

Sonographic Findings of a Semi-Professional Football Player with 1st MTP Joint Pain: Gout or Turf Toe?

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PURPOSE

- Aim** : To review the applications and indications of sonography for forefoot disorders, especially gout and plantar plate injury of 1st MTP joint.
- Introduction**
 - Forefoot disorders are common but forefoot ultrasound is underutilized.
 - Point-of-Care Ultrasound was utilized in initial workup evaluating acute on chronic 1st MTP joint pain in our case study.

BACKGROUND

- Utilization of Musculoskeletal Point-of-Care Ultrasound (POCUS)**
 - Portable, easily accessible, real-time, dynamic exam facilitates better clinical correlation, minimal harm and low cost [1][5]
 - Ultrasound can specify the cause when correlated well with physical exam. [4]
- Forefoot disorders**
 - Metatarsalgia** : Refers to any conditions causing metatarsal region pain. [4]
 - Applications of US**: Gout, pseudogout, RA, OA, Morton's neuroma, bursitis, bone disorders, foreign bodies, mucoid cysts, overuse arthropathy, plantar plate injury, stress fracture, tendinopathy [4][2][3][5]
- Gout** : Inflammatory arthritis conditions by MSU crystal deposition in joints and other tissues producing acute arthritis attack and chronic arthropathy.
- Characteristic US findings of Gout (OMERACT definitions)** [2][3]
 - Specific : double contour sign, aggregates and tophus
 - Nonspecific : synovial fluid/hypertrophy, power doppler signal, erosions
- Turf toe injury** : Injury of plantar ligamentous complex by axial load delivered to a foot in a fixed equinus position at the ankle with the great toe in extension at the MTP joint.
- Grading** : Mild sprain of the plantar ligamentous complex (Grade I) to complete disruption of these soft tissue structures (Grade III)
- Treatment** : Initially treated conservatively despite of any grade [6]
- Indications for surgery** : Large capsular avulsion with joint instability, diastasis of bipartite sesamoid, diastasis of sesamoid fracture, retraction of sesamoid, traumatic hallux valgus deformity, vertical instability, loose body and/or chondral injury in MTP joint, failed conservative treatment. [6]



mechanism of Turf toe

plantar ligamentous complex

(pictures adopted from AAOS)

- US findings of plantar plate injury** 91% sensitivity, 44% specificity
 - Hypoechoic defects punctuating homogeneous hyperechoic plantar plate, increased vascularity on Color & Power Doppler [4][5][7]

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CONTACT INFORMATION

- For additional information, please contact:

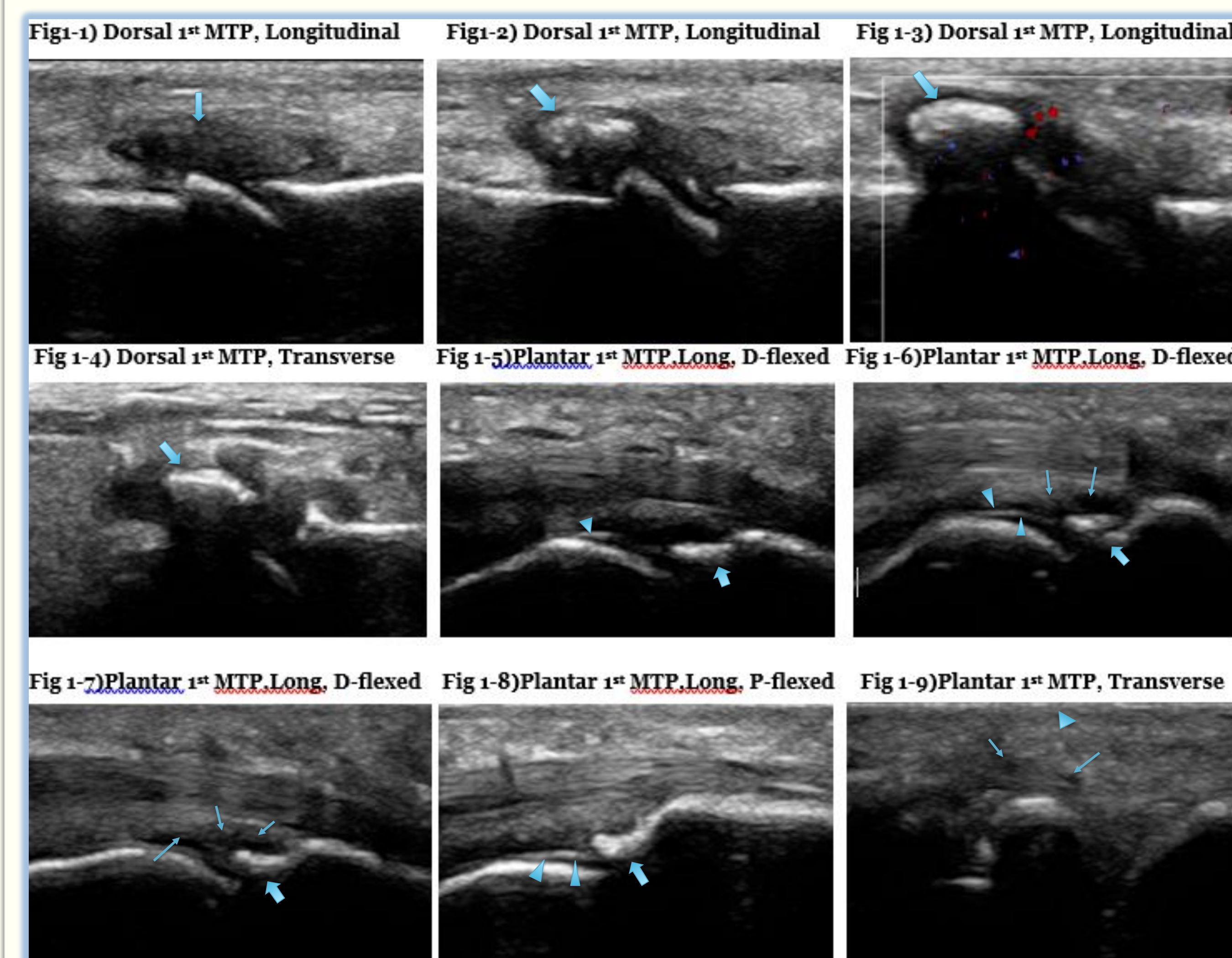
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CASE PRESENTATION

