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Case report

A palmar fracture-dislocation of the proximal interphalangeal joint of the middle finger caused by bowling: A case report

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Abstract
During bowling, a twenty year old man could not pull out his middle finger from the ball in release and injured his finger. X-ray revealed a palmar fracture-dislocation of the PIP joint. We manipulated the PIP joint, but a gap remained at the fracture site on the X-ray after reduction. Surgical treatment was performed with a screw. Postoperatively, the middle finger was fixed with a splint for two weeks, and then active range of motion exercises were started. One year after the operation, the fracture had healed with a congruous joint surface, and the patient had full range of motion in the middle finger with no difficulties in activities of daily living. The etiology of a palmar fracture-dislocation of the PIP joint is still controversial, but we suggested the mechanism of the fracture-dislocation was caused by a shearing force to the middle phalangeal base from a dorsal direction. The main cause of the current injury was the poor fit between the middle finger and the hole of the bowling ball. Bowling is a popular and safe sport, but we should be aware of unexpected hand injuries related to bowling which may occur, especially in players at a recreational level.

Key words: Palmal fracture-dislocation, PIP joint, bowling, sports.

Introduction

The proximal interphalangeal (PIP) joint frequently suffers from sports injuries (Dawson, 1994), but palmar fracture-dislocation of the PIP joint is an extremely rare trauma (Dawson, 1994; Imatami et al., 1997). In this report, we describe a case of a palmar fracture-dislocation of the PIP joint of the middle finger caused by bowling; its etiology is discussed with and previous literature reviewed.

Figure 1. X-ray film before reposition (lateral). A palmar fracture-dislocation of the PIP joint with a dorsally displaced fragment of the middle phalanx is shown.

Case report

A twenty year old man, while bowling with his friends, could not pull out his middle finger from the ball in release and injured the finger. He was referred to our hospital with pain and deformity in the middle finger. On physical examination, the middle finger had swelling around the PIP joint and was fixed at approximately 100° flexion at the PIP joint. There were no neurological or ischemic symptoms. X-ray revealed a palmar fracture-dislocation of the PIP joint with a dorsally displaced fragment of the middle phalanx (Figure 1). We manipulated the PIP joint with an image intensifier under digital block anesthesia. However, although the dislocation could be reduced by slowly extending the PIP joint, a gap remained at the fracture site on the X-ray after the reduction. We selected surgical treatment in order to prevent extension limitation and to shorten the period of immobilization. During the operation under intravenous anesthesia, a split fracture was observed at the insertion of the central extensor tendon. No soft tissue injury was observed around the PIP joint. We reduced and fixed the fragment with a single 1.5mm mini-fragment screw (Figure 2).

Figure 2. X-ray film after surgery (lateral).

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Postoperatively, the middle finger was fixed with a splint for two weeks, and then active range of motion exercises were started. One year after the operation, the fracture had healed with a congruous joint surface, and the patient had full range of motion in the middle finger with no difficulties in activities of daily living (Figure 3).

Figure 3. X-ray film at one year after surgery (lateral).

Discussion

Excluding the metacarpophalangeal joint of the thumb, the PIP joint suffers sports-related injuries more frequently than all other joints in the hand (Dawson, 1994). Most of the injuries at the PIP joint are restricted to the soft tissue, but some injuries are accompanied by fractures or dislocations (Dawson, 1994). While dorsal fracture-dislocations of the PIP joint are common injuries, palmar fracture-dislocations are very rare (Dawson, 1994; Imatami et al., 1997).

Bowling is a very popular recreation sport, and is played by most generations. It is generally recognized to be a safe sport, but can place considerable acute or repetitive stress on the thumb, ring, and middle fingers that are used to hold the ball. Therefore, finger injuries among bowlers are not so rare, especially among bowling enthusiasts (Miller and Rayan, 1998). A variety of injuries related to bowling have been reported including perineural fibrosis of the proper ulnar digital nerve of the thumb, so-called “bowler’s thumb” (Dobyns et al., 1972; Minkow and Bassett, 1972), stress fractures of the fingers (Fakharzadeh, 1989), and stenosing tenosynovitis (Miller and Rayan, 1998). However, a comprehensive review of the literature failed to reveal any previously reported cases of palmar fracture-dislocations of the PIP joint caused by bowling.

