Treatment of a Fractured Juxta-Articular Enchondroma of the Middle Phalanx With a Suzuki External Fixator: A Case Report

Arne Decramer, MD* and Caroline Leclercq, MD†

Abstract: We report the case of a 47-year-old man who presented with a pathologic fracture of the middle phalanx of the fourth finger. The treatment of this juxta-articular lesion close to the proximal interphalangeal joint was performed in 2 stages. First, a biopsy was carried out combined with fixation of the fracture by a Suzuki dynamic external fixator. After 6 weeks, a curettage of the confirmed enchondroma was performed with iliac crest grafting, leaving the external fixator for another 4 weeks. With a follow-up of 48 months, a satisfying functional result has been obtained with a remarkable remodeling of the painless proximal interphalangeal joint.

Key Words: juxta-articular, enchondroma, fracture, external fixator, finger

(*Tech Hand Surg* 2015;19: 46–49)

Solitary enchondromas are often asymptomatic and revealed by routine x-rays. However, in nearly half of the cases, it is a pathologic fracture, with symptoms of sudden pain, swelling, and deformity, which reveals the diagnosis.[1]

Our patient presented a pathologic fracture of a large enchondroma of the middle phalanx of the fourth finger. Because of the proximity of the proximal interphalangeal (PIP) joint, we chose a specific 2-stage surgical treatment.

CASE REPORT

A 47-year-old man was referred to our outpatient clinic 2 weeks after a trauma with a sledge with a diagnosis of fracture of the middle phalanx of his left fourth finger. There was no history of previous trauma or functional impairment of the involved finger. His medical history was unremarkable, except for high blood pressure. Neither Ollier disease nor Maffucci syndrome was associated.

At referral, the fourth finger was very painful when mobilized, with a discrete residual hematoma around the PIP joint. The range of motion was restricted to 20 degrees. There was no axial deformity, or sensory impairment.

The x-rays showed an articular displaced multifragment fracture of the base of the middle phalanx through a large lytic lesion occupying the whole proximal third of the phalanx and suggestive of an enchondroma (Figs. 1A, B).

SURGICAL TECHNIQUE

Because of the specific location of this pathologic fracture, a 2-stage surgical treatment was decided: a biopsy of the lesion to ascertain its chondromatous nature together with dynamic stabilization of the fracture in a first stage; and treatment of the

enchondroma by curettage and bone grafting in a second stage. The whole treatment was performed under Suzuki external fixation and early active motion.

Both stages were performed under brachial block and tourniquet control.

During the first stage, a biopsy of the lytic lesion was obtained through a lateral approach. By means of a curette, a fragment of the lesion was removed. Its shiny whitish aspect and soft texture were very suggestive of an enchondroma, which was later confirmed by histologic examination.

A closed reduction using ligamentotaxis of the fracture was the next step, with placement of a Suzuki-type dynamic external fixator.[2] Because of the juxta-articular tumor, the placement of the K-wires was difficult and only 2 K-wires could be introduced. Peroperative x-ray control showed a satisfactory alignment of the PIP joint (Fig. 2).

Postoperatively, immediate active and passive mobilization was encouraged. By the time of the second stage, the PIP joint had reached an active motion of 0 to 50 degrees and a passive motion of 0 to 64 degrees.

Anatomopathologic investigation confirmed the lesion to be a benign enchondroma.

After 6 weeks, the second stage was performed. The lateral aspect of the middle phalanx was exposed through a longitudinal approach, a cortical window was created, and the enchondroma was removed by meticulous curettage and sent for further histopathologic investigation. The proximal K-wire was repositioned more proximally in the proximal phalanx.

The bony defect was filled up with the iliac cancellous bone harvested under general anesthesia. The Suzuki external fixator was left in place for another 4 weeks. Immediate physiotherapy was initiated with active and passive motion of the finger (Fig. 3). The patient was instructed to clean the pin sites daily with polivinil iodine swabs, and to return for evaluation if any sign of inflammation developed around the pins.

RESULTS AND COMPLICATIONS

Postoperative x-rays showed a complete healing of the fracture at 4 weeks, and a satisfactory incorporation of the graft 6 weeks after the second stage.

