**TITLE:** Open Fractures of the Phalangeal Head and Neck in Children

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**INTRODUCTION:**  Closed reduction and percutaneous pinning of displaced pediatric phalangeal head and neck fractures is the preferred treatment, as open reduction is associated with osteonecrosis. Despite this, open reduction and fixation is performed for open injuries as well as irreducible closed injuries, such as those with delayed presentation. We hypothesize that osteonecrosis is more common in open injuries than open reduction of closed injuries.

**METHODS:**  We performed a retrospective review of all phalangeal head and neck fractures treated surgically at a single tertiary pediatric trauma center from 2010-2017. Manual chart review identified fractures of the phalangeal head and neck that underwent open reduction and pinning. These were divided into open injuries (OI) and open reduction of closed injuries (ORCI) groups. Nominal data are compared with Student t test and categorical data with Chi-squared test.

**RESULTS:** Thirty-one fractures in thirty patients were identified. The OI group consisted of 17 fractures, while the ORCI group had 14 fractures. OI subjects were significantly younger (5.9 vs 11.4 years, p=0.001) and more likely to undergo earlier surgical treatment after injury (1.6 vs 22.4 days, p<0.001). OROI patients were more likely to have a crush or machine entrapment mechanism (75% vs 15.4%, p<0.001), while ORCI patients were more likely to have a sport-related or simple fall mechanism (84.6% vs 6.3%, p<0.001). There was no significant difference in the distribution of phalangeal neck & subcondylar (27), intercondylar (7), and condylar (4) fractures between the groups (p = 0.59). The OI group had a significantly higher incidence of concomitant ipsidigital injuries requiring repair compared to the open reduction group (93.8% versus 7.1%, p < 0.001), involving the extensor tendon (12), fractures (6), digital nerve (3), flexor tendon (2), and digital artery (1). The rate of osteonecrosis in the open injury group was significantly higher (75% versus 7.1%, p<0.001), as was the incidence of resultant coronal malangulation (33.3% vs 0%, p<0.001). One patient in the open injury group underwent amputation at the level of the proximal phalangeal shaft.

**DISCUSSION/CONCLUSION:** Open fractures of the pediatric phalangeal head and neck are severe injuries which frequently require repair of other injuries, and have a higher complication rate. Closed injuries that require open reduction have significantly fewer complications, although osteonecrosis does occur. Surgeons can better inform families of expected outcomes after treatment of open pediatric phalangeal head and neck fractures. Concerns for osteonecrosis after open treatment of closed phalangeal head and neck fractures may be overstated.