2021 AMSSM Case Podium Presentations

Arm Pain in an Adolescent Tennis Player

Primary Presenter/Author: Ashkan Alkhamisi, MD
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History: A 15 year-old male, left-hand-dominant competitive tennis player presented to sports medicine clinic with left arm pain for over 1 year. Pain was worsening 2 to 3 weeks prior to visit while playing tennis, without any causative mechanism of injury or trauma. He reported no pain at rest, up to 5/10 throbbing pain in left upper and lateral arm region during tennis serving and direct contact. He denied any loss of grip strength, swelling, ecchymosis, numbness, tingling or weakness of left upper extremity. He tried OTC pain medications and icing with mild pain relief.

Physical Exam: General: No acute distress. Neck: Normal cervical neck flexion and extension with no neck tenderness. Left elbow: No swelling or erythema. Sensation intact to light touch. No tenderness. Normal ROM with elbow flexion and extension. Strength 5/5 throughout. Negative valgus stress test. Left shoulder: No swelling or erythema. Sensation intact to light touch. Tenderness at proximal and mid-shaft of humerus. Normal ROM with shoulder abduction, forward flexion, internal and external rotation. Strength 4/5 with shoulder abduction, forward flexion and external rotation. Strength 5/5 with internal rotation. Negative Empty Can, Drop Arm, Hawkin's, Neer, O'Brien and Speed's tests.

Differential Diagnosis: Rotator cuff injury; Stress fracture (humerus); Periosteal reaction (Periostitis); Shoulder instability; Bone lesion.

Test Results: AP/lateral views of left humerus revealed periosteal reaction at proximal & mid-shaft of humerus with no cortical thickening or soft tissue calcifications. No acute fracture or dislocation. MRI w/o contrast of left humerus revealed 5 cm lesion in the proximal diaphysis with surrounding periosteal reaction. No cortical destruction, surrounding edema or soft tissue masses. Bone biopsy of left humeral lesion revealed increased plasma cells c/w chronic recurrent multifocal osteomyelitis.

Final Diagnosis: Chronic Recurrent Multifocal Osteomyelitis of left humerus.

Discussion: Chronic regional multifocal osteomyelitis (non-bacterial), is a rare autoinflammatory bone disorder mostly affecting children and adolescents with reported incidence estimated to affect 1 in 1 000 000 individuals. Presents as bone pain with or without fever and objective swelling at the site and mostly negative constitutional symptoms. Osteolytic, sclerotic bone changes may be seen on radiographs and MRI may demonstrate associated bone lesion, marrow edema and periostitis. Lab studies are often normal, whereas a biopsy reveals sterile osteomyelitis. Initial treatment with NSAIDs is considered first line therapy. Second line options include corticosteroids, bisphosphonates and DMARDs.

Outcome: During initial visit, patient's concerning radiographic findings of periosteal reaction prompted a STAT MRI of left humerus. MRI of left humerus significant for intramedullary lesion in the proximal diaphysis with surrounding periosteal reaction. Referral to orthopedic oncology for further workup of lesion.

Follow-up: Patient was referred to ortho oncology who recommended bone biopsy of lesion. Following biopsy, patient had curettage & allograft packing of lesion. He was placed on naproxen BID for 3-month course. At 3-month follow up, repeat imaging revealed maturation of previous periosteal reaction with no new lesions. MRI of whole body was negative for lesions. Patient was pain-free & able to return to sport.

The Achilles Heel for This Lacrosse Athlete

Primary Presenter/Author: Erin S. Barnes, MD
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Affiliation: University of Virginia, Charlottesville, Virginia.

History: A 20 year-old female collegiate lacrosse player presented with a 10 years history of left ankle pain. She reported sharp pain with associated swelling just above the medial malleolus that had worsened 6 months prior without inciting event. Occasionally, she experienced shooting pain radiating from the medial ankle proximally. Symptoms were evoked by walking and running and improved with rest. With symptom progression, her participation in sport had become increasingly limited. She had tried NSAIDs, activity modification and extensive physical therapy without improvement. Of note, she had prior evaluations for this issue including multiple radiographs and MRI of the left ankle which were read as unremarkable. She was treated conservatively for years for the diagnosis of Achilles tendonitis.

Physical Exam: Gait non-antalgic. Musculoskeletal Exam: Left ankle: Medial arch well aligned and without collapse with weight-bearing. Passive dorsiflexion limited to 7°. Reduced active motion at the subtalar and talocrural joints. No pain with passive, active or resisted range of motion. Discrete area of swelling located proximally to medial malleolus, tender to palpation. No tenderness over the Achilles tendon. Tinel's over tarsal tunnel provocative of medial ankle pain. Sensation mildly diminished to light touch in distribution of medial plantar nerve. Negative calf squeeze. Negative hop test. Right ankle: Full range of motion. No palpable masses. No areas of tenderness.

Differential Diagnosis: Tibialis Posterior tendinopathy; Tarsal Tunnel Syndrome; Subtalar dysfunction; Exertional Compartment Syndrome; Lipoma.

Test Results: XR Left Ankle: no fracture, dislocation or bony abnormalities MRI Left Ankle: previously read at outside facility as "unremarkable." Internal radiologist review

http://dx.doi.org/10.1097/JSM.0000000000000917

noted presence of accessory soleus muscle with surrounding inflammation.

Final Diagnosis: Accessory Soleus muscle.

Discussion: Accessory soleus is a rare anatomical variant with a prevalence cited between 0.7% and 5.5%. Although congenital, symptoms of an accessory soleus often manifest in late adolescence due to muscle hypertrophy, especially in the athlete population. It is associated with Achilles tendonitis, exertional compartment syndrome and tarsal tunnel syndrome, however failure to identify the anomalous muscle can lead to treatment failure. In cases refractory to conservative management, the mainstay of treatment is surgical excision, however it is unclear as to whether concomitant tarsal tunnel release is necessary in cases with associated compression neuropathies.

Outcome: Our patient underwent an ultrasound guided corticosteroid injection of the peritendinous sheath of the accessory soleus muscle. This provided only temporary partial relief. She was scheduled for an accessory soleus muscle resection with concomitant tarsal tunnel release, however ultimately elected to have the resection without tarsal tunnel release at an outside institution.

Follow-up: She returned to our clinic 2 years later reporting 75% improvement in symptoms but continued to have tingling pain in the toes that radiated proximally up the medial calf. EMG revealed a mild medial plantar neuropathy. She is currently scheduled to undergo an ultrasound-guided hydrodissection of medial plantar nerve.

A Case of Hip Pain With Atypical Findings

Primary Presenter/Author: Samantha Bolz, MD
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Affiliation: Loyola MacNeal Hospital Family Medicine Residency Program, Berwyn, Illinois.

History: A 28 year old healthy male initially presented to immediate care with acute low back pain after carrying a fridge upstairs with a coworker. He misstepped, twisting his leg and externally rotating the hip. This caused stabbing, cramping pain located in the midline low lumbar region, radiating to the right buttock & lateral thigh, with tingling and numbness in his right lateral thigh and foot. There was no prior trauma, bladder/bowel incontinence or weakness. The patient was initially treated with conservative management with minimal relief. Over the next 9 months the patient's pain had worsened in severity and localized to the right anterolateral thigh, followed by a more focal point in the right lateral gluteal region. On follow up, his significant pain out of proportion, with limited willingness to bear weight, prompted an MRI.

Physical Exam: Initial Exam: Tenderness to palpation of Lumbar back with decreased range of motion in all directions secondary to pain. Positive straight leg raise. Tenderness to right piriformis muscle belly, reproducing symptoms of sciatica. Throughout all exams, retained normal strength and sensation bilaterally, with a normal left hip exam. Subsequent Exam: Tearful during exam. Pain throughout ROM of right hip, leading to diffusely abnormal range of motion. Faber and ober tests positive. Tenderness along IT band, iliopsoas and rectus femoris proximal insertion. Next exam: Pain more focal, located at posterior aspect of trochanter into gluteal region, with inability to bear weight secondary to pain.

Differential Diagnosis: Greater Trochanteric Bursitis; Sciatic Piriformis Impingement; Quadriceps Tendonitis; Stress Fracture; Avascular Necrosis.

Test Results: XR R hip: normal XR. No bone or joint abnormalities. MRI R hip w/wo contrast: 0.7 cm cyst between right posterior acetabulum and obturator internus. No femoral head abnormality. Limited diagnostic ultrasound of posterior R hip performed during follow up: Palpation confirmed the site of tenderness, prior to imaging. Cystic structure just over 1 cm in diameter, inferior to obturator internus, above acetabulum. When compressed with the ultrasound probe, the patient experienced exquisite pain.

Final Diagnosis: Posterior acetabular cyst leading to pain significantly affecting function.

Discussion: Intractable hip pain in young persons can cause concern for stress fracture, disc herniation or avascular necrosis. In this case, a posterior acetabular cyst appeared to be an incidental finding. However on examination, the patient's pain was recreated by localizing the cyst under ultrasound and applying provocative pressure. A steroid injection into the cyst provided relief of symptoms. While unusual, there are examples in the literature of acetabular cysts leading to significant pain and/or paresthesias. That appears to be the case for our patient. Acetabular cysts of the hip are frequently asymptomatic, but in rare cases are debilitating enough to require surgical intervention.

Outcome: Our patient did not respond to an initial trial of conservative management and instead reported worsening symptoms. Further examination focusing on the MRI identified cyst, was able to reproduce the patient's symptoms, indicating that it was the cause of his pain. An ultrasound guided injection into the cyst provided relief in those symptoms, providing further evidence to support our hypothesis.

Follow-up: Following the injection, the patient reported decreased pain and improved ability to tolerate daily activities. The patient remains under our care and longer term follow up is pending. Should his symptoms persist or worsen, he will be referred to orthopaedic surgery for further evaluation.

Numbness, Tingling and Pain, Oh My: Unexpected Etiology of Leg Pain in a Football Player

Primary Presenter/Author: Stephanie Carey, MD, MPH
Joseph Andrie, MD, and Cayce Onks, DO, MS, ATC
Affiliation: Penn State Milton S. Hershey Medical Center, Hershey, Pennsylvania.

History: A 20-year-old Division I college football player experienced acute upper left leg pain after exercising on a track at school without an inciting event. He was evaluated at an outside institution and also endorsed numbness, tingling and back pain. A lumbar MRI was ordered and showed congenital spinal stenosis. He was given an epidural corticosteroid injection without relief of his symptoms. Upon presentation to our office 2 months later, he continued to endorse posterior left leg pain with numbness and tingling on the lateral aspect of his calf and on the dorsal aspect of his foot. He endorsed a painful snapping sensation in the back of his upper leg that was present with running and knee extension when weightlifting. When questioned about the snapping, he did endorse feeling a mass in the back of his leg just above his knee.

Physical Exam: MSK: Tenderness to palpation just superior to the popliteal fossa with a non-mobile mass appreciated in

this area. Tenderness along the lateral lower leg, along the peroneal muscle bellies. No bony tenderness. Mild discomfort with knee flexion against resistance localized to the posterior thigh. Pain with resisted ankle eversion. Negative straight leg. Neuro: 5/5 strength in the bilateral lower extremities distally. Decreased sensation on lateral calf and dorsal foot. Negative Tinel's sign over the tarsal tunnel. Vascular: 2+ dorsalis pedis and posterior tibialis pulses bilaterally.

Differential Diagnosis: Osteochondroma; Osteosarcoma; Calcific Tendinopathy of Hamstring; Congenital Spinal Stenosis; Muscle Spasm with Sciatic Nerve Impingement.

Test Results: XR: Pedunculated exostosis arising dorsally from the femoral diaphysis. MRI & CT-3D: Pedunculated exostosis with thin cartilage cap arising dorsally from the distal femoral diaphysis. The bifurcation of the sciatic nerve into the tibial and common peroneal nerve is draped over the tip of the exostosis with increased signal of the common peroneal nerve just distal to the bifurcation compatible with neuritis. There is also mild mass effect of the semimembranosus muscle. Pathology: Osteochondroma.

Final Diagnosis: Osteochondroma of Left Femur with Neuritis of the Common Peroneal Nerve at the Sciatic Nerve Bifurcation and Mass Effect on the Semimembranosus muscle.

Discussion: Osteochondromas are overgrowths of cartilage and bone from the growth plate. They are the most common benign bone tumors with an incidence of 35% to 40% of benign bone tumors, though true incidence is unknown since most are asymptomatic. The patient's neurologic symptoms are consistent with the common peroneal nerve distribution in the lateral calf and dorsal aspect of the foot. This is likely caused by the neuritis due to nerve irritation at the bifurcation of the sciatic nerve. Snapping sensation in posterior thigh was likely snapping of the semimembranosus muscle over the osteochondroma due to visible mass effect discovered on MRI.

Outcome: The patient was referred to orthopedic oncology and subsequently had the osteochondroma removed in conjunction with neurosurgery, who provided nerve dissection. Patient then remained on crutches for 4 weeks with the hope to return to sport after initiating physical therapy.

Follow-up: Patient returned to the office with persistent positive thigh pain 1 month after surgery. Tinel sign positive over the surgical scar. Scar tissue was suspected to be compressing the nerve. Patient returned to college in the fall and transferred care closer to his school. He has not currently returned to sport and he has red-shirted the fall football season due to persistent symptoms.

Sideline Use of Tuning Fork Helps Guide Management of Knee Injury in a High School Football Player

Primary Presenter/Author: Daniel Chilcote, OMS-V

Joseph Medellin, MD, MPH, MBA, Ryan Rompola, DAT, AT, LAT, ATC, and Sarah Wilhelm, MS, AT, ATC

Affiliation: Arkansas College of Osteopathic Medicine, Fort Smith, Arkansas.

History: An 18 year old male football athlete presents for evaluation on the sidelines after suffering a left knee injury during competition. He states that he missed a block, tried to cut to get back into the play but his foot got stuck in the turf, left knee hyperextended and heard an audible "pop." He was unable to bear weight on his left leg and was helped off the field by the athletic training staff. He complains primarily of pain in the lateral knee and reports instability. He states that the outside of his lower leg feels "tingly.". Upon review of the game film it appears his left knee hyperextended and suffered a varus collapse. ROS: As seen in HPI PMH: Mild Asthma, Acne MEDS: Albuterol, Topical tretinoin, topical minocycline, Oral doxycycline ALL: NKDA.

Physical Exam: General: Well Appearing, in mild distress. Muskuloskeletal: Left Knee: evolving effusion, ROM- flexion 90, extension 0; TTP medial and lateral joint line, TTP fibular head, TTP LCL. Tuning fork at fibular head causes significant pain. Sensation intact distally. Dorsalis Pedis and Posterior Tibial pulse 2+; MCL- solid endpoint with no opening to valgus testing at 0 and 30. LCL- solid endpoint with no opening to varus testing at 0 and 30° but with pain. ACL- Laxity with Lachman with significant guarding, Negative Anterior Drawer. PCL- Negative Posterior Drawer.

Differential Diagnosis: ACL Rupture; LCL Rupture; Fibular Head Fracture; Tibial Plateau Fracture; Posterolateral Corner Injury.

Test Results: X-Ray Left Knee, tibia and fibula: non-displaced fibular head fracture, effusion present. MRI left knee without contrast: Kissing contusion injury of the medial femoral condyle and the medial tibial plateau along with posterior lateral corner injury involving the lateral collateral ligament and popliteal fibular ligament. Avulsion type non-displaced fracture of the proximal fibula at the insertion point of the lateral collateral ligament.

Final Diagnosis: Lateral Collateral ligament Rupture, Posterolateral Corner Injury, Non-displaced fibular head fracture.

Discussion: Initial exam was concerning for tibial plateau fracture, fibular head fracture and internal ligamentous injury of the knee. After obtaining an MRI the diagnosis of LCL rupture and posterolateral corner injury was made. A discussion took place regarding conservative management versus surgical fixation. We re-examined at one-week post injury and obtained varus stress view x-rays at 0 and 30 degrees of flexion. This showed minimal difference in lateral opening between each knee. We also re-examined the ligaments of the knee and found solid endpoints with each test. Finally, a dial test was performed and found to be negative. We proceeded to manage conservatively with bracing and rehabilitation.

Outcome: After 2 weeks of bracing in full extension and no weight bearing, repeat varus stress x-rays of the knee were obtained and were stable. His brace was unlocked to allow 30 degrees of flexion and was able to weight bear as tolerated. He then started in physical therapy. At 3 weeks his brace was unlocked to 90 and at 4 weeks unlocked completely. At 6 weeks post-injury he continues physical therapy.

Follow-up: At this time, our patient is progressing well through physical therapy and continues to work on ROM, stability and strengthening. He is estimated to return to play at 10 to 12 weeks post-injury.

Cross Country Curb: Stepping Into a Surprising Finding

Primary Presenter/Author: Robert Claflin, DO

Kip Owen, MD, Jimmy Gonzales, MD, CAQSM, and Evan Perez, MD, CAQSM

Affiliation: University of Texas Rio Grande Valley, McAllen, Texas.

History: Fourteen year old male cross country athlete presenting to clinic with left knee pain for the last month. Pain started at the end of a 4 mile run when the patient felt like he stepped awkwardly over a curb. He sprinted towards the end of the run where he miss-judged the curb and felt like he stepped awkwardly when his left leg came down. Denies any popping when the step occurred. He was able to finish the race and the pain worsened starting the next day. Pain is on the lateral aspect of his knee and there has been some mild swelling from time to time. He has not taken any medication for the pain. He tried to rest from running for a week and states the pain improved somewhat, however he went back to running and the pain started again. Pain occurs after he starts running and will last through the rest of the day and night. He denies any feelings of instability when walking or running.

Physical Exam: General: alert and cooperative. Extremities: atraumatic, no cyanosis or edema. Pulses: 2 + and symmetric. Skin: Skin color and texture normal. Neurologic: No focal deficits. Musculoskeletal: Left Knee: Gait: Normal. Inspection: no effusion. ROM: 0 to 130°. Strength: 5/5 in Flexion and Extension. Tenderness: Distal Femur: Tender over lateral aspect of distal femur near lateral epicondyle. Medial joint line: None. Lateral joint line: None. Patella: None. MCL: None. LCL: None. Ligament Exam: Lachman's: Negative. Anterior Drawer: Negative. Posterior Drawer: Negative. Laxity with valgus stress: Negative. Laxity with varus stress: Negative. Meniscal Exam: McMurray: Negative. Thessaly: Negative.

Differential Diagnosis: Femoral stress fracture; Osteochondroma; Cortical desmoid; Parosteal osteosarcoma; Osteomyelitis.

Test Results: X-ray of left knee on initial presentation showing a non ossifying fibroma along the lateral cortex of the distal femur measuring 11 × 5 mm with some periosteal ossification. MRI of left knee showing a 1.2 cm curvilinear focus of decreased T1 and T2 signal at the subcortical margin of the lateral femoral epicondyle. Follow up x-ray of left knee 1 month later showing increased density within the desmoid.

Final Diagnosis: Cortical Desmoid of Distal Lateral Femur.

Discussion: A cortical desmoid has been classically been described as a do not touch lesion. In order to rule out malignancy for similar appearing lesions, it is important to evaluate with MRI. This lesion is typically a benign incidental finding and usually occurs in the medial aspect of the distal femur. This patient presented with pain near the area of the cortical irregularity on the lateral aspect of the distal femur. While these lesions are typically incidental and occur without pain, patient's initial symptom were concerning for stress reaction or fracture near the lesion.

Outcome: Patient initially made non-weight bearing due to pain in area of lesion. On 1 week follow up for MRI results, the patient's pain had improved significantly. He was then advised on non-weight bearing over the next month. At follow up he continued to improve and was placed on partial weight bearing where his pain resolved. Patient was then sent to physical therapy for progressive rehabilitation.

Follow-up: After completing 8 weeks of physical therapy patient had resolution of pain and was able to return to cross country running without issue.

Exertional Chest Pain in a Division I Basketball Athlete

Primary Presenter/Author: Michael Dakkak, DO
Affiliation: Cleveland Clinic, Cleveland, Ohio.

History: Nineteen-year-old NCAA Division I female basketball player with no past medical history presented with intermittent exertional dyspnea and chest tightness for 4 months; however, symptoms over the last 2 weeks have been progressive with increased intensity. She began experiencing symptoms within 5 minutes of physical activity and relieved with rest. Additionally, she describes feelings of intermittent fatigue, weakness and palpitations. She reports regular menses. She has no reported prior cardiac history or family history. Denies fevers, chills, orthopnea, cough, wheezing, edema, syncope, dizziness.

Physical Exam: Vitals: 115/59, Pulse 54, Temp 98.2, RR: 16. General: No acute distress. Chest: normal symmetry, tenderness to palpation along the left fourth and fifth ribs, no retractions. Cardiac: Regular rate and rhythm, S1 and S2 normal, no S3 or S4, no murmurs, no gallops, no rubs. Abdomen: soft, non-tender, bowel sounds normoactive, no palpable hepatosplenomegaly. Extremities: no deformities, no clubbing, no cyanosis, no edema. Neurological: No gross or motor sensory deficits.

Differential Diagnosis: Acute Coronary Syndrome; Hypertrophic Cardiomyopathy; Supraventricular Tachycardia; Long QT Syndrome; Wolf-Parkinson White Syndrome.

Test Results: ECG: ST depression with T-wave inversion in leads II, III, aVF which prompted an immediate transfer to the emergency room; further workup was significant for an elevated high sensitivity troponin of 29 (normal < 12), D-Dimer of 790, Hgb of 7.1, MCV of 67.1, RDW of 18.4, Fe level of 18, TIBC 519 and Cr 1.12. Cardiac MRI and CT chest were normal. Echo showed normal size ventricles with EF of 66%.

Final Diagnosis: Acute coronary syndrome due to demand ischemia from secondary iron deficiency anemia.

Discussion: This case demonstrates a unique presentation of how an underlying chronic history of anemia can lead to cardiac demand ischemia in a highly conditioned athlete. In the initial workup, it is imperative to rule out cardiac structural and conduction abnormalities. When evaluating anemia, one should consider the various etiologies such as blood loss, gastrointestinal malabsorption, nutritional deficiency, auto-immune, hereditary, infectious and metabolic causes. When treating iron deficiency anemia in adults, the standard dose of elemental iron is 120 mg per day for a minimum duration of 3 months.

Outcome: Cardiology was consulted for catheterization. They ultimately deemed that in the setting of anemia and a down trending high-sensitive troponin, the etiology was due to demand ischemia. She was given 2 pRBC and discharged in stable condition with instruction to take Ferrous Sulfate 325 mg twice daily and 1000 IU of Vitamin C daily. Hemoglobin was checked 3-months later with a value of 11.0.

Follow-up: After discharge, the athlete was evaluated in cardiology clinic where a follow-up echocardiogram and troponin were performed and found to be normal. The athlete successfully returned to practice 1 week later with a step-wise conditioning program. Three weeks later she was symptom free and successfully returned to competition.

Patient Has Something Up With Her Patella

Primary Presenter/Author: Ashley N.Ford, DO
Lindsay Stephens, DO, and David Schmidt, DO
Affiliation: Texas Institute of Graduate Medical Education Univ. of the Incarnate Word, San Antonio, Texas.

History: A 16 year old female presented to our Sports Medicine clinic with left knee pain. The pain started approximately 1 month prior when she fell through a wooden deck, but on further questioning patient reported chronic knee pain that greatly limited her physical activity. Her knee made contact with the deck when falling. She localized pain primarily to the superior pole of her patella and anterior thigh. Her pain was aggravated by walking or standing for long periods of time and climbing or descending stairs. Pain was slightly relieved with rest and wearing a knee brace. Associated symptoms included locking and popping of the knee. Patient recalled one prior knee injury of falling directly onto patella around age 8 and was told later that her patella was "too high." Patient was obese with a BMI of 36 and had a history of depression for which she was taking Zoloft.

Physical Exam: The patient's left knee exhibited a decreased range of motion lacking 3 degrees of extension and had the ability to flex to only 90°. She had patella alta and crepitus with movement as well as positive patellar apprehension. There was tenderness to palpation around the superior pole of the patella and quadriceps tendon with palpation of possible loose bodies inferior to the patella. McMurray's, Lachman's, anterior and posterior drawer, varus and valgus tests were all negative. The right knee was within normal limits with full range of motion, strength and stable ligaments.

Differential Diagnosis: Patellar fracture; Patellofemoral pain syndrome; Patellar tendon rupture; Loose body; Bone contusion of patella.

