Marked Resorption of the Thumb Proximal Phalanx Following Open Reduction and K-Wire Fixation of a Phalangeal Neck Fracture in a Child: Case Report

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We report on a child with nonunion of a phalangeal neck fracture of the thumb following open reduction and K-wire fixation. There was progressive resorption of the proximal but not the distal fracture fragment. Successful reconstruction was obtained using a non-vascularized iliac crest bone graft. *(J Hand Surg Am. 2015;40(4):688–691. Copyright © 2015 by the American Society for Surgery of the Hand. All rights reserved.)*

Key words Fracture, phalanx, bone resorption.

Of all extra-articular pediatric hand fractures, phalangeal neck fractures have the highest incidence of complications, including stiffness, malunion, nonunion, and avascular necrosis of the phalangeal head.[1–4]

We report on a child with nonunion of a thumb proximal phalanx neck fracture following open reduction and K-wire fixation. There was progressive resorption of the entire diaphysis and most of the metaphysis without any evidence of infection. Reconstruction of the missing bony segment with union was achieved using an autogenous iliac crest bone graft.

CASE REPORT

A 14-month old boy had his right thumb trapped in a closing door, resulting in a displaced proximal phalangeal neck fracture (Fig. 1). When seen immediately at a local hospital, the injury was closed and there was no clinical evidence of vascular compromise. Two days after injury, the patient underwent open reduction and K-wire fixation. The child received a single dose of cephalosporin before surgery. After surgery, the hand was immobilized in a thumb-spica cast for 4 weeks. All postoperative x-rays were done with the cast in place; and hence they were not very clear and our radiologist could not comment on fracture site overdistraction. The K-wire was removed at 4 weeks for reasons not clear in the medical record, but there was no apparent infection or K-wire loosening. The fracture became displaced. At 3 months, the x-ray showed early resorption of diaphysis (Fig. 1B). Progressive resorption of the entire diaphysis and most of the metaphysis occurred over a year (Figs. 1C,D). The child was referred to me 14 months after the initial surgery (age, 28 months). X-rays showed persistent nonunion and bone loss (Fig. 1E). The thumb was short and flail without tenderness, swelling, or erythema (Fig. 1F). White blood cell count, sedimentation rate, and C-reactive protein values were normal. Both parents were nonsmokers and there was no history of second-hand smoking. Two weeks later the child underwent autogenous iliac crest bone graft to reconstruct the missing bony segment and treat the nonunion. The previous longitudinal dorsal scar was used and the extensor apparatus was split. Intraoperative findings did not reveal any evidence of chronic inflammation. There was also no evidence of increased vascularity or extensive soft tissue fibrosis, although there was soft tissue interposition at the nonunion site. Intraoperative soft tissue and bone biopsies were taken for

