

Among Children With Supra Condylar Fracture of Humerus; Buried Versus Percutaneous K-Wires

Subhan Shahid¹, Ghulam Farid², Muhammad Abubakar¹, Maffia Sanobar³, and Muhammad Umair Hashmi⁴

ABSTRACT

Objective: The comparison of pin tract infection rate between buried K-wire fixation and subcutaneous K-wire fixation in supra condylar fracture of humerus in children.

Study Design: Prospective study.

Place and Duration of Study: This study was conducted at the Department of Orthopedic Unit Sir Ganga Ram Hospital Lahore from January 2019 to June 2019.

Materials and Methods: Children up to 14 years of age admitted to orthopedic unit of study institution during study period having supra condylar fracture of humerus (Gartland type-3) not more than 3 days old were included in this study. These cases were divided into two groups Group-A & Group-B. Open or closed reduction of fracture using K-wires were done in all cases but wires were buried in cases of group-A and wires were kept percutaneous in group-B. Rate of pin tract infection was seen in both groups on follow-up and compared with each other. All data was recorded on a predesigned performa and analyzed on statistical software SPSS (version 20) and Microsoft office (version 2017).

Results: There were total 169 cases in our study divided into two groups group-A (N=79) and group-B (N=90). Mean age of patients was 6.5 years. Out of 79 cases with buried k-wires 1.3% cases developed pin tract infection and out of 90 cases with percutaneous k-wires 6.6% cases developed pin tract infection having statistically significant difference with p-value <0.005. Other complications related to surgical wound were also observed such as hypersensitivity of scar tissue seen in 1 case, ulnar nerve palsy in 3 cases, loosening of k-wires in 3 cases, retrograde migration of wires in 1 cases, tendinitis in 2 cases and osteomyelitis was reported in one case. Mean time of hospital stay after operation was 3±1 days. Mean time of union was 4.5 weeks (3-7 weeks).

Conclusion: Our study concluded that among patients with fixation of supra condylar fracture humerus with percutaneous exposed kirschner wires (k-wires) rate of pin tract infection was much higher than buried k-wires and second surgery may be needed to remove infected wires that is a burden on the patient and doctor as well with increased morbidity. Among patients with buried k-wires second surgery is must to remove it after fracture healing but pin tract infection rate is much low.

Key Words: Supra condylar fracture of humerus, Kirschner wires, pin tract infection, ulnar nerve palsy

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INTRODUCTION

¹Department of orthopedic FJMS/SGRH Lahore.

²Department of orthopedic Jinnah Hospital Lahore.

³Department of Orthopedic, Teaching Hospital Yaki Gate Lahore.

⁴Department. of orthopedic unit BVH Bahawalpur.

Correspondence: Dr. Subhan Shahid, Assistant professor orthopedics FJMS/SGRU Lahore.

Contact: 0321 4125299

E Mail: drsubhanorthsurg@hotmail.com

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Supra condylar fracture of humerus is a most common fracture among children. Displaced supra condylar fracture of humerus is fixed with k-wires either by closed reduction or open reduction. But closed reduction method is more suitable.¹ There are many complications associated with this technique but most common is pin tract infection, that is treated by appropriate antibiotics after culture and sensitivity and removal of pins. If this infection is not treated early then it can lead to osteomyelitis, septic arthritis, early fusion of physis and flexor sheath infection. Commonly Gartland classification is used for supra condylar fracture of humerus. In Gartland type 1 and 2 closed reduction and immobilization by cast is used commonly and in type-3 fractures suitable technique is open or closed reduction with percutaneous or buried k-wire fixation.² Rate of pin tract infection is increased

when kirschner wires are left in situ for prolong period of time. There are many methods to prevent this infection such as pin site cleaning daily, release of tethered skin, coating pins with antiseptics and application of topical antibiotics as a prophylaxis. According to a study daily cleaning of pins enhances fear among children and their parents as well so cleaning after 2 days or weekly is also effective having same outcomes.³ Some studies have been done previously on safety of semi sterile technique of percutaneous pinning in supra condylar fracture of humerus but that showed high rate of pin tract infection so semi sterile technique is not suitable.⁴ Supra condylar fracture of humerus accounts 65% of all elbow fractures in children.⁵ In type-3 displaced fractures closed reduction is much difficult to achieve due to thin bone present between coronoid and olecranon fossae and stripping of periosteal layer as well as hyper flexion at elbow to maintain reduction can lead to compartment syndrome and neurovascular compromise. In our study rate of pin tract infection has been determined in percutaneous versus buried k-wire fixation in supra condylar fracture of humerus and both open and closed techniques were used according to surgeon priority..

