

## ORIGINAL RESEARCH

# Comparison of Double vs. Single Fluoroscopy for Fixing Supracondylar Humerus Fractures in Children

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### ABSTRACT

**Aim:** To compare double vs. single fluoroscopy for fixing supracondylar humerus fractures in children. **Methodology:** Sixty-two children with supracondylar humerus fractures of either gender were randomly divided into 2 groups of 31 each. Group I patients were managed with double fluoroscopy and group II with single fluoroscopy. Parameters such as the preparation period, surgical duration, radiation exposure time, fracture types, sides and incidence of complications were also recorded. **Results:** Group I had 20 males and 11 females and group II had 21 males and 10 females. Left side was involved in 12 and right in 19 in group I and 15 in left and 16 in right in group II. Class II type was seen in 8 and class III in 24 in group I and 6 class II and 25 class III in group II. Complications were pin tract infection was seen in 2 each and neuropraxia in 3 in group I and 1 in group II. The difference was significant ( $P < 0.05$ ). Preparation period in group I was 11.4 minutes and in group II was 8.5. Surgical duration was in group I was 32.5 minutes and in group II was 41.3. Total surgical duration was 42.3 minutes in group I and 48.5 minutes in group II and radiation time was 41.2 seconds in group I and 48.6 seconds in group II. The difference was significant ( $P < 0.05$ ). Outcome was excellent in 20 in group I and 16 in group II, good in 7 in group I and 10 in group II and fair in 4 in group I and 5 in group II. The difference was significant ( $P < 0.05$ ). **Conclusion:** Double fluoroscopy can be used safely during closed reduction and percutaneous pinning in displaced pediatric supracondylar humeral fractures.

**Key words:** pin tract infection, supracondylar humerus, Children

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### INTRODUCTION

Supracondylar humerus fractures (SHFs) of paediatric patients may be difficult to treat for an inexperienced orthopedist. These fractures are divided mainly into two types as extension and flexion. Extension type fractures are seen in 95–98% of patients, and in the remaining 2–5%, flexion type fractures are seen.<sup>1</sup> SHFs are classified as three types according to the Gartland classification system. Type 1 is the stable and minimally displaced fractures; whereas, types 2 and 3 are displaced fractures. The treatment of SHF type 1 is closed reduction and plaster application; percutaneous pinning is preferred after either open or closed reduction in the treatment of type 2 and type 3 fractures.<sup>2</sup>

Favorable conditions for the occurrence of fractures allow increased looseness of the collateral ligament laxity structures, immaturity of bone material in the humerus region and the specific relationship of bone structures in the elbow joint.<sup>3</sup> The frequency with

respect to gender shows that these fractures were twice as common in boys than in girls, while in relation to the side are more likely to occur in the left elbow on the nondominant side.<sup>4</sup> In most cases supracondylar humerus fractures in children resulting from falls on the outstretched hand, when the extensional type fracture occurs in approximately 97% of cases, while in 3% the flexion type occurs most often by fall on the bent elbow.<sup>5</sup> We performed this study to compare double vs. single fluoroscopy for fixing supracondylar humerus fractures in children.

### METHODOLOGY

A sum total of sixty- two children with supracondylar humerus fractures of either gender was enrolled after considering the utility of the study and obtaining approval from ethical review committee. Parents' consent was obtained before starting the study. The study duration was 1 year.

Data such as name, age, gender etc. was recorded. Patients were randomly divided into 2 groups of 31 each. Group I patients were managed with double fluoroscopy and group II with single fluoroscopy. The preoperative radiographs of the patients were used to record the humeral supracondylar fractures according to the Gartland classification system. Patients with sagittal plane deformity, closed reduction by simply flexing the elbow under procedural sedative anesthesia (ketamine 1 mg/kg) was done. If the fracture of the patient was displaced in two or three

planes, patients underwent closed reduction and percutaneous pinning (CRPP). AP and lateral elbow radiographs were taken on the first postoperative day, at 3–4 weeks, 3 months and at 6 months. Parameters such as the preparation period, surgical duration, radiation exposure time, fracture types, sides and incidence of complications were also recorded. The results were compiled and subjected for statistical analysis using Mann Whitney U test. P value less than 0.05 was set significant.

## RESULTS

**Table I: Patients distribution**

Gender	Group I (31)	Group II (31)
Male	20	21
Female	11	10

Group I had 20 males and 11 females and group II had 21 males and 10 females (Table I).

**Table II: Assessment of parameters**

Parameters	Variables	Group I (31)	Group II (31)	P value
Side	Left	12	15	0.82
	Right	19	16	
Classification	Class II	8	6	0.04
	Class III	24	25	
Complications	Pin tract infection	2	2	0.15
	Neuropraxia	3	1	

Left side was involved in 12 and right in 19 in group I and 15 in left and 16 in right in group II. Class II type was seen in 8 and class III in 24 in group I and 6 class II and 25 class III in group II. Complications were pin

tract infection was seen in 2 each and neuropraxia in 3 in group I and 1 in group II. The difference was significant ( $P < 0.05$ ) (Table II).