Test Results: Left knee 3 view x-ray showed the patella to have 4 misaligned fragments with one large fragment at the distal femur. Left knee MRI revealed 4 chronic fragmentation avulsion fractures arising from the inferior pole of the patella with extensive scarring and granulation tissue, extensive patella alta and chondromalacia of the patella.

Final Diagnosis: Left knee chronic patella alta status post old patellar sleeve avulsion fracture.

Discussion: Patellar sleeve fractures are rare and occur in children. This is often caused by rapid quadriceps muscle contraction with a flexed knee. A sleeve of tissue is pulled off the patella circumferentially, consisting of articular cartilage and periosteum. This can lead to an island of osseo-potent tissue with the potential to form new bone within the extensor mechanism. The initial diagnosis of a patellar sleeve fracture can be easily missed leading to ossification of the patellar tendon and even patellar duplication leading to patella alta and knee pain. Had the diagnosis of patella sleeve fracture been made earlier in our patient, she may have avoided an extensive reconstructive surgery.

Outcome: After consideration of all possible treatment options, the patient and parent elected to undergo a left knee quadricepsplasty with open lysis of adhesions and application of an external fixator for slow mobilization of the patella.

Follow-up: The patient is now post-operative and has had her external fixator removed. She has not yet started physical therapy. She is currently toe touch weight bearing and slowly improving with home range of motion exercises and quadricep isolations. Our hope is for the patient to gain better function and decreased pain allowing her to lead a more active life.

Phonate a Friend

Primary Presenter/Author: Michael R. Hall, DO
Ross Mathiasen, MD
Affiliation: Department of Emergency Medicine, University of Nebraska Medical Center, Omaha, Nebraska.

History: A 17 years old male arrived to the Emergency Department with neck pain, dysphasia and hoarse voice. The patient had been playing football 5 days prior when he was struck by another player causing his football pads to elevate in the front and strike his anterior neck. He had some left-sided neck pain but nothing that was considered concerning until this morning when he felt like he was having difficulty swallowing and developed voice changes.

Physical Exam: HEENT: Head: normocephalic, atraumatic Eyes: PERRLA, pupil size 3 mm, conjunctiva/corneas normal, EOM intact Ears: Canals without blood or CSF drainage, TMs clear, external ears without lacerations Nose/sinus: nontender, no drainage from nares, septum midline, no crepitus with motion Throat/Oropharynx: Lips, mucosa, tongue normal, posterior pharynx clear, no teeth fractures Face: atraumatic, stable mid-face. Voice exhibits mild hoarseness. Neck: Trachea midline, No cervical spine bony tenderness, crepitus or step off, left neck swelling noted (mild) just lateral to the trachea. Chest: atraumatic non-tender chest wall, respirations clear to auscultation bilaterally.

Differential Diagnosis: Expanding hematoma; Carotid artery traumatic dissection; Thyroid cartilage fracture; Traumatic rupture of thyroglossal duct cyst/seroma; Supraglottic edema.

Test Results: (1) CTA neck: 1.7 × 1.9 × 3.3 cm left hypopharynx mass. In light of the history, this may represent a hematoma. Left thyroid laminar fracture with supraglottic edema. (2) CT head: Normal. (3) Fiberoptic laryngoscopy: Base of tongue not enlarged. Crowded left vallecular space with some residual swelling of the right vallecula. Epiglottis edematous at the base, mildly omega shaped. Significant edematous change of the left arytenoid, aryepiglottic tissue, with obstruction of the left piriform recess.

Final Diagnosis: Left thyroid laminar fracture with supraglottic edema.

Discussion: After initial evaluation per ATLS protocol in the ED trauma bay, ENT was consulted. Secondary to the supraglottic edema, IV Decadron 8 mg every 8 hours for a total of 3 doses was given. Throughout the night he did well with no need for supplemental oxygen. The next morning he underwent a repeat fiberoptic laryngoscopy which revealed reduced edema of left vallecular space with no residual edema on the right vallecular space. Remarkably reduced, but still edematous change of the left arytenoid, aryepiglottic tissue, still obstructing the left piriform recess. Given his reduced edema and stable condition he was discharged home with return precautions. 6 weeks follow up with ENT. No contact sports.

Outcome: Patient's symptoms resolved during his hospital stay and responded well to IV Decadron. No recurrence of symptoms occurred following discharge.

Follow-up: Patient was instructed to avoid contact activity and sports for 6 weeks. At his most recent follow up (4 weeks) the hematoma had resolved and flexible fiberoptic laryngoscopy showed a well-healed supraglottic larynx with no evidence of edema or residual fracture. Ok to resume activities 2 weeks post follow-up visit. Follow up as needed.

High School Football Player With an Acute Axial Loading Injury of the Left Hip

Primary Presenter/Author: Richard Hanley, MD
Nicholas Moore, MD
Affiliation: Ascension Providence Hospital PCSM Fellowship Program, Motor City, Michigan Orthopedic.

History: Fifteen years old M high school football wide receiver presented to an orthopedic sports medicine clinic with acute left hip pain. Nine days prior during a football practice, he jumped to catch an overthrown pass and landed with complete axial load on a fully extended left leg. He felt sudden onset, sharp, diffuse, non-radiating left hip pain and was unable to bear weight. He was weight-bearing with crutches and working with the athletic trainer for 7 days without significant improvement. In the clinic, he had persistent 6/10 diffuse left hip pain, worse with all planes of motion as well as weight bearing. He had associated leg weakness and occasional popping. The pain was improved with ibuprofen.

Physical Exam: General: Alert and oriented, no acute distress, pleasant, cooperative. Left hip: Inspection—no swelling, ecchymosis or deformity. Palpation- non-tender ASIS, SI joint, piriformis, hamstring origin. + tender anterior flexor bundle, + tender greater trochanter. Active range of motion—80 flexion. 0 extension, 50 abduction, 20 adduction, 20 internal rotation, 35 external rotation. Strength- 5/5 PAINFUL flexion, 5/5 extension, 5/5 PAINFUL abduction, 5/5 adduction. Special tests- + FADIR, + FABER, + forced flexion, negative stork testing. Neurovascular: 2 + dorsalis pedis and posterior tibialis pulses, sensation intact to light touch in all distributions throughout the entire lower extremity.

Differential Diagnosis: Muscle strain; Hip labral tear; Fracture versus Apophyseal injury; Athletic pubalgia; Slipped capital femoral epiphysis.

Test Results: AP Pelvis: Sclerotic irregularity across the left anterior acetabulum. No appreciable displaced fracture identified. MRI Left Hip w/o contrast: Salter Harris I shear injury (Bucholz classification) of the triradiate cartilage of the left hip without displacement. There is no evidence of Thurston-Holland fragment to suggest a Salter II injury.

Final Diagnosis: Salter Harris I shear injury of the triradiate cartilage of the left hip without displacement.

Discussion: Pelvic fractures represent 1% to 2% of pediatric fractures, of which 1% to 15% are acetabular. The Bucholz classification differentiates shearing versus crushing injury to the pediatric acetabulum. A shearing injury can be a Salter Harris I or II. A triangular medial metaphyseal (Thurston-Holland) fragment is often seen in a Salter Harris II. A crushing injury is a Salter Harris V. In our athlete, axial loading of the pubis/ischial ramus/proximal femur caused shearing at the interface of 2 superior arms of triradiate cartilage and the metaphyses of the ilium. It is important to consider a Salter Harris type injury with axial loading of the hip and without a clear fracture on x-ray.

Outcome: The athlete was treated non-weight bearing with crutches for 4 weeks. At that time, he had pain free motion and was tolerating activities of daily living, but had yet to progress through any strengthening or physical activity.

Follow-up: The athlete was treated in physical therapy; undergoing strengthening and progression of activity over 4 weeks and was able to participate in full unrestricted winter basketball without exacerbation of symptoms.

A Convoluted Calf Strain

Primary Presenter/Author: Anna Holman, MD
Amy Powell, MD
Affiliation: University of Utah, Salt Lake City, Utah.

History: This is a 47-year-old man with a history of hereditary spherocytosis, hypertension and coronary artery disease presenting with acute worsening right calf pain. 10 days prior to the initial presentation, he felt a sharp pain in his right calf while playing volleyball. In the next few days, he had increased pain and swelling, worse with ambulation. He had an evaluation in the ED with venous duplex ultrasound which was negative for acute DVT, but noted avascular fluid collection in the calf. In the initial clinic visit, he had normal pulses, strength and sensation, but pain was worse than expected for a calf strain. He underwent an ultrasound which showed a large fluid collection consistent with a hematoma. Despite the large fluid collection on ultrasound, only 2cc thick serosanguinous fluid could be aspirated. On return visit 3 days later, he had worsening pain, swelling and numbness.

Physical Exam: Right calf is swollen, tender to palpation. Pain with calf compression. Significantly decreased sensation over deep peroneal, superficial peroneal and tibial nerve distributions. Mildly decreased sensation over saphenous and sural nerve distributions. There is pain with passive great toe dorsiflexion, plantarflexion Strength 4/5 ankle dorsiflexion, plantarflexion and great toe extension Palpable dorsal pedal and posterior tibial pulses.

Differential Diagnosis: Acute DVT; Gastrocnemius Tear; Expanding Hematoma; Acute Compartment Syndrome; Lumbar Radiculopathy.

Test Results: Limited right lower extremity ultrasound: Ultrasound imaging of the right medial calf showed a large hypoechoic fluid collection deep to the medial gastrocnemius, consistent with a hematoma. CT Tib Fib: A small area of hypodensity is identified interposed between the gastrocnemius and soleus at the level of the myotendinous junction of the medial head measuring approximately 2.4×0.9 cm in AP and transverse dimension. This has craniocaudal extent of approximately 5 cm.

Final Diagnosis: Acute compartment syndrome due to a hematoma from a gastrocnemius tear.

Discussion: Acute compartment syndrome is a surgical emergency requiring a high index of suspicion of the examiner to ensure rapid treatment and favorable outcomes. Without timely recognition, increased pressures can lead to irreversible tissue ischemia, permanent sensory deficits and paralysis. Acute compartment syndrome most commonly occurs with trauma such as fractures, crush injury and contusions. It is less common to occur with muscle tears as in this case. This patient's case illustrates the classic progression of symptoms seen in acute compartment syndrome, starting with pain out of proportion to the clinical situation, then pain with passive stretch, paresthesia and sensory deficits.

Outcome: This patient underwent an emergent 4-compartment fasciotomy without complication. He recovered sensation and strength in the right leg, however, he developed an acute DVT 4 days following discharge and was readmitted and placed on anticoagulation therapy.

Follow-up: 3 months following the initial presentation, the patient was able to return to full activity as tolerated with mild swelling as the only residual symptom.

Neck Injury in a Collegiate Level Baseball Player

Primary Presenter/Author: Alyssa Kristine Horne, DO
Matthew Rennels, DO
Affiliation: University of Toledo Primary Care Sports Medicine Fellowship, Toledo, Ohio.

History: The patient is a 22 yo male Collegiate Baseball player. History is initially provided by ATC via phone after-hours. The player was hit in the posterior neck by a baseball during practice. Full range of motion/strength was reported by the ATC without spinous process tenderness. The next day the patient was evaluated by the fellow in training room. He stated that upon impact, his hands curled up and went in toward his chest and he had no control of his arms. He was not forthcoming with this information the previous night as his symptoms resolved within 1 minute. The patient endorsed some blurred vision immediately following the injury. Symptoms day after injury included: paraspinal neck pain, sensitivity to sound and fatigue. He denied headache, nausea, vomiting, weakness, numbness, tingling. No previous history of injury to spinal cord.

Physical Exam: General: NAD. Skin: No ecchymosis. Negative Battle sign Musculoskeletal: Cervical/Thoracic/Upper Extremity: Full cervical ROM. No midline tenderness. Left paravertebral muscle tenderness to palpation from C5-C7. Distal upper extremity exam reveals 5/5 strength bilaterally. Negative Spurling. Neurological Examination: Mental Status: Alert and oriented. Cranial Nerves: II-XII intact B/L. Motor: Normal muscle bulk/tone throughout. Sensory: Grossly intact B/L UE. Gait: balanced, non-antalgic. Concussion Testing: Post-concussion scale revised: total score 54; patient endorses 15 symptoms. Mild symptoms with vertical saccades. No symptoms with horizontal saccades. Balance testing at baseline.

Differential Diagnosis: Clay Shoveler's Fracture; Unstable Cervical Spine Fracture; Concussion; Spinal Cord Contusion; Transient Neuropraxia.

Test Results: Cervical Spine X-ray: No fracture or malalignment. No significant degenerative changes. No prevertebral soft tissue swelling. Cervical Spine MRI: No evidence of spinal cord contusion or cord edema. No evidence of disc herniation, spinal stenosis or narrowing of the neural foramina. No marrow signal abnormality seen to suggest acute bony pathology.

Final Diagnosis: Transient Neuropraxia.

Discussion: Current literature indicates transient neuropraxia is different from a stinger due to the bilateral nature and spinal cord involvement rather than the brachial plexus. The patient's symptoms were not fully elicited until 24 hours post-injury, which led to eventual advanced imaging including evaluation of Torg/Pavlov ratio and Cerebrospinal Fluid Reserve (CSFR). These measurements can be used to evaluate for spinal stenosis and canal narrowing indicating the patient's risk of recurrence. In retrospect, the patient would have been treated as an acute spinal cord injury given his initial symptoms. This case highlights the importance of communication between ATCs, Athletes and Team Physicians.

Outcome: Patient held out of activity for 1 week for monitoring of concussion symptoms and for recurrence of upper extremity symptoms. The patient's symptoms of fatigue, sound sensitivity and neck pain resolved prior to the 7 day period of monitoring. His repeat concussion score was improved from baseline. Repeat physical exam and neurologic testing were within normal limits.

Follow-up: To help determine appropriateness for return to play and likelihood of future episodes, the patient's Torg/Pavlov ratio and CSFR were calculated and noted to be within normal limits. Given these values and mechanism of injury, there is a low likelihood of having recurrent episodes of neuropraxia in the future. The patient was cleared to return to Baseball with no restrictions.

An Unusual Case of Abdominal Trauma Due to Soccer Injury

Primary Presenter/Author: Jason Hui, DO
James Daniels, MD, Cesar Arguelles, MD, and Erica Miller-Spears, PAC
Affiliation: Southern Illinois University Quincy Sports Medicine Fellowship.

History: Our case presentation involves an 18 year old female athlete, who is a soccer player in NAIA play. She was going after the soccer ball when she was kicked by an opponent in the abdomen during gameplay. She complained of immediate epigastric pain, she was removed out of the game and did not return to play. She was winded but remained alert with no breathing difficulities. After being monitored at the sidelines for the first hour with no improvement in her abdominal pain, she was brought to the local emergency room for further evaluation. As she was undergoing workup, her pain and symptoms deteriorated. She was previously healthy with no existing conditions or taking any medications.

Physical Exam: On arrival to the ER, she was not declared a leveled trauma, as she appeared relatively stable. Vitals signs: T(F): 98.1 | HR: 60 | BP: 115/74 | RR: 16 | SpO2: 100% | Wt(lb): 145.2 Physical Exam: GENERAL: Alert, oriented x3 but looks pale | HEENT: Normocephalic, atraumatic | EYES: PERRLA, EOMI | CARDIOVASCULAR: Regular rate and rhythm, no murmurs, S1, S2 normal, no S3, S4 | LUNGS: Air entry bilaterally equal, normal breathing efforts, air movement decreased at the bases | ABDOMEN: Distended, tender, firm, non active bowel sounds, peritoneal signs present | EXTREMITIES: No swelling or peripheral edema. No calf tenderness | SKIN: No rashes | BACK: Without any tenderness | CNS: There is no focal deficit.

Differential Diagnosis: Blunt abdominal trauma, intra-abdominal bleeding; Pancreatic laceration or transection; Splenic laceration or rupture; Small bowel or colorectal injury; Diaphragmatic injury.

Test Results: Initial blood work: WBC: 15.1, HGB: 11.8, HCT: 35.1, ANC: 12.35, AMC: 1.06, Glucose: 135, Lipase: 236. She was also coincidentally found to be positive for COVID 19. CT Scan of the abdomen findings significant for large volume hemoperitoneum with clotting in the upper abdomen, as well as attenuation and hypodensity of the distal body of the pancrease concerning for laceration versus transection. Given CT findings, emergent surgical consultation was made and an exploratory laparatomy was performed.

Final Diagnosis: Large sized retroperitoneal hematoma with approx 1200 cc of blood removed from abdomen; Laceration of the anterior portion of the pancreas without evidence of complete transection.

Discussion: Soccer is the most popular sport worldwide and its nature exposes athletes to abdominal trauma. In adults, isolated pancreatic injuries occur in 15.3% of blunt abdominal trauma. Pancreatic injuries can be difficult to diagnose, as vital sign often remain normal. Further, injury to the retroperitoneal area can present with minimal or nonspecific

discomfort. Delayed diagnosis can lead to dire consequences as traumatic pancreatic injury is associated with high morbidity and mortality. Therefore, it is crucial for the athletic medical staff, who are often the first line of defense, to be vigilant of the differentials of abdominal pain and recognize the possibility of a pancreatic injury.

Outcome: A pancreatography of the mid body of the pancreas was performed and large amount of blood in the intraabdominal space was evacuated during surgery. Patient was transported to the ICU and later transferred to a bigger hospital closer to home where she had further revision procedures to coil 2 aneurisms. She was ultimately discharged from hospital after approximately 1 month since her injury.

Follow-up: The athlete is not expected to be able to return to play this season. She will be followed up post operatively to determine if any follow up revision is necessary. Activities will be restricted until she is fully recovered and cleared by surgery. It is anticipated that she will be allowed to progress to full activities without restrictions at some point next season.

An Albatross: A Golfer With Elevated Heart Rate

Primary Presenter/Author: Donald Joyce, MD
Christopher Miles, MD
Affiliation: Wake Forest Baptist Health, Winston- Salem, North Carolina.

History: Eighteen years old M golfer with no significant past medical history presented to the Training room following 24 to 36 hours of intermittent elevation of heart rate and fever. Had noted an elevated temperature to 100 F but never higher than 100.4 F. Negative prior COVID19 screening. Symptomatic COVID testing negative. Presented after overnight quarantine denied current fever, but had taken acetaminophen. Had been noting Left sided chest discomfort and tightness-most notably when lying down. Denied any recreational drugs, alcohol, tobacco. No significant family medical history. Denied: congestion/rhinorrhea, sore throat, lymphadenopathy, lightheadedness, dizziness or headaches.

Physical Exam: BP 122/74, HR: 121. GEN: Well developed, well nourished. No acute distress. Head: Normocephalic and atraumatic. EYE: PERRL. Conjunctiva normal. CV: Regular rhythm and normal heart sounds. + Tachycardia. Pulm: LCA bilaterally. No respiratory distress. No wheezing. Abdominal: Soft. BS nml. No distention. Neurologic: alert. Skin: Warm. Diaphoretic. Psych: normal mood and affect. Behavior normal EKG was obtained in the Training Room showing normal sinus rhythm HR 86, normal intervals. New onset T wave inversions in II, III, aVF, V5 and V6. New bimodal T wave noted in V4 when compared to baseline EKG. Transferred the hospital for further evaluation.

Differential Diagnosis: Viral illness (Pericarditis, Myocarditis, etc); Tachyarrhythmia; Thyroid disease; Pheochromocytoma; Drug induced tachycardia.

Test Results: Normal CBC with diff and BMP. Elevated CRP and ESR. Troponin elevated to 6268 pg/mL. Normal BNP. Negative COVID19 swab and antibody and UDS. Cardiac Echo- Normal EF. Borderline LV function on Doppler. Normal wall motion. Cardiac MR- Delayed enhancement in segments of: basal-inferolateral and -anterolateral; Mid-anterior, -inferior, -inferolateral and -anterolateral; All apical segments; Apex. Normal coronary arteries. RVP swab-negative. EBV PCR- 865 IU/mL.

Final Diagnosis: EBV Myocarditis.

Discussion: Epstein-Barr Virus infection is a common occurrence in the adolescent and young adult population, including athletes. Typical presentation includes malaise, headache, fever, tonsillitis/pharyngitis and cervical lymphadenopathy. Concerns regarding IM often involve the spleen but there has been a number of case reports of myocarditis as well. Myocarditis has been previously reported as the presenting manifestation prior to the development of any classical signs of IM. Our patient had presented after a low-grade fever, for left chest discomfort and was diaphoretic on examination. The availability of EKG in the training room allowed for prompt recognition of ongoing cardiac pathology.

Outcome: Patient was admitted to the hospital for observation after initial labs and echo in the ED. Cardiac MRI completed on Day 1 of hospitalization. Cardiology was consulted; started on Enalapril, colchicine BID and Acetaminophen for pain. Troponin and inflammatory markers trended down. EKG normalized with resolution of T wave inversions. Patient was discharged with cardiology follow-up.

Follow-up: No competitive physical activity for 3 to 6 months. May chip and putt. Repeat resting EKG 1 month post diagnosis and 24 Holter Monitor; must have no clinically relevant arrhythmias or SVT due to ectopic activity. Exercise stress test 3 to 6 months after initial presentation and repeat Cardiac MRI. Must have normalized cardiac and inflammatory labs, as well as normal systolic function.

Painful Bilateral Popliteal Masses

Primary Presenter/Author: Rachel Kee, DO, MA
Brian Redmond, MD, Chris Clemow, MD, and Andrea Pitts, MD
Affiliation: AnMed Health, Anderson, South Carolina.

History: An 18-year-old male presented to the clinic with a 4-year history of painful bilateral popliteal masses with associated calf pain. He is a varsity soccer player on his high school team with aspirations to join the military after graduation. Over the summer he had been doing additional fitness in preparation for Army basic training. Pain increases with activity and typically subsides 10 to 15 minutes after stopping activity. The masses have increased in size over the last several months and pain is intensifying. Pain begins in the popliteal fossa and then radiates down into bilateral calf muscles. He denies any distal numbness or tingling. He has tried multiple treatment modalities including activity modification, NSAIDs, ice, elevation and multiple rounds of physical therapy with minimal relief.

Physical Exam: Normal gait. Obvious palpable masses to bilateral popliteal fossa extending superiorly which are homogenous, well circumscribed, soft and tender to palpation. Masses harden with terminal knee extension and patient is able to flex masses with contraction of hamstring muscles. No overlying skin changes. Tenderness extends proximally along medial hamstring, no calf tenderness with palpation or squeeze. Knee ROM 0 to 130°. Strength is 5/5 in knee flexion and extension, flexion reproduces pain. Ligamentous testing intact, negative meniscal testing. Intact distal sensation throughout entirety of bilateral lower extremities. Pulses are 2+. Feet are warm, well perfused, brisk capillary refill.

Differential Diagnosis: Bilateral popliteal cysts; Bilateral lipomas; Semitendinosus bursitis; Congenital accessory muscles; Hypertrophy of hamstring or popliteus muscles.

Test Results: MRI b/L LE: Hypertrophy of semimembranosus muscles, no accessory muscle identified. Pre/Post exercise Ultrasound: Dynamic eval of b/L semimembranosus showing well defined fascial tubing surrounding the muscles which terminates distally and demonstrates muscle belly herniation around distal edge of fascia which is more pronounced with contraction. SM measures 3.4/3.37 cm in cross section just above joint line (L/R). Post exercise demonstrated slight enlargement of masses, increased discomfort.

Final Diagnosis: Hypertrophy of bilateral semimembranosus with herniation of muscle belly around distal fascial plane and associated exertional compartment syndrome.

Discussion: Few reports were found in the literature showing similar presentations as above. Eight cases were found showing young active people with semimembranosus hypertrophy. Two of the 8 were treated with partial excision of the muscle, one with fasciotomy and the remaining were effectively treated with activity modification and rest. Reports show good results at short term f/u. Etiology is unknown but thought likely secondary to the unique oblique nature of muscle fibers causing local hypertrophy. In the case of our patient, his hypertrophy and resulting pain were directly correlated with increase in activity and muscle bulk.

Outcome: Initial concern for popliteal artery entrapment was ruled out with normal vascular studies. U/s guided intramuscular steroid injections were performed in an attempt to reduce inflammation and incite atrophy. Unfortunately injections did not produce sufficient results so the patient was taken to the operating room where a fasciotomy was performed to semimembranosus muscles.

Follow-up: Patient was doing quite well at 1 month f/u with minimal pain. Visually the masses were much less prominent and active knee flexion produced minimal pain. At 2 months f/u he did have mild reoccurrence of pain superior to previous site thought likely from scar tissue accumulation. He is currently able to perform long bouts of strenuous exercise with only mild discomfort.