MATERIALS AND METHODS

This study was conducted in orthopedic unit of Sir Gangaram Hospital Lahore. It is a cohort study of prospective type. It is an experimental study. Study was started in January 2019 and completed after six months in June 2019. All children up to the age of 14 years having closed supra condylar fracture of humerus Gartland type-3 not more than 3 days old were included in this study. These cases were admitted in the ward for open or closed reduction and fixation with kirschner-wires. History was taken related to mode of injury and time duration, demographic data like name, age, gender and residential address were noted on a proper designed performa. All cases were divided into two groups group-A & B. In group-A K-wire fixation of fracture was done and wire ends were buried in the skin while in group-B wires were kept percutaneously. Reduction of fracture was done by either closed or open techniques. K-wires were inserted either two crossed k-wires (one from medial and other from lateral side) or two lateral k wires. Ends of k-wires were bent to prevent migration of wire. After fixation splint was applied to the patient and they were given same type of antibiotic regimen for 7-10 days duration. They were examined for any complication particularly pin tract infection on follow-ups after 15 days, 4 weeks and then 6 weeks. Patients above the age of 14 years, having open fracture or older fracture were not included in this study. Patients giving history of any manipulation from quacks before admitting to the hospital with compromised skin conditions on examination were not included in this study as well. In which patients pin tract infection was

found on follow-ups, pus for culture and sensitivity was sent, conservative management was given for 10 days and if not treated then patient admitted for k-wire removal and then managed for pin tract infection accordingly. Pin tract infection was diagnosed on the basis of Modified Openheim classification. Patients having grade-2 score were diagnosed for having pin tract infection. All data was collected on a performa and analyzed using SPSS-20 and Microsoft office-2017. Chi square test was applied on the data. P-value less than 0.05 were considered statistically significant. Results were expressed in the form of tables and graphs..

RESULTS

Total 169 cases were studied including 98(58%) male and 71(42%) female children. In 79(46.7%) cases of group-A after k-wire fixation of fracture wires were buried in the skin and pin tract infection was reported in 1(1.3%) cases while in 90(53.3%) cases of group-B wires were kept percutaneously and pin tract infection was reported in 6(6.6%) cases. Overall rate of pin tract infection in 169 study cases was 4.14%.

Table No.1: Modified Openheim classification¹⁶

Grades	Clinical findings
1	Slight discharge and redness around pin
2	Redness and tenderness in soft tissue with or without discharge of pus
3	As in grade-2 but failure to improve with antibiotics
4	Severe soft tissue involvement affecting more than one pin
5	As in grade-4 with bone involved visible on x-ray
6	Sequestrum formed in the bone with sinus formation

Table No.2: Treatment outcome in both groups (N=169)

	Percutaneous k-wires (n=90)	Buried k-wires (n=79)	p-value
Number of cases with infected wires	6 (6.6%)	1 (1.3%)	0.005
Open reduction	18 (22.8%)	21 (23.3%)	0.01
Closed reduction	61 (77.2%)	69 (76.7%)	0.05
Wires removed early due to infection	2 (2.2%)	1 (1.3%)	

Table No.3: Complications related to k-wires

complications	Number of patients (N=169)	%
Excessive granulation	2	1.18
Scar hypersensitivity	1	0.6
Wire loosening	3	1.8
Retrograde migration of wire	1	0.6
Revision of procedure	1	0.6
Penetrating tendinitis	2	1.18
osteomyelitis	1	0.6
Ulnar nerve palsy	3	1.8%

Mean time of fracture union was 4.5 weeks (3-7 weeks). Out of 79 cases of group-A, open reduction was done in 18(22.8%) cases while closed reduction was done in 61(77.2%) cases. In group-B, out of 90 cases open reduction was done in 21(23.3%) and closed reduction was done in 69(76.7%) cases. Modified Openheim classification was used to diagnose pintract infection among cases in study group. Hence patients having at least grade-2 infection were diagnosed as having pin tract infection. Out of 90 cases of percutaneous k-wires, 6(6.6%) wires were infected, open reduction and k-wire fixation was done in 18(22.8%) cases while closed reduction and k-wire fixation was done in 61(77.2%) cases and due to infection early removal of wires done in 2(2.2%) cases. Out of 79 cases with buried k-wires only one case got pin tract infection, open reduction of fracture was done in 21(23.3%) and closed reduction was done in 69(76.7%) cases, early removal of wires done in only one case.