**Table III: Operatory parameters**

Parameters	Group I (31)	Group II (31)	P value
Preparation period (min)	11.4	8.5	0.01
Surgical duration (min)	32.5	41.3	0.03
Total surgical duration (min)	42.3	48.5	0.05
Radiation time (Sec)	41.2	48.6	0.05

Preparation period in group I was 11.4 minutes and in group II was 8.5. Surgical duration was in group I was 32.5 minutes and in group II was 41.3. Total surgical duration was 42.3 minutes in group I and 48.5 minutes

in group II and radiation time was 41.2 seconds in group I and 48.6 seconds in group II. The difference was significant ( $P < 0.05$ ) (Table III).

**Table IV: Assessment of outcome**

Outcome	Group I (31)	Group II (31)	P value
Excellent	20	16	0.05
Good	7	10	0.04
Fair	4	5	0.91

Outcome was excellent in 20 in group I and 16 in group II, good in 7 in group I and 10 in group II and

fair in 4 in group I and 5 in group II. The difference was significant ( $P < 0.05$ ) (Table IV).

## DISCUSSION

Supracondylar humerus fractures are the most common fractures of the distal end of the humerus in children accounting for about 60% of all fractures in the elbow.<sup>6</sup> Fractures during growth period by its etiology, mechanism of injury and healing, differ significantly from the fracture at the adulthood.<sup>7</sup> Most of these fractures occur in children under the age of

10 years and usually between 5–8 years of age.<sup>8,9</sup> We performed this study to compare double vs. single fluoroscopy for fixing supracondylar humerus fractures in children.

Our results showed that group I had 20 males and 11 females and group II had 21 males and 10 females. Simic et al<sup>10</sup> demonstrated the role of radiographic evaluation by measurement of default radiographic

parameters and indicate the choice of treatment for supracondylar fractures of type I and II by Gartland. The study included 60 children aged 4-14 years, divided into two groups, first with initial radiographic analysis and the second one without radiographic analysis. In patients from first group hospitalization, immobilization duration, as well as physical treatment was shorter and more frequently surgical treatment was applied (manual reduction with K-wire fixation) with statistically significant difference ( $p = 0.042$ ).

Our results showed that left side was involved in 12 and right in 19 in group I and 15 in left and 16 in right in group II. Class II type was seen in 8 and class III in 24 in group I and 6 class II and 25 class III in group II. Complications were pin tract infection was seen in 2 each and neuropraxia in 3 in group I and 1 in group II. Our results showed that preparation period in group I was 11.4 minutes and in group II was 8.5. Surgical duration was in group I was 32.5 minutes and in group II was 41.3. Total surgical duration was 42.3 minutes in group I and 48.5 minutes in group II and radiation time was 41.2 seconds in group I and 48.6 seconds in group II. Gunaydin et al<sup>11</sup> compared single- and double-fluoroscopy methods for the closed reduction and percutaneous pinning (CRPP) of Gartland type 2 and type 3 SHFs. Forty patients who underwent surgery were evaluated retrospectively. Twenty-one patients (group 1) who received double fluoroscopy and 19 patients (group 2) who had single fluoroscopy were evaluated. The mean age of the patients in group 1 and group 2 was 4.76 and 4.68 years, respectively. The mean preparation time of group 1 was 11.3 min; whereas in group 2, it was 8.7 min ( $p < 0.01$ ). The mean surgical duration was 31.76 min in group 1, and 40.47 min in group 2 ( $p < 0.01$ ). The mean radiation exposure time in group 1 and group 2 was 41.19 and 47.36 s, respectively ( $p = 0.04$ ). There were statistically significant differences between the two groups in terms of the preparation period, surgical duration, and radiation exposure time. Radiation exposure time and surgical duration were significantly shorter in group 1; the preparation period was shorter in group 2.

Our results showed that outcome was excellent in 20 in group I and 16 in group II, good in 7 in group I and 10 in group II and fair in 4 in group I and 5 in group II. Kara et al<sup>12</sup> compared single and double-fluoroscopy methods in intramedullary (IM) nailing of femur intertrochanteric fractures. In this study, the preoperative preparation time was found as 19.6 min with single-fluoroscopy and 21.2 min with the double-fluoroscopy method. The mean surgical time was 48.7 min with the single-fluoroscopy method and 32.8 min with double fluoroscopy. The radiation exposure mean time was 65.9 s for single fluoroscopy and 40.2 s for double fluoroscopy. It was emphasized that the double-fluoroscopy method could be safely used in IM nailing for intertrochanteric femur fractures.

## CONCLUSION

Double fluoroscopy can be used safely during closed reduction and percutaneous pinning in displaced pediatric supracondylar humeral fractures.

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