



Persistence
& Creativity

Anatomy Comics, Objectives 5.1, 5.2 and 5.3

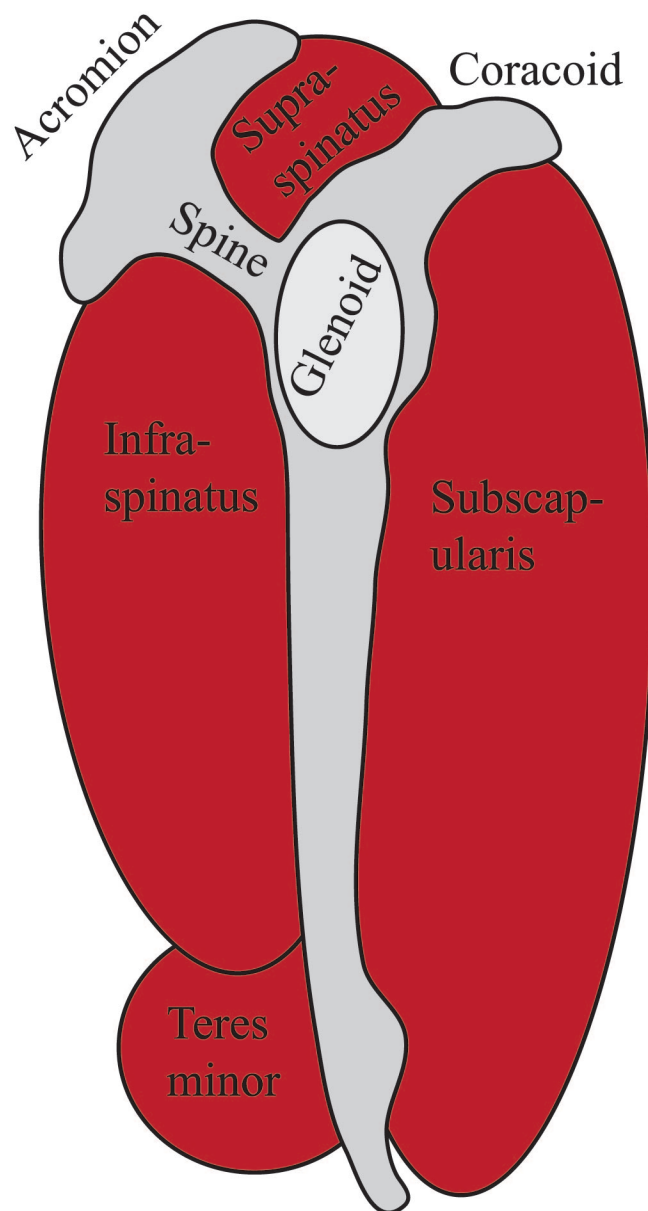


Simple
Comix

5.1 Identify the major processes on the scapula, clavicle and the proximal humerus and their surface projections.

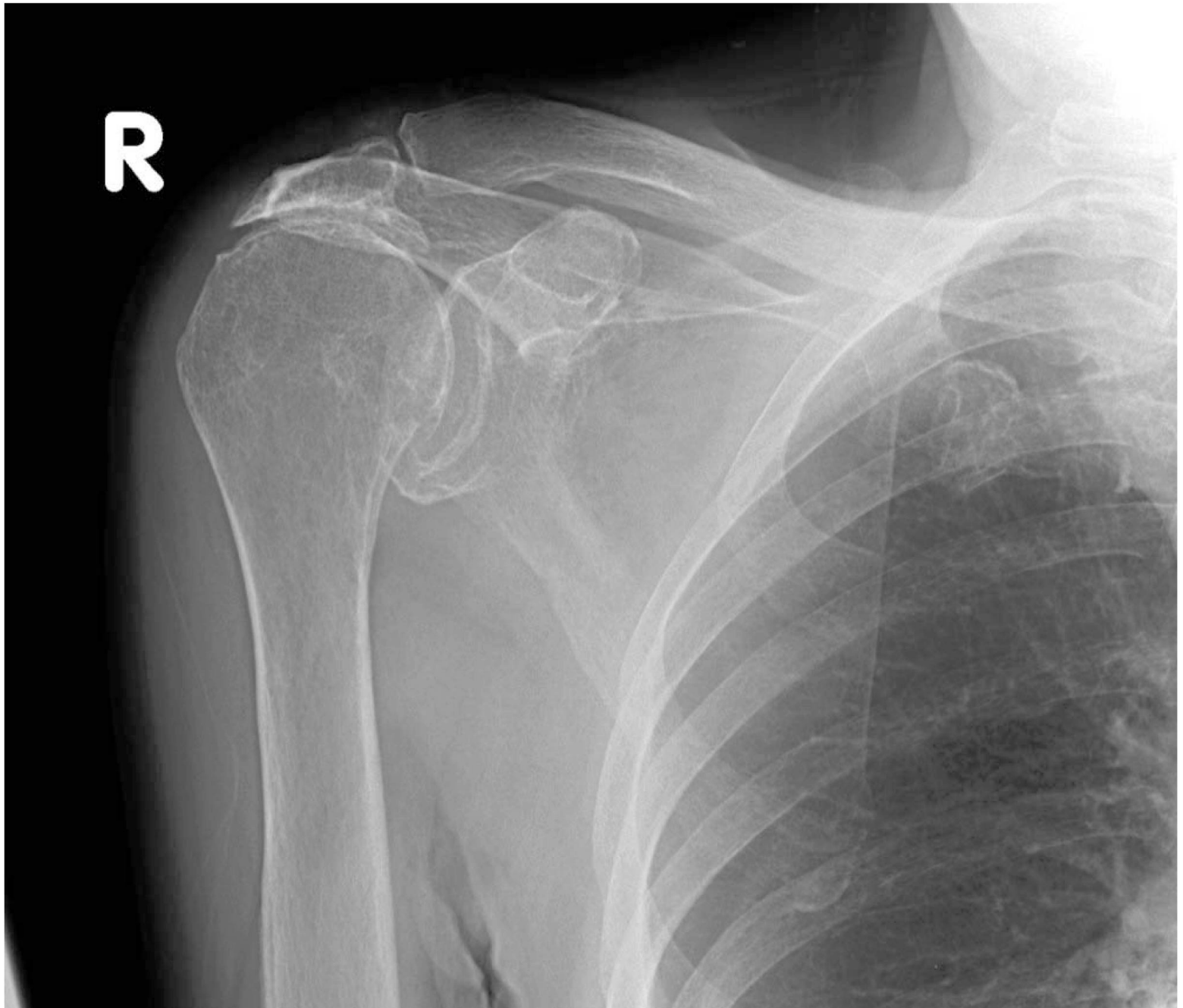
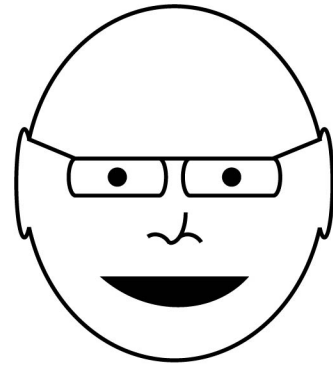
5.2 Demonstrate the joints and supporting articular structures (i.e., ligaments) of the scapula, clavicle, humerus and sternum. Indicate their role in facilitating shoulder motion and maintaining stability of the shoulder.

5.3 Identify the structures that form the borders of the axilla. Identify the muscles that move the humerus, clavicle and scapula. Indicate their primary actions and their innervation. Be prepared to predict the functional consequences of weakness or loss of function of each muscle.

