

## ORIGINAL ARTICLE

**Efficacy of Pre and Postoperative Antibiotics in Percutaneous Pinning of Pediatric Supracondylar Humerus Fractures**FARHAN MAJEED<sup>1</sup>, MUDASSIR SIDDIQUE<sup>1</sup>, MAHAM ASHRAF<sup>2</sup>, MOSHIN TAHIR<sup>1</sup>, AHMAD SHAMS<sup>1</sup><sup>1</sup>Senior Registrar, Department of Orthopaedics, Lahore General Hospital Lahore<sup>2</sup>Senior Registrar, Department of Radiology, Lahore Children Hospital LahoreCorrespondence to: Farhan Majeed, Email: [farhanmajeed\\_85@hotmail.com](mailto:farhanmajeed_85@hotmail.com), Cell: 0330-7038229**ABSTRACT**

**Background:** Supracondylar humerus (SCH) fracture is a common injury to the pediatric age group and often requires closed reduction and percutaneous pinning. Much controversy exists in the literature regarding the use of antibiotics in the pre-operative or postoperative period with some centers administering a single pre-operative dose only, whereas others administering a single pre-operative dose along with few post-operative doses and some centers where no antibiotic is administered at all. The purpose of this study is to evaluate the incidence of surgical site infection in patients receiving a single pre-operative dose only versus single pre-operative along with five days dosage as per local ward policy.

**Material and methods:** We prospectively studied 50 patients at The Children Hospital and Institute of Child Health, Lahore between February 1st, 2021 and July 30th 2021. Following approval from the Institutional Ethical committee, 50 pediatric patients presenting to the Emergency and outpatient department with trauma to affected elbow with Supracondylar humerus fracture were admitted and divided into two equal groups. Group A was given a single pre-operative antibiotic injectable 30 minutes before procedure whereas Group B was given a single pre-operative injectable and another injectable dose on 0 Post-operative day, then oral BD dose for next 5 days which is the routinely followed protocol in our ward setting. Closed Surgical Fixation following manipulation under anesthesia (MUA) with K-wires was performed in each group and Half Cast above elbow was applied for 4 weeks. Patients were discharged on the first post-operative day and called for follow up 2, 4 and 6 weeks. K-wires were removed at 4th week and Range of motion exercises started. Wounds were evaluated at 6th week for surgical site infection. Erythema around the K-wire or any discharge around the wire was labelled as pin tract or surgical site infection. Chi-Square test was used as a significance test and a p-value of 0.05 was considered as significant.

**Results:** Of the 50 patients, there were 32 (58.20%) males and 18 (32.70%) females with the mean age of  $4.84 \pm 1.87$ . There were 27 patients aged between 2-4 years, 16 between ages 5-7 and 7 between 8-10 years. Subjects presenting following Fall while playing and fall from height were equal in number, 23 (41.8%) and Fall due to road traffic accident was a less common than the former two with 4 (7.30%) subjects. Two (8%) patients from group A and 1 (4%) patient from group B developed pin tract infection. There was no statistical difference between the two groups (p-value = 0.552)

Practical implication of this study includes the rational use of antibiotics in young patients. This will prevent avoidable overuse of antibiotics which is one of the major factors in the development of resistance against pathogens. It will also decrease the economic burden on the healthcare as well as the patient attendants.

**Conclusion:** Our data suggests no added advantage of post-operative antibiotic in contrast to single pre-operative antibiotic when fixing a supracondylar fracture of humerus. Of the complications listed in literature, Pin tract infection remains a rare complication following Closed pinning of supracondylar humerus fracture in pediatric population.

**Keyword:** Antibiotic Prophylaxis, Close Pinning, K-wire fixation, Pin Tract infection, Supracondylar Fracture Humerus

**INTRODUCTION**

Comprising about 3% of all pediatric Fractures, Supracondylar fracture of humerus are the most common elbow fractures in pediatric population<sup>1,2</sup>. More common in males than females, these fractures have a peak incidence between 5 and 8 years of age<sup>2-4</sup>. In majority of the cases surgical treatment is required in the form of Closed Reduction and Percutaneous Pinning (CRPP)<sup>5,6</sup>. Some of the common complication associated with CRPP are Pin Tract infections, Hardware failure and Iatrogenic Nerve injuries<sup>7</sup>.

