
# RhAPP

## RHEUMATOLOGY ADVANCED PRACTICE PROVIDERS

# Inaugural National Conference

**December 3 – 5, 2020**

VIRTUAL CONFERENCE

RhAPP
RHEUMATOLOGY ADVANCED PRACTICE PROVIDERS

# Ultrasound in Rheumatology
# Workshop for APPs and PharmDs

Wendy Simmons, PA-C, DFAAPA

Carolina Arthritis Associates

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- Speakers Bureau: Abbvie, Amgen, Boehringer Ingelheim, Pfizer, Radius, UCB
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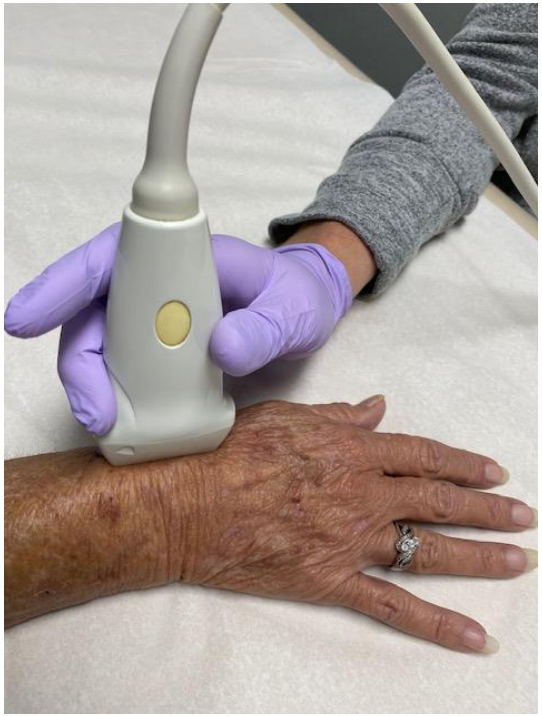
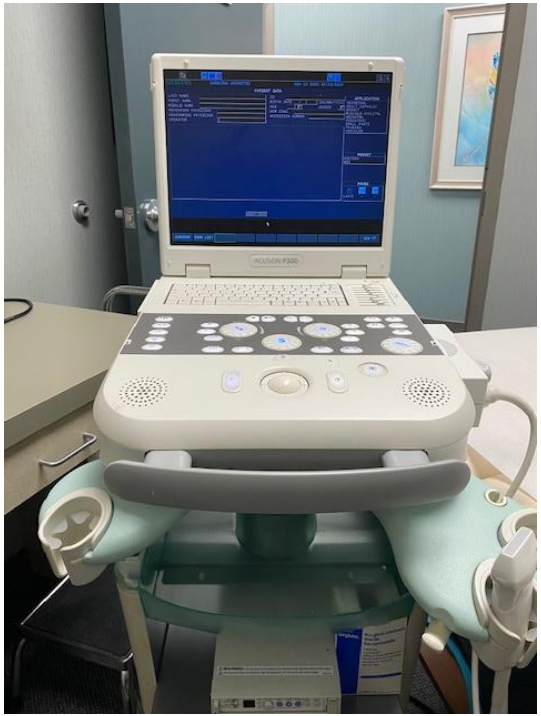
# Objectives

- Understand ultrasound technique and clinical use in office setting
- Learn advantages and when to order ultrasound study
- Review case studies using ultrasound to assist with diagnosing disease states, monitoring FDA approved therapies and evaluating changes in disease
- Ultrasound advantages in COVID -19