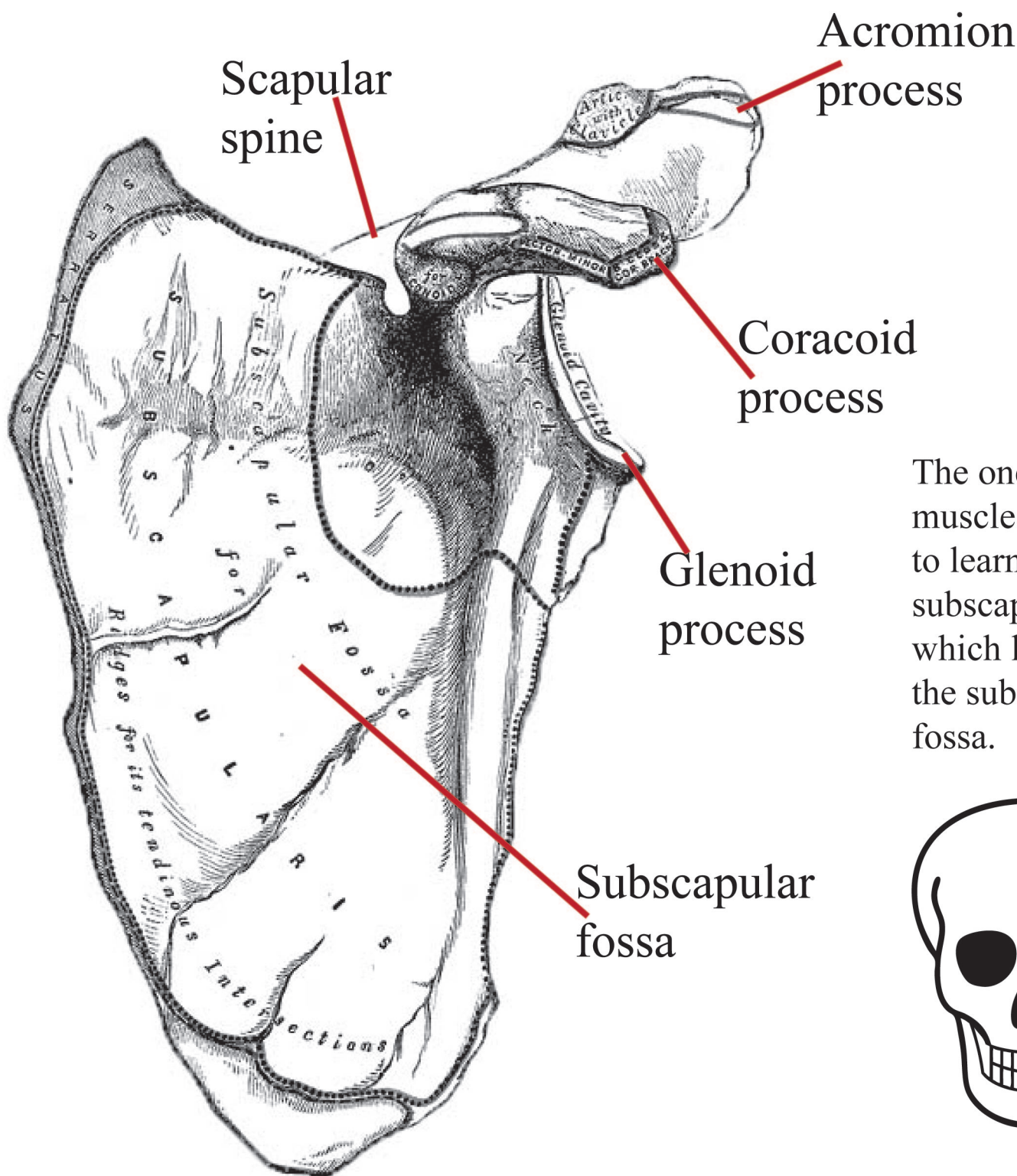
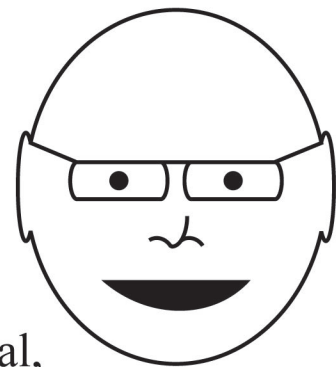


1. A 70 year old woman presents with chronic shoulder pain and the shoulder x-ray shown below. Which rotator cuff tendon is torn?

- A. Supraspinatus
- B. Infraspinatus
- C. Teres minor
- D. Subscapularis



The answer is A, the supraspinatus tendon is torn. To understand why that is the correct answer, we will have to learn the anatomy of the scapula, humerus and the rotator cuff. We'll start with this image of the front of the scapula taken from Gray's Anatomy. I have labelled several important structures. The scapula is quite superficial, I am certain that you can feel all of these structures on yourself.

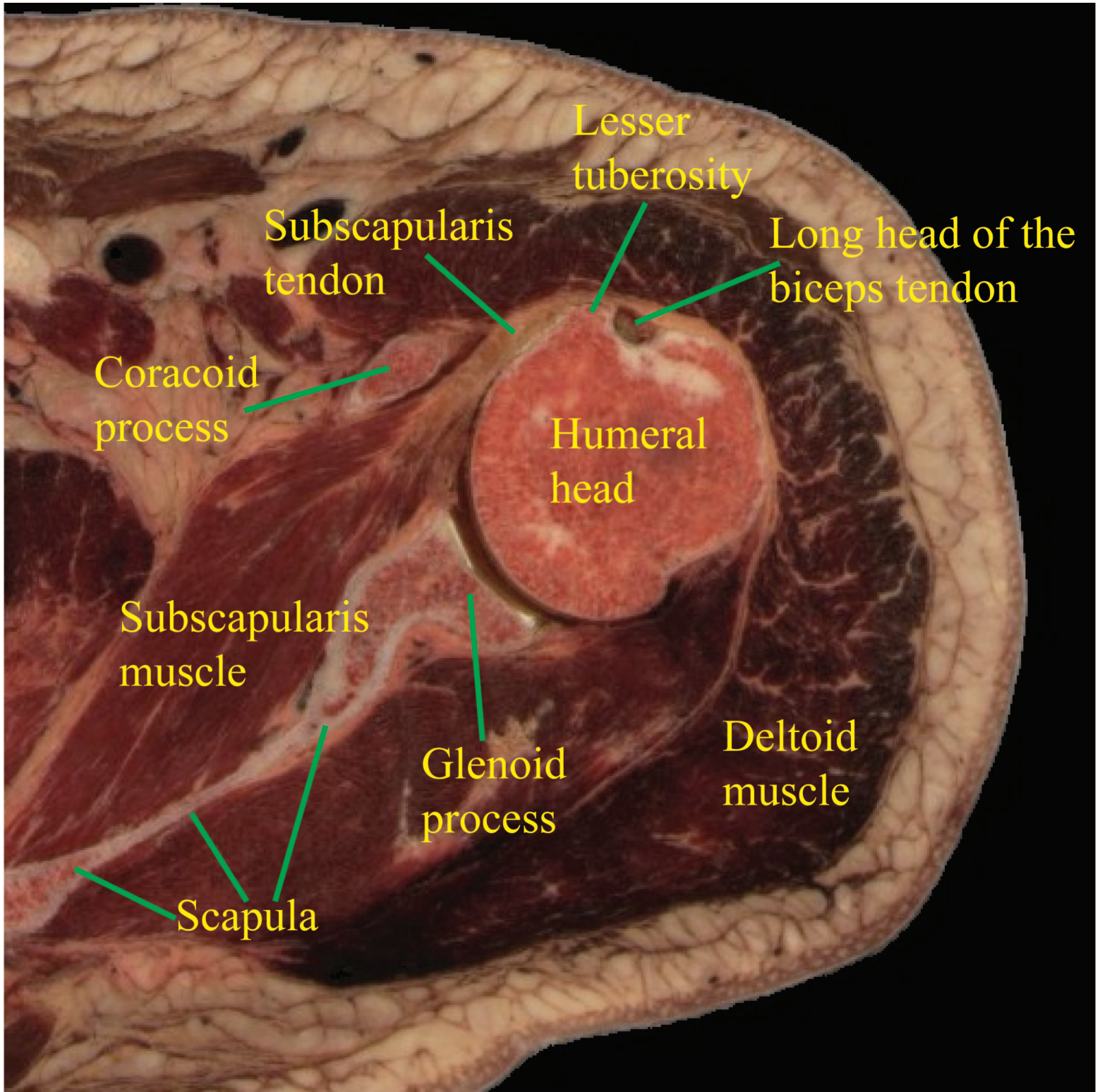


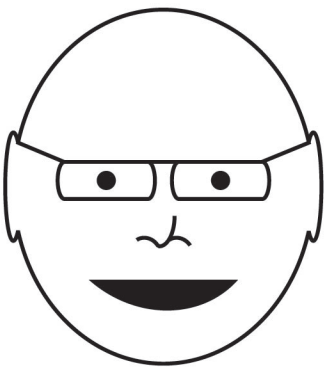
The one anterior muscle we have to learn is the subscapularis, which lives in the subscapular fossa.





