Hand and wrist injuries are common in all sports. It is estimated that 3%–9% of all athletic injuries involve the hand and wrist. Injuries to the hand are common in football, accounting for 15% of all the injuries sustained in the sport. Phalangeal injuries often occur during attempts to handle the football; the hands absorb the initial contact and are not well protected. Certain injuries can sideline an athlete for a prolonged period of time and may have a long-lasting effect on the athlete’s hand function. The purpose of this report is to present a case involving a specific type of hand injury.

Both the anatomy and biomechanics of the proximal interphalangeal (PIP) joint are complex. The PIP joint allows flexion and extension from 0 to 110 degrees. The capsule surrounding the articular surface of the joint is composed of the volar plate, lateral and accessory collateral ligaments, and the extensor mechanism. These structures are arranged in a box-like configuration. When PIP joint stability is disrupted, two or more of the structures may be damaged. Volar dislocation of the PIP joint is a rare injury. The mechanism of injury involves rotational and longitudinal forces while the joint is in a flexed position. The result is a unilateral disruption of a collateral ligament and partial avulsion of the volar plate. This causes the middle phalanx to displace posteriorly, and one of its condyles may rupture the extensor mechanism. The condyle then becomes trapped in a “buttonhole” between the central slip and the lateral band.

The standard treatment for a PIP dislocation that occurs during sport participation is reduction on the sideline. Once reduced, the finger should be placed in an extension splint, and radiographs should be obtained to confirm that the joint is nondisplaced and that there is no fracture. If the radiographs show more than 6 mm of shortening, more than 15 degrees of angulation, or a rotational deformity, surgical reduction and fixation may be needed. A PIP dislocation usually heals correctly when recognized and properly managed.

Case History

A 20-year-old NCAA Division II football wide receiver attempted a routine catch during a game and subsequently came to the sideline with a dislocated fifth PIP joint. The team physician reduced the dislocation on the sideline and the player finished the game in an extension splint. Postgame radiographs demonstrated that his PIP joint dislocation had been reduced and there was no evidence of a bony avulsion. The prescribed treatment was continuous use of an extension splint for six weeks, with no activity restrictions.

The team physician evaluated the athlete at three weeks postinjury and found the PIP joint to be in full extension and well reduced, though there was slight swelling and pain in the joint. The athlete had been compliant with the treatment. The team physician ordered repeat radiographs, which were normal. The athlete was then instructed to continue wearing the splint for three more weeks, and he was allowed to continue full participation in football. He continued to wear the extension splint for the remainder of the football season and discontinued its use at six weeks postinjury. Subsequently, a contracture of his fifth PIP joint developed.
He was sent to an orthopedic hand specialist at eight weeks postinjury, who found a 30- to 40-degree flexion contracture of the fifth PIP joint that prevented the athlete extending the joint. Another set of radiographs demonstrated a prominent volar exostosis that suggested the existence of an old fracture (Figure 1). The hand specialist diagnosed a central slip injury. The prescribed treatment was application of a Rolyan® Sof-Stretch Short Extension Splint for six weeks to correct the boutonnière deformity. A follow-up visit was scheduled for reevaluation in three weeks.

The athlete became discouraged with the slow rate of injury healing and became noncompliant in continuous use of the dynamic splint. When the athlete was seen again by the hand specialist at five months postinjury, a contracture of 40–60 degrees of PIP flexion was observed. The athlete's neurovascular status was found to be normal. The physician diagnosed the condition as a pseudo-boutonnière deformity, i.e., the joint straightened when wearing the splint and the contracture returned when not splinted. The physician instructed the athlete to wear the dynamic splint during the day and to wear a PIP extension splint at night. The hand specialist did not think that surgery would improve the injury.

The athlete was subsequently compliant in wearing the dynamic splint, and the status of his condition was improving, but he reinjured the finger during spring football practice. The athlete was once again seen by the hand specialist at eight months postinjury. At this examination, the athlete had swelling, instability of the collateral ligaments, and a contracture of 40–60 degrees. The treatment plan reiterated to the athlete that he was to wear the splint, since surgery was still not indicated. The athlete still had discomfort and a contracture of the fifth finger when not wearing a splint.

**Discussion**

A blow to the PIP that causes a dislocation often results in a disruption of the central slip of the extensor mechanism. When a PIP dislocation is reduced on the field, a boutonnière deformity may not be recognized. If the injury is not treated properly, the central slip retracts and the triangular ligament becomes stretched. This causes the lateral bands to displace in a palmar direction and they become flexors of the PIP joint. When the lateral bands retract proximally, they hyperextend the DIP joint. The combined effects produce the classic deformity of PIP joint flexion and DIP joint hyperextension.

Several treatment options have been recommended for an acute PIP joint volar dislocation and boutonnière deformity. Most specialists recommend extension splinting of the PIP joint for six to eight weeks. Patient education is a key element of the treatment. Noncompliance in use of the splint can lead to prolonged treatment. This treatment plan is usually highly successful. Athletes are usually allowed to participate while wearing the splint, which can be padded if necessary. Surgical reconstruction may be needed if an athlete has a chronically symptomatic boutonnière deformity, a displaced avulsion fracture at the base of the middle phalanx, instability of the PIP joint with loss of active extension, or failure of splint treatment. No treatment can guarantee return of full ROM.

A pseudo-boutonnière deformity has characteristics that differ from those of a classic boutonnière deformity. A pseudo-boutonnière deformity is usually caused by a hyperextension injury of the PIP joint. The volar plate and one collateral ligament are dam-