Although rare, Pin tract infection is the most common complication of CRPP with incidence ranging between 1 to 21%<sup>8</sup>, with most of these infections being superficial and can be managed with oral antibiotics and good wound care. Various methods have been documented as to prevent pin tract infection in children including regular dressing and daily showers without physical cleansing of the wires<sup>9</sup>. Pin Tract infection can lead to delayed union, loosening, chronic osteomyelitis and non-union<sup>20</sup>. To prevent these infections, pre and often post-operative antibiotics are administered in the patients often without any clear existing evidence supporting their use. Some studies even show no significantly higher rate of pin tract infection in patients who did not receive any pre-operative antibiotic for CRPP in contrast to those receiving pre-operative antibiotics<sup>9,10</sup>. On the other hand, the role of post-operative role of antibiotics is not well studied and sparse literature is available warranting their use.

In our institute, local ward policy includes the use of a peri-operative injectable single dose of antibiotic followed by another injectable dose on zero post-operative day, followed by BD dose of oral antibiotic for 5 days post-operatively. However, this is

inconsistently followed as surgeon preferences varies, and the available literature does not seem to support such usage of antibiotics in CRPP and other minor orthopaedic procedures. Thus, the purpose of this study was to evaluate the incidence of surgical site infection in patients receiving a single pre-operative dose only versus single pre-operative along with five days dosage.

**MATERIAL AND METHODS**

In this prospective, we studied 50 patients at The Children Hospital and Institute of Child Health, Lahore between February 1<sup>st</sup>, 2021 and July 30<sup>th</sup> 2021. After the approval from the Institutional Ethical committee, 50 pediatric patients presenting to the Emergency and outpatient department with trauma to affected elbow with Supracondylar humerus Fracture were admitted. Inclusion criteria included patients aged between 12 years of age and younger who presented within 24 hours of trauma to their elbow having Supracondylar fracture of Humerus. Those excluded were patients with open fractures, associated vascular injury, pathological fracture and those lost to follow-up. These patients were divided into two equal groups. Group A was given a single pre-operative antibiotic Cefuroxime 30mg/kg injectable 30 minutes before procedure whereas Group B was given a single pre-operative Cefuroxime 30mg/kg injectable and another injectable dose on 0 Post-operative day, then oral Cefuroxime BD dose for next 5 days which is the routinely followed protocol in our ward setting.

Closed Surgical Fixation with Percutaneous Pinning was done following manipulation under anesthesia (MUA) with K-wires using fluoroscopy in each group and Half Cast above elbow was applied for a total of 4 weeks. Patients were discharged on the first

post-operative day and called for follow up 2, 4 and 6 weeks. K-wires were removed at 4<sup>th</sup> week and Range of motion exercises started. Wounds were evaluated at 6<sup>th</sup> week for surgical site infection. Erythema around the K-wire or any discharge around the wire was labelled as pin tract or surgical site infection.

The continuous variables were presented as mean and categorical variables were expressed as frequencies and percentages. Demographics, Type of Fracture, site of injury, k-wire configuration and pin tract infection was recorded and compiled using Statistical Package for Social Science (SPSS) software version 26.0 (IBM, Armonk, NY) to perform the statistical analysis. Chi-Square test was used as a significance test and a p-value of less than 0.05 was considered as statistically significant.

**RESULTS**

Out of 50 patients, there were 32 (58.20%) males and 18 (32.70%) females with the mean age of  $4.84 \pm 1.87$ . There were 27 (54.00%) patients aged between 2-4 years, 16 (32.00%) between ages 5-7 and 7 (14.00%) between 8-10 years. The Gender distribution and age range among the study groups are shown in Figure 1 and table 1 respectively. Subjects presenting following Fall while playing and fall from height were equal in number, 23 (41.8%) and Fall due to road traffic accident was a less common than the former two with 4 (7.30%) subjects.