This axial image from the visible human project shows our first rotator cuff muscle, the anteriorly located subscapularis muscle, its tendon and the tendon insertion site on the lesser tuberosity of the humerus. I have also labelled some other important structures. This image beautifully shows why the shoulder is the most frequently dislocated large joint in the body, with a large humeral head articulating with a shallow glenoid. The rotator cuff helps maintain shoulder stability.





Next, we'll look at the back of the scapula and the muscles that live there: the supraspinatus, infraspinatus and teres minor. I have also re-labelled important structures that you should be able to palpate on yourself. The scapular spine separates the anterior/superior supraspinatus muscle from the posterior/inferior infraspinatus muscle.

Acromion

process

Coracoid process

Supraspinatus
fossa

Scapular spine

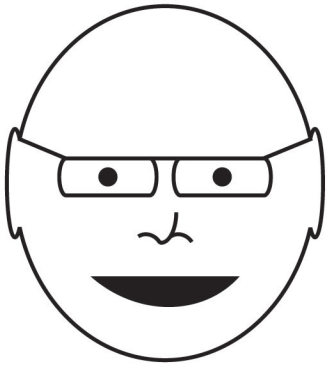
Glenoid
process

Infraspinatus
fossa

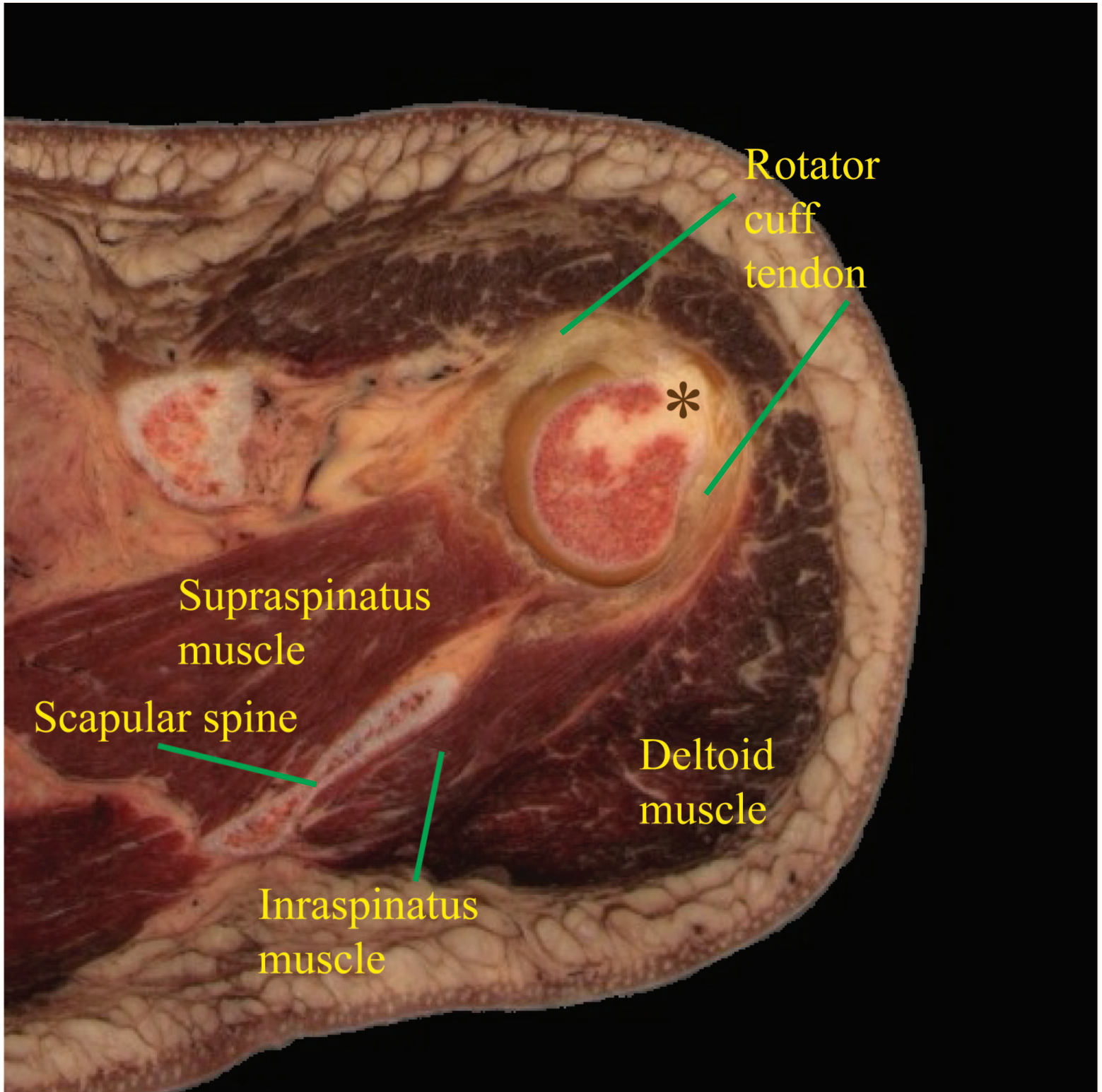
Teres
minor
origin

When you palpate your scapular spine, follow it laterally where it turns into the acromion. If you palpate just medial to the anterior acromion, you can feel the acromioclavicular or AC joint. Just medial and inferior to the the AC joint, you should be able to feel the hook shaped coracoid process projecting anteriorly.





We'll look at axial images at three different locations to show each of the posterior muscles. This image is obtained high in the shoulder, just below the AC joint and shows the supraspinatus and infraspinatus muscles separated by the scapular spine. We also see the conjoined (more on that later) rotator cuff tendon attaching to the greater tuberosity (*) of the humeral head.