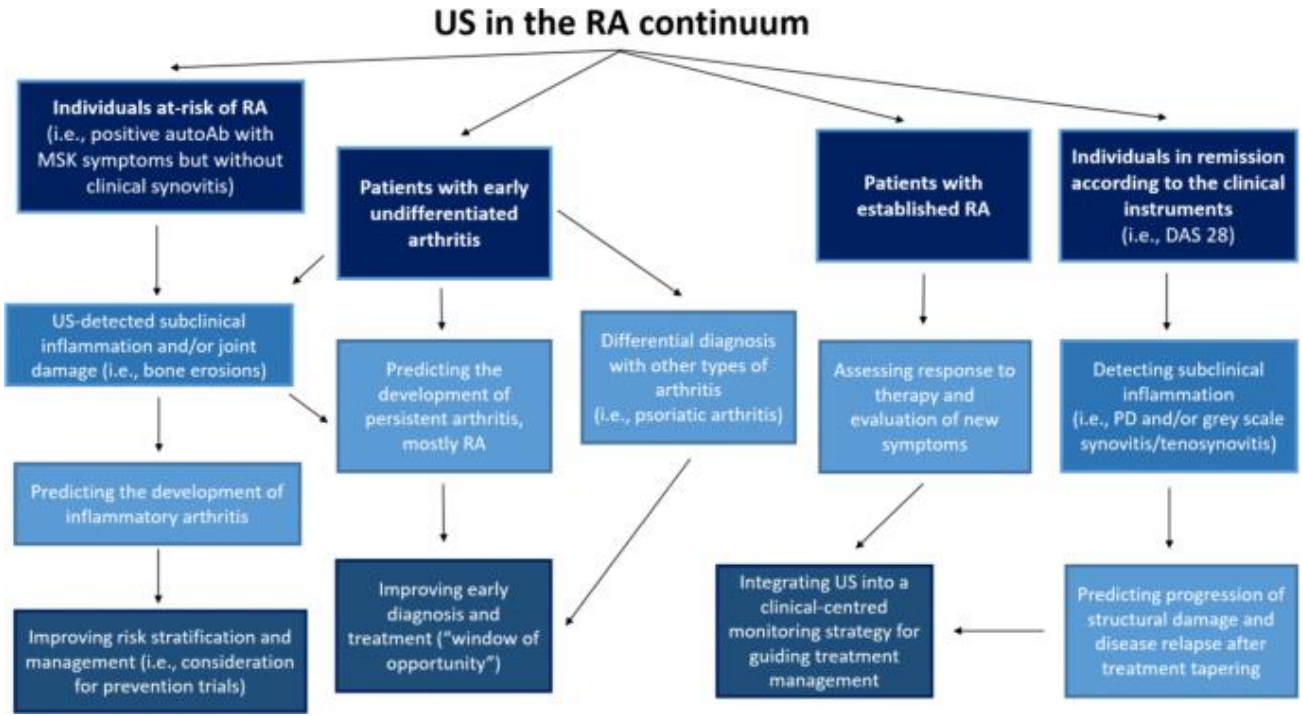




# Introduction to Musculoskeletal Ultrasound

- ACR and EULAR include ultrasound in 2 classification criteria
- Essential part of diagnosing early inflammatory arthritis
- Visualize pathophysiologic changes such as synovitis, tenosynovitis, enthesitis, bone erosions, crystal deposits at subclinical level, making ultrasound effective technique to identify and differentiate most common types of inflammatory arthritis
- Initiate and change treatments, improving patient outcomes, reducing disease activity, prevent joint damage.
- Non- invasive, cost effective, evaluate several joints

# The Role of Musculoskeletal Ultrasound in Rheumatoid Arthritis



# Ultrasound and Rheumatology Patient Case Studies

- RA- seropositive, treatment failure, New Patient Consult
- RA- seropositive, treatment naive, New Patient Consult
- RA- sero-negative
- Crystalline Arthropathy, CPPD, Gout
- Ankylosing Spondylitis, +HLA-B27 with peripheral inflammatory arthritis
- RA/Gout/Pseudogout overlap

Patient Case # 1

# Rheumatoid Arthritis- New Patient Consult in COVID -19, Virtual Telemedicine

# Patient Case 1

**DOC 9/1/2020**

- 67-year-old white female referred by rheumatologist prior to relocating. History of seropositive RA, diagnosed in 2006, transferred care to rheumatology in NC in 2016. History of positive Rheumatoid factor, CCP and ANA. Previous treatment failures include Methotrexate (ineffective and caused pustules on arms and legs), and Leflunomide (caused rash). She has remained on Enbrel 50 mg sq q week (start 3/2019), chronic steroids, currently tapering directed by her PCP. Recent labs with PCP, CCP >250, positive rheumatoid factor, normal CBC with diff, CMP, TSH, CRP.
- Patients insurance changes to Medicare and supplements soon and needs to discuss new treatment options.
- Currently denies any prolonged morning stiffness, red, warm, swollen joints, rashes, fevers, infections, shortness of breath or cough.

# Patient Case 1

- Physical Exam limited and active synovitis not appreciated with virtual exam. Therefore patient asked to return to clinic in office for exam, labs and imaging to assess disease activity and make further decisions on treatment changes.

**RTC 10/01/2020**

- Patient returns almost completely off steroids, prednisone 2.5 mg po qod, continues Enrbel 50 mg sq q week. Now having increased arthralgia's, stiffness and swelling bilateral 2,3 MCPs. Reviewed previous x rays of bilateral hands, showing osteoarthritis without erosive or inflammatory changes. Discussed getting in office ultrasound to evaluate RA disease activity. Also discussed ordering labs for monitoring and assist decisions for treatment changes.

# Patient Case 1

- She again reminds me she will have Medicare and supplement changes and I discussed she needs to check which insurances will be accepted and approve her medication options. FDA approved therapies for RA discussed at this visit. Also reviewed COVID -19 safety with use of Enbrel at this visit.
- Discussed long term risks and effects of steroids, osteoporosis evaluations, monitoring, calcium, vitamin D and FDA approved therapies.