Suspicious Swelling: An Atraumatic Knee Effusion in a High School Basketball Player

Primary Presenter/Author: Daniel R. Kelley, MD
Brendon S. Ross, DO, MS
Affiliation: University of Chicago/NorthShore University HealthSystem, Chicago, Illinois.

History: The patient was a 16-year-old male, with a history of a Salter-Harris (S-H) II fracture of the left distal femur 3 years ago, who presented to clinic with acute left knee pain, stiffness and swelling for 4 days after playing a game of pickup basketball. He did not recall any specific injury but reported intermittent mechanical symptoms of the knee following the game with progressive swelling and pain. Despite relative rest and wrapping his knee with an ACE bandage for the swelling, his knee pain persisted, prompting his mother to bring him to the sports medicine clinic for further evaluation. He denied instability of the knee, radiating pain or neurologic symptoms of the left lower extremity.

Physical Exam: The patient was a well-appearing, overweight male with slightly antalgic gait. Inspection of the left knee revealed swelling without overlying erythema or skin breakdown. Palpation of the knee was notable for an effusion with tenderness at the superior patellar pole, distal quadriceps tendon and lateral joint line. Knee extension was 0° but limited in flexion to 110° with posterolateral knee pain at terminal flexion. Knee flexion and extension strength were 5/5 and he was neurovascularly intact in the left lower extremity. Special testing was unremarkable including negative anterior/posterior drawer, Lachman's, varus/valgus stress, McMurray's and Dial testing.

Differential Diagnosis: Osteochondral Defect; Lateral Meniscus Tear; Reactive Arthritis; Synovial Hemangioma; Juvenile Idiopathic Arthritis.

Test Results: Arthrocentesis via the superior lateral approach yielded 68cc of serosanguinous fluid. XR of the left knee revealed a healed S-H II fracture of the distal left femur. MRI of the left knee revealed a 1.7 × 2.2 × 1.1 cm heterogenous mass, located in the anterior femoral metaphysis adjacent to the physis centrally and medial to the notch, with low signal intensity on T1 and T2. The cortex underlying the lesion was eroded and remodeled into a smooth concavity. Menisci and ligaments were normal.

Final Diagnosis: Pigmented Villonodular Synovitis/Tenosynovial Giant Cell Tumor.

Discussion: This uncommon case of a spontaneous monoarticular effusion demonstrates classic features of a tenosynovial giant cell tumor. The serosanguinous effusion and low T1 and T2 signal intensity—due to hemosiderin deposition in hypervascular synovial cells—are distinctly characteristic. The tumor consists of hypervascular proliferative synovium containing multinucleated giant cells, macrophages and hemosiderin. XR and MRI may show well-circumscribed masses with sclerosis and peripheral cystic erosion. While benign in nature, adjacent bony destruction may lead to disability. Resection plus synovectomy is the preferred treatment depending on the extent of synovial involvement.

Outcome: Immediately following the arthrocentesis at the initial visit, arthralgia and gait mechanics improved. Patient was instructed to take Ibuprofen 600 mg bid ×7 days and a hinged knee brace was provided for support until further imaging with MRI was obtained. At the one-month follow-up with orthopedic surgery, the effusion and arthralgia had resolved and the patient had returned to full activity.

Follow-up: Given return to full activity, orthopedic surgery recommended ongoing conservative management with surveillance MRI with contrast in 3 months. If symptoms return or follow-up MRI demonstrates concerning progression, arthroscopic evaluation of the knee will be considered.

Frequent Fracturing Frustrates Fledgling

Primary Presenter/Author: Lee G. Kenyon, DO
Paul Saluan, MD
Affiliation: Cleveland Clinic, Cleveland, Ohio.

History: Fourteen year-old male presents due to recurrent left midshaft tibia fractures. Has suffered 4 tibial fractures, occurring at age 4, 5, 9 and 13. All were fairly non-traumatic (leg was rolled over, was jumping on trampoline, kicked in shin and a ground-level fall) and treated nonoperatively. He plays basketball and baseball, but notes worsening pain at his left mid-tibia after prolonged running or jumping. Pain improves with rest. No nighttime pain, weight loss, fevers or chills.

Physical Exam: Gen: WDWN, NAD. Cardiopulmonary: Breathing comfortably on room air. Skin: Normal in

appearance, no rashes, ecchymosis, fibromas. Musculoskeletal: Normal gait. Left leg 1.5 cm shorter than right. Full range of motion of hips, knees and ankles. Tenderness to palpation at lateral border of left mid-tibia. No other tenderness throughout the left knee, fibula or ankle joint. No palpable deformities. 5/5 strength in knee flexion, knee extension, dorsiflexion and plantarflexion. Normal sensation and pulses. Negative single leg hop test, syndesmosis squeeze, heel squeeze.

Differential Diagnosis: Osteoid osteoma; fibrous dysplasia; Brodie's abscess; adamantinoma; aneurysmal bone cyst.

Test Results: XR left tibia: focal cortical thickening and bony sclerosis of mid tibia with central, ill-defined lucency. MRI w/o and w IV contrast: rounded areas of low t1 and high t2 signal seen in distal tibia diaphyseal medullary cavity with intervening areas of t1 signal, likely non aggressive osteofibrous lesion. Small fracture at the lesion noted with periosteal new bone. Patchy edema distal medial tibia likely stress reaction.

Final Diagnosis: Osteofibrous Dysplasia (OFD).

Discussion: Osteofibrous dysplasia is a rare, benign condition found most commonly in the anterior tibia of male adolescents (typically < 10 year old). Can be asymptomatic or can present with painless or painful swelling, bowing of the tibia and pseudoarthrosis. First line treatment is observation, with bracing for those with deformity and altered gait. Operative correction with osteotomy is reserved for those with significant deformities. OFD should be distinguished from adamantinomas which are low-grade malignant tumors also found in mid-tibia, but extend into medullary canal or extraosseous soft tissues. These occur in young adults, can metastasize to lungs and are treated with surgical resection.

Outcome: Referred to orthopedic oncology who recommended continued clinical observation with serial imaging over a surgical intervention, given that these lesions can "burn out." If continued problems in the future, consideration for intramedullary rod placement. Other possibilities include open curettage and plating. Provided a heel lift for leg length discrepancy.

Follow-up: Patient had a gradual return to activity over the next 2 months with no subsequent injuries at this time. Will continue to follow up every 6 months.

Shortness of Breath in a Running Back

Primary Presenter/Author: Christina Kim, MD
Joseph Armen, DO
Affiliation: East Carolina University, Greenville, North Carolina.

History: Nineteen year old African American male with a past medical history of childhood wheezing complains of chest tightness and dyspnea on exertion during football practice. He had mild uncomplicated COVID illness approximately 60 days prior. He completed a graduated return to play protocol after isolation ended with no issues. Denies fever, cough, wheezing, chills, fatigue or dizziness.

Physical Exam: BP: 123/68, HR 49 bpm, SpO2 100%, RR: 20, Temp: 98.6 F, Height: 72 inches, Weight: 201 lbs. GEN: AAO × 3, NAD. Pulm: No audible wheezing or cough. CV: Normal S1/S2, no M/R/G. MSK: Chest wall was non-tender to palpation.

Differential Diagnosis: Pulmonary Embolism; Acute Coronary Syndrome; Myocarditis; Post-COVID Syndrome; Exercise Induced Bronchospasm.

Test Results: Initial: ECG: sinus bradycardia with no significant ST segment abnormalities, CXR: WNL, D-dimer: 1.07(<0.49 mg/L),Troponin-I: 0.06(<0.01 ng/mL),CRP: < 1 mg/L. Subsequent: CTA Chest: no PE or infiltrate, mild to moderate cardiomegaly, Bilateral Venous Dopplers: no DVT, Creatinine: 1.50(<1.27 mg/dL) with repeat at 1.24, Repeat Troponin-I: < 0.03, Repeat D-dimer: 1.23, Echocardiogram: EF 60% to 65%, mild biatrial dilatation, trace MR, TR, Cardiac MRI: normal. Pending: Spirometry.

Final Diagnosis: Post-COVID syndrome.

Discussion: SARS-CoV-2 is the virus responsible for the current COVID-19 pandemic. Standard return to play protocol after mild uncomplicated COVID-19 illness was used. Guidelines exist for athletes with persistent symptoms after 10 days of isolation.There are no current guidelines for athletes who develop new cardiopulmonary symptoms >30 days from illness. Troponin level can be briefly elevated in athletes.ECG and echocardiogram can be normal and cardiac MRI can be used to evaluate myocardial involvement.Spirometry may not be available due to concerns about virus droplet spread. There is no data on duration of elevated D-dimer due to COVID-19 and presumed transient post-infectious hypercoagulable state.

Outcome: The athlete's chest tightness and dyspnea on exertion gradually resolved.

Follow-up: Athlete was able to return to football once symptoms resolved with ADLs without significant issues. Spirometry evaluation is currently pending. If spirometry evaluation is negative, additional cardiac work-up will be completed.

Dropped Like He's Hot: Near Syncope and Chest Pain in a Basketball Player

Primary Presenter/Author: Kathleen Kinderwater, MD
Megan Ferderber, MD
Affiliation: East Carolina University, Greenville, North Carolina.

History: Eighteen YO male collegiate basketball player with a history of exercise induced asthma presented to the ED after a near syncopal episode. He was participating in a challenging conditioning practice, running sprints, when he experienced chest pain, shortness of breath, lightheadedness and sensation of near syncope. His athletic trainer denies witnessing loss of consciousness or head trauma. He is alert and oriented, however unable to recall events that occurred between his near syncopal episode and transport to the ED. He has experienced similar episodes in the last few years attributed to exercise induced asthma. He does not have an inhaler with him and did not utilize it prior to practice. He recently visited an urgent care facility for a sports pre-participation physical that was normal. Family history is significant for a brother with an "enlarged heart" and mother with "thyroid disease."

Physical Exam: Vital Signs: 125/69, HR 70, RR 20, Temp 98.6 F. General: No distress, well appearing. HEENT: normocephalic, atraumatic, MMM. Vision intact, gaze appropriately aligned, EOM intact. Cardio: RRR. Normal pulses and heart sounds. No murmur, friction rub or gallop.

Pulm: Effort normal. No tachypnea, accessory muscle usage or respiratory distress. No wheezing, rhonchi or rales. Abd: No distention; soft, non-rigid. No tenderness, guarding or rebound. MSK: Full ROM neck without pain. No marfanoid findings. Neuro: No focal deficit present. A&O × 3. Sensation intact. Motor function, coordination, gait intact. Beighton score 4/9.

Differential Diagnosis: Postural orthostatic tachycardia syndrome (POTS); Asthma exacerbation/exercise-induced bronchospasm; Hypertrophic cardiomyopathy/congenital myopathy; Cardiac arrhythmia; Pericarditis.

Test Results: Labs including CBC, BMP, BNP and troponin normal. EKG NSR with early repolarization in lateral leads. Echo normal without septal hypertrophy. Cardiac stress test abnormal with drop in systolic arterial pressure with signs of dizziness as patient was 46 seconds into recovery. No signs of ischemia. Excellent endurance. No ectopies noted. CT Coronary negative. PFTs normal. Tilt Table test positive. No syncope however HR Rise > 30 BPM in first 10 minutes of passive phase from 51 to 85, max 107.

Final Diagnosis: Symptomatic hypotension during cardiac stress test and tilt table test with noted heart rate rise more than 30 BPM in first 10 minutes, suggesting Postural Orthostatic Tachycardia Syndrome (POTS).

Discussion: In a young, healthy, male athlete who presents with near-syncope, chest pain, shortness of breath and a vague yet positive family history of a male relative with an "enlarged heart," extra care must be taken to rule out cardiac etiology like HOCM, WPW or other arrhythmia/channelopathies prior to his return to play. This patient's prodromal symptoms of lightheadedness and dizziness with normal cardiac exam, EKG, CT and echo are reassuring for a non-cardiac etiology. The tilt table test can be helpful in syncope with an unknown cause and is often considered an initial test. An increase in HR by 30 BPM during tilt table test is diagnostic in adults.

Outcome: His negative cardiac and pulmonary work up was reassuring. His symptomatic hypotension during stress test and positive tilt table test highly suggestive of POTS. He had no repeat attacks and chest pain resolved. Given no structural cardiac abnormality, he was cleared for return to play. Exercise is a hallmark of therapy in POTS patients and symptoms can be worsened by deconditioning and bedrest.

Follow-up: Being 2 to 3 months deconditioned due to work up, he was given a graded return to play schedule. Initial activity included pre-game warm up, with progression to practice at half maximum effort with goal of competitive game play in 2 weeks. Limited research is present on return to activity guidelines in patients with POTS so continued hydration and symptom monitoring was strongly encouraged.

Volleyball Dive Gone Wrong: A Uncommon Case of Acute Shoulder Injury

Primary Presenter/Author: Yana Klein, DO
Jolie Holschen, MD, FACEP, FAMSSM
Affiliation: Loyola University Medical Center, Maywood, Illinois.

History: A 36-year-old Hispanic male, otherwise healthy, presents to the Emergency Department with his right arm held in an upright, fixed and abducted position on arrival with chief complaint of acute right shoulder pain following an indoor volleyball dive injury 30 minutes PTA. He landed on a fully outstretched and abducted arm, with his elbow extended and forearm pronated in attempt to "pancake" the ball for the dig. The pain is described as sharp shooting, non-radiating 9/10 pain localized to his right shoulder. The patient has been unable to move his shoulder since the injury due to pain. He denies any prior MSK injuries or surgeries. Social history is unremarkable.

Physical Exam: GENERAL: no distress, well appearing HEENT: Atraumatic, MMM. Neck FROM without midline tend. External ears normal LUNGS: Breathing non-labored, speaks full sentences CARDIO: pulses normal throughout SKIN: no visible rash, laceration, contusions MSK: Limited range of motion over the right shoulder 2/2 to pain. Clear palpable defect over right deltoid. Humeral head palpable in right axilla. Patient's arm is fixed in full abduction at 135°. Able to perform FROM of right elbow, wrist and digits. Sensation intact throughout right deltoid, arm, forearm and digits. Strength 5/5 in radial, medial and ulnar nerve distributions. RUE neurovascularly intact.

Differential Diagnosis: Luxatio Erecta/Inferior Glenohumeral Dislocation; Humerus/Clavicle Fracture; Acromioclavicular joint dislocation; Rotator Cuff tear; Axillary Nerve Palsy.

Test Results: Xray of the Right Shoulder 2 + Views obtained as shown. The patient was unable to bring arm down for routine imaging, due to pain. Findings: Study slightly limited due to patient motion. Humeral head dislocation that appears to be anterior and inferior in direction. No gross fracture. No arthritic disease. No periosteal reaction. No lytic or blastic bone lesions. Soft tissues are unremarkable. No radiopaque foreign bodies.

Final Diagnosis: Luxatio Erecta.

Discussion: While shoulder dislocations account for 45% of all large joint dislocations, with anterior dislocations being by far the most common, inferior joint dislocations are rare resulting in an incidence of 0.5% of all shoulder dislocation presentations, making this case noteworthy. Classically, patients will present with a fixed, abducted and overhead shoulder, thereby coining the Latin term luxatio erecta (erect dislocation). Given that these inferior dislocations have concerning complications including humeral fractures, bone contusions, rotator cuff or labrum tears, recurrence and neurovascular bundle injuries in serious cases, they are important to identify and treat.

Outcome: Using a posterior intra-articular injection and pain control with IV Dilautid, the patient tolerated the reduction well using the 2-step maneuver without sedation. We manipulated the arm by converting the dislocation into an anterior dislocation. From there, we maintained adduction with the elbow at 90° while gently externally rotating the forearm until a palpable clunk was appreciated.

Follow-up: The patient was placed in a sling and advised to follow up with the orthopedic clinic in 1 week. He verbalized understanding and was agreeable to the plan. The patient was lost to follow up.

Double Trouble a Puzzling Case of a Youth Powerlifter With Persistent Bilateral Hip Pain

Primary Presenter/Author: Ashley Nicole Koontz, DO
Cayce Onks, DO
Affiliation: Penn State Health Family and Community Medicine, Hershey, Pennsylvania.

History: A 16-year-old female with a history of depression was referred for a second opinion of bilateral hip pain following extensive unremarkable workup by numerous physicians. She was most recently referred to pediatric surgery for concern of athletic pubalgia who felt her hip pain would be more appropriately addressed by sports medicine. She competes as a powerlifter. The onset of pain was insidious, initially in the right hip. She was able to continue to practice, but progressed to have identical pain in the left hip that became constant bilaterally. Pain is most specifically in the groins and radiates down the anterior thighs with tingling. Physical therapy made her pain worse. At this point, the patient has such significant pain with ambulation that she is not able to participate in sports, which have caused this young active patient a great deal of distress.

Physical Exam: General: seated comfortably, no acute distress. Psychiatric: appropriate mood and affect without significant anxiety, conversational. Neurologic: 5/5 strength of bilateral lower extremities in hip flexion, hip abduction, hip adduction, knee extension, dorsiflexion, plantar flexion. able to complete standing squat, toe walk, heel walk without difficulty. Musculoskeletal: full lumbar range of motion without difficulty. full hip passive range of motion bilaterally, FABER reproduces groin pain bilaterally, positive FADIR bilaterally. no pain with resisted hip adduction bilaterally. negative Thomas test bilaterally.

Differential Diagnosis: Athletic Pubalgia; Acetabular Labral Tear; Iliopsoas Tendinopathy; Slipped Capital Femoral Epiphysis; Congenital Hip Dysplasia.

Test Results: Completed in workup prior to referral to sports medicine: X-ray of bilateral hips: unremarkable for abnormality. MRI without contrast of bilateral hips: unremarkable for abnormality. Ordered by sports medicine after initial evaluation for second opinion: MR arthrogram of left hip: focal detachment of the anterior superior labrum. mild edema of left quadratus femoris. MR arthrogram of right hip: focal detachment of the anterior superior labrum.

Final Diagnosis: Bilateral Acetabular Labral Tears.

Discussion: Early specialization and female gender are risk factors for injury impacting this adolescent female powerlifter. While there is growing evidence that supervised weight training is protective against injury, opposing studies show a higher injury rate in competitive power lifting. The 2008 American Academy of Pediatric guidelines also do not recommend powerlifting until physical maturity is reached. Unfortunately, adolescent females are less likely to resistance train and thus, many studies prior to the development of these guidelines are male dominant. Our patient is an example that this participation pattern is shifting and could benefit from further research and updated safety guidelines.

Outcome: The patient received bilateral ultrasound-guided corticosteroid hip injections. She had 80% pain reduction and was able to play recreational tennis for approximately 6 weeks until the pain returned now with popping and clicking with bilateral hip flexion and extension. Given the patient's inadequate pain relief, she was referred to orthopedic surgery for consideration of hip arthroscopy.

Follow-up: The orthopedics team initially recommended a new 8-week course of physical therapy focusing on the iliopsoas, with adjunctive aquatic therapy. She experienced no relief in pain. Ultimately, the patient was deemed to benefit from operative labral repair and ilipsoas tenotomy beginning with unilateral intervention of the right hip before proceeding with a future procedure on the left.

Left Side, Weak Side: Persistent Shoulder Weakness in a High School Football Player

Primary Presenter/Author: Katie Krebs, MD
Steven Albrechta, MD
Affiliation: Ohio State University, Columbus, Ohio.

History: A 14-year-old right hand dominant football player presents with 13 days of left shoulder weakness after an opponent's helmet struck his left anterior shoulder. He completed the game then presented to an emergency department for evaluation. He played in one more game despite persistent weakness and partially improved pain. He has modified his play to favor his other shoulder due to weakness. He reports difficulty using his left arm including lifting and carrying items, performing household chores and putting on and off his backpack. His initial achy, constant left shoulder pain has resolved. ROS: + left shoulder weakness. No numbness or tingling. All other systems negative. PMH: Healthy. No prior shoulder injury or previous surgeries. Fam H: No known. Soc H: Also plays lacrosse. No alcohol, tobacco or drug use.

Physical Exam: General: Stooped posture. Neck: Normal exam. Right Shoulder: normal exam. Left Shoulder: Protracted shoulder. Prominent acromion and deltoid muscle atrophy. Sensation normal. ROM: active abduction 40° with trapezius elevation, passive abduction normal. No scapular winging. No tenderness to palpation of greater tuberosity, sternoclavicular joint, trapezius, rhomboids. Strength: 3/5 abduction and external rotation, 4/5 internal rotation, 5/5 elbow flexion, extension and supination. Positive drop arm test, otherwise negative testing for apprehension, Hawkins, impingement, cross arm, sulcus sign, external rotation lag sign. Reflexes: biceps 1 + L, 2 + R. brachioradialis: 1 + L, 2 + R.

Differential Diagnosis: Brachial plexopathy; Nerve root avulsion; Rotator cuff tear; Cervical fracture; Disc herniation.

Test Results: Day of injury: XR L shoulder: normal. 13 days out: XR spine cervical 4 views: normal. 16 days out: L shoulder MRI: Partial thickness tear of infraspinatus. Faint intramuscular edema within the posterior deltoid, supraspinatus, infraspinatus and teres minor muscles. 25 days out: EMG: Abnormal spontaneous activity in muscles innervated by the upper trunk of L brachial plexus. 39 days out: L brachial plexus MRI: Sequelae of traumatic injury. No evidence of nerve root avulsion.

Final Diagnosis: Left upper trunk traumatic brachial plexopathy with partial tear of left infraspinatus.

Discussion: This athlete presented with a classic mechanism for a stinger, but his symptoms persisted instead of resolving quickly. This case highlights the importance of careful assessment by trainer and team physician in the setting of weakness. While it is likely that the athlete minimized his symptoms to continue competing, especially after an emergency department visit he should have been assessed more carefully before being cleared to play. He is fortunate that he did not sustain further injury while competing weak and should not have returned until he regained full strength. Ultimately after ruling out more serious pathologies he improved with time and physical therapy.

Outcome: The athlete noted some improvement in active range of motion after 40 mg prednisone daily for 5 days. Shoulder abduction remained persistently weak with visible atrophy of his left deltoid muscle. He was held out from football while he began formal physical therapy, completing a total of 22 visits over the course of 5 months with gradual improvement in his range of motion and strength.

Follow-up: Four months out from injury he began light lacrosse stick drills. Five months out physical therapy was put on hold due to the coronavirus pandemic, but he continued home therapy. On return nine-month visit he had 5/5 strength in all directions of left shoulder with minimal anterior deltoid atrophy and was cleared to return to sport without restrictions. He participated fully in football.

Janitor With Bilateral Elbow Pain

Primary Presenter/Author: Brent W. Lambson

Travis Mille, DO, Daniel Payne, MD, and Christopher Gordon, MD

Affiliation: Utah Valley Family Medicine Residency: Intermountain Healthcare, Provo, Utah.

History: A 46-year-old female with no medical problems presents with bilateral elbow pain for the last 2 weeks. She is increasing her work as house cleaner secondary to COVID and uses both arms constantly. Various positions worsen her discomfort. Complains of pain in her left shoulder and upper back which will intermittently radiate pain down her arm into the left wrist. Her elbow pain also causes difficulty sleeping. Chiropractic treatments, ibuprofen and Tylenol have not alleviated her symptoms. Her PCP gave her bilateral corticosteroid injections around the extensor carpi ulnaris tendon. She reports these injections did not help. Previously seen in our sports clinic where she was prescribed Zanaflex, Diclofenac and Trazodone, none of which has helped her symptoms. On today's visit she reports continued pain, awakening from sleep and a new bilateral tingling into her hands.

Physical Exam: Vitals: BP: 133/79, HR: 87 Right and left elbows: No swelling, erythema or ecchymosis. There is moderate tenderness to palpation over the lateral and medial epicondyles and distal common extensor tendon complexes bilaterally. She has normal range of motion bilaterally. 5/5 strength to resisted elbow flexion and extension bilaterally. Resisted wrist extension causes mild discomfort at the lateral tendon complexes bilaterally. No ligamentous laxity or joint instability with varus or valgus testing. Shoulders: Bilateral tenderness to palpation over deltoids Neurologic: Spurling's test causes increased pain in corresponding arms. Sensation intact in bilateral extremities.

Differential Diagnosis: Lateral Epicondylitis; Medial Epicondylitis; Cervical Radiculopathy; Nerve Entrapment; Rheumatologic Arthritis.