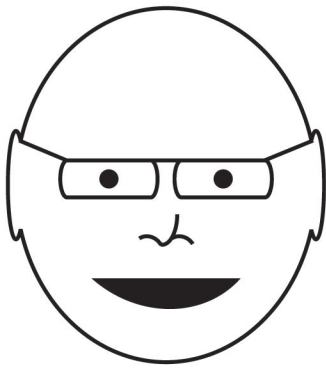




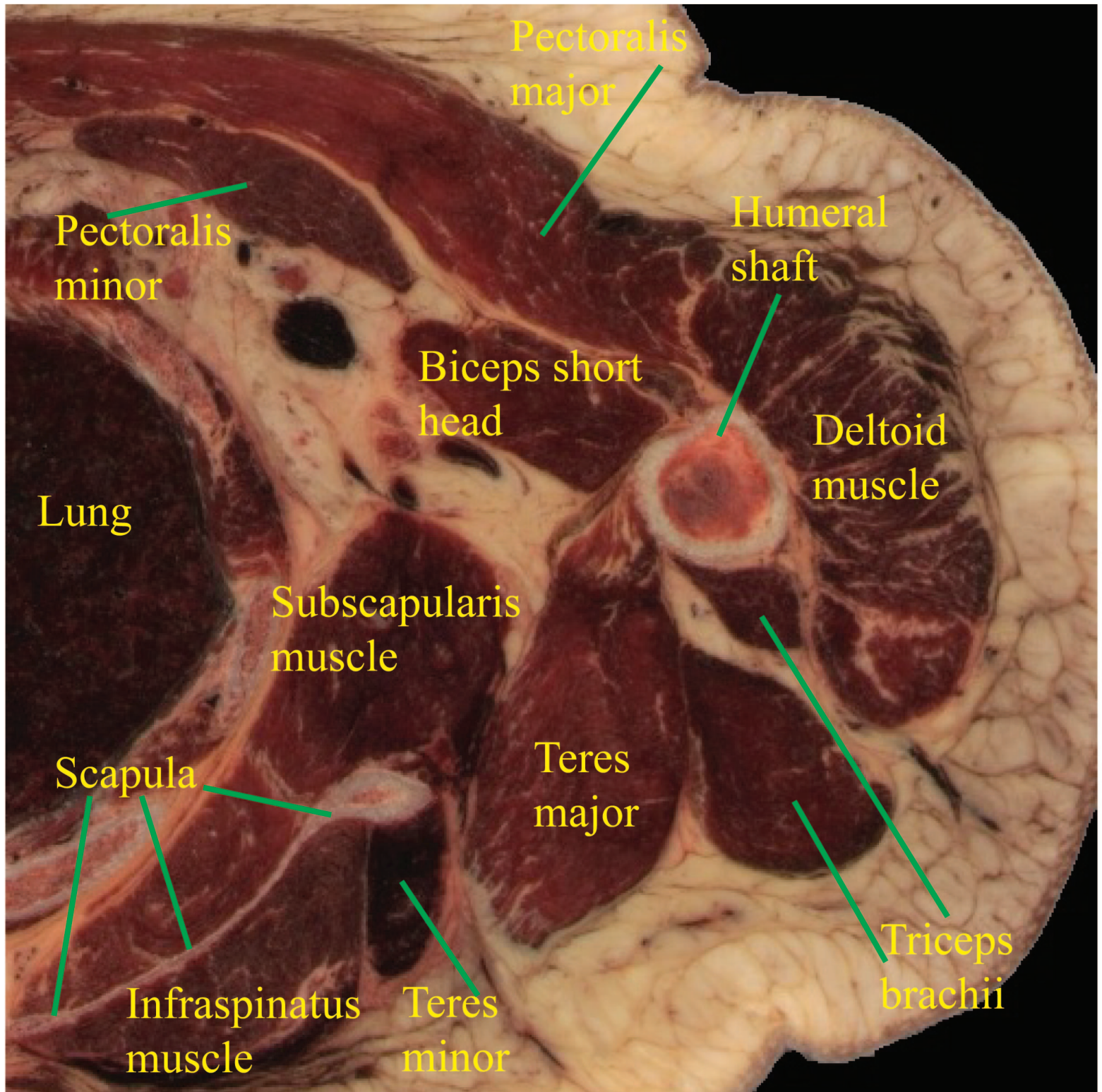
We've already seen this image, obtained more inferiorly. See if you can identify the structures that you saw before. We are now below the level of the supraspinatus muscle and can recognize how big the infraspinatus is.

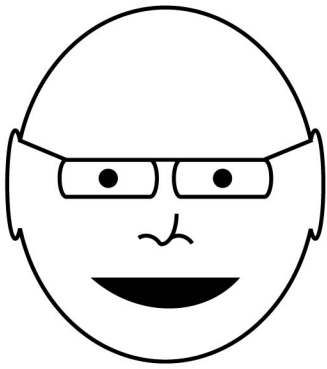


Infraspinatus
muscle

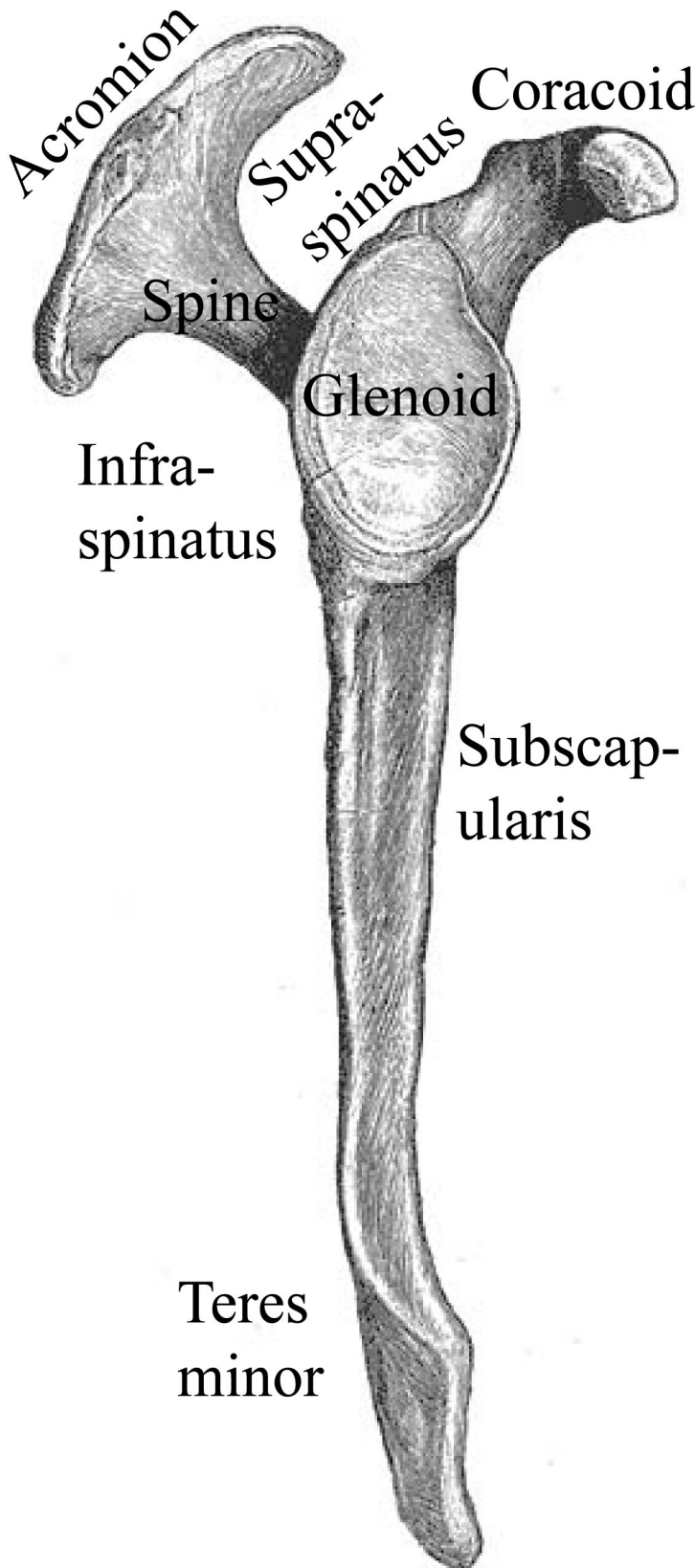


Moving even further inferiorly, we come to the teres minor muscle, which is literally last and least.



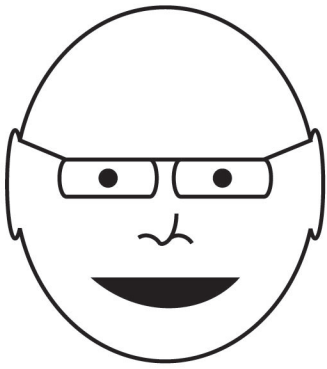


We are 1/3 of the way to explaining the answer to our question! Its time to switch to the sagittal plane, which we will explore with this picture stolen from Gray's Anatomy. You are looking at the glenoid process of the scapula en face and should be able to imagine where the rotator cuff muscles live. If you can't, I have labelled them for you.

