



BASIC SCIENCE

Anatomic cadaveric study of the extensile extensor digitorum communis splitting approach for exposing the ulnar coronoid process



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Background: The extensile extensor digitorum communis (EDC) splitting approach can access the ulnar coronoid process (UCP), which can be used to treat terrible triad injuries. The present study anatomically examined the extensile EDC splitting approach for exposing the UCP.

Methods: Twenty fresh frozen cadaveric upper limbs were dissected. The splitting length of the EDC and detachment length of the extensor carpi radialis brevis (ECRB)–extensor carpi radialis longus (ECRL)–brachioradialis (BR) origin were measured to expose the UCP. The distance between the most distal site of the EDC splitting and the point at which the posterior interosseous nerve (PIN) crosses the anterior aspect of the radial shaft, and the distance between the most proximal site of the ECRB-ECRL-BR origin detachment and the point at which the radial nerve crosses the anterior aspect of the humeral shaft were measured.

Results: The splitting length of the EDC was 45.4 ± 4.8 mm, the detachment length of the ECRB-ECRL-BR origin was 30.2 ± 4.7 mm, the distance between the distal site of the EDC splitting and PIN was 10.6 ± 6.1 mm (minimum distance, 1.1 mm), and the distance between the proximal site of the ECRB-ECRL-BR origin detachment and the radial nerve was 49.5 ± 9.7 mm (minimum distance, 31.7 mm).

Conclusions: The extensile EDC splitting approach can sufficiently expose the UCP. However, splitting must be performed carefully because the most distal site of the EDC splitting is close to the point at which the PIN crosses the anterior aspect of the radial shaft (average distance, 10 mm; minimum distance, 1 mm).

Level of evidence: Basic Science Study; Anatomy; Cadaver Dissection

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Keywords: Extensor digitorum communis; ulnar coronoid process; terrible triad injury; posterior interosseous nerve; radial nerve; extensile lateral approach; anatomy; fresh frozen cadaver

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Excellent visibility at the anterolateral region of the elbow joint can be obtained by using the extensile lateral approach, which was developed by expanding an existing and conventional lateral approach in the proximal and distal directions; therefore, the extensile lateral approach is useful for

osteosynthesis of coronal shear fractures of the humeral capitellum.^{2,15,17,18,20,22} This approach can access the ulnar coronoid process (UCP).²

The extensile extensor digitorum communis (EDC) splitting approach² is one of the extensile lateral approaches, which was developed by expanding the EDC splitting approach^{10,19} in the proximal and distal directions. During the extensile EDC splitting approach, the center of the EDC is split in the fiber direction from the lateral epicondyle (LE), and the extensor carpi radialis brevis (ECRB)–extensor carpi radialis longus (ECRL)–brachioradialis (BR) origin is detached from the LE along with the humeral crest. The annular ligament and the articular capsule is subsequently split to expose the inside of the elbow joint. When the extensile EDC splitting approach is used, excellent visibility can be obtained at the anterolateral region of the elbow joint, the EDC can be quickly and easily found, and the lateral ulnar collateral ligament can remain intact.

The following must be determined when the UCP is exposed using the extensile EDC splitting approach: the splitting length of the EDC, detachment length of the ECRB-ECRL-BR origin, positional relationship between the most distal site of the EDC splitting and the posterior interosseous nerve (PIN), and the positional relationship between the most proximal site of the ECRB-ECRL-BR origin detachment and radial nerve (RN). This information is necessary to perform the extensile EDC splitting approach safely.

The aim of the present study was to anatomically estimate the splitting length of the EDC and detachment length of the ECRB-ECRL-BR origin, which is required to expose the UCP during the extensile EDC splitting approach, and elucidate the positional relationship among the splitting and detachment stumps, PIN, and RN.

Materials and methods

In the present cadaveric study, 20 upper limbs (10 right and 10 left) of 10 fresh frozen cadavers (6 women and 4 men) were examined. The average age at death was 88.7 years (range, 78-97 years). The donors had no history of surgical operation around the elbow or past trauma.

