

The subanconeus muscle

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There is a paucity of information in the extant literature regarding the detailed anatomy of the subanconeus (articularis cubiti) muscle. Our current study seeks to elucidate further the presence, morphology, and potential function of this muscle. Eighteen cadaveric upper extremities underwent dissection of their posterior elbow joint capsule with special attention to any fibres attaching to it from the triceps brachii muscle. We found that all specimens had various amounts of muscular attachment of the medial head of the triceps into the posterior joint capsule. It was noted that the highest concentration of fibres was into the joint capsule near the groove for the ulnar nerve. No specimen was found to have a distinct muscle belly associated with these connections to the joint capsule. On all sides these fibres were simply deeper attachments of the medial head of the triceps brachii muscle. Following tension on these deeper fibres retraction of the joint capsule was not noted but rather compression of the capsule. We would speculate on the basis of our study that these fibres of the medial head of the triceps brachii muscle do not represent a separate muscle per se and do not retract the posterior elbow joint capsule with extension of the forearm as has been theorised. It is possible that compression of the posterior elbow joint capsule from these deeply placed fibres of the triceps brachii restricts the elbow fat pad from being displaced and allows it to cushion the contact made between the olecranon process and the olecranon fossa.

Key words: elbow, joint, triceps brachii, articular

INTRODUCTION

The subanconeus muscle (articularis cubiti) has received relatively little attention in the anatomical or medical literature. This muscle or muscle part is usually described in one to two sentences as originating from the deep part of the medial head of the triceps brachii and inserting into the posterior aspect of the joint capsule of the elbow [10, 18]. The subanconeus muscle can be classified as a capsular muscle, a term that has been suggested for the articularis genu [5]. However, some have stated that the olecranon process of the ulna is the sole bony insertion for all heads of the triceps brachii [6]. The

present study seeks to elucidate further the presence, morphology, and potential function of the subanconeus muscle.

MATERIAL AND METHODS

Eighteen elbows from nine adult formalin-fixed cadavers (five females, four males) underwent dissection for this study. The ages of these specimens ranged from 62 to 85 years (mean 75 years). No previous surgical incisions were noted on the upper extremity in any specimen. In the prone position the triceps brachii muscle was transected with a scalpel at the mid humerus and carefully reflected and traced

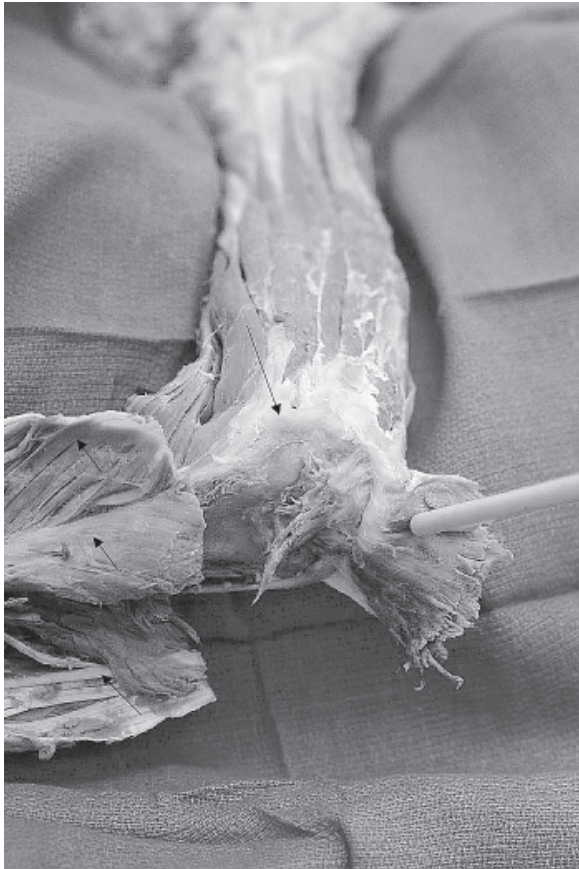


Figure 1. Right posterior upper extremity from a female cadaver. Note the dissected heads of the triceps brachii (long head at lower left arrow, medial head at left middle arrow, and lateral head at left upper arrow). The primary insertion of the triceps brachii is folded inferiorly with a dissecting pin. For reference note the lateral epicondyle of the humerus (long arrow).



Figure 2. Closer image of Figure 1. Note the deeper head of the medial head of the triceps brachii (lower left arrow) with a separate attachment directly into the olecranon of the humerus (long arrow). Also shown is the ulnar nerve (at base of lower left arrow). Fibres (subanconeus) from this deep portion of the medial head of the triceps brachii can be seen attaching to the fibrous capsule of the posterior elbow (upper left arrow).

distally toward the olecranon process. Observations were made of any attachment of the above mentioned muscle to the posterior joint capsule of the elbow, which was filled with saline via a syringe and a 27 gauge needle. Additionally, tension was placed on the triceps brachii muscle in anatomical position to discern any effect on the posterior joint capsule by this muscle.