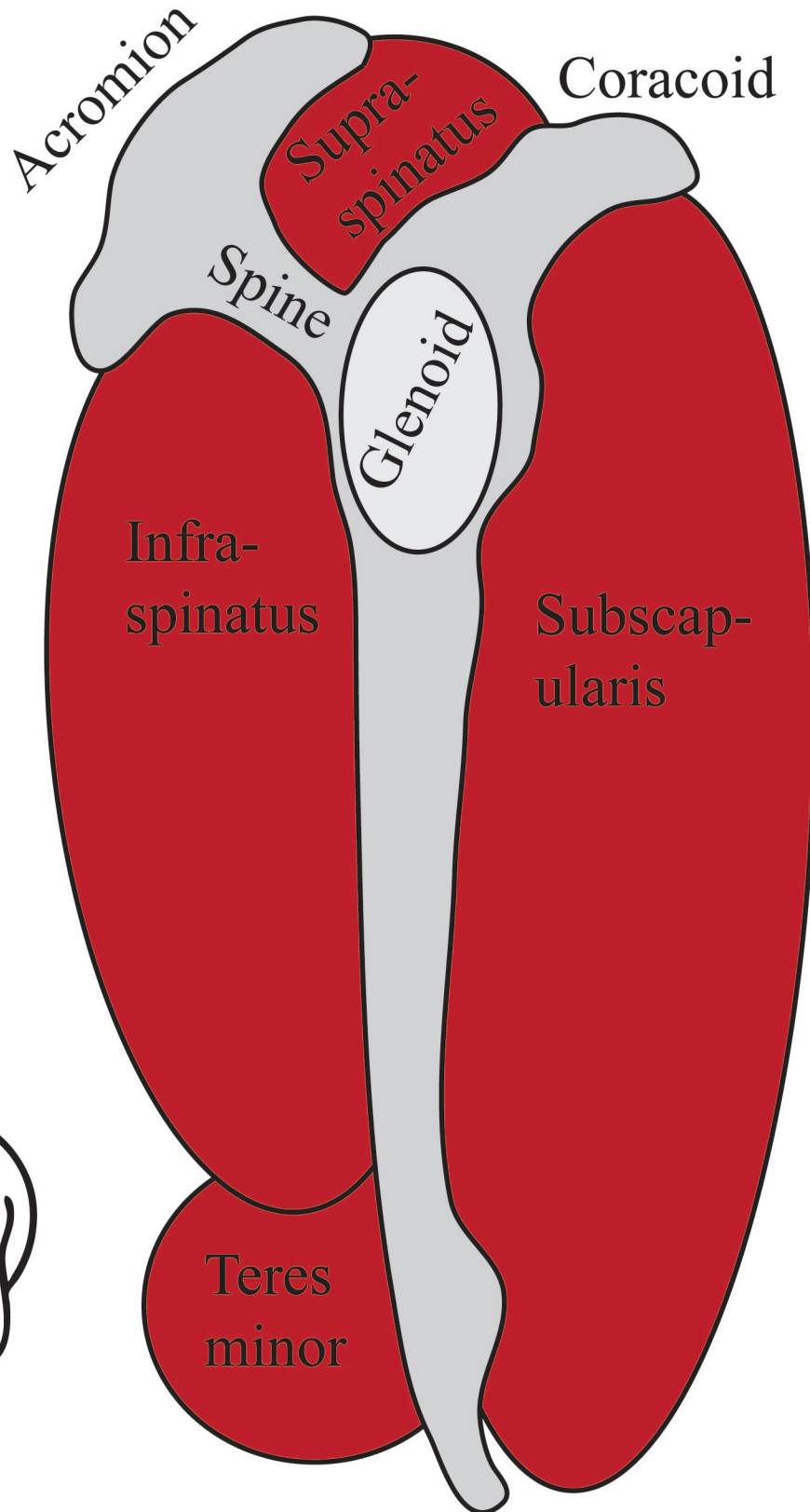


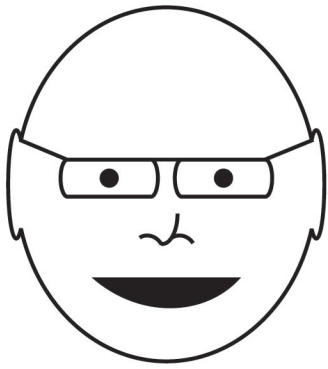
The mnemonic for the rotator cuff muscles is “SITS”, for supraspinatus, infraspinatus, teres minor and subscapularis. The first 3 muscles in the mnemonic live posterior to the scapula and attach to the greater tuberosity of the humerus, while the last muscle, the subscapularis lives anterior to the scapula and inserts on the lesser tuberosity of the humerus.



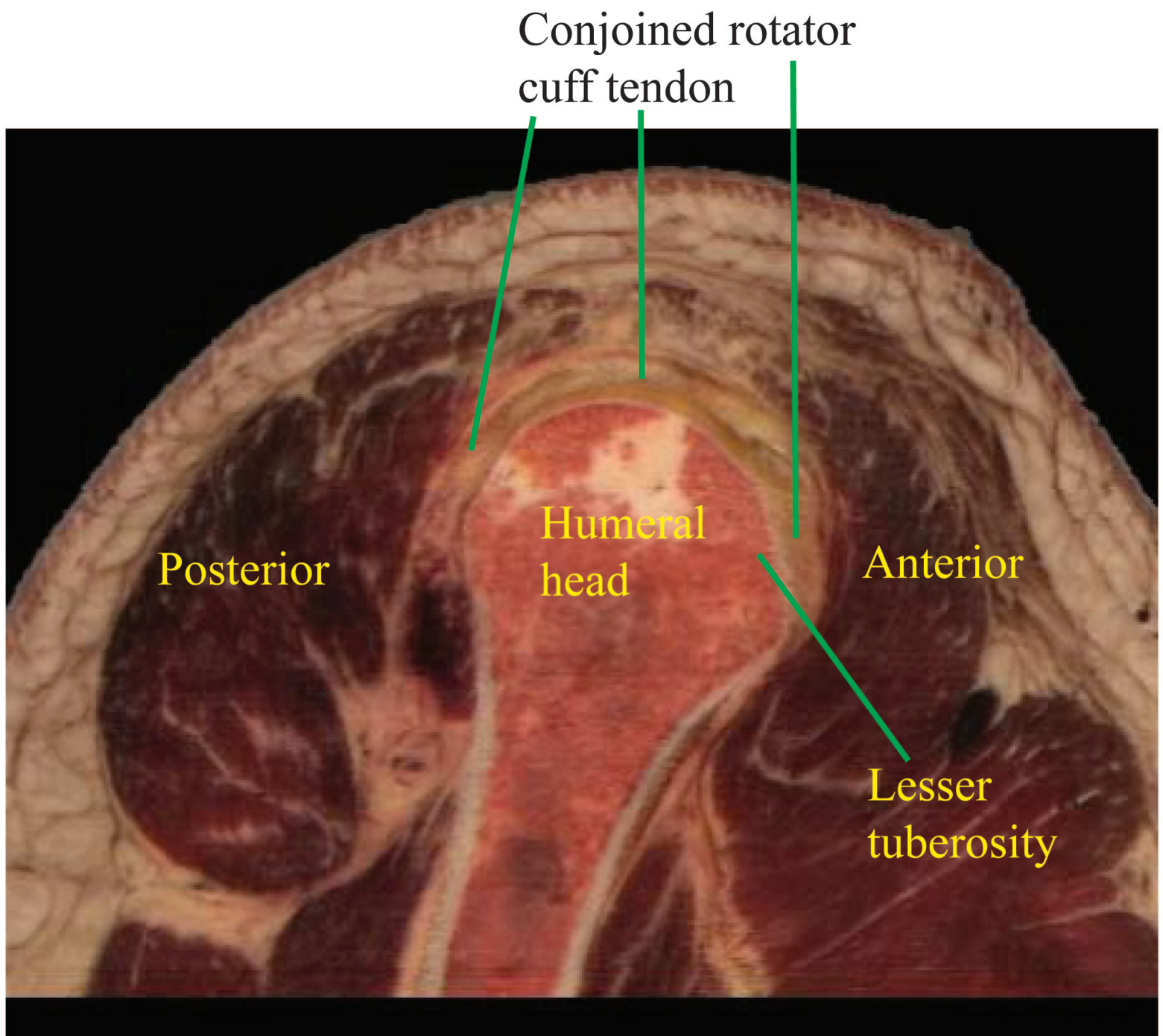


Now it's time for a drawing that you can do! Draw the scapula from an en face view of the glenoid, then add the muscles.