Before dissection, the distance between the lateral end of the acromion and LE was measured as the length of the brachium, and the distance between the LE and radius styloid process was measured as the length of the antebrachium. Anatomic dissection was performed at 70° of elbow flexion with the forearm in pronation.

In the distal portion, the center of the EDC was split from the LE in the fiber direction. In the proximal portion, the ECRB-ECRL-BR origin was detached from the LE along with the humeral crest (Fig. 1). In the deep portion, the lateral ulnar collateral ligament remained intact, and the annular ligament and articular capsule were split together and then raised together to expose the inside of the joint. A 1.3-mm wire was inserted perpendicularly to the bone axis from the tip of the

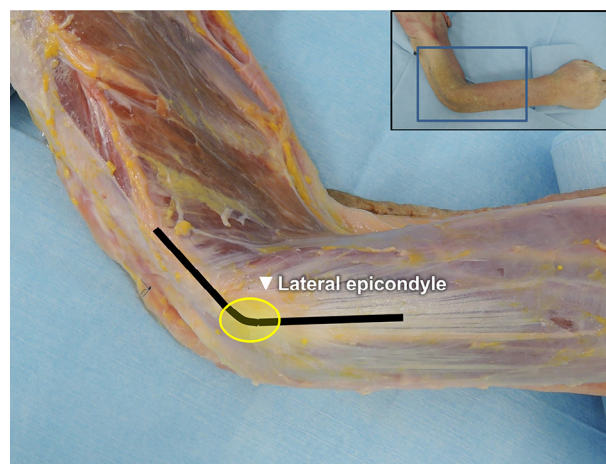


Figure 1 Anatomic dissection was performed at 70° of elbow flexion with the forearm in pronation. In the distal portion, the center of the extensor digitorum communis was split from the lateral epicondyle in the fiber direction. In the proximal portion, the extensor carpi radialis brevis–extensor carpi radialis longus–brachioradialis origin was detached from the lateral epicondyle along with the humeral crest.

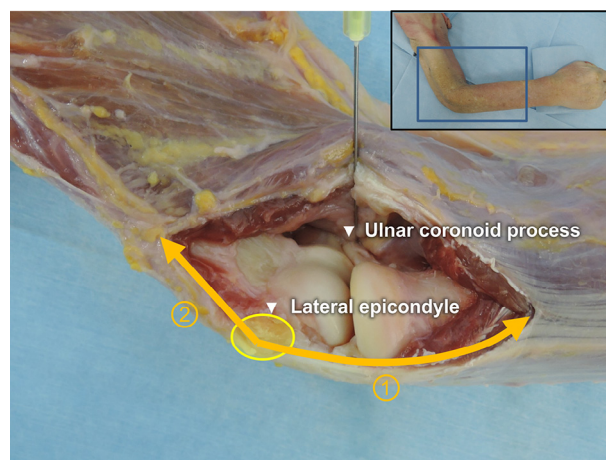


Figure 2 The splitting length of the extensor digitorum communis from the lateral epicondyle (1) and the detachment length of the extensor carpi radialis brevis–extensor carpi radialis longus–brachioradialis origin (2) were measured to expose the ulnar coronoid process.

UCP, and splitting and detachment were extended equally in the distal and proximal directions. When the muscle tension on the wire disappeared and the bend in the wire disappeared, the splitting length of the EDC and detachment length of the ECRB-ECRL-BR origin from the LE were measured, as the muscle splitting and detachment lengths were required to expose the UCP using digital calipers (Model 19974; Shinwa Rules Co., Ltd., Niigata, Japan; Fig. 2).

In the distal portion, the supinator muscle was exposed. In the supinator muscle, the PIN that courses obliquely through the radial shaft was exposed. The point at which the PIN crosses over the anterior aspect of the radial shaft (lateral view)

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