DISCUSSION

In pediatric fracture kirschner wires are most commonly used for internal fixation. Two k-wires are passed through fracture either crossed k-wires or two lateral k-wires can be used. Studies have proved that two lateral wires are as good as two cross wires.⁶ In this study we compared rate of pintract infection among buried and percutaneous k-wires. Data recorded regarding various complications after operation. Previously conducted study on 490 cases reported pin tract infection in 4.3% cases, superficial infection was present in 3.1% and deep infection like osteomyelitis and septic arthritis was found in 1.2% cases. In our study rate of pin tract infection was higher (22.2%) as compared to this study but rate of deep infection was much lower (0.6%).⁷

In percutaneous pinning microbes enter into the wound through pin site openings and create infection. A study described very simple method of using rubber stopper on percutaneous ends of pin to prevent pin tract infection. It is very simple and inexpensive way of infection prevention with excellent results.⁸

A study conducted in united state concluded that preoperative use of antibiotics reduces rate of infection which was just 2.4% according to their study. Preoperative one dose of antibiotics is more effective than using post operative multiple doses. This rate is much lower as their health system is more developed than our system and highly developed operation theaters as well.⁹

There are two techniques fracture reduction, open reduction with incision or closed reduction without giving large incision. Both techniques reduce fracture successfully but there is cosmetic disadvantage in open technique and wound healing takes time followed by

formation of a scar tissue. While in closed method no scar tissue is formed.¹⁰

Most of the supra condylar fractures occur between 5-10 years of age and 98% are extension type. According to a study conducted in India most of the fractures were found in male children (59.5%) and mostly on left side (57.14%). Most common mode of injury was trauma while playing (42.8%). They used crossed k-wire fixation via medial approach and on follow up after 3 months, 6 months and one year range of motion on elbow was satisfactory in most of the cases.¹¹

Previously a study conducted in Pakistan in M.M. Medical College reported that there is no significant difference in outcomes in cross k-wire fixation or two lateral k-wires fixation but there was found some risk of iatrogenic ulnar nerve injury in medio-lateral cross k wire fixation but it was just neuropraxia which recovered after mean time of 3-months.¹²

According to another study conducted in Turkey on open supra condylar fractures of humerus gustilo type-1 and 2 in children and management by k-wires fixation reported that out of 26 study cases 23 showed excellent outcome and in other 3 cases successful outcome found. Pin tract infection rate was just 3%. These results were excellent in open fractures.¹³

Kwak-Lee et al described that two lateral pin insertion and one medial pin insertion has better outcome than just two lateral pins insertion. According to a study conducted by Shahid Hussain et al cross k wires fixation was done through lateral approach and it showed satisfactory results in 90% cases with good range of motion according to Flynn's criteria within 6 weeks after pins removal.^{14,15}

In our study crossed k-wire fixation was done in most of the cases and in other two lateral wires were passed. Open and closed both techniques were used and in mostly cases pins ends were buried while in others they left percutaneously. Main objective of this study was to determine rate of pin tract infection in percutaneous vs buried k-wires.

CONCLUSION

In this study it has been evident that in percutaneous kirschner-wire fixation of supra condylar fracture of humerus rate of pin tract infection is high as compared to those in which k-wires are buried beneath the skin and its ends are not exposed. In buried k-wires there is low rate of infection and hence no need of early removal and low chances of fracture displacement due to infection. There is one disadvantage of buried k-wires and that is burden on the patient of second surgery for removal of k-wires that is done under general anesthesia in children that is financial as well as emotional burden on the patient and parents of children and also burden on the doctor for preparing the patient for second surgery.

Author's Contribution:

Concept & Design of Study: Subhan Shahid
 Ghulam Farid,
 Drafting: Muhammad Abubakar
 Maffia Sanober,
 Data Analysis: Muhammad Umair
 Hashmi
 Revisiting Critically: Subhan Shahid, Ghulam
 Farid
 Final Approval of version: Subhan Shahid

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