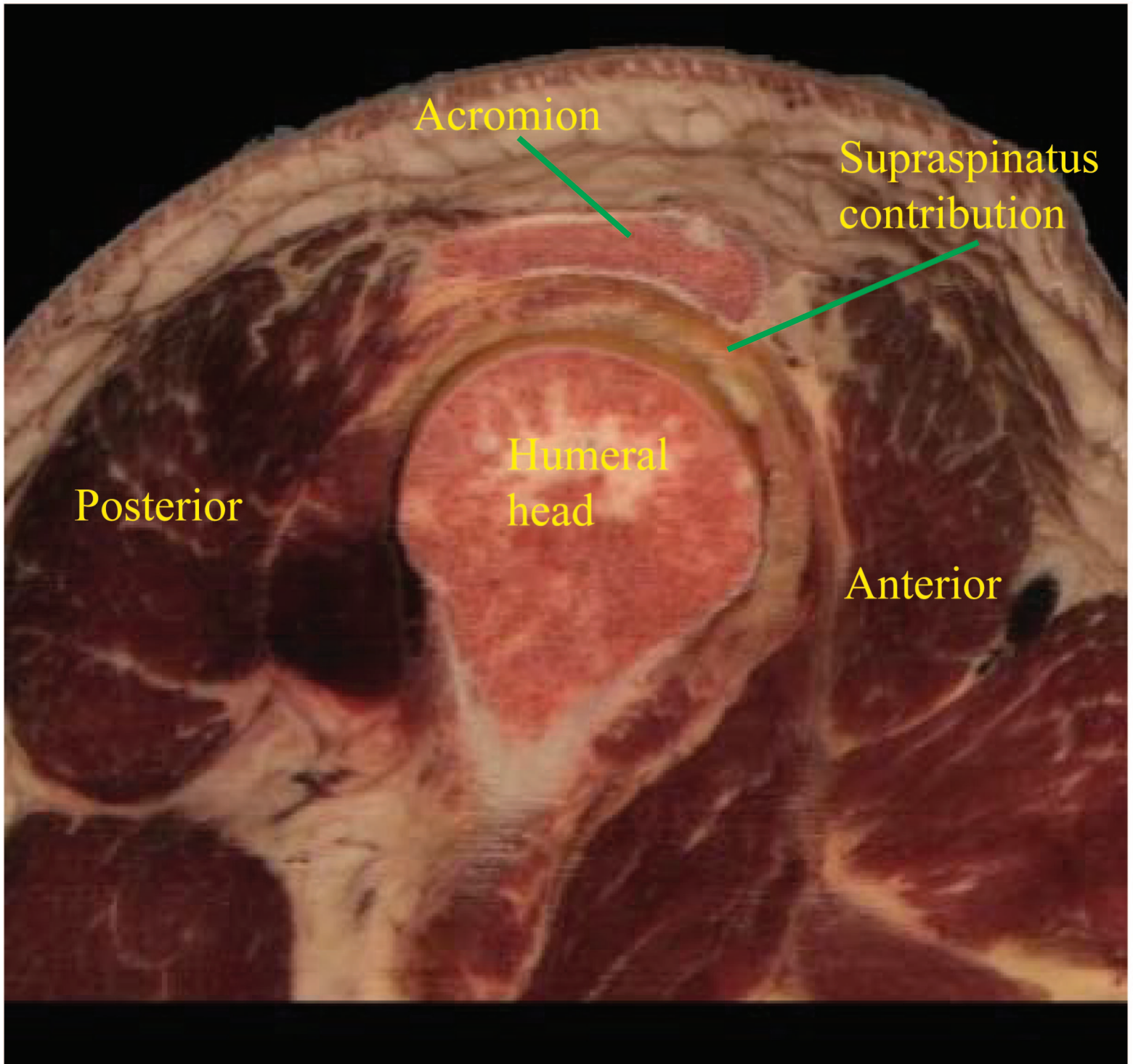


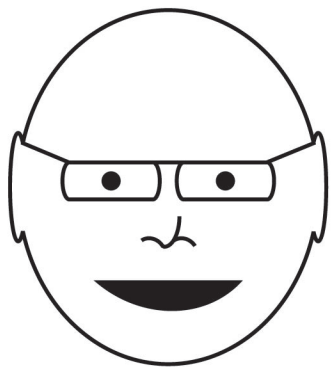
Let's step through some sagittal images to firm up this anatomy. This image was obtained just lateral to the acromion process and shows that the rotator cuff really is a conjoined tendon with contributions from (anterior to posterior) the subscapularis, supraspinatus, infraspinatus and teres minor muscles. Remember that the lesser tuberosity is an anterior structure.