- History** : 48-year-old male who is a retired-semi-professional football player. He has h/o mild intermittent toe pain following several significant turf toe injuries over last 2 years playing football. Has never been evaluated.
- 1 week prior to presentation, he developed acute left great toe pain while walking. He denies recent injury. Pain significantly worse than previously. He is unable to put his shoe on secondary to pain and walks with a limp. Pain/swelling minimally improved despite Ibuprofen 800mg TID for 1 week.
- Preliminary evaluation by physician revealed red and swollen left 1st MTP. He was advised to take Ibuprofen and Tylenol 1 more week.
- 4 weeks later, he returns to clinic. Pain, erythema and swelling of left 1st MTP improved significantly, but still demonstrates tenderness to palpation. Pain worsens with weight-bearing on toe flexion. Uric acid level and X-ray of foot ordered. Point-of-Care ultrasound performed.
- Physical Exam** : General, cardiopulmonary, neurologic (unremarkable)
- MSK** : Moderate tenderness on left 1st MTP joint with mild erythema and swelling. Slightly limited extension of 1st MTP of left foot. Slight limp.
- Differential Diagnosis** gout, pseudogout, tendinopathy of HLF or HLE tendons, bursitis, sesamoiditis, recurrent Turf Toe, plantar plate injury, OA of 1st MTP joint, RA, stress reaction/fracture, intra-articular body
- Labs** Uric Acid: 7.2 CBC, BMP, ESR: normal
- X-ray of Left Foot/Toe**: Joint space narrowing, spur and subchondral cyst on lateral side of 1st MTP, compatible with osteoarthritis.



Point-of-Care Ultrasound (POCUS)



- 1-1) distended synovial pannus
- 1-2) to 1-4) hyper-echoic oval round calcification
- 1-3) negative color doppler for synovitis
- 1-5) to 1-8) double contour sign on hyaline cartilage
- 1-5) to 1-7), 1-9) Tear of plantar plate (irregular disruption of heterogenic tissue) and effusion

Diagnosis

- Acute gout on chronic high grade plantar plate sprain and consequential arthritis on 1st MTP joint of left foot secondary to previous turf toe injuries. Questionable intra-articular body.**
- Outcome**
 - Recommended tylenol, short-term NSAIDs, ICE and hard sole shoes with wide toe box, which helped alleviate some pain. However, patient continued to experience mild-to-moderate lingering pain.
- Follow-up**
 - Recommended MRI evaluation given chronicity of pain. Patient has not completed studies at this time.

