Distal biceps ruptures are uncommon injuries that comprise approximately 3% of all biceps pathology. This injury is most commonly seen in 40- to 60-year-old men, and the mechanism of injury involves a forceful extension movement to a flexed elbow. Without surgical intervention, patients are left with measurable weakness in elbow flexion and supination as well as a cosmetic deformity that often leaves them dissatisfied. Consequently, early surgical repair is advocated for physically active individuals. A variety of surgical approaches and fixation devices are currently used for distal biceps repair. The single-incision cortical button repair for distal biceps avulsions has become popular since Bain introduced the technique in 2000. The advantage of the cortical button biceps repair technique is the significantly higher failure strength than either the 2-incision technique or the suture anchor repair. The initial repair strength of the cortical button technique allows immediate active elbow range of motion and accelerated rehabilitation. Additionally, the single-incision anterior approach is less invasive than the 2-incision biceps repair and results in a lower incidence of heterotopic ossification. One disadvantage of this approach, however, is the risk of injury to the posterior interosseous nerve. The authors report a case in which the posterior interosseous nerve was incarcerated between the cortical button and the radius during acute distal biceps repair, resulting in complete posterior interosseus nerve palsy. This case report details the surgery leading to the nerve palsy and the subsequent nerve exploration that identified the cause of the nerve palsy. Recommendations are made on how to avoid this complication during distal biceps tendon repairs. [Orthopedics. 2015; 38(1):e68-e71.]
Single-incision cortical button repair for distal biceps tendon avulsion has become popular since Bain introduced the technique in 2001. The advantage of cortical button biceps repair is the significantly higher failure strength than with either the 2-incision technique or suture anchor repair. Additionally, the single-incision anterior approach is less invasive than 2-incision biceps repair and results in a lower incidence of heterotopic ossification. One disadvantage, however, is the theoretical risk of injury to the posterior interosseous nerve. To date, there have been no published reports confirming direct posterior interosseous nerve injury during cortical button distal biceps repair and there are only a few technique reports on how to avoid this potential complication. The authors report a case in which the posterior interosseous nerve was incarcerated between the cortical button and the radius during distal biceps tendon repair and propose techniques to avoid this complication.

**CASE REPORT**

A 41-year-old, right-hand-dominant man tore the distal biceps tendon while playing recreational football. The patient was concerned about the prospect of a cosmetic deformity as well as the potential for weakness in forearm supination and elbow flexion. He underwent distal biceps repair with the cortical button technique approximately 1 week after the initial injury. A single anterior transverse incision, approximately 4 cm long, was placed at the antecubital flexion crease. An Endobutton CL Ultra, with the continuous loop removed (Smith & Nephew, Andover, Massachusetts) was affixed to the distal biceps tendon stump with a running locking #2 FiberWire (Arthrex, Naples, Florida). Because of the acute nature of the injury, blunt dissection easily led to the bicipital tuberosity with the forearm fully supinated. Once the tuberosity was palpable, a drill guide was placed on the tuberosity. A guide pin was then drilled into the tuberosity with the forearm maximally supinated. Fluoroscopic images confirmed that the guide pin entered the center of the tuberosity on lateral view. The guide pin was then advanced through the dorsal cortex of the radius and bluntly pushed through the skin of the dorsal forearm. Because the skin incision at the antecubital crease is proximal to the radial tuberosity, the guide pin was directed distally from the skin incision to enter the center of the bicipital tuberosity. The trajectory of the pin across the radius was therefore proximal to distal at approximately 45° to the longitudinal axis of the radius (Figure 1). In addition, the guide pin was placed without deviation in an ulnar or radial direction. After placement of the guide pin, a cannulated acorn reamer was used to create a unicortical 7-mm hole in the near cortex of the radius and a 4.0-mm reamer was used to drill the far cortex. A clamp was placed on the guide pin where it exited the dorsal forearm to prevent the pin from spinning in soft tissue. The Endobutton CL Ultra sutures were pulled through the radius in a volar to dorsal direction with use of the guide pin. Once the sutures were visible dorsally, the Endobutton CL Ultra was shuttled through the radius and flipped when fluoroscopic lateral imaging confirmed that the button had cleared the dorsal cortex. The Endobutton CL Ultra sat flush on the dorsal surface of the radius. The biceps was secure in the radial tunnel, and the skin was closed.