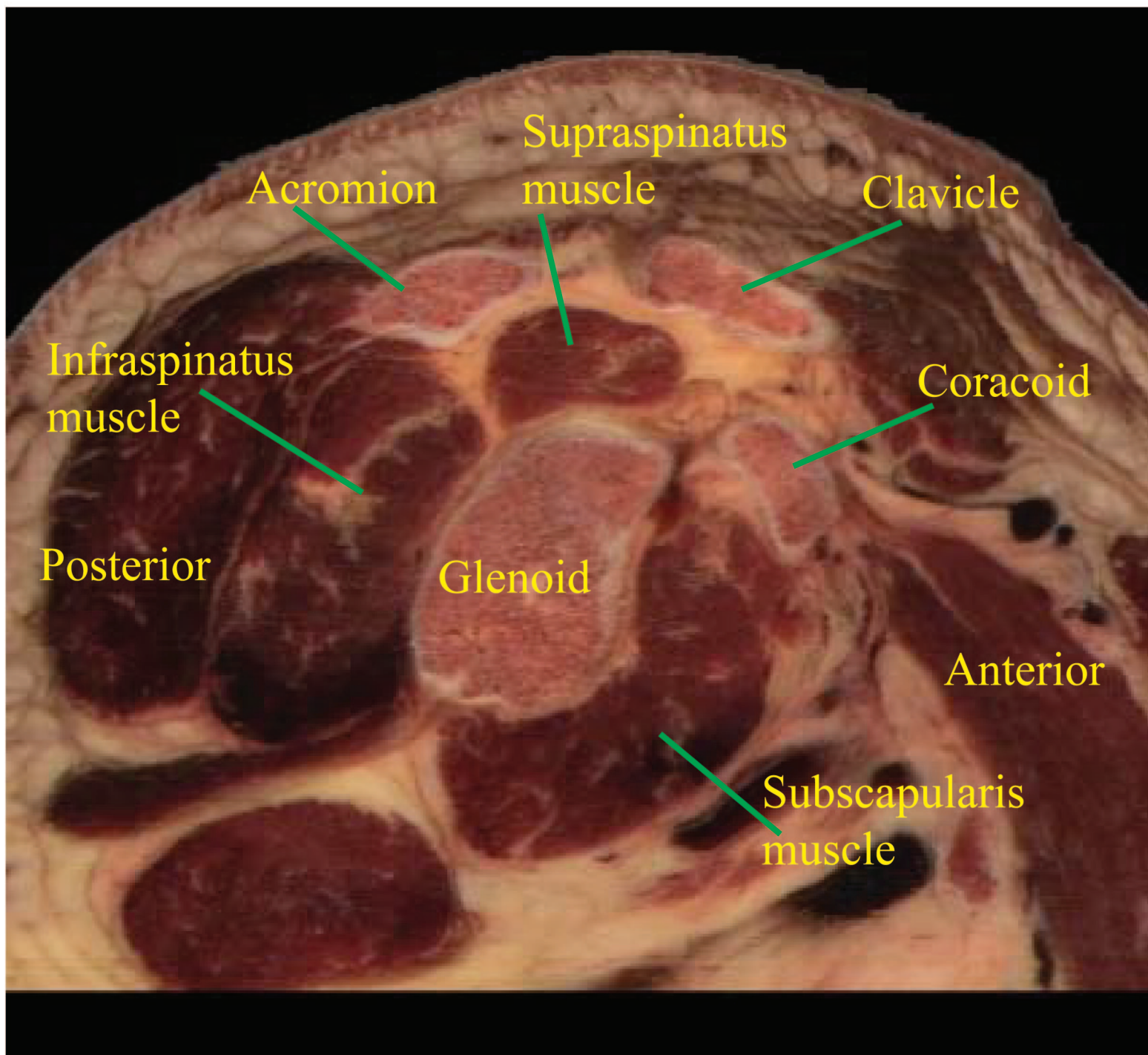


This image was obtained just medial to the previous one and shows the rotator cuff tendon passing under the acromion. The cuff fibers underneath that little hook on the front of the acromion arise from the supraspinatus muscle.



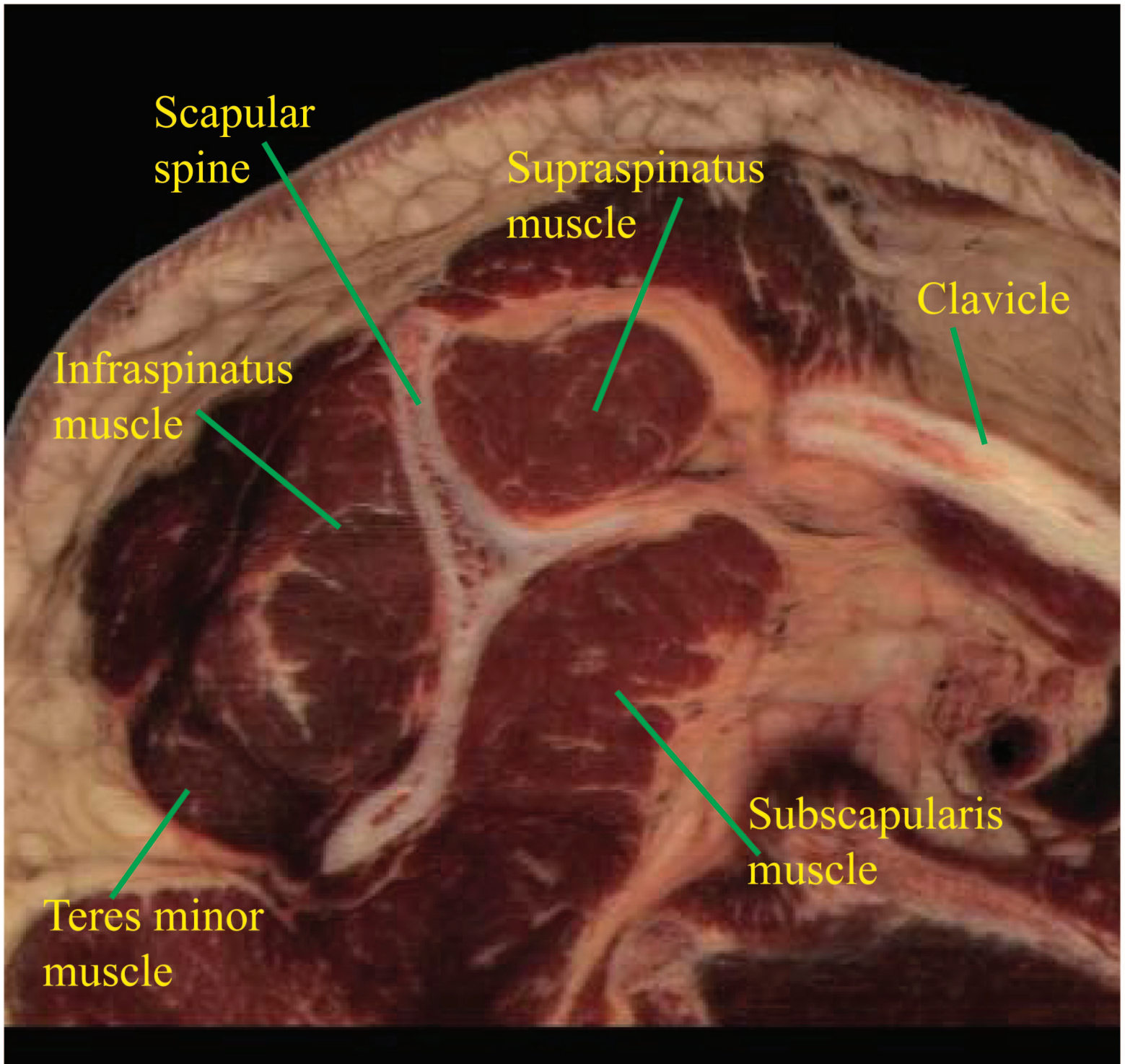


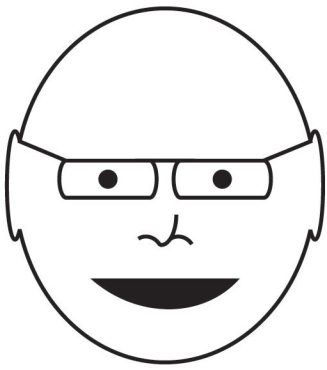
Moving still more medial, we have reached the glenoid and we can recognize additional osseous features and the cuff muscles.