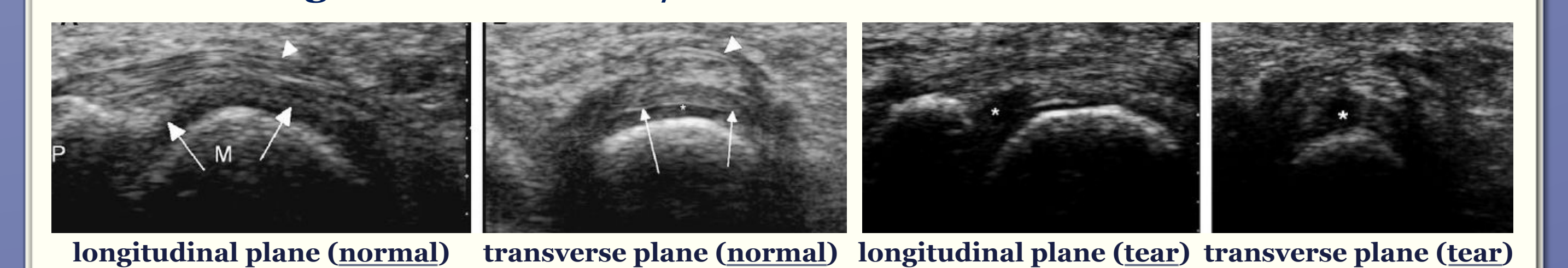
CASE DISCUSSION

- Factors suggesting acute gout attack**
 - (1) Acute podagra (2) Elevated uric acid (3) Double contour sign & erosion (US)
- Factors suggesting chronic plantar plate injury / consequential OA**
 - (1) Chronic lingering pain (2) Recurrent Turf toe (3) Arthritic changes (X-ray)
 - (4) Plantar plate insufficiency / arthritic changes at plantar plate insertion (US)
 - (5) Large oval calcification within the synovial membrane (US)
- Plan** Follow-up on MRI to confirm intra-articular body and assess extension of damage on plantar plate-ligamentous complex and intra-articular cartilage. Will need to determine the need for foot and ankle surgeon referral

REVIEW : IMAGING FOR FOREFOOT DISORDERS

- Standard Radiography (AP& Oblique)** [5]
 - First-line study, more panoramic than US.
 - Assesses bones, joints and calcifications of para-articular soft tissues.
- Computed tomography (CT)**
 - Rarely obtained due to excellent resolution of standard radiographs.
- Magnetic Resonance Imaging (MRI)**
 - Great capabilities including high tissue contrast and multi-planarity but not readily available, expensive, and has relative and absolute contraindications.
- Ultrasound Scan (US)**
 - Accurately guides local injections and other interventional procedures.
 - Allows dynamic exam of joints, tendons and nerves. No contraindications.
 - Limited assessment of internal structures of joints, bones, bone marrow.

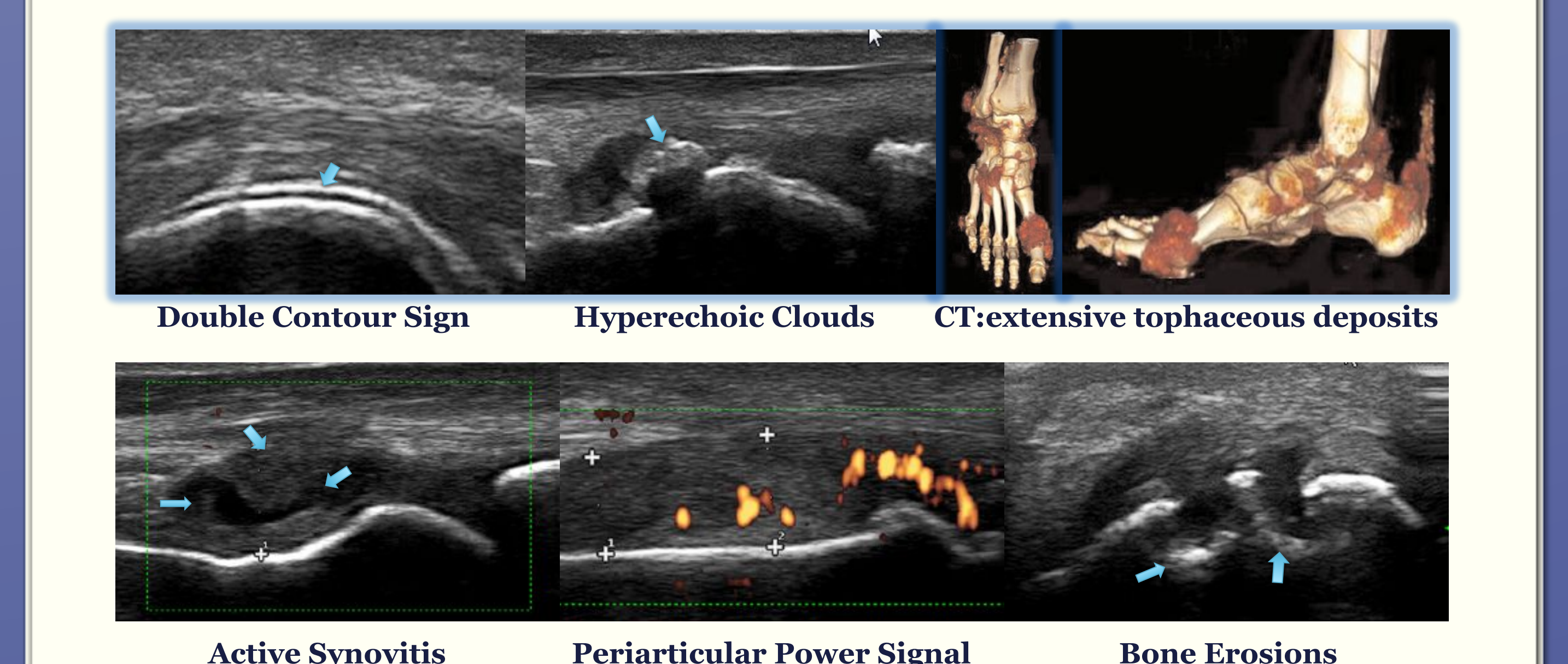
US findings of the Normal /Abnormal Plantar Plate [4]