The postoperative period was disturbed by a new trauma involving a mallet finger of the same finger 7 weeks after the second surgical procedure, which required immobilization of the DIP joint for further 8 weeks. Care was taken meanwhile to ensure free movements of the PIP joint. At the final follow-up, 4 years postoperatively, the finger was free of pain, and active motion of the PIP joint was 10 to 88 degrees. The intercurrent mallet finger healed with a limited 20 to 60 degrees DIP motion (TAM: 118 degrees). The patient is still an active golf player and has a painless and stable PIP joint (Figs. 4A, B)

Radiologic control showed no recurrence of the benign tumor, normal alignment of the joint, and satisfactory height of the joint space (Figs. 5A, B).

FIGURE 1. Initial x-rays: lateral view (A) and anteroposterior view (B).

DISCUSSION AND HISTORICAL PERSPECTIVE

Up to 54% of all enchondromas are located in the hand and wrist.[3] They involve mainly the small tubular bones of the hand, and predominantly the proximal phalanx, metacarpal, and middle phalanx, respectively, with the little finger being significantly more often affected than the other rays.[4,5] Occurrence in the carpal bones (scaphoid) and even a sesamoid bone of the thumb have been reported.[6–8]
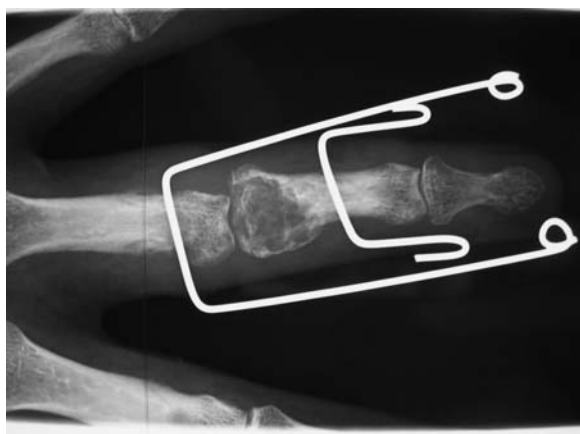

FIGURE 2. First stage: postoperative anteroposterior view.
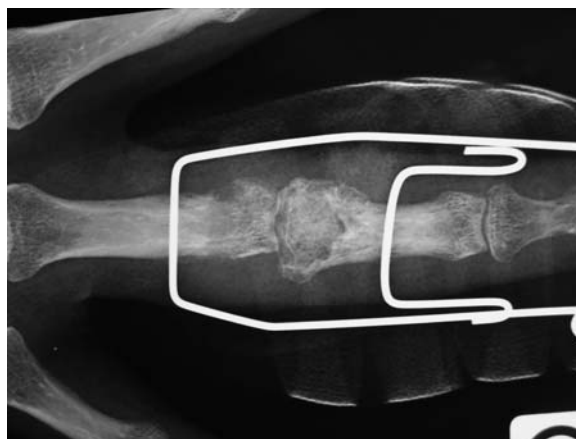
FIGURE 3. Second stage: postoperative anteroposterior view.

Other enchondromas, whether isolated or multiple (Ollier disease, Maffucci syndrome), must be sought.[4]

The natural course of a solitary phalangeal enchondroma is characterized by the risk of pathologic fracture and degeneration of the joint articular surfaces.[9,10] Spontaneous resolution is extremely rare.[1] Because enchondromas and chondrosarcomas may be very difficult to differentiate both clinically and histologically, there is still controversy regarding
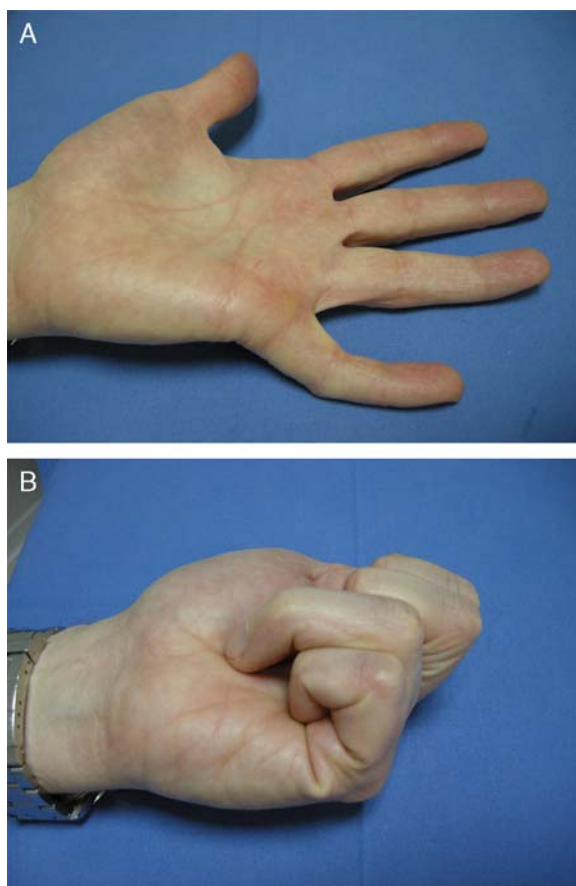
FIGURE 4. Clinical results at 4 years postoperatively: active extension (A) and active flexion (B). Note the sequella of the intercurrent mallet finger. full color online