RESULTS

All sides were found to have some attachment of the deep aspect of the triceps brachii (medial head) to the posterior aspect of the elbow joint capsule (Figs. 1–3). However, these attachments were variable. Some specimens were found to have only two to three small attachments ($n = 7$ sides), while others were found to have moderate (four to six attachments, $n = 4$ sides) to significant (greater than six sites of attachment, $n = 7$) attachment. The greatest concentration of these muscular fibres attached

to the posterior capsule of the elbow joint near the groove for the ulnar nerve and in some ($n = 3$) also near the olecranon fat pad. It was also noted that all muscles fibres arose from the part of the medial head of the triceps brachii with an independent insertion into the olecranon process of the ulnar [8] (Fig. 2). No obvious difference was noted between the sides or genders of the specimens used in this study. Following the replacement of the medial head of the triceps brachii muscle against the posterior aspect of the humerus tension was applied superiorly. This attempt at recreating the effect of its fibres attaching to the posterior aspect of the elbow joint capsule resulted in little if any retraction of the capsule itself, which was quite adherent to the surrounding bone and had little redundancy in any specimen. Rather, all specimens were noted to have compression of the joint capsule when this manoeuvre was performed.



Figure 3. Another right-sided specimen with the joint capsule opened (dissecting pin) demonstrating fibres (subanconeus) attaching to this capsule (lower arrow) and for reference some of the elbow fat pad (upper arrows). The ulnar nerve is seen to the right of this image.

DISCUSSION

The articularis genu (*tenseur de la synoviale*, capsular muscle of Meckel) is perhaps the most well known muscle with an attachment to the external aspect of a joint capsule [4]. However, other less well described muscles have attachments into joints that they cross. For example, some have depicted fibres of the brachialis muscle as attaching to the anterior surface of the joint capsule of the elbow [16]. Interestingly, these authors also label this muscle as the articularis cubiti. Macalister [13] has described the triceps brachii as occasionally sending a small slip to the capsule of the shoulder. Other skeletal muscles that do not insert into bone include, for example, the scalene minimus, which attaches partially to the suprapleural membrane (Sibson's fascia), and the levator palpebrae superioris, which attaches into the superior lid.

Muscle attachment into the capsule of a joint is not unique to humans. Kjaersgaard [12] has found in the tapir that fibres of the articularis humeri (a muscle arising from the neck of the scapula and inserting into the neck of the humerus) inserted directly into the shoulder joint capsule. Bergman et al. [2, 3] have stated that when a fourth head of the triceps brachii [7] is found, it may attach to the capsule of the shoulder joint. Comparatively, the subanconeus may be found in other animals. Gruber [9] has described it in the rabbit and cat. Variations of

the triceps muscle near its insertion site into the olecranon process of the ulna include attachment of it into the medial epicondyle [14].

The subanconeus has been described as "the name given to a few fibres from the under surface of the lower part of the triceps muscle, which are inserted into the posterior ligament of the elbow joint. By some authors it is regarded as the analogue of the subcrureus (articularis genu) in the lower limb, but it is not a separate muscle" [8]. Our present study confirms the notion that this described muscle is not a separate muscle. Regarding the attachment of the subanconeus into the joint capsule, however, this resembles the articularis genu in its morphology but our findings do not support the hypothesis in terms of function. The actions performed by the subanconeus are speculative. Williams [20], for example, states that this muscle probably "draws up" the posterior part of the capsule of the elbow joint during extension of the forearm. Rosse and Gaddum-Rosse [17] described this muscle as preventing the elbow joint capsule from being "caught" by the olecranon. Even the much larger articularis genu has controversy surrounding its function. Some have claimed that the articularis genu has no independent function and represents a series of posterior elements of the quadriceps femoris muscle that in a process of slow atrophy were unable to survive when not connected to the patella, an event that presumably occurs in some muscles after amputation [4]. However, others have opined that this muscle prevents the capsule of the knee from being pinched during a sudden extension of the leg [1, 11]. DiDio et al. [5] have mentioned that there are increased symptoms of capsular "nipping" of the knee joint during extension of the leg in older adults that could be explained by the atrophy of the articularis genu seen in individuals of over approximately 50 years of age. It has been said that when the articularis genu is small its action seems to be compensated for by a more extensive adhesion of the synovial cul-de-sac by the tendon of the quadriceps muscle [5].

Posterior surgical exposures of the elbow joint that might encounter the subanconeus muscle include synovectomy and joint debridement, intra-articular elbow fractures, and total elbow arthroplasty [15]. Sucher and Herness [19] have misused the term "subanconeus", describing it as arising from the medial border of the olecranon and inserting into the dorsal aspect of the medial epicondyle. These authors reported compression of the ulnar nerve by the muscle described above.

We believe that the subanconeus is not a separate muscle in itself and that it is merely deep fibres of the medial head of the triceps brachii. On the basis of our study we speculate that these fibres compress the posterior joint capsule, thus potentially inhibiting the elbow fat pad from travelling posteriorly during extension and allowing for more cushioning between the olecranon process and fossa. The knee joint has unique morphological features associated with human orthostatic posture [4] that may make the functions of the subanconeus and articularis genu functionally incomparable and only morphologically similar. Moreover, we would speculate that with the greater concentration of fibres of this muscle being found near the groove for the ulnar nerve contraction might tend to tether the medial component of the triceps brachii, thus decreasing the likelihood that it would compress the ulnar nerve.

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