Test Results: Cervical Spine XR—Intervertebral disk space is narrowed at C4-5, C5-6 and C6-7 with anterior vertebral body spurring and mild neuroforaminal narrowing. There are no fractures present. Reversal of normal cervical lordosis. Cervical MRI—Large extra medullary spinal canal mass, with severe cord compression and cord edema, most pronounced at the C7 level. Advanced degenerative disc disease from C4—C7 with degenerative narrowing of the spinal canal diameter and neural foramina at these levels.

Final Diagnosis: Metastatic spinal cord compression (MSCC) of the cervical spine secondary to lymphoma.

Discussion: Metastatic Spinal cord compression (MSCC) is a complication of cancer and an oncological emergency. Only 4% to 7% of MSCC occurs in the cervical spine, making upper extremity symptoms uncommon as the first complaint. Resected MSCC from lymphoma has a 66% survival at 3 months, compared to untreated MSCC that leads to death in 90% of patients at 1 month. Lateral epicondylitis (LE) is common in those 40 to 50 years old and occurs after repetitive or forceful work. LE uncommonly presents with bilateral symptoms, ~12% of the time. Therefore when evaluating bilateral LE, close follow up and cervical cord examinations (Spurling's) are recommended to rule out a more complex neurologic pathology.

Outcome: The patient was informed by telephone of her MRI results and directed to the ER for further evaluation; she left AMA secondary to fear of surgery and a belief that her faith would heal her. After further communication from our clinic about the urgency of this diagnosis, she returned to the ER 2 days later for admission and surgical decompression with spinal fixation.

Follow-up: Her neurologic symptoms improved after decompression and cervical fixation. She had 5/5 bilateral strength on repeat exam. Final pathology regarding her mass remains unknown secondary to inconsistent lab data but is thought to be B-cell lymphoma. PET scan revealed a potential focus in the uterus and therefore Gynecologic Oncology is performing continued oncologic evaluation.

Do Not Let Athletes Slip Through the Cracks

Primary Presenter/Author: Sarah Kay Langston, DO

Christopher Miars, DO

Affiliation: Southwest Sports Medicine and Orthopedics, Waco, Texas.

History: Fifteen year old male with PMHx of ADHD presents to sports medicine clinic for evaluation of possible concussion. He has no history of a previous concussion or other medical problems. Mechanism of injury was helmet to helmet hit in a football game the night before. Immediate symptoms included balance, coordination problems and headache. There was no loss of consciousness. He also complains of neck pain during the clinic visit. He denies any previous history of neck or back pain/injuries. Pt notes limited neck rotation due to pain. His ImPACT post-concussion symptom score at clinic visit was 19/144.

Physical Exam: The patient is of short stature with a wide based neck. He has noted dizziness with saccades, difficulty with balance, but recall and short-term memory are intact. Patient has decreased ROM of neck in all directions. He also has tenderness to palpation of the upper cervical spinous processes.

Differential Diagnosis: Concussion; Acute Cervical Sprain/Strain; Acute Post-Traumatic Torticollis; Cervical Fracture; Spinal Cord Injury.

Test Results: XRAY Cervical Spine: There is subtle radiolucency to the posterior arch of C1 suggestive of possible fracture. In addition, there is loss of the normal lordotic curvature on extension views. The anterior aspect of C5/C6 bodies is suggestive of possible compression fractures. CT Cervical Spine: Nondisplaced fracture through the right C1

posterior arch near its confluence with the right lateral mass. Gentle reversal of the normal lordosis noted. An additional fracture is not identified.

Final Diagnosis: The patient followed up in the clinic immediately following the CT scan. This did reveal a nondisplaced C1 fracture of the posterior arch. The case was reviewed with a spine surgeon.

Discussion: This fracture occurs when the head is hyperextended and the posterior arch of C1 is compressed between the occiput and the strong, prominent spinous process of C2, causing the weak posterior arch of C1 to fracture. Radiographically, the lateral projection did show a fracture line through the posterior arch. The odontoid view failed to show any displacement of the lateral masses of C1 with respect to the articular pillars of C2, a finding that distinguishes this fracture from a Jefferson fracture. The transverse ligament and the anterior arch of C1 are not involved, making this fracture stable. Therefore, only use of a cervical orthosis is required.

Outcome: All the information was reviewed with the patient and his mother. The importance of utilizing the soft collar to prevent displacement of the fracture were discussed. They were instructed to seek out immediate ER care should he develop an increase in pain in his upper/lower body or paresthesia/weakness presents. Patient was placed in a soft collar and scheduled for f/u with the spine surgeon.

Follow-up: The patient was continued on standard concussion protocol with resolution of symptoms within 1 week of injury. Pt completed f/u with the spine surgeon 1 month from DOI, in which he received counseling again regarding collision sports activity with consideration of noncontact sports participation. He will require 8 weeks of immobilization, with no contact sports for at least 1 year.

Persistent Leg Pain After Negative Workup in a Home Exerciser During a Pandemic

Primary Presenter/Author: Charles Robert Litchfield, MD
Frank Nguyen, DO, and Patrick Cleary, DO
Affiliation: SUNY Downstate Medical Center, Brooklyn, New York.

History: Sixty-eight year old African American female who was isolating at home during the pandemic presented to the Sports Medicine clinic for persistent right lower extremity pain. She had been exercising at home during the pandemic employing many alternative methods for staying in shape and recently started a new regimen of weighted stair climbs using a case of water acting as a 30 pound weight which she carried in front of her as she ascended and descended the stairs. She was most interested in increasing her quadriceps strength. During one set as she was mounting the final stair she felt herself begin to pitch forward and without thinking she stood up straight very quickly as a reflex and felt immediate and sharp pain in her left leg. She noted a small indentation in her calf and then began to notice progressive swelling in the area. She was seen in the ED and sent to sports clinic for followup.

Physical Exam: General: middle aged black female in no acute distress Cardiac: non-tachycardic, mildly hypertensive LLE: swelling with ecchymosis compared to RLE most prominent in proximal calf, also noted in ipsilateral ankle. No erythema or warmth. No deformity. Mildly antalgic gait. TTP at proximal third of calf at the medial aspect and distal third in the posterior midline. Calcaneal tendon palpably intact along its course into muscle belly. Full range of motion at knee, hip and ankle but with calf pain at extremes of knee flexion and extension. Pain with resisted plantar flexion of the foot. Knee ligaments stable. Positive Homan's sign. Positive Pratt's test. Neg Thompson test. Neg Matles test.

Differential Diagnosis: Deep venous thrombosis; Partial calcaneal tendon tear; Plantaris rupture; Gastrocnemius strain/tear; Soleus strain/tear.

Test Results: LLE duplex U/S: No evidence of DVT noted on exam. MSK U/S of LLE: Intact calcaneal tendon along entire course, plantaris present and intact. Large hypoechoic area ($8 \times 2 \times 5$ cm) located at medial aspect of proximal and middle third of space typically occupied by medial gastrocnemius muscle belly. Superficial cobblestoning noted. Negative sonopalpation over hypoechoic area. Complete discontinuity of medial gastrocnemius with no intervening fibers. Lateral gastrocnemius intact.

Final Diagnosis: Medial gastrocnemius muscle belly rupture with hematoma formation.

Discussion: The patient suffered a righting reflex response to a sensation of forward pitch resulting in contraction of the muscles of her posterior chain. Eccentric contraction is the most common etiology of a muscle rupture. Putting the gastrocnemius at further risk is its biarticular nature, a quality only shared by a handful of additional muscles which traverse 2 large joints. Simultaneous plantar flexion and knee extension from a starting position of ankle dorsiflexion and knee flexion puts an unusually large load on the gastrocnemius musculature. The medial gastrocnemius is more likely to tear than its lateral counterpart given the oblique orientation of its fibers.

Outcome: The patient was seen for a follow up appointment after 1 month via telemedicine and reported improvement in her pain and denied any functional limitations. She was ambulating without difficulty and the swelling and bruising had significantly reduced in her LLE. Her physical therapy regimen has focused on lower extremity strengthening and proprioception training.

Follow-up: She has since initiated a gradual return to activity protocol where she is only ambulating on level ground and performing isometric exercise with gradual and graded transition to concentric and eventually eccentric exercise.

When a Bike Ride Takes the Wrong Turn

Primary Presenter/Author: Dalton J. Lohsandt, MD
Ryan Muehling, MD, Kevin Clary, MD, and Aaron Gray, MD
Affiliation: University of Missouri Family & Community Medicine, Columbia, Missouri.

History: A 7-year-old male soccer player, with family history of parents from Thailand and past medical history of hemoglobin E, presented to the emergency room with 1 day history of worsening pain in the right lower extremity after a fall from a bicycle. He had difficulty ambulating throughout the day with swelling in the knee and ankle. History obtained from mother revealed that he was having pain in the right leg and knee for the last 2 months. Pain started gradually while playing soccer, with no known injury. Right knee did not catch or give out and pain was relieved with rest. Recently he had difficulty kicking a ball and a significant limp due to pain with weightbearing. Injury from bicycle crash prompted the hospital visit when ibuprofen did not provide relief. Review of systems revealed recent tactile fevers, poor appetite and undefined weight loss causing loose-fitting clothes.

Physical Exam: General: Well-developed child in no acute distress; Weight 23.2 kg & BMI 16.1. Extremities: Strength testing 5/5 bilaterally. Sensation fully intact. Lower extremity pulses present and equal bilaterally. Right leg: Mild swelling around knee. No warmth, erythema or ecchymosis. Moderate tenderness elicited with palpation over the proximal tibia on medial and lateral aspects. Passive and active range of motion of hip, knee and ankle showed no deficits. Hesitation and moderate pain with knee stability testing, but no instability noted. Ankle exam was normal except for a small bruise near the medial malleolus. Left leg: unremarkable. Gait: Unable to assess due to pain with weightbearing on RLE.

Differential Diagnosis: Tibial fracture; Septic arthritis; Internal knee derangement; Juvenile arthritis; Malignancy (osteosarcoma, leukemia, lymphoma).

Test Results: Labs: RBC 5.93, Hgb 10.4, Hct 33.9, MCV 57.2, MCH 17.5 and MCHC 30.7 consistent with hemoglobin E. WBC 8.33, CRP normal < 0.40 and ESR elevated at 73.0. XR right tibia: heterogenous lesion in the proximal tibia measuring 1.1×0.5 cm. MRI right knee: diffuse marrow replacing process, soft tissue edema, nondisplaced fracture of the proximal tibial metaphysis posterior cortex and joint effusion. Ankle XR: unremarkable. Bilateral iliac crest bone marrow biopsy provided further diagnosis.

Final Diagnosis: Pathological fracture, Salter-Harris Type II, of the right posterolateral tibia due to underlying precursor B-cell acute lymphoblastic leukemia (ALL).

Discussion: Pathological fractures have been reported as the initial presentation in children diagnosed with acute lymphoblastic leukemia 5.7% to 12% of the time. Osteopenia is observed in all phases of the disease and has been seen post-treatment up to 20 years. ALL is the most diagnosed cancer in children under the age of 15 and there are approximately 41 cases per 1 million children age 0 to 14 years in the United States. Current regimens of treatment achieve over a 90% survival rate at 5 years. Typical presentation of ALL are general fatigue symptoms, fevers, bruising and bone pain. A biopsy is needed for diagnosis and treatment involves years of chemotherapy based on individual risk classification.

Outcome: The tibial fracture was healed 2 and a half months after initial visit. He had some deconditioning but full range of motion. One day after diagnosis, chemotherapy was initiated following COG AALL0932 protocol. He had favorable prognosis due to WBC count, age, no CSF involvement and cytogenetics. Induction phase, completed in 29 days, lead to remission with negative end of induction morphology.

Follow-up: Three months after diagnosis he was cleared for activity without restriction; advised to return if new pain develops. Allowing children with ALL to return to physical activity as tolerated after fractures have healed is important due to positive impact on bone, muscle, cardiovascular and mental health. Maintenance chemotherapy will be continued until 2.5 years have passed from diagnosis date.

Chicken or the Egg?

Primary Presenter/Author: Ryan D. Lurtsema, MD

Frank Perez, CAFS, LAT, ATC, MAT, Colbert Perez, MD, Roy Jacob, MD, and Jennifer Mitchell, MD, FAAFP, FAMSSM

Affiliation: Texas Tech Univ Health Sciences Ctr, Dept of Family Med, Sports Medicine Fellowship, Lubbock, Texas.

History: A 19 yo Male Division 1 Cross Country athlete was seen for return to play (RTP) clearance following SARS-CoV-2 infection (COVID-19). Patient diagnosed via routine team screening and reported 1 day of mild sore throat on day one of the 10-day isolation period, with no other symptoms. At clinic visit, patient denied symptoms including no active or prior fever, chills, CP, SOB, peripheral edema or syncope. The patient did admit to running 3 miles daily on his own during his isolation, including the morning of evaluation. PMHx: Uncomplicated PSHx: None Meds: None Allergies: NKDA Social: Denies tobacco, alcohol or drug use.

Physical Exam: Vitals: T 97.7oF; BP 114/58; HR 63; RR 12; Pox 97%, RA Gen: AOx4, no acute distress CV: RRR, no murmurs, gallops or rubs. 2+ peripheral pulses with no peripheral edema Resp: CTAB, no wheezing, rales or rhonchi Abd: Soft, non-distended, non-tender to palpation; no bruits or masses noted.

Differential Diagnosis: Full recovery following COVID-19 infection; Post-COVID myocarditis; Post-COVID cardiomyopathy; Post-COVID silent myocardial inflammation; Previously undiagnosed cardiac abnormality.

Test Results: ECG: No changes from baseline done Aug 2019 TTE: Normal; no changes from baseline of Aug 2019 High-sensitivity Troponin T (hsTropT): 22.3 (normal < 19.0) Patient exercised day of troponin, so it was repeated 3 days later and was 9.1 Due to Big 12 Conference algorithm on post-COVID RTP, cardiac MRI was indicated Cardiac MRI: LV EF 52% (Nl: 59%-74%); RV EF 38% (Nl: 43%-65%) with RV dilation; regional wall dyskinesia involving the LV apex Interpretation: Non-ischemic cardiomyopathy (images).

Final Diagnosis: Post-COVID-19 Cardiomyopathy versus Previously Undiagnosed Cardiomyopathy versus Silent Myocardial Inflammation.

Discussion: Exercise during COVID-19 myocardial injury may precipitate malignant ventricular arrhythmia, mandating cardiopulmonary clearance in athletes before return to play. Recommended evaluation generally includes: history and exam, EKG, TTE and hsTropT. Cardiac MRI (cMR) is advised if any of these are abnormal, to identify the primary post-infection cardiac sequelae: cardiomyopathy, myocarditis or silent cardiac inflammation; resulting from cytokine storm or direct myocardial infection. cMR is ideal for evaluating myocarditis, but in this case identified ventricular dysfunction, not seen on TEE. Data such as this are crucial in further refining RTP criteria after COVID-19 infection.

Outcome: Given cardiomyopathy with low ejection fractions, the patient is now held from physical activity per AHA/ACC Task Force Guideline 3. A repeat cMR is planned for 3 months after the initial. Regular follow-up by his athletic training staff is ongoing, with particular attention to his mental health.

Follow-up: If prior findings have resolved on follow-up cMR, he may undergo stress echocardiography and/or 24-hour Holter monitoring with slow progression of activity, if those are normal. If concern for cardiomyopathy persists, secondary imaging to evaluate for non-infectious etiologies will be pursued.

The Importance of Diagnosis Bias: A Less Known but Common Cause of Leg Weakness

Primary Presenter/Author: Calvin Luu, DO

Christopher Bruti, MD

Affiliation: Rush University Medical Center, Chicago, Illinois.

History: Fifty-two-year-old woman with multiple ER visits presents for low back pain and right lower extremity weakness, numbness and pain. Patient states the weakness and numbness are progressively worsening and she is having difficulty ambulating due to her right foot drop. She denied any injuries, no saddle anesthesia or bowel/bladder incontinence. She also notes intermittent radicular pain radiating from her back and buttocks down her leg. Notes the pain is not positional and the numbness is constant. At her first ED visit, she was given Flexeril and discharged with PCP follow-up. On her second ED visit 1 day later, lumbar spine MRI was obtained, Medrol dose pack given and she was told to follow-up with her PCP. On her third ED visit 1 week after her second ED visit, thoracic spine and repeat lumbosacral MRIs were ordered. Neurosurgery was consulted for her foot drop and radicular symptoms.

Physical Exam: She has a non-antalgic gait with right foot drop. Right lower extremity: Decreased sensation to light touch, vibration and temperature along dorsum of right foot and lateral aspect of right leg below the knee. Decreased strength 1/5 with ankle dorsiflexion, 1/5 strength with first toe extension and 1/5 strength with foot eversion. Muscle strength otherwise 5/5 in the rest of right lower extremity. Left lower extremity and bilateral upper extremities with 5/5 strength. Patella and Achilles reflexes 2 + bilateral lower extremities. Trace bilateral pitting edema of lower extremities, right > left. The rest of her physical exam is non-contributory.

Differential Diagnosis: Lumbar radiculopathy; peripheral neuropathy; upper motor neuron disease; stroke; nerve tumor.

Test Results: MRI lumbar spine w/o contrast: small left paracentral disc protrusion at L4-5 causing left lateral recess stenosis and effacement of traversing left L5 nerve root. Mild right and moderate to severe left foraminal stenosis. Repeat MRI lumbosacral spine without any significant interval change. Thoracic spine MRI unremarkable. Right lower extremity doppler without DVT. Lab results remarkable for TSH 172.4 and total T4 < 3.

Final Diagnosis: Hypothyroidism-induced peroneal neuropathy.

Discussion: The patient's presentation was not consistent with a lumbar radiculopathy and was more consistent with a peripheral neuropathy. However, diagnostic bias was involved as lumbar spine issues are more common causes of neuropathy. Medical history, though often overlooked, is important when such situations arise. This patient had a known history of hypothyroidism and admitted to medication noncompliance. She was seen in the ED 3 times in a span of 1 week and received 3 MRIs before a TSH was checked. Peripheral neuropathies are relatively common in hypothyroidism, with clinical signs of carpal tunnel syndrome and polyneuropathies being present in up to 42% of hypothyroid patients.

Outcome: Referral to outpatient neurology for NCS/EMG resulted in evidence of severe right common peroneal neuropathy at the knee. No evidence of right lumbosacral motor radiculopathy or right sciatic neuropathy. She was restarted on thyroid hormone replacement therapy upon discharge with plans to slowly increase dosage of Synthroid every 4 weeks.

Follow-up: Patient's symptoms improved once restarted on thyroid hormone replacement therapy. She was able to resume her usual activities and is seeing physical therapy on an outpatient basis for her foot drop.

Tennis-Synovitis: Shoulder Pain and Finger Swelling in a Female Athlete

Primary Presenter/Author: Kana Maeji, DO
Justin Mark J. Young, MD
Affiliation: University of Hawai'i Family Medicine Residency Program, Aiea, Hawaii.

History: Twenty-one-year-old right-handed female college tennis player with medical history significant for lumbosacral (L5-S1) spondylolisthesis presented with acute right shoulder pain. The pain began during a tennis tournament, but she denied trauma or injury. She recalled a mild upper respiratory infection at that time. She subsequently developed slow-onset right index finger and right ankle pain, swelling and stiffness. She failed conservative management with Naproxen, Diclofenac, icing, physical therapy and cupping. She was evaluated by an orthopedic hand surgeon and received a cortisone injection in her right index finger for presumed trigger finger, but it provided only mild relief. Due to worsening joint pain and swelling, she presented to the emergency room and was prescribed antibiotics for presumed cellulitis. The symptoms persisted and she was no longer able to participate in tennis.

Physical Exam: Normal Vital Signs General: No acute distress Pulmonary: Clear to auscultation bilaterally Cardiac: Regular rate and rhythm Skin: No rash or lesions Musculoskeletal: Tenderness to palpation of right anterior shoulder, bicipital insertion and acromioclavicular joint | Edema, erythema and tenderness to palpation of right second distal interphalangeal joint, proximal interphalangeal joint and metacarpophalangeal joint with slight contracture | Edema and tenderness to palpation of right medial malleolus | ROM limited in right index finger and right shoulder | Right shoulder: Positive Painful arc Positive O'Brien's | Positive Hawkins Positive Neer's.

Differential Diagnosis: Rotator Cuff tendonitis; Acromioclavicular joint separation; SLAP lesion; Rheumatoid arthritis; Spondyloarthritis.

Test Results: HLA-B27: positive Anti-CCP IgG: 3.3 CRP: 51.9 ESR: 42 MRI R shoulder: grade 1 acromioclavicular joint sprain and surround edema. No signs of rotator cuff or labral pathologies. MRI R ankle: large tibiotalar joint effusion, non-specific peritendinous edema and inflammation and marrow edema of talar body. MRI lumbar spine: bilateral anterior SI joint signal intensity, thought to be due to inflammatory arthropathy. X-ray R hand: no acute fracture. Diffuse soft tissue swelling of second digit.

Final Diagnosis: The final diagnosis is HLA B27 axial spondyloarthritis.

Discussion: The patient is a young female who presented with asymmetric oligoarthritis, dactylitis and enthesitis following a suspected viral URI during a tennis tournament. There was a delay in diagnosis as her complaints were thought to be due to overuse injuries. This case highlights the challenges and biases of diagnosing a systemic inflammatory disease in a healthy collegiate level athlete, whom you expect acute and chronic musculoskeletal complaints secondary to injury or overuse. This case also emphasizes the importance of further investigating acute complaints of joint pain and swelling, in order to consider other underlying conditions in patients with no past medical or family history.

Outcome: She was referred to rheumatology for further evaluation. Over a course of 4 months, trials of different medications including sulfasalazine, prednisone and

methotrexate were stopped due to significant side effects. Finally, she tolerated hydroxychloroquine with appropriate response. Her joint pain and inflammation improved and repeat ESR and CRP levels were within normal limits.

Follow-up: The disease-modifying anti-rheumatic drugs caused significant fatigue, but she was able to gradually incorporate physical activity as her joint pain and swelling improved. She gradually returned to play after 2 months of hydroxychloroquine therapy. Her symptoms are currently controlled and she returned to her previous level of activity after 4 months.

Ballooning Back Pain: A Surprising Outcome to a Common Complaint

Primary Presenter/Author: Vincent Marchese, DO

Kevin Duprey, DO, David Baxter, DO, Andrew Reisman, MD, and David Webner, MD

Affiliation: Crozer Health Sports Medicine, Springfield, Pennsylvania.

History: A 73 year old male recreational tennis player and golfer with a past medical history of hypertension, hyperlipidemia and coronary artery disease presented to our sports medicine clinic with low back pain. The pain had started 3 weeks ago after pulling a heavy bed. The pain was located diffusely across the low back. He described the pain as dull and achy with intermittent sharpness. One week ago he began to have radiation of the pain down the posterior aspect of his left leg, with associated numbness and tingling. He denied myelopathic symptoms. The pain was worse with prolonged walking and standing. He had been unable to play tennis or golf due to the pain. The pain does not wake him up from sleep. He has been taking acetaminophen and ibuprofen without much relief. He has had episodes of pain like this in the past, but never for this long or with radicular symptoms.

Physical Exam: This is a healthy appearing male. Examination of the patient's low back revealed pain with full forward flexion and extension in the paravertebral muscles in the L4-5 distribution on the L side. Tenderness to palpation over the paraspinal muscles in the L4-5 distribution on the L side. Positive straight leg raise, negative crossed straight leg raise and positive Lasegue's dural tension test in the L4-5 region on the left side. Specific nerve route testing L4-S1 negative for pain, motor strength deficits, paresthesia's and numbness. 2 + deep tendon reflexes in the lower extremities bilaterally. Downgoing Babinski bilaterally.

Differential Diagnosis: Lumbar muscle strain; Lumbar herniated disc with radicular symptoms; Degenerative disc disease; Spinal stenosis; Abdominal Aortic Aneurysm.

Test Results: X-ray of the Lumbar spine showed multilevel spondylosis without compressive deformity. An incidental, calcified abdominal aortic aneurysm was also found measuring at least 7 cm.

Final Diagnosis: Unstable abdominal aortic aneurysm with radicular symptoms.

Discussion: Low back pain is one of the most common musculoskeletal complaints addressed by sports medicine physicians. After conservative therapy has failed, x-rays are often the first imaging modality of choice. While we are almost always evaluating for musculoskeletal pathology it is important to remember that there can be non-musculoskeletal causes for low back pain. This case is a reminder of how important it is to evaluate the entire x-ray image.