FIGURE 5. Radiologic result at 4 years postoperatively: lateral view (A) and anteroposterior view (B).

the possibility of malignant transformation of a benign enchondroma. However, most authors agree that malignant degeneration of a benign lesion is never secondary to a solitary enchondroma, but rather to either a chondromatosis, an osteochondroma, or an osteochondromatosis.[9–11] In any case, examination of the entire tumor by an experienced histopathologist is mandatory.

Whereas all authors agree on complete removal of the enchondroma by thorough curettage, there is no consensus on whether or not to fill up the cavity, and if so, with cement, injectable calcium phosphate, or bone graft. Similarly, when the enchondroma is fractured, there is disagreement on whether or not to perform fixation, and on 1-stage or 2-stage treatment.[12–14]

In our case, the displaced articular dorsal lip of the middle phalanx (Fig. 1A) required reduction and fixation, and filling up the cavity was necessary to avoid joint collapse, subsequent malalignment, and potential degenerative arthritis. We opted for a 2-stage treatment for several reasons. Firstly, we felt that a primary biopsy was necessary to ascertain the benign nature of this large, expansive bone tumor with a cortical fracture. Secondly, primary curettage of the tumor through a juxta-articular multifractured bone would have been technically very challenging, with a high risk of incomplete removal because of instability of the bony fragments, although primary fixation, followed by curettage, after bone healing proved to be technically safe.

The dynamic pins and rubber traction system (PRTS) has proved to be effective in the treatment of articular fractures and fracture dislocations of the PIP joint, with satisfactory joint remodeling and return of a functional range of motion.[2] In our case, immobilization of the fracture would have most probably led to joint stiffness. We combined treatment of the enchondroma with fixation of the fracture by this Suzuki dynamic fixator, which led to satisfactory reduction of the displacement and early healing, while maintaining joint motion.

Several potential complications may occur with the use of the PRTS. Pin tract infection has been reported to occur in 13% to 25% cases.[15] In most cases, it resolved spontaneously with oral antibiotics.[16] In 2 series, however, the traction device had to be removed in 2 cases and 1 case, respectively. Although the system was removed at, respectively, 12 and 22 days in 1 series, the reduction was preserved.[17,18]

Lateral shift of the frame was reported in 2 series. In the Kiral series, it was treated by realignment of the pins under digital bloc.[19] In Ruland's cases, it was associated with radiographic evidence of loosening of the pins with osteolysis of the proximal condyle. Patients were instructed to manually center the frame to avoid skin compromise. These patients achieved the greatest degree of PIP joint flexion of the whole series.[16]

A 15-degree clinodactyly occurred in 1 case in De Smet's series.[17] We have experienced this problem in 2 instances of PRTS after fracture dislocation of the PIP joint (De Cramer A, Leclercq C, Valenti P; 2012), which improved after reducing the amount of rubber traction on the side of the clinodactyly.

Other potential complications such as pin breakage have not been reported to the best of our knowledge.

Bickels et al[13] reported on polymethylmethacrylate cement fixation and early mobilization in 8 fractured enchondromata of 13 cases, with a satisfactory outcome. In contrast, one fractured enchondroma in 8 cases treated by Yasuda et al[14] with calcium phosphate bone cement had a poor clinical outcome.