Several investigators have proposed a mechanism for palmar fracture-dislocations of the PIP joint (Imatami et al., 1997; Peimer et al., 1984; Rosenstadt et al., 1998; Spinner and Choi, 1970). Spinner and Choi, who explored the mechanism of palmar fracture-dislocation of the PIP joint using fifteen cadaver fingers, proposed that the injury was produced by a combination of a varus or valgus force and an anteriorly directed force, similar to pure palmar dislocations (Spinner and Choi, 1970). In contrast, Rosenstadt et al described the mechanism of the palmar fracture-dislocation as direct palmar subluxation without a rotational component, thus different from that of palmar dislocation without fracture (Rosenstadt et al., 1998).

The cause of the current injury was entrapment of the middle finger in the hole of the ball which could not be released during delivery. We suggested the mechanism of the fracture at the insertion of the central slip was caused by shearing force occurring when the edge of the hole hit the middle phalangeal base from a dorsal direction (Figure 4). After that, the load as the ball moved forward led to the PIP joint palmar dislocation. It is thought that rotatory or lateral force was not involved in the current injury as there was no observable collateral ligament injury. Imatami et al. reported eight displaced central slip attachment fractures and classified the fracture into three types by their mechanisms (Imatami et al., 1997). Among the three types of fracture, the current case was similar to the split fracture, which is produced by longitudinal shearing force and forward displacement of the base of the middle phalanx (Imatami et al., 1997).

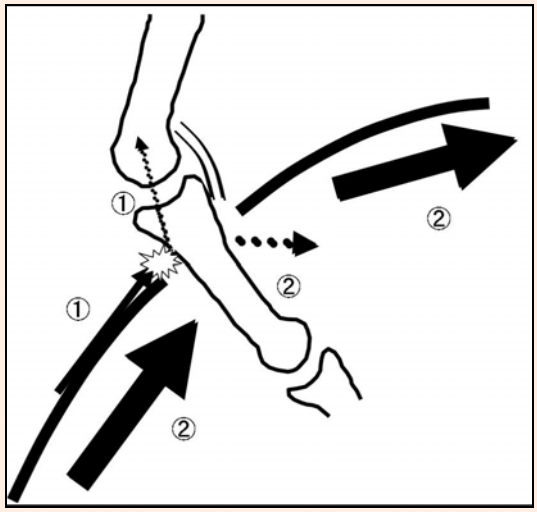

Figure 4. The mechanism of the current injury. (1) The edge of the hole hit the middle phalangeal base from a dorsal direction, and the fracture at the insertion of the central slip was caused by the shearing force. (2) The load when the ball moves forward leads to the PIP joint palmar dislocation.

We propose the main cause of injury was the poor fit between the middle finger and the hole of the ball, and the mechanism of the current injury may not be so rare, thus care should be taken while bowling. There are two types of ball grips in bowling: fingertip grip and conventional grip. While some professional bowlers use a fingertip grip in which the fingers extend into the holes of their own balls only to the level of the DIP joint, most amateur bowlers use a conventional grip in a rental ball in which the fingers extend into the holes to the level of the PIP

joint. Therefore, players who bowl for occasional recreation are more likely to suffer from injuries of the PIP joint. We suggest that the selection of an appropriate ball is very important in preventing injuries to the PIP joint.

Conclusion

Bowling is a popular sport which many people occasionally play for pleasure, but we should be aware of injuries related to bowling which may occur, especially in players at a recreational level.

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Key points

- We presented a palmar fracture-dislocation of the PIP joint in a middle finger that occured while bowling.
- We discussed the mechanism and suggested the main cause of the injury was the poor fit between the middle finger and the hole of the bowling ball.
- We advised that while bowling is recognized as a safe sport, due to its popularity we should be aware of unexpected hand injuries which may occur, especially in players at a recreational level.

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