Outcome: The patient was contacted with x-ray results shortly after leaving the office. He was advised to be evaluated in the emergency room. He was evaluated by vascular surgery and taken for urgent endovascular repair of a 6.8 cm infrarenal abdominal aortic aneurysm.

Follow-up: The patient is doing well post operatively and had no complications. He is back to his normal activities of daily living. He does continue to have acute on chronic low back pain with radicular symptoms and has started a course of physical therapy.

Flying Knees and Varices: Complications of Abdominal Trauma in an MMA Fighter

Primary Presenter/Author: James Mattson, MD

Amie Kim, MD

Affiliation: Mount Sinai Hospital, New York, New York.

History: A 31 year old male amateur MMA fighter with history of seizure disorder presented to the emergency room with a chief complaint of fatigue and flank pain. For past 2 weeks he has had progressively worsening fatigue and now gets tired and out of breath after walking just 1/2 a block. He also has had constant left sided lower chest and flank pain present for the same duration, which he describes as achy and rates 5 to 6/10 in severity. Symptoms started at about the time he flew back to New York from Hawaii, where he had been working as a stuntman doing MMA on a film set. At his baseline, he is very active and trains 4 to 5 times a week, so this fatigue has been debilitating for him. He endorses nausea and dry heaving as well since this morning. Otherwise, he has no other complaints on review of systems. Of note, he has a remote history of daily alcohol use but none in past 3 years.

Physical Exam: His initial vital signs were Temp 98.5, P 115, BP 119/79, RR 20, SpO2 99%. On general exam, he is pale but otherwise non-toxic appearing and in no acute distress. He is tender to palpation over left lateral ribs 6 through 10 and costal margin with no step-offs, crepitus or ecchymosis. His breath sounds are clear bilaterally and heart sounds are normal. He is tender in his left upper quadrant and has left costovertebral angle tenderness, but no abdominal rebound or guarding. Skin exam did not reveal rash or ecchymoses. Extremity exam showed no joint effusions, edema or deformities. Neurologic exam was normal.

Differential Diagnosis: Rib fracture with pulmonary contusion; Pulmonary embolism; Splenic laceration/hematoma; Renal laceration/hematoma; Gastrointestinal hemorrhage.

Test Results: Initial labs were notable for anemia with hemoglobin 4.4 and hematocrit 12.8, with WBC 13.7 and platelets 301. Basic metabolic panel, liver function tests, cardiac enzymes and coagulation studies were normal. A CTA of the chest revealed no pulmonary embolism or consolidation. CT abdomen/pelvis revealed and large surrounding subcapsular collection of the left kidney resulting in Page kidney. The patient subsequently developed bright red hematemesis, which prompted EGD showing gastric varices.

Final Diagnosis: The patient had a subcapsular hematoma of the left kidney that caused splenic vein compression resulting in gastric varices. Initial injury was thought to occur from stunt fighting 3 weeks prior.

Discussion: This patient sustained a significant renal injury from sports-related trauma that had life-threatening

consequences. Though significant abdominal injury is relatively rare in sports, it is possible particularly in contact sports such as football, rugby or combat sports and in high-velocity sports such as biking or skiing. The American Association for the Surgery of Trauma developed injury grades for kidney trauma, which has been validated as a predictor of need for surgery. However, return to play guidelines for kidney trauma lack robust data to guide clinical decisions. The severity of this patient's injury and sequelae thus warrants a nuanced and goal-directed plan for return to sport.

Outcome: This patient had a complicated hospital course that included initial resuscitation requiring activation of massive transfusion protocol, an EGD confirming gastric varices and IR drainage of renal hematoma and placement of splenic vein stent. His bleeding stabilized and he was discharged after a 1 week hospital stay. A repeat EGD later showed resolution of gastric varices.

Follow-up: The patient did not return to MMA training or stunt work after discharge from hospital with a plan for outpatient follow-up. However, he had a recurrence of his renal hematoma 1 month later, which was managed conservatively and a subsequent EGD showed resolution of gastric varices. The patient got a job as a tattoo artist and as of most recent follow up, stopped his stunt work and MMA training.

From a Suspected Right Ankle Sprain to Subsequent Foot Drop in a Soccer Player: What Was Missed?

Primary Presenter/Author: John William McNeil II, MD
Mark Mirabelli, MD
Affiliation: University of Rochester, Rochester, New York.

History: A 26-year-old male recreational soccer player presented to University of Rochester Sports Medicine clinic for evaluation of persistent right foot and ankle weakness with. The patient was initially seen in the Emergency Department—7 months prior—due to worsening right foot and ankle pain 1 day after playing soccer. He was thought to have an ankle sprain and was subsequently treated conservatively with splinting, nonsteroidal anti-inflammatory medication and crutches. The patient's pain improved; however, his loss of function remained.

Physical Exam: The patient's physical exam was remarkable for atrophy of the right extensor digitorum brevis muscle, negligible ankle dorsiflexion (0/5), preserved plantar flexion (5/5)/inversion (5/5)/eversion (5/5), negligible extension of the great toe and second through fifth digits, decreased sensation to light touch in the deep peroneal region, weak heel walk and a notable steppage gait.

Differential Diagnosis: Acute Exertional Compartment Syndrome; Chronic Exertional Compartment Syndrome; Vasculitis; Myositis; Entrapment Neuropathy caused by compressive lesion.

Test Results: Right 3 view foot and ankle Xrays—no fractures or subluxation; MRI of right tibia/fibula/calf—diffuse edema of the tibialis anterior and extensor digitorum muscles; EMG/NCS—severe right deep peroneal neuropathy, Repeat EMG/NCS completed -severe complete right deep peroneal neuropathy with suspicion for left anterior compartment injury; neuromuscular U/S: R tibialis anterior fibrosis; Anterior compartment pressure testing at rest: 81 mm Hg and 91 mm Hg; CBC, ESR, CRP, ANA, TSH, CK—normal.

Final Diagnosis: Acute exertional compartment syndrome.

Discussion: Acute exertional compartment syndrome is the least common form of compartment syndrome and is often the most missed. It is best described as a rise in a closed fascial space pressure without a preceding traumatic event, such as a fracture, vascular injury or severe extremity trauma without the presence of a fracture. It is distinguished from the less acutely severe chronic exertional compartment syndrome by the persistent presence of symptoms even after exertion has ceased. It is important for clinicians to maintain a high index of suspicion in recently active patients who develop persistent severe atraumatic lower extremity pain following physical activity that persists after rest.

Outcome: Initial treatment focused on AFO bracing and physical therapy with no improvement in demonstrated weakness. The patient recently underwent a posterior tibial tendon transfer and midfoot release surgery and is currently back in physical therapy to help optimize function of his right foot.

Follow-up: The patient will unlikely be able to play soccer like he used to, but will most certainly have improved function over his previous level function after suffering compartment syndrome.

No Pain and No Gain: Muscle Bulk Imbalance in a Body Builder

Primary Presenter/Author: Scott M. Meester, MD
Diego Riveros, MD, Aaron Monseau, MD, FACEP, Nicholas Chill, MD, FACEP, and Brenden Balcik, MD, FACEP
Affiliation: West Virginia University, Morgantown, West Virginia.

History: A 22-year-old right-handed male presented to the Sports Medicine clinic with concerns of muscle asymmetry of his upper extremities. The patient previously played college football but currently works at a gym and lifts weights daily following a meticulous routine. He noticed that while lifting he is able to sustain muscular contraction of the right upper extremity for a longer period than his left. He has also noted greater muscle bulk of the right shoulder, biceps and triceps when compared to the left. The patient notes that he has had acromioclavicular (AC) joint separations on both shoulders due to football injuries but has healed well from each. He has no other past medical history aside from an appendectomy. The patient is a fraternal twin and was a known triplet, however, one fetus was lost in utero.

Physical Exam: Gross examination showed asymmetry of muscle bulk on the right upper extremity compared to the left but with equal muscle bulk of the lower extremities. Cardiac exam revealed a regular rate and rhythm without rubs, murmurs or gallops. The right radial pulse was 2+ and the left radial pulse was 1+. Dorsalis pedis pulses were 2+ bilaterally. Capillary refill was less than 3 seconds bilaterally. Strength was 5/5 in bilateral upper extremities. Sensation was intact to bilateral upper extremities. The patient's shoulder exam was equal bilaterally and negative for Hawkins, Neer's and Speed's. Measuring the patients mid-humerus showed the right arm to be 4 cm larger in circumference.

Differential Diagnosis: Thoracic Outlet Syndrome; Cervical Radiculopathy with Atrophy; Coarctation of the Aorta; Kommerell's Diverticulum L. SCA Stenosis; Quadrilateral Space Syndrome.

Test Results: Computed tomography angiography (CTA) imaging was obtained and showed a right-sided aortic arch with Kommerell's diverticulum and an aberrant left subclavian artery. Significant stenosis at the origin of the left subclavian artery was also noted. Aortogram was performed with vascular surgery confirming a right sided aortic arch with left aberrant subclavian artery with Kommerell diverticulum and stenosis of the left subclavian artery with multiple collaterals.

Final Diagnosis: Kommerell's Diverticulum with aberrant subclavian artery and stenosis of the left subclavian artery.

Discussion: The prevalence of KD with right aortic arch with aberrant left subclavian artery has been reported to be 0.04% to 0.4%. Of this population, right aortic arch with aberrant left subclavian artery is twice as common in men than in females with females more often presenting with left aortic arch with aberrant right subclavian artery. Most commonly, children will present with breathing difficulties secondary to the development of the trachea and malleable tracheal rings. Early surgical intervention is recommended given the abnormal forces and risk of rupture. Surgical repair involves reconstruction of the aberrant subclavian artery with resection of the diverticulum.

Outcome: The patient underwent further diagnostic imaging and pre-surgical evaluation with vascular surgery. They are currently planning for surgical intervention with either an open or thoracic endovascular aortic repair (TEVAR) approach.

Follow-up: At this time, the patient is being held from exercise while surgical evaluation and eventual repair takes place. Vascular surgery will help guide the patient's return to activity following surgical repair.

Foot Drop in a High School Football Player

Primary Presenter/Author: Abbie Jo Metzler, DO

Affiliation: University of Minnesota, Minneapolis, Minnesota.

History: Seventeen year old male senior high school football middle linebacker and running back who presented to training room, 3 days following injury, for leg pain and foot weakness. During Friday football game athlete developed a burning sensation in his right lateral lower leg after a cutting maneuver. Finished game without difficulty. He noted a helmet hit to the lateral portion of his leg earlier in the game that may have contributed to his symptoms. Athlete was evaluated by ATC following the game. Instructed to follow up in training room on Monday morning for reevaluation. 24 hours after the game he developed weakness and was unable to lift his foot. Intermittent 3/10 pain. Numbness and tingling from mid lateral lower leg to the top of his right foot. Noticed new muscle tightness over his lateral lower leg. Denies any known back trauma or back pain.

Physical Exam: Fit appearing male in NAD. Skin no erythema, ecchymosis or abnormality. No TTP bilateral. Area of firmness along the lateral compartment of the right lower leg. AROM: unable to DF ankle or great toe, eversion 5°, inversion 15°, plantar flexion 45°. PROM: WNL. Strength: 0/5 ankle DF, toe ext. and great toe ext., 1/5 ankle eversion, 5/5 ankle PF, inversion, toe flexion and great toe flexion. Negative Tinel's at the prox. fibula. AROM (lumbar spine) WNL without pain. No midline tenderness. Decreased sensation along right lower leg extending into the dorsum of the foot. 2 + pedal pulses bilaterally. 2 + patellar and achilles reflexes bilaterally. Negative SLR. Steppage gait.

Differential Diagnosis: Peroneal nerve palsy from compression; Peroneal n. traction or laceration injury—trauma; Compartment Syndrome; Tibialis anterior/Extensor digitorum longus injury; Peroneus longus/brevis tendon injury.

Test Results: R tib-fib xrays (AP and lateral): negative. MRI: full-thickness tear of the proximal aspect of the peroneus longus muscle/myotendinous junction with approximately 4.2 cm of distal retraction of the central tendon/myotendinous junction fibers. The visible portion of the common and the superficial and deep peroneal nerves appear intact. Preliminary results of baseline EMG/NCS, 2 weeks post injury, shows markedly reduced nerve conduction through the peroneal nerve. Formal report currently pending.

Final Diagnosis: Full thickness peroneus longus myotendinous tear and peroneal nerve palsy.

Discussion: Foot drop is the inability to activate the dorsiflexors due to peroneal nerve dysfunction. Causes: compressive disorder, trauma, compartment syndrome, iatrogenic and neurological disorders. If transected, nerve reconstruction should occur within 72 hours. For remaining etiologies tx is typically nonsurgical. Surgery considered if no improvement in 3 to 6 months after. Tear to the peroneus longus muscle are typically due to an acute athletic injury or chronic overuse. Mechanism of injury occurs from a rapid forced dorsiflexion of the inverted foot. Tx involves conservative therapy. If patient fails conservative therapy then tendon debridement/repair or tenodesis is considered.

Outcome: Placed in AFO and referred to physical therapy. Therapy modalities will include gait training, electrical stimulation, neuromuscular re-education, manual therapy and therapeutic exercise. Unable to return to football during the 2020 season. Patient is 2 weeks out from injury and has had no significant improvement. Will continue close monitoring and follow up.

Follow-up: Patient was discussed with orthopedic surgery and neurology. No plan for surgery at this time. Repeat EMG at 6 weeks and 3 months. If no significant improvement at the 3 months mark patient will be sent to neurosurgery. Return to activity pending improvement with physical therapy.

Leg Weakness After Heading a Soccer Ball

Primary Presenter/Author: Kaitlin Minnehan, MD

Heather Gillespie, MD

Affiliation: Maine Medical Center, Portland, Maine.

History: A 37-year-old man with a past medical history of a renal transplant (on immunosuppressive therapy), hypertension and hyperlipidemia presented to the outpatient sports medicine clinic with 2 months of intermittent left hip pain and leg weakness. He first felt this sensation after jumping up to head a ball in a soccer game. He landed squarely on both feet and did not feel any pain, popping or giving way. He described suddenly feeling weakness in his leg and trouble walking off the field that lasted several minutes. He denied headache, neck pain or blurry vision at the time. The patient's symptoms improved by the end of the game but returned 2 weeks later while sitting down. He described feeling a muscle spasm starting in his hip and radiating down his leg and up to his shoulder. These symptoms became more frequent and he also developed a right-sided headache.

Physical Exam: Patient was sitting on exam table in no acute distress, alert and oriented x3. Gait was non-antalgic, however he struggled to walk on toes and heels of left foot. Left hip had no swelling or redness and was non tender to

palpation along the greater trochanter, IT band or piriformis. He had full active range of motion of his hip without pain. Strength of left hip flexion, left knee extension and flexion, left ankle extension and flexion all 4+/5, strength of right hip was 5/5 in all planes. Negative log roll, FABER and FADIR. Normal knee exam. Cranial nerves II-XII were intact. Patella and Achilles reflexes 3 + on left and 2 + on right. Sensation was intact to light touch in all 4 extremities.

Differential Diagnosis: Muscle strain and weakness/spasm; Spinal cord mass; Intracranial Mass; Focal seizure; Amyotrophic lateral sclerosis.

Test Results: Xray of left hip showed no acute abnormality. Brain MRI showed a well-circumscribed mixed solid and cystic lesion measuring 2.5 ×2.6 ×2.2 cm with surrounding edema in the right precentral gyrus without midline shift. Brain mass pathology: Monomorphic post-transplant lymphoproliferative disorder; EBV + Diffuse Large B-Cell Lymphoma.

Final Diagnosis: EBV + post-transplant CNS Large B-Cell lymphoma and focal seizures secondary to brain lesion.

Discussion: One week after patient's office visit, he presented to the Emergency Department with worsening left leg weakness at which point he had an emergent brain MRI that showed a right sided brain mass. He was started on dexamethasone and followed by neurosurgery and neuro-oncology. He was safely discharged to continue an outpatient work-up. At his outpatient neurology follow up, it was determined that patient had been having focal seizures of his left lower extremity and he was started on levetiracetam.

Outcome: Patient had a right frontal craniotomy 2 weeks after diagnosis. Pathology of brain mass confirmed diagnosis of EBV + post-transplant CNS Large B-Cell lymphoma. There was no sign of metastatic or systemic disease on further work up. He was treated with 4 doses of weekly Rituximab infusions.

Follow-up: Patient started weekly physical therapy a month after his surgery to strengthen his left leg. He slowly got back to jogging and biking about 6 months after surgery. He noted some mild weakness in his leg but overall was feeling well. He has not yet gotten back to the soccer field.

Post-traumatic Blurry Vision in a Highly Competitive Soccer Player

Primary Presenter/Author: Connor Anthony Mitrovich, DO
Ryan Kelln, DO
Affiliation: Children's Hospital Los Angeles, Los Angeles, California.

History: A 14 year-old, male soccer player presented to the ED complaining of blurry vision and headache after an injury 12 days prior. The patient had collided with another player and experienced a brief headache, blurry vision, but no loss of consciousness. He had been evaluated in the same ED with a benign exam and diagnosed with a concussion. Over the next 2 weeks, he experienced twice-daily headaches over his occiput, extending towards the vertex, associated with photophobia, but no visual disruption. He returned to school with no concentration deficits, but did not return to soccer as he still experienced dizziness with ambulation. His symptoms maintained a mild course until the morning he re-presented to the ED. His blurry vision returned, though now it was specifically localized to the left visual field of his left eye, which progressed to include the left visual field of his right eye.

Physical Exam: He presented with normal vital signs. He was well-appearing, in no acute distress and alert and oriented. His skull was atraumatic without edema or bone step-off. Eye examination revealed blurriness in the left side of his visual fields on both the left and the right with monocular and binocular testing. He had full range of motion, but developed pain at end range of all eye motions. Ophthalmology performed a dilated funduscopic examination, which showed no afferent pupillary defect, papilledema or loss in visual acuity. Red desaturation was not present. The remainder of his neurologic exam was benign.

Differential Diagnosis: Concussion with ocular symptoms; Retinal detachment; Traumatic optic neuropathy; Demyelinating process; Central nervous system tumor.

Test Results: Bedside ultrasound of the orbits was negative for hemorrhage, papilledema or retinal detachment. Brain and orbital MRI revealed patchy enhancement of the left optic nerve just prior to the optic disc, compared to the right optic nerve. There was no mass effect, hemorrhage, hydrocephalus or acute infarction. Cerebral spinal fluid from a lumbar puncture was sent for infectious and demyelinating studies.

Final Diagnosis: Optic Neuritis. Blurry vision and painful ocular movement, combined with optic nerve enhancement on MRI are consistent with this diagnosis. The cause was unknown as CSF studies were pending.

Discussion: Vision assessment is critical to the evaluation of concussion on the sideline and in a clinic setting, but is often neglected. With many concussive symptoms not being specific for concussion, visual defects can herald other neurological disorders and therefore must be recognized. For this patient, his left-sided blurriness and painful extraocular movements warranted further investigation for an alternative diagnosis and subspecialty consultation. It is interesting to consider whether his concussive event might have uncovered or predisposed him to optic neuritis. A relationship between concussions and optic neuritis has not yet been reported in the medical literature.

Outcome: After his diagnosis was made, this patient was given 3 days of high dose intravenous steroids. His blurry vision, pain with ocular movement and headaches markedly improved and he was discharged home on a 4 week steroid taper with close follow-up scheduled with Neurology and his pediatrician that included review of the results from his lumbar puncture.

Follow-up: Three weeks after discharge, he remained asymptomatic. His CSF studies resulted with a seropositive IgM Mycoplasma antibody level of 1640 (negative < 770), leading us to presume that his optic neuritis was due to a mycoplasma infection and he was subsequently cleared to return to play soccer on his 3 different teams.

Ruptured Into Submission: An Uncommon Hand Injury in an Elite Wrestler

Primary Presenter/Author: Mehwish Moinuddin, DO
Paul Herickhoff, MD
Affiliation: Penn State Health, State College, Pennsylvania.

History: An 18 year old right-handed male, who is an elite wrestler, presents to clinic 3 days after a right thumb injury he sustained while wrestling. He attempted an arm drag on his opponent, when his thumb got stuck and then hyperextended. He felt a popping sensation at the time of injury, but continued to wrestle. Later that night, the pain worsened and he started using a velcro thumb spica splint. Past medial history: Recent

grade 1 UCL sprain of the left thumb Past surgical history: Fasciotomy for compartment syndrome of his forearm, meniscus repair.

Physical Exam: Inspection: Mild swelling over thenar eminence Palpation: TTP over medial and lateral aspect of the thumb at the level of the MCP. There is no TTP over the snuffbox or CMC joint. Motion and strength: Unable to flex at the MCP joint due to pain. Referred pain to MCP with resisted extension at the IP joint. Unable to resist distraction of pincer grasp. No appreciable laxity with stressing at MCP. Full ROM and strength of his wrist and appropriate dexterity of his remaining digits. Special test: Unable to perform Finkelstein's due to limited mobility. Neurovascular: Sensation is intact to light touch over radial, median and ulnar distribution. Capillary refill less than 2 seconds. RP 2+.

Differential Diagnosis: Ulnar collateral ligament sprain/tear; Metacarpal or proximal phalanx fracture; Volar plate avulsion; Flexor tendon rupture; Pulley injury.

Test Results: XR right hand: No acute fracture, dislocation or opaque foreign body. Soft tissues are unremarkable. MRI Right Hand (1) High-grade partial/full-thickness equivalent tearing of the insertional fibers of the flexor pollicis brevis deep head with high-grade partial-thickness tearing of the insertional fibers of the superficial head. Moderate reactive edema tracks along the myotendinous junction. (2) Grade 2 sprain of the ulnar collateral ligament. No full-thickness tear or Stener lesion.

Final Diagnosis: (1) Grade 2 UCL sprain (2) High-grade partial/full-thickness tear of flexor pollicis brevis deep head (3) High-grade partial-thickness tear of flexor pollicis brevis superficial head.

Discussion: Flexor pollicis brevis (FPB) is an intrinsic thenar muscle that is responsible for flexion of the thumb at the metacarpophalangeal joint and assists with flexion of the first metacarpal at the CMC joint. It contains a superficial and deep head, both of which insert on the radial side of the base of the proximal phalanx of the thumb. The deep head varies in size and may be absent. There is little information known about the incidence and the best management of tears of FPB. This case is unique, not only because tears of the FPB are rare, but also because the concomitant grade 2 UCL injury, in our research, has not been reported together since it was cited by Dr Stener in 1963.

Outcome: Initially, he was advised to use the thumb spica splint continuously. After the MRI was completed, he was placed in a thumb spica cast. After 10 days in the cast, it was removed and re-examined. At that time, he had been pain free for 5 days with improvement in swelling. He was placed in a soft thumb spica splint and advised to wear this or to be taped when wrestling.

Follow-up: He was able to return to wrestling with the use of a thumb spica splint/taping. He continued to do well, but approximately 2 weeks later sustained a shoulder injury which kept him from further competition at this time.

Acute Shoulder Pain in a Collegiate Baseball Pitcher

Primary Presenter/Author: James P. Moran, DO

Andrew Reisman, MD, Kevin DuPrey, DO, David Webner, MD, and David Baxter, DO

Affiliation: Crozer-Keystone Sports Medicine, Springfield, Pennsylvania.

History: A 20 year old Division I collegiate male baseball pitcher presented to the office 1 day after feeling a pop to his lateral right shoulder while pitching in an intrasquad scrimmage. He noted immediate stabbing pain and was unable to continue pitching. He notes it felt like his shoulder popped out and then popped back into place. He notes swelling to the shoulder and axillary region. He has used ice and Tylenol as needed for pain.

Physical Exam: Right shoulder—no bony abnormalities, edema or ecchymosis; tender to palpation overlying the latissmus dorsi and its insertion along humeral groove/shaft; limited active ROM due to pain; full passive ROM; decreased strength testing due to pain; sensation intact; positive sulcus sign; positive apprehension test; pain noted with resisted adduction.

Differential Diagnosis: Shoulder dislocation/subluxation; Labral injury/tear; Rotator cuff injury/tear; Latissimus dorsi tear; Humerus fracture.

Test Results: Musculoskeletal ultrasound on day of presentation showed normal appearing rotator cuff without clear evidence of tear/rupture; X-ray right shoulder showed bony changes to humeral shaft near latissimus dorsi insertion; MRI showed avulsion of latissimus dorsi tendon near humerus with retraction, complex cyst within humeral head, no labral or rotator cuff pathology.

Final Diagnosis: Right latissimus dorsi tear.

