

Appendix 1. SPORTS US SCANNING PROTOCOLS

The following document provides scanning protocols for each body region and is adopted from the AIUM Guidelines for Performance of the MSK US Examination 2012 (www.aium.org). Please consider this document as a reference when learning and performing SPORTS US examinations. Additional structures or regions should be examined as clinically indicated or based on practice needs.

Shoulder

A complete shoulder examination is performed in most cases, including the structures indicated below. In specific circumstances, a targeted examination of a specific anatomic structure may be performed (e.g., follow-up scan of the supraspinatus tendon to assess for tear progression)

- Biceps tendon and muscle
- Subscapularis muscle and tendon
- Dynamic exam for biceps subluxation & subcoracoid impingement (as indicated)
- Acromioclavicular joint
- Infraspinatus tendon and muscle
- Teres minor tendon and muscle
- Posterior glenohumeral joint (including dynamic imaging as indicated)
- Spinoglenoid notch (as indicated, region of suprascapular nerve)
- Supraspinatus tendon and muscle, with subacromial-subdeltoid bursa

- Dynamic rotator cuff evaluation and impingement testing
- Suprascapular notch (as indicated, region of suprascapular nerve)
- Extended field of view – supraspinatus & infraspinatus muscle bellies (as indicated)

Elbow

Examination may involve a complete assessment of 1 or more quadrants or may be focused on a specific structure.

Anterior:

- Anterior humeroradial joint
- Radial fossa
- Dynamic scan of annular recess of radial neck (supination/pronation, as indicated)
- Anterior humeroulnar joint
- Coronoid fossa
- Biceps tendon and muscle, including dynamic scanning
- Brachialis muscle (as indicated)
- Brachial artery and vein (as indicated)
- Median nerve (as indicated)
- Pronator teres muscle and tendon (as indicated)
- Radial nerve (as indicated)
- Brachioradialis muscle (as indicated)

Lateral:

- Lateral epicondyle, common extensor tendon and muscles
- Lateral collateral ligament complex
- Lateral humeroradial joint (including dynamic imaging as indicated)
- Radial nerve bifurcation and course through supinator muscle
- Proximal attachment of brachioradialis
- Proximal attachment of extensor carpi radialis longus

Medial:

- Medial epicondyle, common flexor-pronator tendon and muscles
- Ulnar collateral ligament
- Dynamic valgus stress of ulnar collateral ligament (as indicated)
- Humeroulnar joint
- Ulnar nerve (also included in posterior region scan)
- Dynamic flexion-extension (as indicated)
 - evaluate for ulnar nerve subluxation
 - evaluate for snapping triceps tendon

Posterior:

- Triceps tendon muscles
- Olecranon fossa and posterior joint space
- Olecranon process

- Olecranon bursa
- Ulnar nerve (also included in medial region scan)
- Dynamic flexion-extension (as indicated) (also included in medial region scan)
 - evaluate for ulnar nerve subluxation
 - evaluate for snapping triceps tendon

Wrist and Hand

Examination may involve a complete assessment of 1 or more of the 3 anatomic regions or may be focused on a specific structure.

Volar:

- Carpal tunnel contents
 - Flexor retinaculum
 - Median nerve
 - Flexor pollicis longus tendon
 - Flexor digitorum profundus and superficialis tendons
 - Dynamic examination with flexion & extension – tendon & nerve motion
- Palmaris longus tendon
- Flexor carpi radialis longus tendon and radial artery
- Ulnar nerve and ulnar artery within Guyon's canal
- Flexor carpi ulnaris tendon
- Joints as clinically indicated (e.g. volar radiocarpal joint)

Ulnar/Medial:

- Extensor carpi ulnaris tendon and muscle
- Dynamic examination for extensor carpi ulnaris subluxation
- Triangular fibrocartilage complex
- Ulnocarpal joint

Dorsal:

- Extensor retinaculum, 6 compartments, 9 tendons and muscles
- Dynamic tendon examination – flexion/extension of the fingers (as indicated)
- Dorsal scapholunate ligament
- Joints (as clinically indicated)
 - Radiocarpal (RC), metacarpophalangeal (MCP), proximal interphalangeal (PIP), distal interphalangeal (DIP)
 - Dorsal and volar
- Superficial radial nerve (as indicated)

Hip

Examination may involve a complete assessment of 1 or more of the 4 anatomic regions or may be focused on a specific anatomic structure.

Anterior Region (patient supine):

Sagittal oblique, parallel to long axis of femoral neck

- Femoral head, neck, capsule, and anterior synovial recess
- Hip joint assessment for effusion

Sagittal plane

- Anterior labrum

Transverse

- Femoral vessels and nerve
- Iliopsoas muscle, tendon and bursa
- Sartorius and tensor fascia lata tendons and muscles
- Lateral femoral cutaneous nerve
- Rectus femoris tendon(s) and muscles
- Dynamic scanning if snapping hip (as indicated).