longitudinal plane (normal) transverse plane (normal) longitudinal plane (tear) transverse plane (tear)

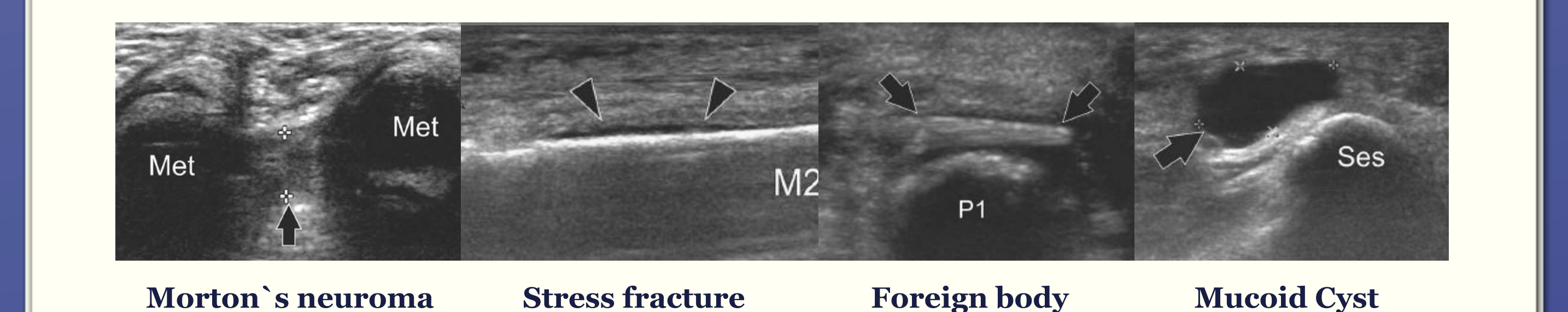
- Acute changes of plantar plate** : Plantar plate thickening, heterogeneity, hyperemia, fibrosis of soft tissues superficial to abnormal plantar plate
- Chronic changes of plantar plate** : Osteophyte formation, replacement of normal hyperechoic fibrocartilage with focal hypoechoic defects

Ultrasonography in Gout Diagnosis [2] [3]



- Gout Ultrasound Elemental Lesions** [2][3] : Double contour sign, hyperechoic soft-tissue areas, snowstorm appearance of synovial fluid, bone erosions, positive doppler signal, tophi (+/- post. shadow), soft-tissue edema

Sonographic findings of Other Forefoot Disorders [4] [5]



CONCLUSION

- Ultrasound is a reliable, accurate and cost-effective tool for evaluating common forefoot disorders such as gout, plantar plate injury, tendinopathy, ligament injury, bursitis, Morton's neuroma, and foreign body.
- Ultrasound should be the first-line imaging modality combined with plain films for forefoot disorders** before considering more expensive and less assessable imaging techniques such as MRI.