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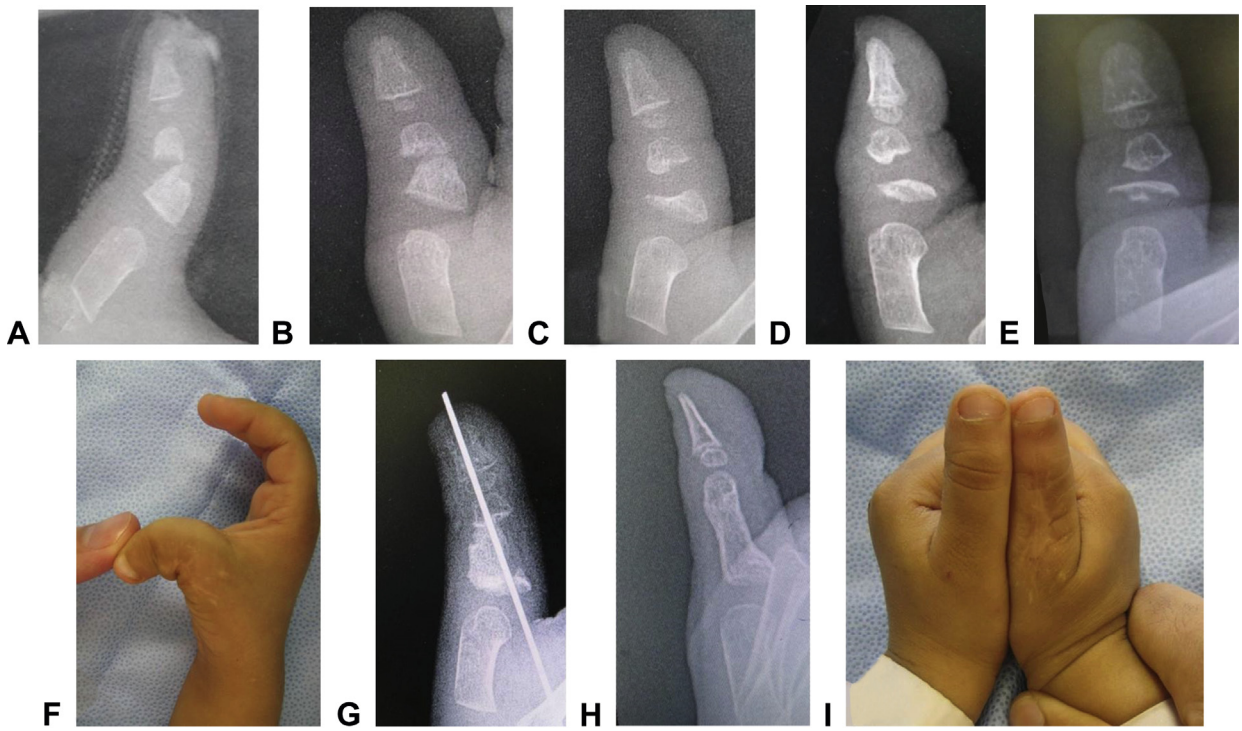

FIGURE 1: **A** X-ray at the time of injury. **B** X-ray at 3 months. There is nonunion and early resorption of the proximal fragment. **C**, **D** X-ray at 6 and 12 months, respectively, showing progressive resorption of the proximal fragment. **E** X-ray at 14 months (the time of presentation to the author). **F** Clinically, the thumb was flail. **G** The bone graft is fixed with a single K-wire. **H**, **I** Radiological and clinical appearance 20 months after the bone graft procedure.

cultures and they were all negative. Debridement of the sclerotic bony edges at the nonunion site was done until punctate bleeding was seen from the bony edges. A corticocancellous bone graft was taken from the iliac crest and was fixed with a K-wire (Fig. 1G). A thumb-spica cast was applied. Initial follow-up was done in his home town. The cast and K-wire were removed at 6 weeks. The patient was seen at my clinic 20 months later (age, 48 months). X-rays showed union and remodeling of the bone graft without any evidence of resorption (Fig. 1H). Clinically, the thumb was stable and equal in length to the contralateral normal thumb (Fig. 1I). There was stiffness at both the interphalangeal (0° to 15° of motion compared with 0° to 90° on the normal side) and metacarpophalangeal (0° to 70° of motion compared with 0° to 110° on the normal side) joints. The parents were satisfied and the child was using his thumb in all activities with no specific complaints.

DISCUSSION

In a recent review of nonunion following phalangeal neck fractures in children there were no cases of resorption of proximal fracture fragments.[5] This case is unique because there was extensive resorption of the proximal fragment.

A literature review in preparation of this case report led to a classification of the causes of bone resorption into 7 groups (Table 1). Following trauma or open surgery, the first cause that comes to mind is infection, which was not apparent in the currently presented case. Bone resorption (both at the fracture site and within the hand) following fractures of the distal radius has been observed specially in elderly osteoporotic women.[6] Da Cruz et al reported on a large series (110 patients) of extra-articular fractures of the distal phalanx. Isolated bone resorption of the tuft was seen in 26 patients with comminuted tuft fractures.[7] Similarly, resorption of the comminuted part of the fractured phalangeal head was attributed to the poor blood supply of the fractured phalangeal head.[8] Resorption in the presently reported case occurred in the well-vascularized proximal segment and not in the distal relatively ischemic head. Subperiosteal bone resorption in the hand is known to occur in renal failure patients secondary to hyperparathyroidism.[9] Resorption of the tips of the distal phalanges is also known to occur with chronic wounds of the finger tips in patients with scleroderma[10] and leprosy.[11]