We chose to fill the residual cavity with the autologous iliac cancellous bone. Despite its morbidity, it has our preference over cement or other nonbiological material, because it makes analysis of the radiologic follow-up easier, especially in relation to recurrence. After 6 weeks, a good incorporation of the graft was noticed in our case. Simultaneous dynamic fixation of the fracture and PIP joint led to an active motion of 78 degrees. The patient was very satisfied, despite the mild limitation of total active motion of his fourth finger increased by the sequella of his extensor tendon rupture. This case illustrates the recommendation to operate finger enchondromata, even if asymptomatic, especially when they are large, with circular cortical thinning. Treatment of a fractured enchondroma may prove very challenging, as shown in this case report.

To the best of our knowledge, there is no previous report of a similar treatment sequence with a dynamic external fixator for a fractured juxta-articular finger enchondroma in the literature.

REFERENCES

1. Yamamoto T, Kurosaka M, Mizuno K. Spontaneous resolution of a phalangeal solitary osteochondroma. *J Hand Surg (Am)*. 2001;26: 556–558.

2. Suzuki Y, Matsunaga T, Sato S, et al. The pins and rubbers traction system for treatment of comminuted intraarticular fractures and fracture-dislocations in the hand. *J Hand Surg (Br)*. 1994;19(B): 98–107.

3. Unni KK, Dahlin DC. *Dahlin's Bone Tumors: General Aspects and Data on 11,087 Cases.* 5th ed. Philadelphia: Lippincott-Raven; 1996.

4. O'Connor MI, Bancroft LW. Benign and malignant cartilage tumors of the hand. *Hand Clin.* 2004;20:317–323.

5. Gaulke R. The distribution of solitary enchondromata at the hand. *J Hand Surg (Am).* 2002;27:444–445.

6. El Mrini A, Daoudi A, Loudyi D, et al. Scaphoid enchondroma revealed by a fracture. *Chir Main.* 2006;25:103–105.

7. Redfern DR, Forester AJ, Evans MJ, et al. Enchondroma of the scaphoid. *J Hand Surg (Br).* 1997;22:235–236.

8. Louaste J, Amhajji L, Eddine EC, et al. Chondroma in a sesamoid bone of the thumb: case report. *J Hand Surg (Am).* 2008;33:1378–1379.

9. Bonnevialle P, Mansat M, Durroux R, et al. Chondromas of the hand. A report of thirty-five cases. *Ann Chir Main.* 1988;7:32–44.

10. Takigawa K. Chondroma of the bone of the hand. *J Bone Joint Surg.* 1971;53A:1591–1596.

11. Leclercq C. Chondrosarcoma. In: Egloff D, ed. *Tumors of the Hand.* London: Taylor & Francis; 2004:p183–p186.

12. Tordai P, Hoglund M, Lugnegard H. Is the treatment of enchondroma in the hand by simple curettage a rewarding method? *J Hand Surg (Am).* 1990;12:525–528.

13. Bickels J, Wittig JC, Kollender Y, et al. Enchondromas of the hand: treatment with curettage and cemented internal fixation. *J Hand Surg (Am).* 2002;27A:870–875.

14. Yasuda M, Masada K, Takeuchi E. Treatment of enchondroma of the hand with injectable calcium phosphate bone cement. *J Hand Surg (Am).* 2006;31:98–102.

15. Henn CM, Lee SK, Wolfe SW. Dynamic external fixation for proximal interphalangeal fracture-dislocations. *Oper Tech Orthop.* 2012;22: 142–150.

16. Ruland R, Hogan C, Cannon D, et al. Use of dynamic distraction external fixation for unstable fracture-dislocations of the proximal interphalangeal joint. *J Hand Surg Am.* 2008;33A:19–25.

17. De Smet L, Boone P. Treatment of fracture-dislocation of the proximal interphalangeal joint using the Suzuki external fixator. *J Orthop Trauma.* 2002;16:668–671.

18. Deitch MA, Kiefhaber TR, Comisar BR, et al. Dorsal fracture dislocations of the proximal interphalangeal joint: surgical complications and long-term results. *J Hand Surg (Am).* 1999;23A:914–923.

19. Kiral A, Erken Y, Akmaz I, et al. Pins and rubber band traction for treatment of comminuted intra-articular fractures in the hand. *J Hand Surg (Am).* 2014;39:696–705.