Antegrade flexible nailing for pediatric metaphyseal-diaphyseal junction distal radius fracture, is it safe?

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INTRODUCTION:

Fractures involving the metaphyseal-diaphyseal junction of the distal radius present a unique challenge for pediatric orthopaedic surgeons. Because of its anatomical location, it is too proximal for percutaneous K-wire fixation and too distal for retrograde flexible nailing. The purpose of this study was to: 1) determine the safety of a described antegrade approach from the posterior interosseous nerve (PIN) by performing a cadaveric study; 2) assess the efficacy of antegrade nailing in cases of distal metaphyseal-diaphyseal junction fractures; and 3) describe a standardized proximal lateral approach to the radius.

METHODS:

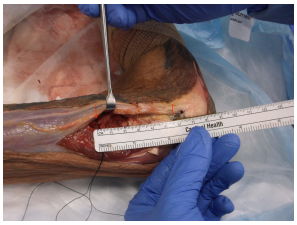
A cadaveric study was performed using adult forearms that included elbow and hand. Anterograde flexinail was introduced at the proximal radius based on the previous described proximal “safe zone” of the radius. Distal metaphyseal-diaphyseal junction fractures were created using osteotomes. The primary outcome was to determine the distance between the entry point to the PIN. The secondary outcome was to determine the quality of the reduction for metaphyseal-diaphyseal junction distal radius fractures.

RESULTS:

A total of 10 cadaveric arms were used (5 females, 5 males). The average age was 66.6 years old (range: 51 – 89). There were 4 left arms and 6 right arms. The average distance between the entry point and piercing instrument to the PIN was 5.4 cm (range: 4.7 – 6.0 cm). When grouped based on sex, the average distance was significantly further for males (5.8 cm, range: 5.2 – 6.0 cm) versus females (4.9 cm, range: 4.7 – 5.2 cm), $p = 0.004$. Fractures reduction was not maintained following the introduction of the antegrade flexible nail across the fracture site. For all specimens, more than 25% displacement was seen on the AP.

DISCUSSION AND CONCLUSION:

Based on this cadaveric study, our modified lateral approach to the starting point in the proximal radius is safe. As long as the entry point for antegrade flexible nailing stays proximal to the radial tuberosity during the lateral approach to the proximal radius while the elbow is flexed and forearm pronated, the PIN will remain well distal to the entry point.



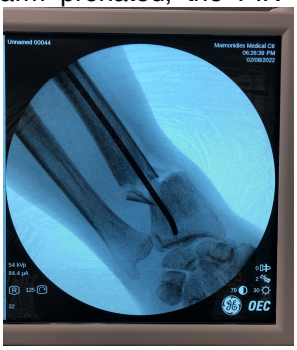


Table 1. PIN location in each cadaveric specimen

Specimen	Age	Sex	Laterality	Weight (lb)	PIN location (cm)
1	65	F	L	160	5.2
2	56	M	L	180	5.5
3	89	M	L	115	6.2
4	51	F	L	150	5.0
5	85	M	R	110	6.0
6	65	F	R	160	4.7
7	56	M	R	180	5.2
8	77	F	R	184	5.1
9	51	F	R	150	4.7
10	71	M	R	140	6.0