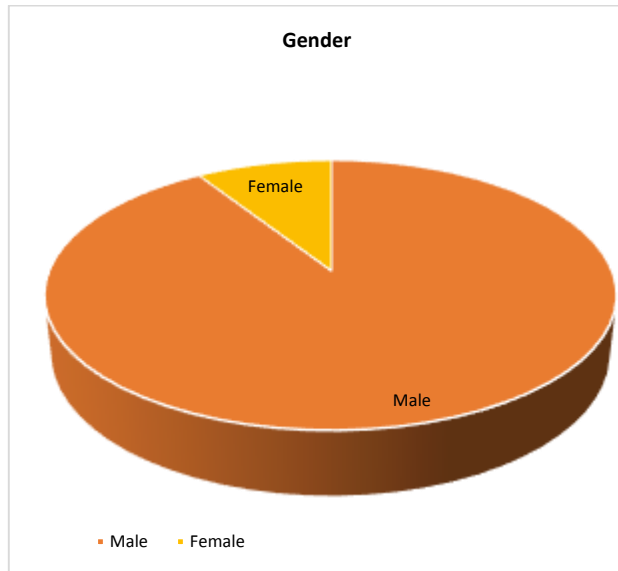


Figure 1: Gender distribution among the studied cases

Gartland type 3 fracture was the most common presentation with 33 (60%) of the presenting subjects, whereas 13 (26%) presented with type 2 and 4 (7.30%) presented with type 4. On examination 45 (81.8%) had intact distal neurology and 5 (9.1%) had neuropraxia of anterior interosseous nerve which recovered with passage of time at follow-ups. Forty-seven (5.5%) patients

had intact distal vascularity on presentation and 3 (5.5%) had weak pulse and delayed capillary refill which returned to normal following CRPP. Twenty-six (47.3%) subjects had injury on the right side in contrast to 24 (43.6%) who had left sided injury. Parallel K-wire configuration was more common, 33 (60%) than the cross configuration with 17 (30.9%) subjects and 4 (7.3%) of the subjects required 3 k-wires due to instability of fracture as compared to 33 (60%) subjects with a more stable fracture pattern requiring only 2 k-wires for fixation. A total of 3 (3.5%) subjects developed pin tract infection with 2 (8%) patients from group A and 1 (4%) patient from group B. Mean follow-up was  $6.6 \pm 0.53$  weeks with 43 (78.2%) subjects having follow up of 6 weeks, 4 (7.3%) of 7 weeks and 3 (5.5%) having 8 weeks follow-up. Patients requiring prolonged follow-up had developed pin tract infection for which regular dressing and antibiotic had to be prescribed at follow-ups. There was no statistical difference between the rate of pin tract infection between the two groups (p-value = 0.552)

Table 1: Age distribution among the studied cases

Age groups	No. of Patients	%age
2-4	27	54.00 %
5-7	16	32.00 %
8-10	7	14.00 %
Total	50	100 %

Table 2: Baseline Data

	n (%)
Group	
A	25 (50)
B	25 (50)
Mode of Trauma	
Fall while playing	23 (41.8)
Fall from Height	23 (41.8)
Fall due to Road Traffic Accident	4 (7.30)
Gartland Type	
2	13 (26)
3	33 (60)
4	4 (7.30)
Neurology	
Intact	45 (81.8)
Not Intact	5 (9.1)
Vascularity	
Intact	47 (5.5)
Diminished	3 (5.5)
Not Intact	0 (0)
Site of Injury	
Right	26 (47.3)
Left	24 (43.6)
Number of Pins	
2	46 (83.6)
3	4 (7.3)
K-wire Configuration	
Parallel	33 (60)
Cross	17 (30.9)
Pin Tract Infection	
Present	3 (3.5)
Absent	47 (85.5)
Follow-up	
6 weeks	43 (78.2)
7 weeks	4 (7.3)
8 weeks	3 (5.5)

Characteristics of patients of both groups is shown in table 4. Correlation between the variables is shown in table 3. There was no significant correlation between infection and the variables studied (p > 0.05).

Table 3: Pearson Correlation between individual Variables.

	Infection	Age	Sex	Mot	Gartland	Neurology	Vascularity	Configuration	Site	Pins
Infection	1	-0.023	-0.161	-0.115	0.070	0.084	0.064	-0.181	0.074	0.075
Age	-0.023	1	0.225	-0.097	0.128	-0.067	-0.134	0.101	.288*	-0.188
Sex	-0.161	0.225	1	-.387**	0.168	-0.111	-0.014	0.011	-0.137	-0.068
Mot	-0.115	-0.097	-.387**	1	-0.205	-0.201	-0.019	.299*	-0.135	-0.061
Gartland Type	0.070	0.128	0.168	-0.205	1	-0.132	-0.070	0.072	0.167	-0.037
Neurology	0.084	-0.067	-0.111	-0.201	-0.132	1	.477**	-0.183	-0.053	.639**
Vascularity	0.064	-0.134	-0.014	-0.019	-0.070	.477**	1	-.352*	0.094	.857**
Configuration	-0.181	0.101	0.011	.299*	0.072	-0.183	-.352*	1	-0.071	-.411**
Site	0.074	.288*	-0.137	-0.135	0.167	-0.053	0.094	-0.071	1	0.012
Pins	0.075	-0.188	-0.068	-0.061	-0.037	.639**	.857**	-.411**	0.012	1