Discussion: Latissimus dorsi (LD) and teres major (TM) injuries are uncommon but can affect overhead athletes, particularly baseball pitchers. They are often misdiagnosed leading to issues with return to sport. The LD and TM function to extend, adduct and internally rotate the humerus. They play a role in the late cocking, acceleration and deceleration phases of the pitching cycle. Depending on extent of injury, they can be treated non-operatively or operatively. However, studies reporting outcomes are limited. Limited data has shown strains/partial-thickness tears can be treated non-operatively, while full-thickness tears, particularly those with > 2 cm of retraction, should be treated surgically.

Outcome: After consultation with team orthopedic surgeon, decision was made to proceed with surgical intervention. The surgery was performed 11 days after initial injury. The latissimus dorsi was found to be partially attached to the humeral insertion with a free limb adhered to the teres major. This was tacked back down by the surgeon without bone anchors.

Follow-up: The patient was seen 4 days post op and allowed to begin pendulum exercises and passive elbow ROM. Ten days post op, he began rehabilitation with ATC with flexion and abduction no $> 90°$. At 6 weeks, he started full ROM activities and active strengthening. He started throwing progression at 3 months with mound progression at 6.5 months. At 8 months, he was cleared to return to full activity.

Acute Heartburn on the Tennis Court

Primary Presenter/Author: Landon Mueller, MD

Christian Glaser, DO, and Korin Hudson, MD

Affiliation: MedStar/Georgetown Sports Medicine, Washington, District of Columbia.

History: A female adult, who was otherwise healthy, developed symptoms of "heartburn" while playing in a tournament match. She requested to be seen by medical personnel during a change over for heart-burn symptoms and sensation that she "could not get enough air" with inspiration.

She did not have any significant prior medical history. She was not on oral contraceptives, but she did fly for 10 hours prior to the tournament. She did not think her symptoms were limiting her effort or athletic performance. She was given antacid medication and finished her match. She was evaluated again after the match and reported that the heart burn sensation had improved, but she still felt dyspneic. The athlete appeared stable at this time and was discharged with close follow-up. However, later that night she developed increasing dyspnea and was directed to the emergency room for further evaluation.

Physical Exam: Examination after the match at the medical tent: Vital signs: Afebrile, BP 110/74, HR 80, RR of 14 and pulse ox 99% without supplemental oxygen. Cardiac auscultation: regular rate & rhythm with no murmurs/rubs/gallops. Distal extremity perfusion was intact. Pulmonary exam: no respiratory distress, patient able to speak in full sentences, no wheezes, crackles or rales were auscultated.

Differential Diagnosis: Pulmonary embolism; Spontaneous pneumothorax; Spontaneous pneumomediastinum; Gastro-esophageal reflux; Cardiac arrhythmia.

Test Results: Testing performed at the emergency room: ECG demonstrated normal sinus rhythm with no ectopy or ischemic changes. Chest x-ray was performed with no significant abnormalities. CT angiography of the chest was performed to evaluate for pulmonary embolism. There was no evidence of embolism, but the CT did show free air in the pneumomediastinum. There was no evidence of pneumothorax or pulmonary embolism.

Final Diagnosis: Spontaneous exertional pneumomediastinum.

Discussion: Pneumomediastinum is free air that has infiltrated the mediastinum through the lungs, trachea or esophagus. The classic mechanism is forceful vomiting (ie Boerhaave syndrome), but any increase in intrathoracic pressure is a risk factor. Patients are usually young and healthy. The most common symptoms are retrosternal chest pain and dyspnea and subcutaneous emphysema the most common physical exam finding. While complications such as infection are possible, most cases are self-limiting and only require close outpatient follow-up. Exertional spontaneous pneumomediastinum has been described in athletes from several sports including basketball and soccer, with no long-term sequela.

Outcome: In the emergency room she was diagnosed with spontaneous exertional pneumomediastinum. She was deemed stable and discharged to follow-up with pulmonology as an outpatient.

Follow-up: Pulmonology evaluated her and who recommended she did not fly for 4 weeks. This prevented her from participating in tournaments that required extensive travel. A repeat CT scan demonstrated resolution of the pneumomediastinum and she was cleared to return to play with no long-term sequela.

Football Practice Took the Strength Right Out of Me

Primary Presenter/Author: Chenai S. Nettey, MD

Daniel Murphy, MD, FAAFP, Colby Genrich, MD, Justin Wright, MD, FAAFP, and Gerardo Vazquez, MD

Affiliation: Texas Tech Univeristy Health Sciences Center, El Paso, Texas.

History: A 19 year-old American-Samoan division I college football offensive lineman presented to the athletic training room with poor balance and left arm weakness. These symptoms presented shortly after practice and was initially thought by his trainers that the player was exhausted from practice. Over the next 24 hours, his symptoms worsened prompting evaluation by the team physician. The athlete reported left arm and leg weakness, poor coordination of the upper extremity and feeling drowsy. He described his drowsiness as feeling "slow" and having difficulty concentrating. His mother reported mood swings since the onset of symptoms. The athlete's medical history was significant for an ACL repair 10 months prior followed by repeat surgery for the same tear 7 months later. Family medical history was unremarkable.

Physical Exam: Alert and Oriented to person, place and time Pupils equal, round and reactive Lungs clear to auscultation Heart regular rate and rhythm without murmurs Saccades intact Vestibulo-ocular motor reflex intact Left facial droop No lingual deviation Short term memory 3/3 word recall Concentration intact with serial 7 s and reverse alphabet Romberg positive Tandem gait: difficulty with eyes open, worse eyes closed Strength: left upper extremity 4/5 with poor coordination, right side: 5/5 with appropriate coordination Dysdiadochokinesia left upper extremity Hyperreflexia with left biceps and patellar tendon reflex Sensation intact upper and lower extremities No swelling or pain of the extremities.

Differential Diagnosis: Stroke; Concussion; Multiple Sclerosis; Complex Migraine; Conversion Disorder.

Test Results: BP: 106/78|Pulse: 64|O_2 sat:96% room air, Ht: 74in, Wt: 273Lbs|Hypercoagulable workup negative| EKG:Sinus Bradycardia Early repolarization|CTA head and neck: Negative for large vessel occlusion, normal circle of willis, no stenosis or aneurysm|MRI brain w/wo contrast: Acute right lacunar infarct|Echocardiogram: Mild LVH, EF 55% to 60%, mildly increased ventricular septum thickness, right atrium mildly dilated, mildly thickened tri-leaflet aortic valve, Mild Aortic and mitral valve regurgitation.

Final Diagnosis: Acute right lacunar infarct of unknown etiology. No associated risk factors including malignancy, lipid disorder, hyper-coagulability, hemoglobinopathy or family history.

Discussion: Ischemic infarcts, once thought rare in those aged less than 40, comprise 15% of ischemic strokes each year. Research focuses on events occurring in the older population, as a result, identifying a stroke in an adolescent or young adult is often delayed. Once identified, at least 30% of strokes are labeled as "unknown etiology." This unfortunately leads to difficulty in the management and prevention of future strokes. Caution must be implemented when returning to full physical activity.

Outcome: Over the course of 2 weeks, the athlete's stroke symptoms worsened prompting his readmission to the hospital. Imaging did not identify progression of the infarct or cause for the infarct. Neurology continued the aspirin and atorvastatin was discontinued due to unremarkable lipids. He was discharged home with physical and occupational therapy. Follow up with neurology was scheduled for 1 month.

Follow-up: Prior to the start of the football season, neurology cleared the athlete and gave the option to discontinue aspirin. Evaluation by the sports medicine team identified a sequela of symptoms still persisting from the infarct. Full discussion with the athlete was completed, giving him full precautions and possible consequences. The athlete further discussed with his family and elected not to return.

Atraumatic Left-Sided Chest Pain on the Slopes

Primary Presenter/Author: Laika M. Nur, MD
Amy Leu, DO
Affiliation: UC San Diego, San Diego, California.

History: Twenty-six year old left-handed male with chronic dermatitis presenting for 3 weeks left shoulder pain and superior left chest wall swelling without acute injury. He first noticed it while on a ski trip with his family a couple weeks ago. He was doing pull ups to increase endurance and had gradual onset of shoulder pain. Difficult to describe exact location. Shoulder pain is worse with abduction. Denies radicular symptoms and weakness. Feels chest wall swelling is increasing in size and becoming tender to palpation. Denies bruising or specific trauma. Reports taking several falls while skiing but cannot pinpoint a specific injury. He was seen at an out of state Urgent Care for these complaints 3 weeks ago and was told his chest and shoulder X-rays were normal. He was told to RICE which he feels has helped a little. He denies shortness of breath, leg swelling, pleuritic chest pain and fevers.

Physical Exam: Vitals: 129/86 Pulse: 91 BMI: 24 Temp: 98.2 F. No cervical lymphadenopathy INSPECTION: fullness at L superior sternum, around the second rib articulation with TTP. No piano key noted. No crepitus. L shoulder: full AROM, pain with end ROM with abduction STRENGTH TESTING: Left: 5/5 deltoid, supraspinatous, triceps, biceps, internal and external rotators. Pain with resisted IR NEUROVASCULAR: sensation to light touch intact in the C4-C8 distribution, 2 + radial pulses bilaterally SPECIAL TESTS: Mild + Impingement signs (Neer's/Hawkins) Neg Drop arm test, Neg Crossover test, Neg Crank test, Neg Speeds/ Yergason's, Neg Obrien's.

Differential Diagnosis: Pectoralis Major Injury; Stress Injury; Costoclavicular Ligament Injury; Malignancy; Osteomyelitis.

Test Results: MRI Sternoclavicular Joint: Enhancing soft tissue/fluid arising from first costochondral junction/ chondromanubrial junction extending to the left aspect of the manubrium and the first rib cartilage associated with osteolysis of the manubrium. Enhancement also involves left pectoralis major and left sternocleidomastoid muscles and inferior aspect of the left sternoclavicular joint. Concern for infectious or inflammatory process. Biopsy Results: chronic inflammation with fibrosis. CRP: 1.38 ANC 7.9.

Final Diagnosis: SAPHO (synovitis, acne, pustulosis, hyperostosis, osteitis) Syndrome.

Discussion: SAPHO Syndrome is a rare inflammatory disorder of bone, joints and skin. Prevalence estimates are 1 in 10 000 and pathogenesis is not well understood. Bone and joint manifestations are the hallmark and occur regardless of active dermatologic findings. Synovitis is most frequently a non-erosive inflammatory arthritis. Osteitis is commonly seen in the cortex or medullary cavity. Hyperostosis with boney overgrowth is a late disease manifestation. Any joint can be involved but anterior chest wall involvement is seen in 65% to 90% of cases with the sternoclavicular and sternocostal joints typically effected. Skin findings include severe acne and neutrophilic dermatosis most commonly.

Outcome: The patient was seen by Orthopedic Oncology, Infectious Disease and CT Surgery. He underwent bone biopsy to rule out osteomyelitis and malignancy. Biopsy pathology was benign. It demonstrated inflammation but was inconsistent with osteomyelitis. Cultures grew P. Acnes which was thought to be a contaminant by Ortho Oncology and ID, but has been noted in other case reports of SAPHO Syndrome.

Follow-up: He is being followed clinically and his symptoms have improved with NSAIDs. He has not had any additional interventions or treatments. He does not have an activity restrictions.

An Emergent Sports High Energy Wrist Trauma

Primary Presenter/Author: Raymond Scott O'Bryan, DO
Gregory Seelhoefer, MD
Affiliation: Houston Methodist Hospital, Houston, Texas.

History: A 17 year-old male presented to an outpatient sports medicine clinic with complaints of left dorsal lateral wrist pain. He is a left-handed dominant, cornerback for a local high school football team. The injury occurred after a collision with an opponent football player and fall on an outstretched hand during the previous night's game. He immediately experienced pain to his wrist with a popping sensation during his fall. His range-of-motion was significantly limited. He was assessed at the sideline and placed in a removable splint. He was restricted from further play. During the night, he experienced swelling and ecchymosis to his dorsal wrist and numbness and tingling of his hand and fingers in a median nerve distribution. For pain relief he took ibuprofen and frequently applied ice to help reduce swelling.

Physical Exam: Left Hand Exam Inspection: Moderate swelling and ecchymosis circumferentially around the wrist. No erythema or scars noted. Pulses intact. Subjective numbness noted in a median nerve distribution, but otherwise, the hand is neurovascularly intact. Exam limited due to pain. Palpation: Tenderness in the dorsal area, snuff box and distal radial area. Range of Motion: Unable to form a fist due to pain. Minimal movement in wrist extension, flexion, radial deviation, ulnar deviation and supination. Muscle Strength: Difficult to assess due to pain but gross motor function is intact.

Differential Diagnosis: Sprained Wrist; Closed distal radial fracture; Closed second metacarpal base fracture; Closed scaphoid fracture; Closed perilunate dislocation.

Test Results: An X-ray of the left hand in the PA, PA angled, Lateral and Oblique views showed a perilunate dislocation and suspicion for a scaphoid fracture. In the PA view, Gilula's first and second Arcs are disturbed. The entire scaphoid could not easily be seen but suspicious rough edges, shadowing and bone fragments are noted. In the lateral view there is a spilled teacup sign demonstrating a volarly dislocated lunate.

Final Diagnosis: Closed perilunate dislocation (Mayfield classification stage III) and closed proximal pole scaphoid fracture.

Discussion: A perilunate dislocation is an uncommon injury. It occurs after a high energy trauma that forcefully hyperextends the wrist with ulnar deviation and intercarpal supination. Treatment is emergent surgical correction. The diagnosis is missed at initial evaluation 14% to 25% of the time, especially among inexperienced physicians. Delay in surgical correction can lead to complications at surgery, poor functional outcomes, mid-carpal arthritis, recurrent dislocations, median-nerve damage and avascular necrosis of the lunate. Return of full function is generally not expected; however, early intervention typically have the best outcomes. Common sequelae include decreased grip strength and stiffness.

Outcome: The patient was initially placed in a short arm splint and was immediately seen by a hand surgeon who performed an ORIF on the same day of clinic arrival. The procedure was tolerated well with good alignment of the carpal bones using K-wires to fix the lunate to the triquetrum, sutures to repair the scaphoid lunate ligament and a screw to repair the proximal pole of the scaphoid in place.

Follow-up: After the procedure, the patient was placed in a post-op splint. At follow-up sutures were removed, he demonstrated full ROM of his thumb but with some dorsal discomfort with movement. He had good pronation and supination of his hand and was found to be neurovascularly intact. X-rays showed good alignment of hardware, scaphoid fracture and carpal bones.

Semi-pro Soccer Struggle

Primary Presenter/Author: Jordan Orr, MD
Adam Lewno, DO
Affiliation: University of Michigan, Ann Arbor, Michigan.

History: A 19-year-old female semi-pro soccer player presenting with a 3 years history of progressive exertional leg pain with bilateral paresthesias along her plantar foot which spread to encompass her whole foot and radiate along her calf. Her paresthesias develop 20 minutes into her soccer warm-up. If she attempts to continue, her left side paresthesias advance to the posterior buttock region. When she stops her warm-up, her symptoms rapidly improve. She denies any symptoms while weight training or biking. She denies skin or temperature changes, weakness, ankle swelling or trauma. She reports initially having similar symptoms in high school where she underwent a prolonged stretching and gluteal strengthening program with some improvement. However, a similar program with her athletic trainer has not had any beneficial effect. She denies relief from ibuprofen or orthotics.

Physical Exam: General: No acute distress, well developed. Neuromuscular: Full AROM of hips, knees and ankles. 5/5 strength in bilateral lower extremities sensation grossly intact at L2 to S2. Gait: without visible abnormality or antalgic gait. Lower limb: No swelling, erythema or ecchymosis. Neutral hind foot with mild flexible pes planus. No tenderness to palpation of foot, distal leg or ankle structures. Popliteal space without palpable cyst or mass occupying lesion. Slight decrease in dorsalis pedis pulse during dorsiflexion (DF) in neutral compared to knee extension. Otherwise, no change in dorsalis pedis or posterior tibial pulses during DF or plantarflexion when preformed in full knee flexion.

Differential Diagnosis: Chronic Exertional Compartment Syndrome; Popliteal Artery Entrapment Syndrome; Tibial Nerve Entrapment; Peripheral Neuropathy; Iliac Artery Endofibrosis.

Test Results: Bedside ultrasound revealed bilateral popliteal artery compression with isometric dynamic maneuvers. Exertional ABI showed moderate PVOD bilaterally post-exercise. MR angiogram without and with contrast was without evidence of popliteal entrapment. Diagnostic angiogram showed widely patent common femoral, profunda femoris and popliteal arteries bilaterally. With active dorsiflexion, there was complete cessation of flow of the left popliteal artery and severe narrowing on the right.

Final Diagnosis: Left popliteal artery entrapment syndrome.

Discussion: Popliteal artery entrapment syndrome (PAES) has 2 types: functional and anatomical. PAES differs from chronic exertional compartment syndrome (CECS) in that pain from PAES resolves immediately after stopping exercise. Walking is often more painful than running in PAES due to prolonged gastrocnemius contraction as compared to running. According to the Popliteal Vascular Entrapment Forum classification for PAES, there are 7 types based on the anatomy of the popliteal artery, medial gastrocnemius, popliteus and fibrous bands, as well as functional entrapment. Point of care ultrasound can be used to help distinguish between CECS and PAES.

Outcome: She proceeded with left popliteal artery entrapment release with vascular surgery. Postoperative angiogram showed resolution of previously noted occlusion with resisted plantarflexion.

Follow-up: One-month post-op, she noted slight left calf pain after prolonged walking, but to a much lesser extent than prior to surgery. She continued her physical therapy home exercise program and gradually increased her walking. She was released 2.5 months post-op to return to play soccer without restrictions. She will consider having the right popliteal artery entrapment released in the future.

Elevated Troponins in a Cross-Country Athlete Diagnosed With COVID-19

Primary Presenter/Author: Patrick Ouzts, MD
Ian McKeag, MD, and Irfan Asif, MD
Affiliation: University of Alabama at Birmingham, Sports Medicine Fellowship, Birmingham, Alabama.

History: Eighteen-year-old female presented for a preparticipation physical for UAB CC and T&F on 8/18/2020.12 days prior she tested positive for COVID-19 via PCR testing. Had short-lived symptoms but had been asymptomatic for a few days before presenting for her physical. She did report having symptoms with exercise, mainly being unable to finish workouts. She denied any persistent chest pain, dyspnea, fatigue or syncope. Reduced stamina was her main symptom. At that visit she had a normal EKG and physical exam, however labs did show elevated Troponin. She was not cleared for physical activity and was referred to the Cardiologist.

Physical Exam: VITALS: BP: 112/69, Temp: 99.4F, Pulse: 75, BMI 22.8, SpO2: 99% GENERAL: Well-appearing, in no acute distress HEENT: NCAT, PERRLA CARDIAC: RRR with no murmur PULMONARY: lungs clear to auscultation bilaterally ABDOMEN: soft, non-tender MSK: balance, strength, reflexes and sensation normal throughout.

Differential Diagnosis: COVID-19 infection; Myocarditis; Stress Cardiomyopathy; Strenuous Exercise; SIRS (Cytokine Storm).

Test Results: COVID-19 (SARS CoV-2) PCR: Positive 8/6/2020 COVID-19 (SARS CoV-2) PCR: Negative 8/25/2020 Troponin-1: 24 (H) 8/17/2020 Troponin-1: 75 (H) 8/19/2020 Troponin-1: 17 (H) 8/25/2020 EKG: NSR ECHO x 2: WNL as per Cardiology EXERCISE STRESS TEST: WNL as per Cardiology BUN/Cr: 18/0.8 (WNL) 8/19/2020 GFR: (WNL) 8/19/2020 CRP: < 1.00 (WNL) 8/19/2020

Final Diagnosis: COVID-19 infection with positive troponin and negative cardiac work-up with no clear etiology for the troponin elevation.

Discussion: The effects of COVID-19 infection continue to be researched and studied. One of the concerns with

post-infection sequelae is cardiac injury, whether acute or chronic and it is especially relevant in young athletes. Current protocols for athletes include frequent testing and cardiac follow-up with troponin testing and echocardiograms for athletes that have positive antibodies. Troponin elevation during or after COVID-19 infection has been noted in patients and while the exact etiology is unclear, the ramifications of myocardial injury that is typically indicated by elevated troponin makes appropriate research and follow-up studies appropriate, especially in young athletes.

Outcome: Patient was referred to Cardiology and not cleared for physical activity after her initial pre-participation physical. She had a normal ECHO and exercise stress test with Cardiology. Her Troponin increased on follow-up and then trended down. After her follow-up on 9/3/2020 she was cleared by UAB team physician and cardiologist to return to training.

Follow-up: Patient returned to full participation in the UAB cross-country Fall season. She plans to run Track & Field as scheduled this Spring. If further symptoms were to develop a Cardiac MRI would be the next step in the cardiology work-up. She will be seen by the UAB team physician for a follow-up appointment at the end of the year.

A Surprise Ending to Exercise

Primary Presenter/Author: Franklin Terry Perkins III, MD, MBA
Jason Deck, MD
Affiliation: OU Primary Care Sports Medicine Fellowship, Tulsa, Oklahoma.

History: Twenty-one-year-old male soccer player presents concerned about having an episode of ejaculation during exercise. Patient states that the incident occurred during a team weight lifting session. Patient states that the team had been focusing on upper body and abdominal exercises. Patient states that he was doing sets of abdominal crunches followed by chin-ups and during his chin-up he had an expulsion of semen/ejaculatory fluid. Patient states that the incident occurred with a flaccid penis and no arousal. Patient denies any previous episodes. Patient denies any fever, changes in weight, heat or cold intolerances, dysuria, hematuria, discharge, foul odor or recent sexual intercourse. Patient also denies any new foods, medications, stressors or previous history of sexual disorders or dysfunction.

Physical Exam: General: No acute distress. Awake and conversant Eyes: Normal conjunctiva, anicteric, Round symmetric pupils ENT: Hearing grossly intact. No nasal discharge Neck: Neck is Supple. No masses or thyromegaly Respiratory: CTA B/L, non-labored without wheeze or rhonchi Skin: Warm. No rashes or ulcers, normal hair distribution Psych: Alert and oriented. Cooperative, appropriate mood and affect, Normal judgement. CV: RRR with no m/r/g appreciated, no lower extremity edema Chest: no signs of gynecomastia GU: Testes descended B/L without masses, no hernias noted. Normal external appearance. MSK: Normal ambulation. No clubbing or cyanosis Neuro: Sensation and CN II-XII grossly intact.

Differential Diagnosis: Exercise Induced Ejaculation; STD; Prostatitis; Urethritis; Medication Side Effect.

Test Results: None.

Final Diagnosis: Exercise Induced Ejaculation.

Discussion: Ejaculation is the forcible emission of semen from the urethral meatus that typically occurs during arousal and erection; however, this athlete had neither. Both men and women can experience orgasms during exercise or coregasm. In one survey, ~2000 men were asked about experiencing a coregasm, with only 6% admitting having experienced one. The mechanism is unknown but there are speculations. Most coregasms are reported during strenuous exercise when the lower abdominal muscles become exhausted, leading to potential conscious or subconscious squeezing of the muscles surrounding the prostate gland, the pubococcygeus, which squeezes the prostate and therefore expel semen or ejaculatory fluid.

Outcome: The athlete was reassured that this incident, although uncommon, can occur and that no further testing was necessary at the time. The athlete has not any any other occurrences.

Follow-up: Athlete rested for the rest of the day and resumed activity the following day with no further issues. Athlete has yet to have any other occurrence.

Why Does My Calf Hurt, Says the Tennis Player

Primary Presenter/Author: Thomas L. Pommering, DO
Affiliation: Nationwide Children's Hosp, Div of Sports Med, The Ohio State Univ College of Med, Columbus, Ohio.

History: A 15 y/o tennis player presents with a year of evolving exertional right leg pain. It started in her foot and medial arch. One month prior or presentation, the pain now involved her calf and was accompanied by pallor and coolness in her foot. Her symptoms predictably occurred with running or tennis but could also now appear with minimal exertion such as walking or by lying in the wrong position. Rest would resolve her symptoms within minutes to an hour. No lower extremity swelling, numbness, weakness or cyanosis. No LBP. Environmental temperature had no effect on her symptoms. Her contralateral lower extremity nor upper extremities were involved. No PMHx or FMHx of aneurysm, hypercoagulability, SLE, Raynaud's or other autoimmune disease. Her medications included Vitamin B12 and a multivitamin. No medication allergies nor surgeries.

