CASE REPORT

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Physical Therapy-Induced Secondary Bony Mallet Finger Deformity

Hyun Ho Han, Jong Yun Choi, Suk Ho Moon

Department of Plastic Surgery, Seoul St. Mary's Hospital, College of Medicine, The Catholic University of Korea, Seoul, Korea

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Correspondence to: Suk Ho Moon
Department of Plastic Surgery, Seoul St. Mary's Hospital, College of Medicine, The Catholic University of Korea, 222 Banpo-daero, Seocho-gu, Seoul 06591, Korea
TEL: +82-2-2258-6144
FAX: +82-2-594-7230
E-mail: nasuko@catholic.ac.kr

After operation for fracture in the phalangeal bones, rehabilitation is initiated in order to minimize joint stiffness if in the case, complete bony union is confirmed by hand surgeons. The described case demonstrates that bony mallet deformity can occur during physical therapy following by surgical pinning of a proximal phalangeal fracture. This mallet finger deformity occurred due to vigorous rehabilitation for correction of postoperative joint stiffness. So, when hand surgeons treat patients with proximal phalangeal fracture, it is important to minimize joint space involvement and close follow-ups accompanying imaging studies during rehabilitation period.

Keywords: Mallet deformity, Rehabilitation, Stiffness, Fracture

INTRODUCTION

Mallet finger injury is characterized by discontinuity of the terminal extensor tendon resulting in an extensor lag at the distal interphalangeal (DIP) joint with or without compensatory hyperextension at the proximal interphalangeal (PIP) joint[1]. This leads to terminal extensor tendon tear or tendon avulsion with a bony fragment.

Snagging the extending finger on a pants cuff, a bedsheet, or other object that suddenly flexes the extending DIP joint are frequent etiologies[2]. Sometimes, in athletes, it is commonly seen that with a forceful blow to the tip of the finger causes sudden flexion[3]. And DIP joint hyperextension can also cause mallet finger secondary to a dorsal lip fracture as the hyperextended distal phalanx impacts on the head of the middle phalanx[4]. If left untreated, mallet finger leads to a swan neck deformity from PIP joint hyperextension and DIP joint flexion[2].

The authors present a case of secondary bony mallet injury that occurred while performing physical therapy dur-

ing a rehabilitation program after proximal phalangeal fracture healing.

CASE REPORT

A 40-year-old man injured his right little finger by smacking on the floor after slipping down. Radiographs depicted a comminuted fracture of the head of the proximal phalanx of the little finger (Fig. 1A). The patient underwent closed reduction and fixation using longitudinal Kirschner wire at 7 days after injury (Fig. 1B), and at 5 weeks postoperatively, the authors removed the Kirschner wire and confirmed bony union (Fig. 1C). However, the patient had a limited range of motion of the PIP and DIP joints, that was 50° at the PIP joint, and 30° at the DIP joint respectively. Thus, physical therapy was prescribed and treatment was initiated at 1 month after surgery.

A physical therapist aided in passive exercise for the patient about 1 week, and gentle active exercise was added to the passive exercise. Then the splint was changed to a dynamic one, blocking flexion and extension exercises were done. Compression bandages were used to reduce edema and deep heat therapy and hydrotherapy was also used for rehabilitation.

Lost to follow-up occurred after the patient being transferred to a local rehabilitiation facility. However, the patient had revisited this institution due to a mallet deformity at 5 months after the surgery (Fig. 2A).

Mallet deformity was treated with extension-block percutaneous Kirschner wire pinning using the Ishiguro technique (Fig. 2B)[5]. The Kirschner wire was removed 6 weeks after second surgery, and the patient was followed up for 6 months. Finally, the patient's range of motion was 90° at the PIP joint, and 45° at the DIP joint. The fracture united without further complications, and no extension lag was observed.

DISCUSSION

In our cases, while the fracture was united, the joint motion of the injured finger was limited due to adhesion that hindered tendon gliding and led to joint stiffness caused by fixed Kirschner wire that was passing through the joint.