\*. Correlation is significant at the 0.05 level (2-tailed).  
 \*\*. Correlation is significant at the 0.01 level (2-tailed).  
 Mot: Mechanism of trauma

Table 4: Comparison between 2 groups

	Group A n (%)	Group B n (%)
Age (Mean)	6 (24)	7 (28)
Sex		
Male	16 (64)	16 (64)
Female	9 (36)	9 (36)
Mode of Trauma		
Fall while playing	15 (60)	8 (32)
Fall from Height	10 (40)	13 (52)
Fall due to Road Traffic Accident	0 (0)	4 (16)
Gartland Type		
2	9 (36)	4 (16)
3	16 (64)	17 (68)
4	0 (0)	4 (36)
Neurology		
Intact	24 (96)	21 (84)
Not Intact	1 (4)	4 (16)
Vascularity		
Intact	23 (92)	24 (96)
Diminished	2 (8)	1 (4)
Not Intact	0 (0)	0 (0)
Site of Injury		
Right	18 (72)	8 (32)
Left	7 (28)	17 (36)
Number of Pins		
2	23 (92)	23 (92)
3	2 (8)	2 (8)
K-wire Configuration		
Parallel	8 (32)	9 (36)
Cross	17 (36)	16 (64)
Pin Tract Infection	2 (8) p-value = 0.552	1 (4) p-value = 0.552

## DISCUSSION

Routine use of antibiotics in minor orthopaedic procedures is common with no clear evidence supporting their use. Often, they are prescribed based on the surgeon's individual personal experience in practice. CRPP also considered a minor orthopaedic procedure as the wires are inserted percutaneously under aseptic conditions, often with a single pre-operative prophylactic antibiotic, which in some available literature is shown to be equally effective to single pre-operative and multiple post-operative doses for CRPP<sup>11, 12</sup> as normally done in major orthopaedic procedures performed, which is also the followed regimen in our ward set-up. In a retrospective study of patients less than or equal to 16 years from 2012 to 2018 who underwent primary CRPP, Bloomer et.al in 2022 showed that there was no difference in the rate of surgical site infection between patients receiving no pre-operative antibiotic versus those receiving pre-operative antibiotics<sup>18</sup>. Irrational use of antibiotics without any evidence can lead to increased prevalence of antibiotic resistance as well as adverse reactions to antibiotic. This calls for strict surveillance of antibiotic use in the clinical practice<sup>13,14</sup>.

In our study the overall rate of pin tract infection was 3.5% which is consistent with the rate of pin tract infection reported in the previous literature in patients undergoing CRPP. Pin tract infection was diagnosed on average post-operative day 25. Two patients developed cellulitis and pin site drainage for which local wound care and oral antibiotics were prescribed. One patient developed deep infection around one of the wires which had to be removed and thorough wound wash has to be done followed by oral antibiotics. All three patients recovered uneventfully. There was no significant difference between the rate of surgical site infection in both groups, thus, single pre-operative with post-operative antibiotics did not have any significant advantage over single pre-operative antibiotic dose only.

Although younger age is a risk factor for development of surgical site infection, as documented in previous, but sparse literature<sup>15-17</sup>, there was no correlation between age and development of surgical site infection in our study. However, due to limited sample size, drawing conclusion would not be accurate and further study with a larger sample size is required to have more consistent results.

The study is not without limitations. Apart from the small sample size, other factors need to be considered when looking for

the rate of surgical site infection following CRPP which were not included, such as time between injury and surgery, pattern of fracture and nutritional status of the patient to name a few, all of which may affect the outcome of study. Despite taking utmost care in managing wound in the clinical setup, patient factor is difficult to control as many patients presenting to the Government set up are from poor background and having poor understanding of the importance of good hygiene, living in poor hygiene conditions can prone the patient to develop surgical site infection.

## CONCLUSION

Our study did not show any significant superiority of single pre-operative antibiotic and post-operative antibiotic regimen over single pre-operative antibiotic in managing closed Supracondylar Humerus Fracture. Thus the commonly performed practice of prescribing undue antibiotics following closed reduction may not be of any benefit at all. Although a much larger sample should be studied, however, our study puts our current ward policy regarding antibiotic coverage for CRPP to question.

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