Physical Exam: Gen—well, no distress. Gait—no limping. BLE—NTTP over bones and soft tissues. Homan's sign negative. FROM of hip, knee ankles. No swelling, redness or rash at rest. Functional LE exam—toe/heel walking caused pallor and coolness in her R foot and ankle. Posterior tibial artery pulses were diminished with minimal exertion compared to at rest. Within 10 minutes of rest her symptoms resolved and posterior tibial artery pulses were equal to the unaffected side. (A picture of her affected pallorous foot will be provided). Back—FROM without pain nor provocation of LE symptoms. No radiculopathy. Skin—warm and dry at rest without bruising. Neuro—motor-sensory exam was normal.

Differential Diagnosis: Popliteal Artery Entrapment Syndrome; Popliteal Artery Aneurysm; Raynaud's Disease or Phenomena; Buerger's Disease; Chronic Exertional Compartment Syndrome (CECS).

Test Results: R Tib-Fib Films—Normal. R Foot Films—Normal. ABIs—RLE 0.71 LLE 1.15. MR Angiogram of RLE using PAE Protocol—R popliteal artery entrapment between the medial femoral condyle and the medial head of the gastrocnemius causing an abrupt obliteration of contrast beginning just above the femoral condyles and extending 4 cm distal which was independent of foot position.

Final Diagnosis: Right Popliteal Artery Entrapment (PAES).

Discussion: PAES is a rare cause of exertional leg pain though some experts would suggest that it is underdiagnosed. The overlap of symptoms for PAES and CECS is significant often leading to a delayed diagnosis. The diagnosis may be suggested with loss of pulses during active plantar flexion or passive dorsiflexion, ABIs and Duplex US scan. Rarely, do patients present with such dramatic vascular occlusive symptoms with minimal exertion as this patient did. Entrapment is usually from anatomic variants of the gastrocnemius though it can be functional. Diagnosis is confirmed with MR or CT angiography or what is considered the gold standard, LE arteriography. Surgery is the definitive treatment.

Outcome: She was referred to Vascular Surgery who obtained an arteriogram confirming popliteal artery entrapment just above the knee. She subsequently had a right popliteal artery release and distal superficial femoral to below-knee popliteal artery bypass using a reversed saphenous vein graft. Her ABI's normalized, she had no complications and was allowed to return to sport.

Follow-up: There are no evidence-based guidelines for return to play since this is a relatively rare condition in athletes. This patient returned to tennis 2 months post-operatively and will be followed for a year with ABIs and Duplex scans every 6 months. Outcomes for athletes based on case reports are generally good. Resolution of symptoms has been reported in 70% to 100% of patients.

A Peculiar Case of Chronic Ankle and Wrist Pain in a 7 Year-Old Youth Football Player

Primary Presenter/Author: Elizabeth Brodsky Portin, DO

Affiliation: Baylor College of Medicine, Houston, Texas.

History: A 7 y/o male youth football player was referred to the pediatric sports medicine clinic for gradually worsening right wrist, hand and foot discomfort. The patient's mother first appreciated that his wrist looked off about 10-months prior to the clinic visit, but he did not have pain at that time. However, about 2-months prior to evaluation, the wrist became more swollen and he started favoring the left hand. He also developed right hand and wrist weakness and pain resulting in inability to hold a pencil or write. His right foot also started hurting about 2-months prior to the visit with occasional gait changes and the pain was localized to the midfoot and across the top of his foot, especially when wearing shoes. Medical history revealed a recent diagnosis of psoriasis after seeing a dermatologist for a worsening rash previously thought to be eczema.

Physical Exam: Vitals within normal limits. Well appearing, well nourished, cooperative, no acute distress. No focal neurological deficits and reflexes 2 + throughout. Moderate swelling over the dorsal aspect of the right hand and over the radial aspect of the right wrist with mild to moderate thenar muscle wasting, bilateral fingernail pitting and tenderness over the right distal radius, distal volar forearm, base of the right thumb and thenar eminence. The right wrist had reduced active pronation and supination as well as decreased strength with flexion, extension, pronation, supination and grip. Ankle and foot exam demonstrated pain to the right tarsal-metatarsal joint with motion and toenail pitting.

Differential Diagnosis: Juvenile Idiopathic Arthritis (JIA); Dermatomyositis; Carpal tarsal osteolysis; Lyme disease; Reactive arthritis.

Test Results: Right hand and forearm x-rays showed soft tissue swelling about the hand and wrist with demineralized appearing bones. Normal right foot x-ray. Right wrist MRI with contrast showed chronic multicompartmental inflammatory arthritis as well as extensor and flexor tensynovitis. Right foot MRI with contrast revealed supraphysiologic tibiotalar and subtalar joint effusions. Labs were signigicant for WBC 3.77, ESR 14, CRP < 0.5, LDH 549, COVID-19 PCR negative and HLA-B27 positive.

Final Diagnosis: Juvenile idiopathic arthritis, psoriatic subtype.

Discussion: The patient's presentation was consistent with a rheumatological process. He was referred to Pediatric Rheumatology & was diagnosed with psoriatic JIA. JIA is a clinical diagnosis, but labs can help guide treatment & predict outcome. Patients with rheumatologic diseases are often first seen by sports medicine physicians due joint pain and swelling, & sports physicians should know how to initiate evaluation & treatment of these diseases. Initial work-up should include CBC, ESR, CRP, x-ray and often MRI. HLA-B27 should be included if there is concern for spondyloarthropathy, psoriasis and/or IBD as it can predict clinical course. ANA & RF are nonspecific and should not be routinely obtained.

Outcome: The patient started methotrexate and adalimumab, a biologic agent, due to the extensive inflammatory arthritis in his right wrist. He has responded well to the medication without any complications and he is expected to do relatively well with good suppression of his arthritis. While some children outgrow JIA, he will likely have psoriatic arthritis as an adult given his HLA-B27 positive status.

Follow-up: The patient's JIA will not prevent him from playing any sports and sports are actually strongly encouraged to help kids feel normal. The patient was diagnosed during the COVID-19 pandemic and due to his immunocompromised status given his medication regimen, he should refrain from high exposure risk sports including football. Pediatric Rheumatology will continue to follow him.

A Rare Atraumatic Cause of Vague Buttock Pain in a High School Football Player

Primary Presenter/Author: Nivin Porwal, DO

John Morasso, DO, and Jose Bouffard, MD

Affiliation: Detroit Medical Center, Detroit, Michigan.

History: A 16-year-old male football player with a history of left gluteal tendinitis was seen in clinic with insidious onset left buttock pain that started 2 months prior. The pain was over his left buttock, non-radiating, sharp in nature and a 4/10 on the VAS. It worsened with exercise, up to a 5/10. It improved with rest, down to a 0/10. He could not remember an inciting injury. He plays offensive and defensive tackle and had not missed any time from football. Due to COVID-19, his team was not able to participate in their typical strength and conditioning program. By the middle of practice, he would gain a slight limp, but would continue playing anyway. No numbness or tingling in his legs. No bowel/bladder incontinence. He takes Naproxen 500 mg BID for his pain, which helps minimally. He completed 4 weeks of physical therapy for gluteal tendinitis, which did not improve his pain.

Physical Exam: Vitals: HR 95, BP 134/64. General: Alert, oriented, no acute distress. Head: Normocephalic, atraumatic. Cardio/Pulmonary: No respiratory distress, audible wheezing, cyanosis or edema. Psychiatric: Appropriate affect and mood. Left Hip Exam: Inspection—No swelling, ecchymosis or deformity. Palpation—Mildly tender greater trochanter and SI joint, non-tender ASIS/AIIS. Active ROM—Flexion to 100, Extension to 0, Abduction to 60, Adduction to 20, Internal rotation to 30, external rotation to 45. Strength—5/5 hip flexion, hip extension and hip adduction. 4/5 hip abduction (5/5 on R). Neurovascular—2 + DP and PT pulses. Sensation—L3-S2 intact to light touch. Gait—non-antalgic.

Differential Diagnosis: Left gluteal tendinopathy; Left sacroiliitis; Piriformis Syndrome; Femoral-acetabular Impingement; Greater trochanteric apophysitis.

Test Results: Hip and Pelvis xrays in office—No acute fracture/dislocation. The sacrum is obscured by overlying bowel content. No soft tissue swelling. MRI Hip—Mild marrow edema involving the left ilium at the level of the SI joint with a trace amount of fluid in the posterior aspect of the left SI joint may represent mild sacroiliitis. CT Pelvis—Asymmetric widening and articular surface irregularity involving left SI joint, may be secondary to an overuse injury. Inflammatory sacroiliitis also possible.

Final Diagnosis: After reviewing the CT Pelvis with our head diagnostic musculoskeletal radiologist: Left medial iliac wing plus zone 1 sacral ala stress reaction/avulsion fracture.

Discussion: The patient was shut down from football and other athletic activity for nonoperative management of his sacral fracture. At his follow up, he remembered that he had been doing power cleans to condition for football at the onset of his symptoms and kept training through the pain even when it developed. In the young adult population, sacral fractures are most common after high energy trauma, such as motor vehicle accidents or a fall from height. Power cleans, though an explosive lift, do not generally cause the amount of force thought of required to cause a sacral fracture. This is a rare example of a repeated lower energy force causing a sacral fracture in a young man.

Outcome: At first follow up, the patient had improved to the point of having well controlled pain at rest, however he was still attempting to run and push through his pain, aggravating his injury and causing pain. After a lengthy discussion he agreed to truly rest and left with crutches for partial weight-bearing for ambulation.

Follow-up: The patient used crutches for progressive weight-bearing until pain-free ambulation. He then did physical therapy to strengthen hip extensors, abductors and external rotators. We expect the sacrum to heal 8 to 12 weeks from the start of treatment. He is following a progressive return-to-play protocol and we will follow up with the patient every 6 to 8 weeks as he improves.

Transient Neck Pain and Weakness in Adolescent Male

Primary Presenter/Author: Millicent A Schratz, DO
Mathew Saffarian, DO
Affiliation: Michigan State University, East Lansing, Michigan.

History: A 13-year-old male presented with a 5-year history of transient neck pain and upper extremity weakness, initially starting in first grade with gradual neck locking up. There was no history of injury or trauma. Over the past few years, when the neck pain is severe, he experiences headaches without associated nausea, vomiting, photophobia or phonophobia. Over the last few months, he's noticed transient upper extremity weakness and paresthesias, occurring most often in the morning upon waking. He denies paralysis, bowel or bladder incontinence or saddle anesthesia. He enjoys baseball and football, neither of which exacerbated his symptoms. After evaluation by Neurology and Neurosurgery, participation in these activities was discouraged. These activity restrictions have resulted in symptoms of adjustment and anger. During the time of evaluation, he denied paresthesias or weakness.

Physical Exam: Comfortable appearing male, with a height of 67 inches, weighing 135Lbs and a BMI of 21.1. Full strength appreciated with shoulder abduction, elbow flexion and extension, wrist extension and hand intrinsics. Bilateral upper extremity reflexes were 2/4 with biceps, triceps and brachioradialis. No clonus appreciated in the bilateral ankles. Babinski reflex were downgoing bilaterally and Hoffman's sign was negative bilaterally. Full active and passive range of motion noted with neck motion. Mild tenderness to palpation over the bilateral cervical paraspinal musculature noted and cervical facet loading positive bilaterally. Spurling sign was negative bilaterally.

Differential Diagnosis: Myofascial pain; Congenital cervical spondylosis; Cervical dystonia; Os odontoideum; Fracture and non-union of the odontoid process.

Test Results: Cervical XR: Normal evaluation without injury, congenital or developmental anomaly. CT C Spine: Non-union of the dens with the C2 body, stable compared to prior exam, which may be old injury or unfused os odontoideum, without central canal stenosis. Patent neural foramina and soft tissues within normal limits. MRI C spine: Os odontoideum versus ununited type II odontoid fracture with some hypertrophic change with anterior effacement of subarachnoid space with 9 mm central canal stenosis, normal cord.

Final Diagnosis: Os odontoideum.

Discussion: (1) Evaluated by Neurosurgery with no surgical intervention recommended. (2) Previous studies have documented participation in athletics can positively impact social acceptance, behavior and self-confidence. As a result, an extensive discussion of risk stratification of sports and activity ensued between provider, patient and his mother. Previous providers recommended no impact sports including baseball and football, rough-housing or jumping on trampoline, all contributing to significant adjustment disorder.

Outcome: Educated patient/mother about risks of specific activities including trampoline stunts and football, which should be avoided. Extensive discussion of risk stratification in sports and what sports are appropriate/safe for patient. Provided emotional support for symptoms of adjustment.

Follow-up: Recommended return to baseball with knowledge of risks, benefits and education of how to obey cervical spine precautions during sport participation. Scheduled to follow up in 2 months.

Unexplained Unilateral Leg Pain and Loss of Power in an Elite Male Cyclist

Primary Presenter/Author: Aaron Smathers, MD, MS
Massimo Testa, MD, Brian Coleman, MD, and Jim Barrett, MD
Affiliation: Department of Family and Preventive Medicine University of Oklahoma, Oklahoma City, Oklahoma.

History: Patient is a 38-year-old healthy elite male road cyclist who presented with left sided leg pain and loss of power during training and racing sessions. Patient reported cramping and pain of the upper thigh with mild to moderate paresthesia at near maximal efforts with loss of power demonstrated on his power meter with recovery with rest or reducing effort. Symptoms had been progressing to more frequently with rides over the past several months. No history of trauma or medical history to explain loss of power. Previous workup included hip and lumbar Xrays, MRI's with inconclusive results.

Physical Exam: General: No acute distress, alert and oriented X 4 CV: RRR, no rubs, murmurs or gallops Lung: CTAB bilaterally Abdomen: soft, non-tender, non-distended, +bowel sounds Extremities: Normal inspection of upper and lower legs with well-defined musculature bilaterally, no evidence of swelling, warmth, erythema. Normal femoral, DP pulses, normal sensation, strength 5/5 in all plains, normal ROM with IR/ER, hip flexion and extension. Capillary refill < 2 seconds.

Differential Diagnosis: External Iliac Artery Endofibrosis; Femoral Acetabular Impingement; Compartment Syndrome; Hip Flexor/Extensor strain; Deep Vein Thrombosis.

Test Results: Vitals: BP 128/76, HR 55 bpm ABI Supine Normal 1.0 at rest ABI Positive left leg after 10 to 15 minutes of near lactate threshold effort with demonstrated loss of power in watts measured on indoor cycling ergometer. Ultrasound with demonstrated arterial narrowing on doppler study.

Final Diagnosis: External Iliac Artery Endofibrosis (EIAE).

Discussion: EIAE is an uncommon injury with common presenting symptoms. Three historical questions may indicate EIAE: Is pain present during exercise with resolution of symptoms within 5 minutes of ceasing exercise; do you have thigh pain or cramping; do you have leg weakness? Symptoms are usually unilateral. The physical exam is unremarkable with normal pulses in all 4 extremities at rest. The presence of a femoral bruit with hip flexed in the affected leg is highly indicative of EIAE. Post-exercise ABI pressure index between leg is a necessary diagnostic test to confirm or exclude EIAE. Ultrasound is a useful, non-invasive tool that can be utilized to demonstrate arterial narrowing.

Outcome: Bike fit adjustment with a more forward seating position and elevation of the handle bars to open the hip angle. Ultrasound with demonstrated arterial narrowing on doppler study. Surgical referral for evaluation of endarterectomy.

Follow-up: Full return to elite cycling.

Upper Extremity Pain and Digital Pallor in a Collegiate Volleyball Athlete

Primary Presenter/Author: Calan Sowa, MD
Christina Gutta, MD, Franklin Sease, MD, and Vicki Nelson, MD
Affiliation: Prisma Health, Greenville, South Carolina; Steadman Hawkins Clinic of the Carolinas.

History: A 21-year-old right-handed men's collegiate volleyball player was evaluated for complaints of right upper extremity discoloration with paresthesia and pain. He reported that for approximately 2 weeks prior to initial evaluation, he had noted pallor in the third and fourth digits of his right hand with some associated numbness. Symptoms were exacerbated by participation in sport, particularly with overhead motion, resulting in right upper extremity pain, hand cramping and progression of digital pallor. These symptoms were insidious in onset. He had not experienced recent trauma and denied upper extremity injury or prior surgery. He did not endorse upper extremity or hand-grip weakness, fevers, chills, headache, dizziness/lightheadedness, palpitations, chest pain or shortness of breath. He had no personal or family history of hematologic disorders.

Physical Exam: General: Alert and oriented x 3, NAD. Cardiac: RRR, no murmur, no rub. Vascular: Radial pulses 2+ bilaterally, however decreased R radial pulse with elevation of the right upper extremity. Allen's test normal bilaterally. Pulmonary: Normal effort, CTAB without wheeze or rhonchi. Neuro: Cranial nerves II-XII intact, neuro exam nonfocal, bilateral UE strength 5/5 and sensation intact and equal bilaterally. Skin: Pallor and splinter hemorrhages of the right 3rd and 4th digits.

Differential Diagnosis: Thoracic Outlet Syndrome; Deep Vein Thrombosis; Arterial Thrombosis; Exertional Compartment Syndrome; Hypothenar Hammer Syndrome.

Test Results: RUE Ultrasound: Filling defect of the right ulnar artery. Waveforms and pressures in the right 3rd-5th digits dampened. Mild arterial compression with thoracic outlet maneuvers. RUE Angiography: Subclavian artery normal. Evidence of clot in the median and distal ulnar arteries. Arterial disease in the 2nd-5th digits. TTE: Normal. 30-day Event Monitor: Normal. Factor V Leiden: Heterozygous carrier. Antithrombin, Protein C/S: Normal. ANA, Lupus anticoagulant: Negative.

Final Diagnosis: Right upper extremity arterial thrombosis.

Discussion: Factor V Leiden is a genetic disorder characterized by a poor anticoagulant response to activated Protein C and an increased risk for venous thromboembolism. It is a well-documented cause of DVT and is postulated to be a risk factor for arterial thrombosis. Around one in 1000 people annually will develop an abnormal blood clot, however heterozygous carriers of the factor V Leiden mutation carry an increased risk (approximately 3-8 in 1000 people annually). This patient was found to be a carrier of Factor V Leiden and had evidence of thoracic outlet compression on upper extremity ultrasound as well, likely resulting in a synergistic effect, increasing his risk to even greater levels.

Outcome: During angiography, tPA was administered. He was started on oral anticoagulation (Xarelto 20 mg) after cardiac workup was normal. Thrombosis was thought to be secondary to heterozygous Factor V Leiden state in combination with compressive physiology in the thoracic outlet. Vascular medicine did not recommend decompressive surgery and anticoagulation was discontinued after a period of 6 months.

Follow-up: Return to play progression began shortly after diagnosis and initiation of anticoagulation. He was counseled regarding the risk of recurrent thrombus and of the low bleeding risk associated with participation in volleyball while anticoagulated. Anticoagulation was discontinued after 6

months and he remains on Aspirin 81 mg indefinitely without recurrence of thrombosis or upper extremity symptoms.

Adult-Onset Gait Abnormality Precipitated by Activity-Related Fatigue

Primary Presenter/Author: Derek Stokes, MD
Adele Meron, MD
Affiliation: University of Colorado School of Medicine, Aurora, Colorado.

History: Forty year old female runner with a 3 years history of persistent left lower extremity weakness, numbness and gait abnormality despite confirmed resolution of left peroneal neuropathy on EMG/NCS within the same interval. Reports indicate symptom onset as the day progresses and with extended walking, running or elliptical activity consisting of non-specific left lower extremity weakness, lateral foot numbness and a combination of tightness and tingling at the lateral aspect of the calf adjacent to the fibular head. The patient is aware that her gait becomes abnormal and is accompanied by the sensation of instability. She reports strategies to temporarily maintain proper mechanics including intentional heel-toe gait or altering cadence; but with fatigue, she transitions to a plantar flexed, forefoot contact posture with difficulty dorsiflexing and making heel contact with the ground.

Physical Exam: Pre-exercise: Full strength in all major lower extremity muscles bilaterally. Deep tendon reflexes (DTRs) within normal limits. No sensory deficits. Gait evaluation significant for decreased left foot clearance in swing phase, left foot scuffing and slapping, and slight left knee flexion throughout the gait cycle. Post exercise: Full strength in all major lower extremity muscles bilaterally. DTRs within normal limits. No sensory deficits. Increased left plantar flexor tone. Gait evaluation significant for left foot slapping with immediate progression from left heel strike to heel rise with increased forefoot contact time and prominent knee flexion throughout stance phase.

Differential Diagnosis: Runner's Dystonia; Exertional Compartment Syndrome; Peroneal Nerve Neuropathy; Lumbar Plexopathy; Chronic Demyelinating Disease (MS, CIDP).

Test Results: Plain film radiographs in 12/2017—left hip, lumbar spine and left knee were unremarkable. Advanced imaging—MRI lumbar spine in 12/2017, left knee in 8/2018 and lumbar plexus in 10/2018 significant for increased signal of the left peroneal nerve at the fibular head correlating to EMG/NCS in 8/2018 significant for left peroneal nerve conduction abnormality at the level of the knee. EMG/NCS in 1/2019 within normal limits. Exertional compartment pressure testing in 10/2020 within normal limits.

Final Diagnosis: Focal, task-specific, lower limb dystonia also known as Runner's Dystonia.

Discussion: Runner's dystonia is a rare form of adult-onset, focal dystonia occurring mostly in long distance runners and often initially misdiagnosed resulting in delayed management. The case described above is concerning for an exertional, task specific gait abnormality. Overall diagnostic workup was largely unremarkable or resolved with repeat testing. Elicitation of symptoms during clinical evaluation was also elusive. However, more recent precipitation of symptoms upon fatigue during compartment pressure testing resulted in increased left plantar flexor tone and identified concerns for focal dystonia, causing a toe walking pattern in the left lower extremity consistent with runner's dystonia.

Outcome: The patient will undergo botulinum toxin injections of the left lower extremity including the tibialis posterior, gastrocnemius and soleus muscles with the goal to reduce fatigue induced tone (or focal, task specific dystonia) in order to facilitate return to physical activity.

Follow-up: The full extent and level of return to activity is to be determined pending the response to botulinum toxin injections and follow-up gait evaluation. However, with a definitive diagnosis identified and plan of care established, the patient and care team together remain optimistic regarding return to full functional status and physical activity in the near future.

Anterior Right Shoulder Pain in a Pitcher

Primary Presenter/Author: Nicholas Tsitsilianos, MD
Kathryne Bartolo, MD, and Christopher Visco, MD
Affiliation: Columbia-Cornell Department Rehabilitation and Regenerative Medicine, New York, New York.

History: A 16-year-old male pitcher presents with right arm pain while pitching that began 4 weeks prior to his initial visit. He had noticed progressive difficulty with generating force while pitching and an overall decrease in his throwing speed as the innings progressed during games. Prior to being seen, he had rested for 2 weeks and was feeling slightly better. His pain was located anteriorly on the right shoulder and was associated with numbness and tingling in the right thumb and second digit. He rated the pain as a 1/10 in the office but indicated it can reach as high as a 7/10 with throwing, laying on his right side and stretching the arm in full extension. He described his arm as heavy, "like a loose noodle," with numbness as described previously. The patient noted that he had mild upper respiratory infection symptoms at 1 point during the summer prior to initial visit in September.

Physical Exam: Appeared well, in no acute distress. Focused upper extremity (UE) exam revealed: atrophy on the right pec major clavicular head. Right scapular dyskinesia. Tenderness to palpation on the right coracoid process and none in the subacromial space, biceps tendon long head, AC joint or periscapular muscles. Full and painless bilateral range of motion with no instability or crepitus noted. Special testing was + for a median neural tension test. Normal sensation to light touch in bilateral upper extremities. On the right: 5/5 strength in shoulder abduction, elbow and wrist extension, finger flexion and finger abduction. 4/5 strength in shoulder external and internal rotation and elbow flexion.

Differential Diagnosis: Hirayama's Disease; Parsonage-Turner Syndrome; Rotator Cuff Injury; C5/C6 Radiculopathy; Transverse Myelitis.

Test Results: MRI cervical spine: Mild wasting of the spinal cord at C5 and C6, dorsal indentation of the cord, with the dorsal and right lateral margins of the dura non-adherent to the subjacent right lamina extending from C4-5 to C6-7. Mild broad-based cervical spine dextrokyphosis and prominent flow voids (likely epidural congestion) within the right lateral aspect of C6-7 to C7-T1, associated with a markedly tortuous right vertebral artery.