In patients with phalangeal fractures in hand, rehabilita-

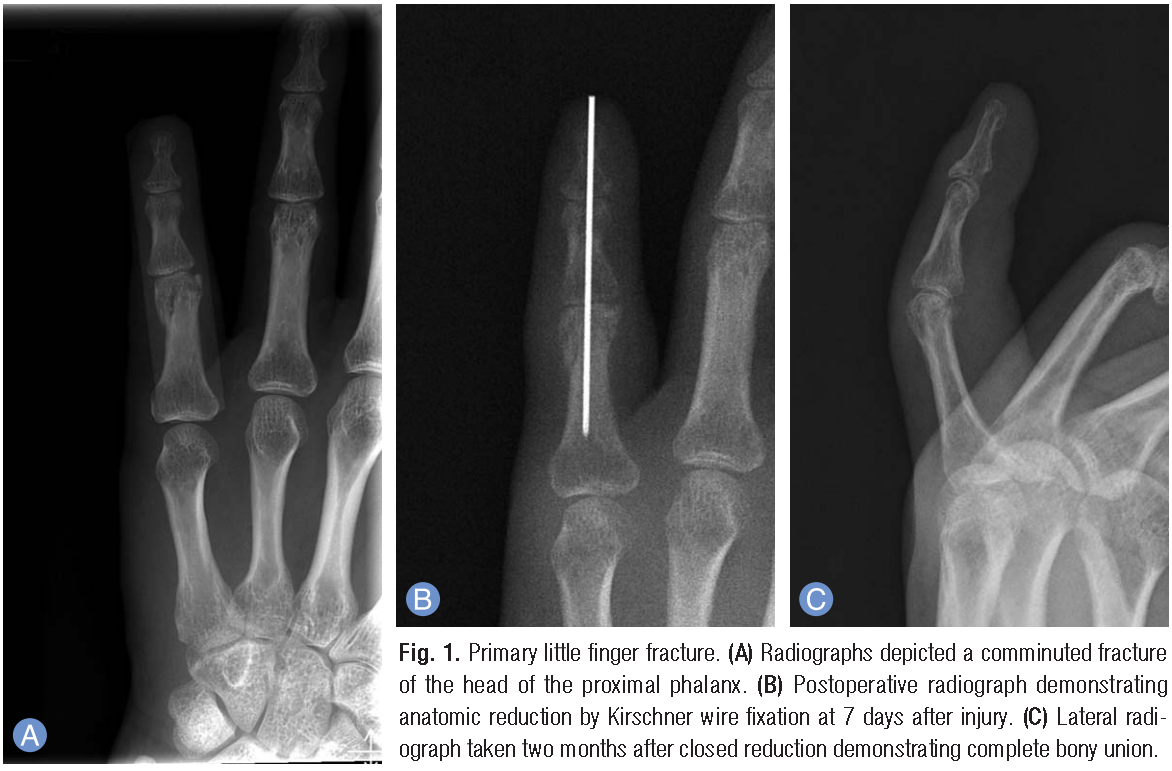

Fig. 1. Primary little finger fracture. **(A)** Radiographs depicted a comminuted fracture of the head of the proximal phalanx. **(B)** Postoperative radiograph demonstrating anatomic reduction by Kirschner wire fixation at 7 days after injury. **(C)** Lateral radiograph taken two months after closed reduction demonstrating complete bony union.

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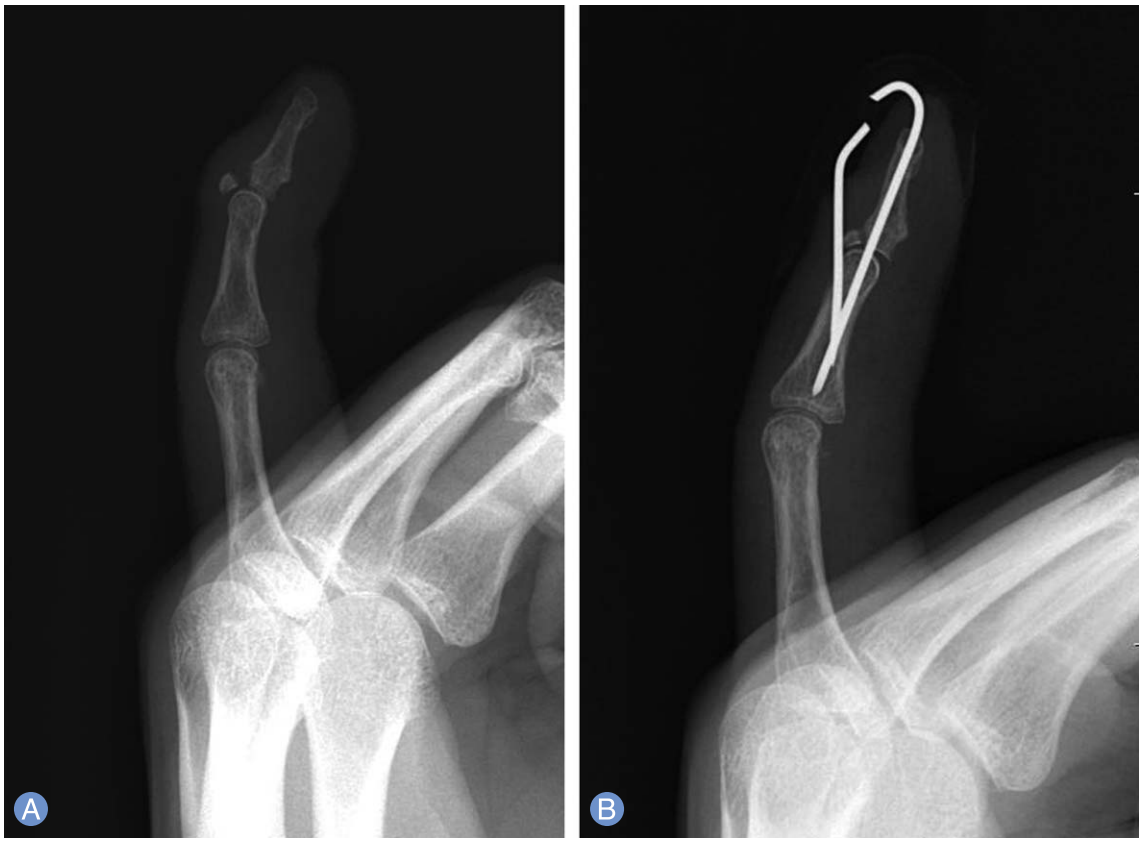