In the recovery room, the patient could not actively extend the fingers or thumb at the metacarpophalangeal joints but was able to weakly extend the wrist. He also had burning pain radiating from the wrist. He was diagnosed with an iatrogenic posterior interosseous nerve injury. The posterior interosseous nerve palsy was initially suspected to be neuropraxia secondary to retractor placement, and the initial plan was observation, anticipating that the weakness would resolve. After careful reflection, however, it was noted that no retractors had been placed over the lateral border of the radius. Because of the dense nature of the posterior interosseous nerve palsy and the lack of early improvement, suspicion arose that the patient’s posterior interosseous nerve palsy was the result of either laceration from the guide pin as it exited the dorsal cortex of the radius or entrapment by the Endobutton CL Ultra. As a result, nerve exploration was recommended. One week after the initial surgery, nerve exploration was performed through a longitudinal dorsal forearm incision. The posterior interosseous nerve was identified at the distal edge of the supinator and traced proximally. On further proximal dissection, the Endobutton CL Ultra was found to be deployed directly on top of the posterior interosseous nerve. The biceps repair was revised, and the Endobutton CL Ultra was passed through a more ulnar hole in the dorsal radius, providing approximately 5 to 7 mm of clearance between the Endobutton CL Ultra and the nerve. The nerve was contused, but in continuity. The patient was followed at regular intervals over the next 12 weeks, and posterior interosseous nerve function slowly improved. At 12-week follow-up, the patient showed full active elbow mo-
tion and full wrist and finger extension strength. He had residual thumb extension weakness, with a muscle strength grade of 4/5 compared with the contralateral hand. The patient was contacted by telephone 2 years postoperatively, and the residual weakness had completely resolved. Forearm and elbow strength and function were symmetric with the uninjured arm. He expressed satisfaction with the cosmetic and functional benefit of the distal biceps repair and continues to be an avid weightlifter.

**DISCUSSION**

Cortical button fixation of the distal biceps has shown superior pullout strength in biomechanical testing compared with suture anchors or bone bridge fixation. Excellent results with range of motion and strength also have been reported. However, this technique has potential pitfalls, including posterior interosseous nerve entrapment by the cortical button, as described in this case report.

Most posterior interosseous nerve injuries reported in biceps repair case series are transient. This suggests that the most common cause of posterior interosseous nerve injury during biceps repair is neuropraxia, possibly secondary to retractor placement. Delayed-onset posterior interosseous nerve injuries also have been reported in case studies as a result of heterotopic ossification or scar formation, leading to compression of the nerve. To the authors’ knowledge, injury to the posterior interosseous nerve by a guide pin during cortical button repair or incarceration of the nerve by the cortical button has not yet been reported. This report describes a case in which the cortical button was deployed on top of the posterior interosseous nerve, causing complete nerve palsy. Fortunately, after exploration and cortical button revision, the posterior interosseous nerve palsy improved and the patient had complete restoration of function. This would probably not be the case if the authors had not made the correct diagnosis and performed early exploration of the posterior interosseous nerve.

This complication led to an anatomic study evaluating the safest trajectory of the guide pin during biceps repair. Previous studies showed the importance of avoiding a radially directed trajectory of the guide pin and a benefit to aiming the posterior interosseous nerve ulnarly to increase the distance between the guide wire and the posterior interosseous nerve. However, these studies did not evaluate the risk of aiming the guide pin distally. The authors found that drilling distally or radially placed the posterior interosseous nerve at significantly increased risk of injury during biceps repair (Figure 2) compared with an ulnar or direct anterior to posterior trajectory. Additionally, the authors observed that a transverse skin incision at the antecubital crease forced a distal drill trajectory, leading to compression of the nerve.

**CONCLUSION**

Cortical button distal biceps repair is an excellent option because of its high initial failure strength, low risk of heterotopic ossification, and ability to allow immediate postoperative active elbow range of motion. Fortunately, the reported incidence of permanent iatrogenic posterior interosseous nerve injury is very low. The surgeon should be certain to avoid a distal or radial drill trajectory during preparation of the radial tunnel for cortical button biceps repair and to avoid placing retractors over the lateral radius to minimize risk to the posterior interosseous nerve.

**References**