Final Diagnosis: Early Onset Proximal Type Hirayama's Disease.

Discussion: Hirayama's Disease is a rare cervical myelopathy that typically affects young men in the second or third

decade of life, causing weakness and atrophy, often distally and unilaterally, in the forearm and hand. An even more rare subtype with proximal weakness has been described. On MRI, there is cord compression by an expansion of the posterior extradural space, worsened by neck flexion, possibly caused by vascular congestion in the epidural space. An upper cervical kyphosis may also contribute to this cervical myelopathy. Our patient's proximal weakness and MRI findings are suggestive of this proximal type Hirayama's disease and adds to the 6 documented cases available in current literature.

Outcome: After a course of physical therapy focusing on gentle strengthening of weak proximal right upper extremity muscles and a home exercise program, he noted slight improvement in his elbow flexion weakness. However, he then developed weakness in the right abductor digiti minimi and the fourth and fifth flexor digitorum superficialis.

Follow-up: After discussion with the patient, he had decided to defer playing baseball due to concern for worsening symptoms. Surgical evaluation was discussed, however, he is not interested in pursuing surgery at this time. We recommended that he continue physical therapy and use a soft cervical collar to remind him to avoid cervical flexion, since it may exacerbate his symptoms and progression of disease.

A Lacrosse Goalie With a Lax Left Limb

Primary Presenter/Author: Kristofer N. Tupper, DO
Allison Schafer, DO
Affiliation: UCONN Primary Care Sports Medicine Fellowship, Farmington, Connecticut.

History: A right hand dominant 20-year-old college women's lacrosse goalie presented with left shoulder discomfort of 4 months duration. She complained of decreased shoulder mobility with overhead motions and intermittent numbness in the third-fifth digits of her left hand. Pain is located deep within the shoulder. Numbness is reliably reproduced with abduction above shoulder height. No previous trauma or instability. Denies viral illness or tick bite prior to onset. She was exercising over the summer without issues. Her complaints have not significantly impacted her sport. She has no symptoms affecting her right upper limb or either lower limb. She is able to do push-ups and planks without difficulty. She is receiving physical therapy, as well as cupping and dry needling. No family history of neurologic disease.

Physical Exam: Orofacial symmetry with full neck motion. Upper extremity sensation intact to all stimuli with normal grip and 2 + reflexes. Normal limb perfusion. Positive Tinel's of left elbow. Left shoulder asymmetry with atrophy, drooping and weak shrug. Scapular winging at rest, more pronounced with scaption but not wall pushups. Painful active motion limited to 90° flexion and 70° abduction. Passive motion full and non-painful. Reduced strength of supraspinatus 3.5/5, infraspinatus 4.5/5 and trapezius 4/5. Sternocleidomastoid strength 5/5. Unimpaired throw with left arm. No impingement on Neer's or Hawkin's. Negative O'brien's and Speed's. No instability on load & shift or clunk test.

Differential Diagnosis: Parsonage Turner syndrome; Rotator cuff tear; Scapular dyskinesia; Brachial plexus injury; Spinal accessory nerve injury.

Test Results: Normal x-ray of left shoulder. MRI demonstrated thinning of the distal insertional trapezius muscle on the scapular spine without focal fatty infiltration or intramuscular edema. Rotator cuff and labrum were intact. Acromioclavicular and glenohumeral joints were normal. Electromyography (EMG) revealed focal weakness of the left spinal accessory nerve without significant axonal involvement, suggestive of a possible compressive lesion.

Final Diagnosis: Primary diagnosis of left spinal accessory nerve palsy of moderate severity. Unrelated secondary diagnosis of ulnar neuropathy of left hand.

Discussion: The spinal accessory nerve (SAN) or cranial nerve (CN) XI, exits the skull and descends along the neck and shoulder girdle to provide motor branches to the sternocleidomastoid (SCM) and trapezius muscles before returning to converge with C2 and/or C3 at the occiput. Its superficial course makes it vulnerable to direct injury. Weakness and atrophy may result from Wallerian degeneration following axonal injury. While some motor neuron diseases may affect the SAN, it is most commonly injured iatrogenically, followed by blunt or penetrating trauma. Similarly, traction injuries of brachial plexus or cervical spine may lead to palsy. However, the atraumatic nature of this case is unusual.

Outcome: She is experiencing left trapezius atrophy and weakness due to a spinal accessory nerve palsy. This is suspected to be the result of a compressive lesion from tight-fitting sports bra. There did not appear to be significant axonal involvement or fatty replacement of muscle. We opted for continued conservative management. No further workup was explored.

Follow-up: She was able to continue playing lacrosse and training at her usual level of intensity without restriction. She was advised to wear snug but looser fitting athletic clothing on her upper body. She was encouraged to work on improving shoulder strength and motion with regular therapy. Close follow-up with sports medicine to monitor her progression and neurology follow-up as needed.

Atypical Shoulder Pain

Primary Presenter/Author: Philippus J. van Niekerk, DO
Brandan Mayer-Blackwell, MD
Affiliation: Kaiser Permanente, San Diego, California.

History: An active 28-year-old woman presents to clinic for shoulder pain. The pain is of atraumatic onset and has been present for 3 weeks. She had been doing some yardwork recently but not significantly more than normal. No other changes in activity were noted. The patient did report a recent flu shot. The pain was over the lateral shoulder and diffuse. Her pain was severe with activity and a dull ache at rest. It was worse with any arm activity and lifting anything. The pain seemed to be worse at night but not specifically due to lying on her arm. She felt some weakness in the arm and was unsure if it was due to pain. She denied weakness in her hand. There was no numbness, tingling or burning in the arm. Neck movement did not recreate pain in her shoulder. Family History: Mother with Guillain-Barre.

Physical Exam: Normal vital signs. Inspection of her shoulder is normal with no skin changes. Her shoulder range of motion is limited to 145 degrees of active flexion but with full passive motion. Her external rotation is limited to 45° active motion but with full passive motion. Internal rotation range of motion is intact. 4/5 strength with shoulder flexion and external rotation. 5/5 strength with internal rotation. Hawkins positive, empty can positive, cross arm adduction

negative, Speed test negative, O'Brien test negative. No shoulder laxity noted and negative apprehension test.

Differential Diagnosis: Suprascapular Nerve Compression; Rotator Cuff Tear; Parsonage Turner Syndrome; Subacromial Bursitis; Deltoid Strain.

Test Results: Xray normal. MRI and EMG consistent with parsonage turner syndrome and mild tendinosis of rotator cuff.

Final Diagnosis: Parsonage Turner Syndrome.

Discussion: Parsonage Turner Syndrome is a type of brachial plexus neuritis. It is often precipitated by a virus or trauma. It starts with a painful phase and progresses to a weakness phase. The suprascapular, long thoracic and axillary nerve are commonly involved. Atrophy of the innervated muscles is common and helpful in confirming the diagnosis. EMG showing fibrillation and positive sharp waves can help confirm the diagnosis as well. MRI can demonstrate atrophy of the affected muscles with abnormal signal. Treatment often consists of steroids if given during the painful phase. Physical therapy is commonly utilized during the weakness phase. Approximately 75% of patients have a complete recovery.

Outcome: After receiving steroids, the patient had rapid improvement in her pain. She started physical therapy and had a very slow improvement in her range of motion and strength.

Follow-up: The patient was eventually cleared for return to sport and she was instructed to follow up for any residual symptoms.

Walk Until Your Foot Drops

Primary Presenter/Author: Kendall Vogel, DO

Affiliation: Fort Belvoir Community Hospital, Fort Belvoir, Virginia/NCC Primary Care Sports Medicine Fellowship.

History: A previously healthy 37-year-old male presents with progressively worsening left anterior leg pain after an unaccustomed exercise. The day prior, he performed the United States Air Force 2-km speed-walk test. He was initially evaluated 3 hours after completing the test in the emergency room for bilateral anterior lower leg pain, which improved with acetaminophen and 1 L of intravenous normal saline. Twenty-four hours later, he presents with increasing left anterior lower leg pain, described as 7 to 8/10 with ambulation and at rest, left ankle swelling and weakness with left ankle dorsiflexion. He denies paresthesias of the lower extremity. Opioid medications did not relieve his pain. There was no specific mechanism of injury or trauma. The patient denied a history of exertional leg pain.

Physical Exam: INSP:Antalgic gait, swelling of the left ankle. No skin color changes. PALP:Severe pain of left anterior lower leg. No temperature changes. ROM:Ankle plantarflexion, dorsiflexion, eversion and inversion normal. Pain with passive plantarflexion of the left ankle. STR:4/5 muscle strength (MS) with pain in dorsiflexion and eversion of the left ankle; 5/5 MS with plantarflexion and inversion. NV:2 + Achilles' reflex, capillary refill normal, palpable dorsalis pedis and posterior tibial pulses. Normal sensation to light touch over tibial and superficial/deep peroneal nerves. Over several hours, the anterior compartment became palpably tense and the patient had decreasing dorsiflexion strength.

Differential Diagnosis: Acute Compartment Syndrome; Rhabdomyolysis; Deep Vein Thrombosis; Tibial Stress Fracture; Muscle strain.

Test Results: Creatinine: 1.23 mg/dL Creatine Kinase: 19074 U/L AST: 426 U/L ALT: 129 U/l Bilirubin: 2.37 mg/dL Serum Myoglobin: 1111 ng/mL Urinalysis: 2+ Hgb; 2 RBCs/HPF Left tib/fib x-ray: no acute osseous abnormalities Left lower leg anterior compartment pressure: 199 mmHg

Final Diagnosis: Rhabdomyolysis induced Acute Exertional Compartment Syndrome (AECS).

Discussion: AECS is a rare condition, with less than 50 documented cases. In a literature review, this is the only case that resulted from low impact activity in a patient without suspected Chronic Exertional Compartment Syndrome. The highest incidence is in the anterior compartment of the lower leg. The most common symptom is pain, usually out of proportion to stimuli, with progressive neurologic symptoms and pulselessness. A long term neurologic deficit can develop if treatment is delayed and occurs more frequently in cases of AECS compared to traumatic cases. It is a clinical diagnosis, but intra-compartment pressure testing can support clinical findings. Treatment is emergent fasciotomy.

Outcome: The patient was admitted initially under the diagnosis of rhabdomyolysis. After the progression of his neurologic symptoms and compartment pressure testing, he underwent fasciotomy and had a partial return of dorsiflexion following surgery. He was aggressively rehydrated with IV crystalloids for his rhabdomyolysis. His CK decreased to 4968 U/L and he was discharged after a 4-day hospital stay.

Follow-up: The patient has 4-/5 muscle strength with ankle dorsiflexion after formal physical therapy. He underwent a revision fasciotomy due to persistent pain with activity, which provided no additional relief. He continues to have left anterior lower leg pain with minimal exertion. He is restricted to light military duty and has an exemption from military physical fitness testing.

A Complicated Recovery in an Athlete With COVID

Primary Presenter/Author: Lauren Wichman, MD

Marie Schaefer, MD, and Tamanna Singh, MD

Affiliation: Cleveland Clinic, Lakewood, Ohio.

History: A 19 yo female NCAA Division I volleyball player developed cough, fatigue and body aches on 8/13/20. Significant past medical history included inducible laryngeal obstruction, moderate persistent asthma and supraventricular tachycardia (SVT) s/p ablation in 2017. She was diagnosed with COVID on 8/18/20. After isolating for more than 10 days and remaining afebrile for more than 24 hours, she was deemed to be at acceptable risk to proceed with class and non-athletic activities on 8/24/20. She was referred to a sports cardiologist for formal cardiovascular assessment prior to starting graded return to exercise. At the cardiology visit on 9/4/20, she endorsed new onset palpitations and elevated heart rates (HR) discordant with her perceived level of exertion. When standing for too long, she felt short of breath, fatigued and the need to sit down. She reported adequate hydration.

Physical Exam: At home, she reported HR increase from 90 at rest to 140 with standing and 190 with walking upstairs. Orthostatic Vitals: Supine BP 115/68 HR 55; Seated BP 127/70 HR 73; Standing BP 113/76 HR 97. General: Well appearing, in no acute distress. Neck: No jugular venous distention, no carotid bruits, carotids have a normal upstroke, no palpable thyromegaly. Lungs: Clear to auscultation bilaterally, no wheezing or rhonchi. Heart: Regular rhythm, PMI not displaced, S1, S2 normal, no S3, no S4, no heaves, no

rub and no murmur. Extremities: No peripheral edema. Grade 2/4 distal pulses bilaterally.

Differential Diagnosis: Recurrent Supraventricular Tachycardia (SVT); Acute Viral Myocarditis; Postural Orthostatic Tachycardia Syndrome (POTS); Vasovagal syncope; Pulmonary embolism/thromboembolic disease.

Test Results: Labs: Troponin normal; ESR 8; CRP 0.1. EKG: sinus tachycardia with standing. Echo: Dilated left ventricle EF 62%. Normal function, no valvular abnormalities. Tilt Table: accentuated postural tachycardia from 59 to 120 bpm at 3 minutes of 70-degree tilt with stable BP with near loss of consciousness. Cardiac MRI: Mildly dilated L and R ventricles, normal systolic function. No infiltrative process, inflammation or injury. Consistent with athlete's heart. Heart monitor: No recurrence of SVT.

Final Diagnosis: Post-COVID Postural Orthostatic Tachycardia Syndrome (POTS).

Discussion: POTS is a form of orthostatic intolerance characterized by increased heart rate upon standing without hypotension. Clinical symptoms are non-specific—lightheadedness, weakness and fatigue with minimal activity. Diagnostic testing includes head up tilt-testing showing HR increases of more than 30 bpm over baseline or to more than 120 bpm total. Infection is a well-known trigger of POTS and was even observed after the 2002 SARS epidemic. Known neurologic manifestations of COVID include anosmia/ageusia, headaches, encephalopathy and even acute cerebrovascular disease. However, only one case of post-COVID POTS has been published to date and this is the first known case in an athlete.

Outcome: Supportive measures like compression socks, 5 grams dietary sodium and 2 L daily fluid intake were recommended as well as cardiac rehabilitation. Her resting HR remained elevated, so ivabradine was started to lower resting HR. Ideally, this would allow for greater exertional tolerance and less dysregulation. Without success, ivabradine was replaced with midodrine and pyridostigmine.

Follow-up: Per exercise physiology, patient may see improvement in 6 to 10 months, but her return to sport timeline is indefinite. Prior to returning to sport, she will require invasive cardiopulmonary exercise testing to assess her hemodynamics, A–a gradient, lactate with exercise, oxygen consumption and oximetry. Patient is regularly followed by sports cardiology, exercise physiology and sports medicine.

Pop Goes the Shoulder

Primary Presenter/Author: Stephanie Wilding, MD
Teri McCambridge, MD
Affiliation: Johns Hopkins Hospital, Baltimore, Maryland.

History: A 12-year-old male with history of mild hemophilia A presented in clinic as a 2 weeks follow up after presentation to the ED for left shoulder pain. Injury occurred while swinging a baseball bat left-handed. At the time of injury, he heard a pop in the posterior aspect of his left shoulder. Initially he had minimal, intermittent pain, but pain acutely worsened over the week prior to presentation with inability to lift his arm. He reported pain in his shoulder, scapula, ribs and upper arm. He also had ecchymoses that went across his nipple and wrapped around his scapula. He denied swelling, weakness, numbness, tingling or burning. It would also wake him up at night if he rolled onto his shoulder. X-ray of the left shoulder in the ED showed no acute fracture, subluxation or dislocation. He had normal labs including normal factor level and normal white blood cell count with differential.

Physical Exam: Moderate distress with tachypnea and pallor. Shoulder and rib cage with no ecchymoses, asymmetry, swelling or scapular winging. No pain on compression of rib cage. Pain with forward flexion and extension of neck and diffuse muscular tenderness. With shoulder flexion, he flexes to 90° and then experiences pain and drops his arms. He has pain with abduction past 90°. Full strength wrist extension, flexion, finger adduction, abduction, elbow flexion. Discomfort with triceps extension, but can maintain 5/5 strength. No radicular symptoms, intact sensation to light touch. No warmth, redness or swelling around shoulder. Deferred deltoid testing due to patient discomfort.

Differential Diagnosis: Shoulder subluxation/dislocation; Rhomboid muscle strain; Rib fracture or labral tear; Abscess; Hemophilia-related bleeding.

Test Results: MRI of left scapula showed subtle bone marrow edema of inferior tip of scapula, which may be related to mild stress reaction or bone bruise. MRI also showed enlarged left axillary and subpectoral adenopathy with axillary nodes measuring at 4.3 × 3.0 × 7.9 cm. Lyme antibody titer positive. T spot TB, Bartonella antibody panel and urine histoplama antigen negative. ESR and CRP normal. MRI 2 months later with demonstration of left lymphadenopathy measuring 4.5 × 1.5 × 7.8 cm.

Final Diagnosis: Lyme adenitis.

Discussion: This case presents a unique diagnosis underlying a common sports injury complaint. Left shoulder pain after a strong rotational force, such as swinging a baseball bat, in conjunction with hearing a pop and inability to fully abduct the arm is concerning for several etiologies including shoulder subluxation, muscle injury, rib fracture or labral tear. MRI is the imaging modality of choice to rule out these types of injuries. The lymphadenopathy seen on this patient's imaging was unexpected, but significant and very likely the etiology of his pain. It should also be considered, however, that the pop and shoulder pain could have been a red herring for an underlying problem.

Outcome: In the setting of positive Lyme antibody titers and with the degree of lymphadenopathy, the patient received 3 weeks of treatment with doxycycline. His left arm and shoulder pain improved and he was able to return to full activities. He later reported fatigue to a provider, but has not complained of fevers, night sweats or palpable lymphadenopathy. His shoulder pain has not returned.

Follow-up: Over the span of several weeks and after treatment with antibiotics, his pain significantly improved and he was able to return to full activity and to sport with no restrictions. He is planned to have a follow up CT scan and a repeat MRI in a few months to continue to follow the lymphadenopathy.

Syncope on the Stairmaster

Primary Presenter/Author: Nadia Naushin Zaman, DO
Carolina Gonzalez Lopez, MD, Bulat Gibadullin, and Amie Kim, MD
Affiliation: Icahn School of Medicine at Mount Sinai, New York, New York.

History: Forty-seven-year-old active female presented to the ED after syncope on the Stairmaster. 15 minutes into exercise, she experienced gradual onset bilateral neck pain and nausea. Bystanders reported she appeared to be "foaming at the mouth"

and voided urine. Her next memory was "waking up on the ground," and she remembered subsequent EMS arrival. On evaluation, patient endorsed neck pain as her most bothersome complaint, non-radiating and with associated nausea. She denied headache, photo- or phonosensitivity, speech changes, paresthesia or paresis. She confirmed a similar episode of generalized neck pain during a long-distance run. She was evaluated at an urgent care and discharged with a clinical diagnosis of cervical nerve impingement. She denied past medical and surgical history and family history of neurologic or vascular disorders. She endorsed recreational synthetic marijuana and alcohol.

Physical Exam: Vitals WNL. Patient was in a rigid cervical spine collar. Trauma: Secondary exam was without findings. She complained of pain secondary to the collar and cervical spine was clinically cleared by Nexus criteria. Neck had no ecchymosis or soft tissue swelling. Mild TTP diffusely to bilateral posterior neck. ROM was limited in flexion and extension due to pain. Lateral bend intact with some pain. C4-T1 nerve roots were 5/5 and painless. Motor strength and sensation to light touch were intact in all 4 extremities. Pulses intact. Neuro: Cranial nerves II-XII were grossly intact. No visual neglect. No upper or lower motor signs, no cerebellar signs noted.

Differential Diagnosis: Seizure—cerebrovascular; seizure—dehydration; syncope—carotid sinus; syncope—cardiogenic arrhythmia; syncope—orthostasis.

Test Results: CT head: diffuse subarachnoid hemorrhage bilaterally, more prominent in the left hemicranium. CT angiography head/neck: Ruptured 0.4 x 0.7 cm bilobed aneurysm arising from the anterior communicating artery. 0.2 cm right posterior communicating artery aneurysm CT angiography chest/abdomen: no findings BMP: metabolic acidemia Creatinine (0.48 mg/DL) Low CO2 (18.3 mmol/L) Low Glucose 129 mg/dL High Troponin (0.059ng/mL): High PTT and INR: WNL EKG: NSR @63. III TWI.

Final Diagnosis: Subarachnoid hemorrhage (SAH).

Discussion: Exercise-associated collapse, in young, healthy athletes should trigger suspicion of organic etiology. EAC can be due to cardiovascular or cerebrovascular etiology. Because patient's initial presenting symptom included axial neck pain without headache or neurologic deficits, cerebrovascular etiology was missed in urgent care until imaging was done in ED. SAH during or post-exercise is very rare, but more often seen in younger population and with milder presentation. Return-to-play can be difficult, as physical activity may increase risk of recurrent SAH due to increased blood pressure. Medical history of cardiac, neurologic, rheumatologic and social history risk factors should be considered.

Outcome: Patient underwent cerebral angiogram with coil embolization of left Acomm aneurysm. She was discharged to Neurology and Neurosurgery follow up. Eight months post-procedure, she underwent right pterional craniotomy and prophylactic PCOMM clipping. Ten months post-procedure, she suffered first-time status epilepticus after exercise. She was intubated and CT head revealed frontal subdural hematoma.

Follow-up: Post-SAH and post procedural patients are at risk for epilepsy. This is heightened by a theoretical risk during exercise, while limited by a known impairment in post procedural fitness. Our patient is managed with valproic acid and severe activity restriction and is eager to return to cardiovascular activity. Exercise prescription must be tailored by a risk evaluation and risk mitigation.

Pull Up Pop

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History: We present a 15-year-old male, right hand dominant baseball player, who presented with 1 week of left shoulder pain that started while performing pull ups. While lowering himself down, he felt a pop in the front of his shoulder which was associated with immediate anterior shoulder pain. His pain had improved significantly at time of presentation, but he experienced continued limitation with forward flexion of his shoulder. Of note, he endorsed starting a work up for a possible connective tissue disorder due to a family and personal history of hypermobility and skin hyper-plasticity.

Physical Exam: Inspection: Slight swelling in anterior inferior shoulder, Palpation: TTP along coracoid, LHB tender. Non-tender acromion, clavicle, delto-pectoral junction and pectoralis tendon. ROM: Flexion- 180 deg, abduction 170 deg, External rotation- 70 deg, Internal rotation- 70 deg. Strength: 5/5 abduction, internal and external rotation, 5-/5 Shoulder flexion, 5/5 Straight arm adduction. + Speeds, + Biceps Load, —O'Briens, —Drop Arm, —Empty Can, -Popeye sign Beighton score: 4/9 (MCP >90 bilaterally and thumb opposition bilaterally).

Differential Diagnosis: Proximal biceps strain/rupture; Subscapularis rupture; Pec Major Strain/rupture; Pec Minor Strain/rupture; Labral Tear.

Test Results: XR Shoulder: Normal bony structures. Normal left shoulder without findings to explain pain. MR Left Shoulder: Coracoid tendons: There is a complete rupture of the origin of the coracobrachialis tendon from the coracoid process with approximately 11 mm distal tendinous retraction. The fibers of the short head biceps tendon origin appear intact more laterally on the coracoid process. Rotator Cuff, Long Head of Biceps intact. No labral pathology.

Final Diagnosis: Isolated Proximal Coracobrachialis Rupture.

Discussion: Coracobrachialis (CB) ruptures are extremely rare. When ruptures do occur, they are usually the result from a traumatic injury and present with concomitant ruptures of either the short head of the biceps and/or subscapularis tendon. To the best of our knowledge, an isolated rupture of the proximal origin has yet to be reported in the literature. The location of the rupture typically occurs within the muscle belly or at the insertion on the humerus, rather than the tendinous origin on the coracoid. A connective tissue disorder could have predisposed our patient to this rare injury. However, at this time, he does not have a confirmatory diagnosis.

Outcome: Conservative treatment was based on the following:1. Full ROM and strength on exam 2.The amount of retraction, only 11 mm, effectively preserves the muscle length tension relationship 3. With the short head of the biceps still intact and because they share a common origin, this will likely serve as a scaffold for the ruptured CB 4. The affected arm was also the patient's non dominant arm.

Follow-up: After 6 weeks, our patient slowly returned to activity as tolerated. Musculocutaneous traction neuropathy has been reported with CB ruptures as the nerve pierces through the muscle approximately 5 cm distal to the coracoid. Should our patient develop lateral forearm paresthesias in the future, further investigation into traction neuropathy is warranted.