wire osteosynthesis.^{1,12,13,14}

Different configurations of pinning for fixation are proposed for the treatment of supracondylar humeral fractures in children. Danielsson and Pettersson¹⁵ used only one pin and noted a loss of reduction. Swenson,³ Flynn et al⁴ and Nacht et al⁵ have, using two pins, introduced through the medial and lateral epicondyles, respectively. In recent biomechanical studies it has been shown that cross-wire pinning configuration is the most stable fixation technique.⁶

Iatrogenic neural injury rates of 2–5% have been reported after closed reduction.^{8,12,13} Royce et al.⁹ and Wind et al.¹⁶ reported even higher rates. Apart from nerve injury pin site infection is a important issue for patients' safety in fixation using percutaneous pins. Pin site infection may occur after treatment of displaced supracondylar fractures. Deep infection and osteomyelitis are rare. In recent publications, an infection incidence of 2.4–6.6% has been reported with percutaneous fixation.^{9,10} In the present study, we compared lateral parallel wiring technique versus time trusted medio-lateral cross wiring for supracondylar humeral fractures.

Shannon¹⁷ reported on one patient with a minor pin-site infection. Similarly in our study, superficial pin site infection was seen in 8 (10%) of 80 pins in group 1 and in 7 (8.53%) of 82 pins in group 2 that resolved after K-wire removal and oral antibiotics. There was no statistically significant difference between the two groups ($p > 0.05$).

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Wael et al¹⁸ reported six patients (8.6%) who had minor pin-site infection that resolved after K-wire removal and oral antibiotics, however they noted excessive granulation tissue around a wire which was not noted in our study may be because of good pin site care.

Memisoglu K et al¹⁹ noted Pin site infection in 14 (9.3%) of 150 pins in group 1 in which fixation was achieved with crossed K-wires placed from the lateral condyle and lateral humerus towards the medial epicondyle and in 11 (8%) of 128 pins in group 2 in which fixation was achieved by, two cross-wires passed—one from medial and one from lateral. There was no development of deep infection or osteomyelitis. There was no statistically significant difference between the two groups ($p > 0.05$).

Despite all aseptic precautions pin site infection occurred in our patients also but statistically there is no difference in between the two techniques in terms of infection. The relatively increased infection rate (in terms of percentage) in lateral wiring group in the present study may be attributed close proximity of lateral pins adjacent to each other which leads to large haematoma formation which is a good source for bacteria to flourish.

So the lateral parallel wire fixation technique may be a good choice in the treatment of paediatric supracondylar humerus fractures as it reduces the possibility of ulnar nerve damage however it is associated with more pin tract infection as compared to medio-lateral fixation technique.

CONCLUSION: Within the obtained results, complications, and limitations of the present study, the lateral parallel-wiring technique is a viable solution for percutaneous fixation of displaced supracondylar fractures in children. A further large sample size study will be needed with a sufficient power so that a valid conclusion can be drawn.

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