Lateral Region (side lying with hip flexed 20-30 degrees)

- Gluteus maximus – fascia lata – tensor fascia lata
- Gluteus minimus tendon and muscle
- Gluteus medius tendon and muscle
- Greater trochanteric bursa (subgluteus maximus bursa)
- Dynamic scanning for snapping hip (as indicated)

Medial Region

Supine neutral

- Femoral vessels and nerve (unless already examined with anterior region)

Abducted-Externally rotated (frog leg)

- Adductor muscles (A. longus and gracilis → A. brevis → A. magnus) and tendons
- Distal iliopsoas tendon
- Pubic bone and symphysis (joint)
- Distal rectus abdominis muscle and tendon

Posterior (prone w/wo pillow under hips)

- Gluteus maximus muscle and tendon
- Gluteus medius muscle and tendon
- Deep short external rotators (as indicated)
- Hamstring tendon and muscles
- Ischial tuberosity and bursal region
- Sciatic nerve
- Posterior hip joint (as indicated)

Prosthetic Hip

- Assess for joint effusions and extra-articular fluid collections
- Greater trochanter and integrity of gluteal attachments
- Iliopsoas tendon and bursa
- Impingement on acetabular component

Knee

Examination may involve a complete assessment of 1 or more of the 4 quadrants of may be focused on a specific anatomic structure.

Anterior:

- Quadriceps tendon and muscles
- Suprapatellar recess of knee joint
- Patella and prepatellar bursa
- Patellar tendon and tibial tubercle
- Superficial infrapatellar bursa
- Deep infrapatellar bursa
- Vastus medialis and medial retinaculum (also with medial region scan)
- Vastus lateralis and lateral retinaculum (also with lateral regional scan)
- Distal femoral cartilage (as indicated)

Medial:

- MCL/tibial collateral ligament
- Valgus stress testing (as indicated)
- Medial meniscus and tibiofemoral joint space
- Pes anserine tendons and bursa
- Medial patellar retinaculum and patellofemoral joint (also with anterior region scan)

Lateral:

- Iliotibial band
- Lateral meniscus and tibiofemoral joint space
- LCL/fibular collateral ligament
- Varus stress test (as indicated)
- Biceps femoris tendon and muscles
- Popliteus tendon and muscle
- Lateral patellar retinaculum and patellofemoral joint (also with anterior region scan)
- Proximal tibiofibular joint (as indicated)

Posterior:

- Popliteal fossa
- Popliteal artery and vein
- Semimembranosus tendon and muscle
- Medial & lateral gastrocnemius muscles, tendons, and bursae

- Sciatic, tibial, and common fibular nerves
- Posterior horns of both menisci (as indicated) and tibiofemoral joint
- PCL (as indicated) (may be seen in sagittal oblique plane)

Ankle /Foot

Examination may involve a complete assessment of 1 of the 4 quadrants or may be focused on a specific structure.

Anterior:

- Tibialis anterior (from musculotendinous junction to insertion)
- Extensor hallucis longus tendon and muscle
- Extensor digitorum longus tendon and muscle
- Peroneus tertius (congenitally absent in some patients)
- Deep fibular/peroneal nerve and dorsalis pedis artery
- Anterior joint recess (effusion, loose bodies, and synovial thickening)
- Anterior joint capsule
- Anterior inferior tibiofibular ligament

Medial:

- Posterior tibialis tendon and muscle
- Flexor digitorum longus tendon and muscle
- Posterior tibial nerve

- Medial and lateral plantar nerves (as indicated)
- Tibial artery and veins
- Flexor hallucis longus tendon and muscle
- Deltoid ligament and medial tibiotalar joint

Lateral:

- Fibularis (peroneus) longus & brevis tendons and muscles
- Superior fibular (peroneal) retinaculum
- Dynamic assessment for fibular (peroneal) subluxation (as indicated)
- Anterior talofibular ligament
- Calcaneofibular ligament (incl. lateral tibiotalar joint and posterior subtalar joint)
- Posterior talofibular ligament (as able and indicated)
- Sural nerve (as indicated)

Posterior:

- Achilles tendon and paratenon
- Dynamic scanning in of Achilles (as indicated to assist with tear evaluation)
- Retrocalcaneal bursa
- Retro-Achilles/Superficial Achilles bursa
- Plantaris tendon (may be absent) (as indicated)
- Posterior tibiotalar and subtalar joints
- Plantar fascia
- Plantar fat pad

Digital:

Assess for synovitis, dorsal and/or plantar

Metatarsophalangeal (MTP) joints

Interphalangeal (IP) joints

Interdigital:

Dorsal or plantar approach can be used

Longitudinal and transverse views

Intermetatarsal bursa (on the dorsal aspect of the interdigital nerve)

Dynamic scanning, applying pressure for Morton's neuroma, and/or ultrasonographic

Mulder's click (as indicated)