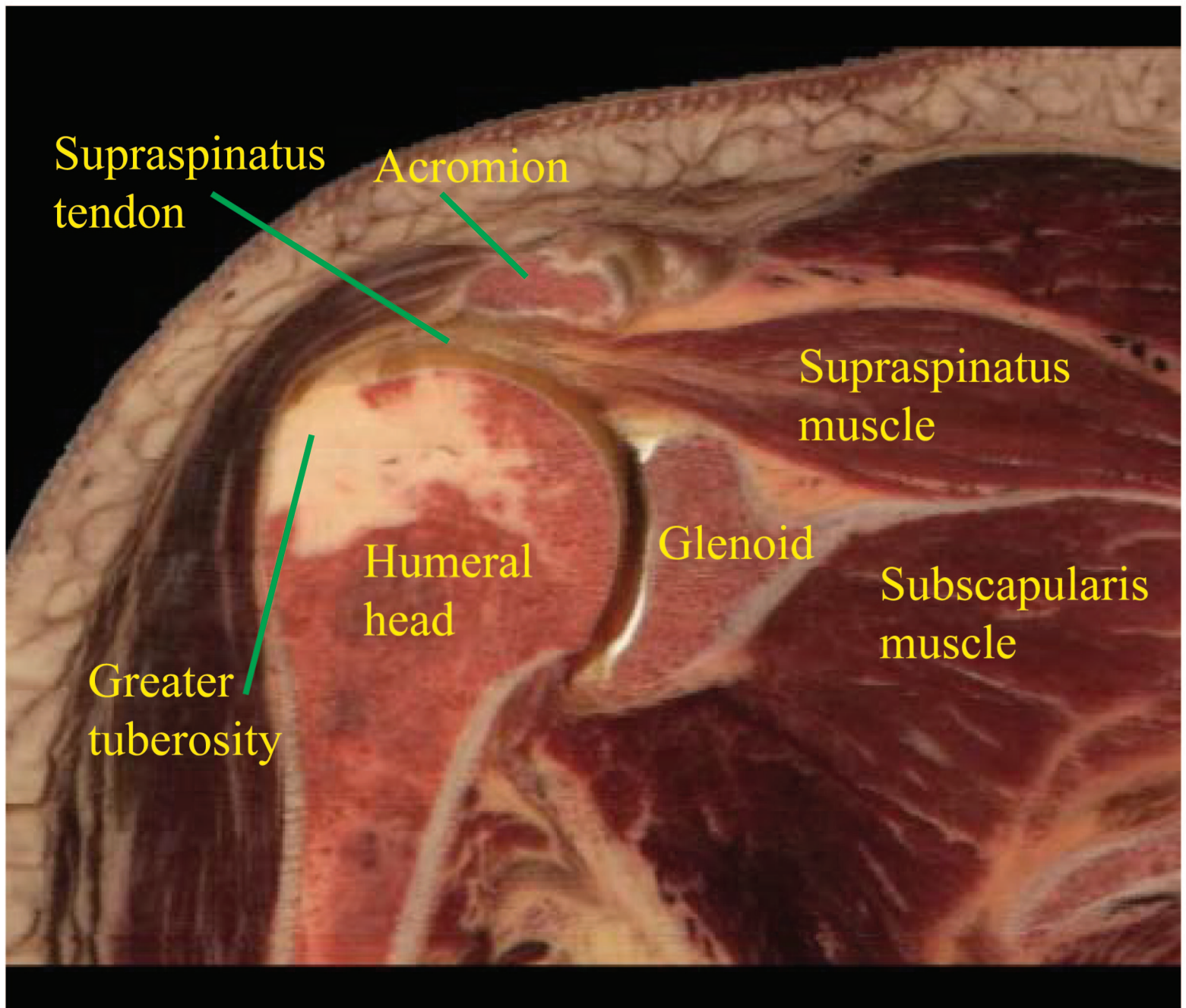


Still more medial, we have reached the scapular spine and can see all four rotator cuff muscles and their relation to the scapula. Believe it or not, we only have one more image to look at to understand the answer to our question.



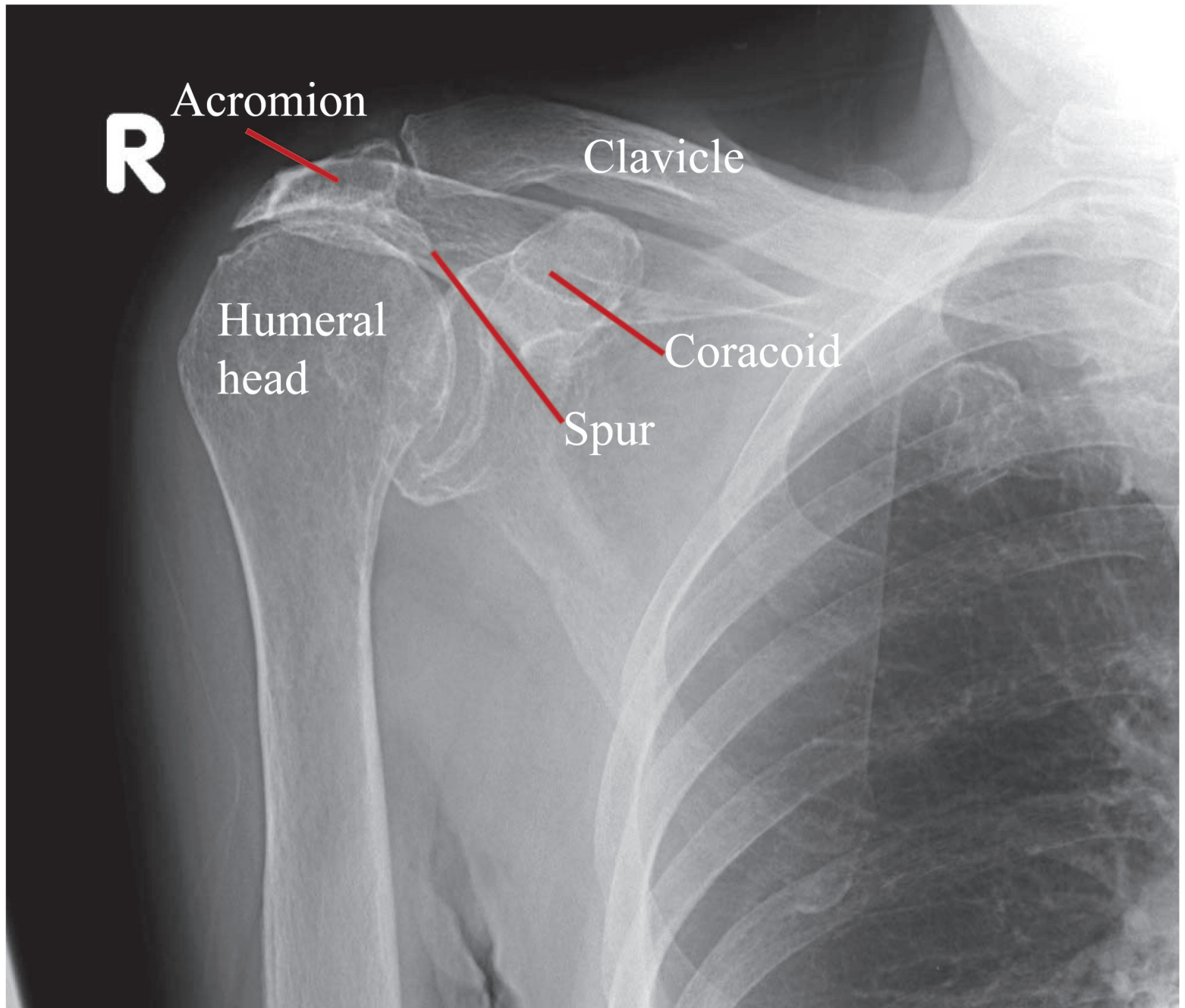


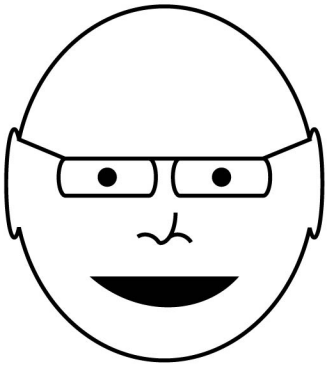
This coronal image shows the supraspinatus tendon passing below the acromion and inserting on the greater tuberosity. The most common reason for tearing the rotator cuff is a process called impingement: if you have an osteophyte (bone spur) hanging off the bottom of the acromion or AC joint, it rubs on the cuff and over the course of many years, the cuff frays and eventually tears. The tendon that is most vulnerable because of where it lives is the supraspinatus tendon and indeed, it is the most frequently torn rotator cuff tendon.





Our case shows a big bone spur hanging off the bottom of the acromion. These spurs frequently grow along the coracoacromial ligament, like this one. The clue that this spur has torn the rotator cuff is the position of the humeral head: it is too close to the undersurface of the acromion. Normally, the intact supraspinatus tendon separates the humeral head from the acromion. In this case, the humeral head and the acromion process are almost in contact. Compare this x-ray to the normal shoulder in the next panel.





In this normal shoulder, the humeral head and the under surface of the acromion are separated by the intact supraspinatus tendon. That's it for this episode of Anatomy Comics! Don't miss our next thrilling adventure!