Fig. 2. Secondary bony mallet deformity. **(A)** The patient represented due to a distal phalangeal bone fracture on his little finger. **(B)** The extension block method was used to treat the bony mallet injury.

tion is generally initiated when union is confirmed and from then on, the surgeon tends to consider their job completed and delegate treatment to physical therapists. In fact, the subject of this case report presented to a surgeon two weeks after secondary extension lag developed. Lack of observation by a hand surgeon after operation could be a factor for delayed diagnosis.

It has been reported, complication rate (infection, joint incongruity, implant failure and residual pain) after phalangeal fracture treatment was increased during Kirschner wire fixed through involving joint space[6,7]. Sometimes, although it has been treated by surgical fixation, these complications led to worse result than conservative treatment[7,8].

As mentioned in our case report, penetrating a joint space during fixation of phalangeal fracture using Kirchner wire could lead to increased joint stiffness, longer rehabilitation period and may affect the range of joint motion. It has provided the authors a valuable lesson that is important to select surgical methods involving minimal joint spaces.

Rehabilitation after proximal phalangeal bone fracture operation is an important treatment step, which aims at mobilizing digital chains as soon as possible to minimize finger stiffness[9]. Therefore, during physical therapy undertaken to extend the movement range of a joint in a finger fracture patient, surgeon must always remember that the treatment process is not over until the physical therapy is actually finished. Regular X-ray follow-up is important, especially regarding the possibility of mallet deformity due to secondary fracture. It would also be wise to educate physical therapists of this possibility.

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재활 치료로 인한 수지의 이차성 망치형 변형

한현호 · 최종윤 · 문석호
서울성모병원 성형외과, 가톨릭대학교 의과대학 성형외과학교실

수지 골절에 대한 수술적 치료 후, 골절의 완전한 유합이 이루어졌다는 판단이 되면, 일반적으로 관절의 경직을 가능한 한 최소화하기 위해 재활 운동을 시작하게 된다. 저자들은 수지의 근위지골 두부 골절의 치료 후 재활운동 중에 발생한 골성 망치 수지를 경험하였기에 보고하고자 한다. 골성 망치 수지는 수술 후 생긴 관절 강직과 또한 이를 완화하기 위한 과도한 물리 치료로 인하여 발생하였다. 이 증례를 통하여 근위지골 골절에 대한 수술적 치료 시에 가능하다면 K-강선이 관절 부위의 침범을 최소화하면서 수술을 진행하는 것이 관절 강직을 최소화하는데 유리하다는 것과, 이후 운동 범위의 정상화를 얻기 위한 재활운동기간 중에도 방사선 촬영을 동반한 주기적인 경과 관찰이 중요하다는 것을 상기시켜 준다.

색인단어: 망치형 손가락, 재활치료, 경직, 골절

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교신저자 문석호
서울특별시 서초구 반포동 505
서울성모병원 성형외과 가톨릭대학교 의과대학 성형외과학교실
TEL 02-2258-6144 **FAX** 02-594-7230
E-mail nasuko@catholic.ac.kr