**RTC 1014/2020**

- Patient returns to review ultrasound report and labs. Patient is now completely off steroids, feeling poorly with significant arthralgias and arthritis of multiple joints including hands, wrists, shoulders and knees. She notes prolonged morning stiffness with swelling of hands. Continues treatment with Enbrel. Also discussed osteoarthritis in multiple joints and we discuss we will focus on inflammatory arthritis and controlling rheumatoid arthritis

# Patient Case 1

**Ultrasound of bilateral wrists and hands**

- **Primary indication:** Inflammatory Polyarthropathy
- **Technique:** A high frequency probe was used in real time imaging of the longitudinal view of the radio-carpal and ulno-carpal joints as well as dorsal and volar views of the 2nd, 3rd, and 5thmetacarpophalangeal joints. Transverse views were also obtained of the distal ulna, scapho-lunate, and radio-ulnar joints. Power Doppler was used to assess for synovitis and tenosynovitis. Cross sectional evaluation of the median nerve was performed as well. All soft tissue structures in these views were evaluated. Provider may request additional views.

# Patient Case 1

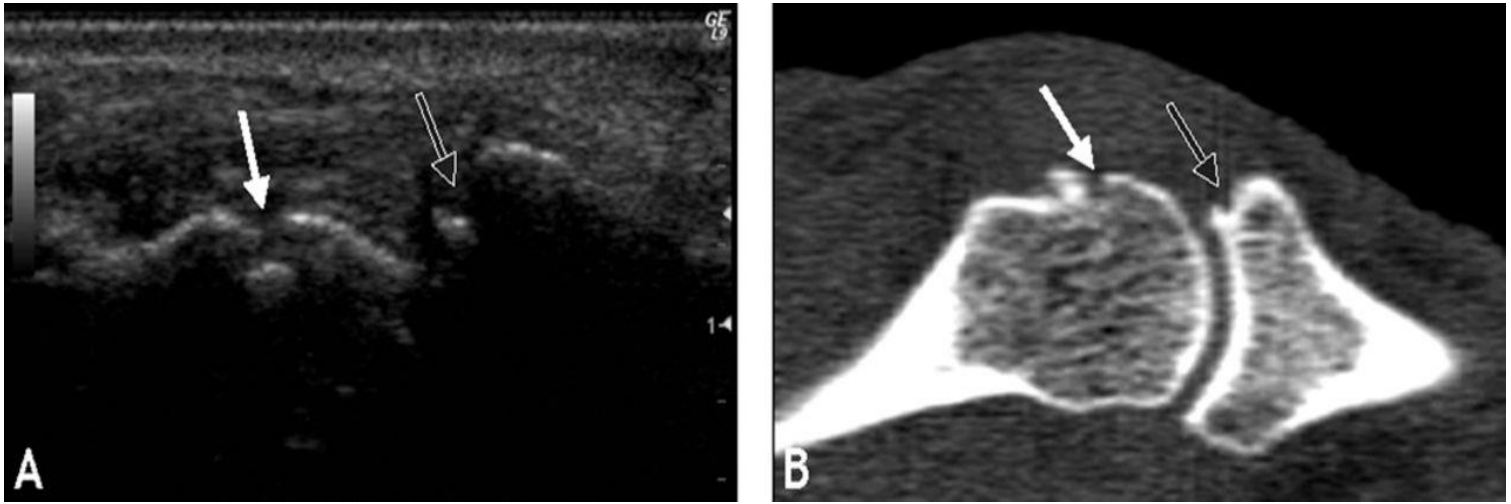
**Findings:** Left hand and wrist. Erosion on the dorsum of the distal ulna. Tenosynovial hypertrophy of the ECU tendon. Significant synovial hypertrophy in the 2nd MCP with an erosion on the radial aspect of the 2nd metacarpal head. Significant synovial hypertrophy in the left 3rd MCP. The visualized portions of the bones and soft tissues are otherwise normal appearing.

Right hand and wrist. Tenosynovial hypertrophy of the ECU tendon with active power Doppler signal and erosions on the dorsum of the distal ulna. Significant hypertrophy in the right 2nd MCP with an erosion on the radial aspect of the 2nd metacarpal head. Synovial hypertrophy on the volar aspect of the 2nd MCP. The visualized portions of the bones and soft tissues are otherwise normal appearing

# Patient Case 1

- **Impression:** Significantly active and erosive inflammatory arthritis most common with rheumatoid arthritis.

# Ultrasound Hand Erosions



Patient Case #2

Rheumatoid Arthritis New Patient Consult

# Patient Case #2
# Rheumatoid Arthritis New Patient Consult

**DOC 9/8/2020**

- Patient is a 70-year-old white female referred for evaluation of both osteoporosis by gyn and PCP for inflammatory arthritis. Patient was hoping to be evaluated for both in one visit. Patient first had her osteoporosis evaluation with history of failure of Fosamax causing rash. DXA reviewed, FRAX score 10-year probability of major osteoporosis fracture 17% and hip fracture 5%. FDA approved therapies reviewed, daily calcium and D supplements and completion of secondary evaluation. Patient discussed her baseline history of osteoarthritis, s/p knee arthroscopy, and using a cane for ambulation assistance. Discussed her inflammatory symptoms with prolonged morning stiffness, worse in am, better with activity, gelling. Pain, swelling of hands, wrists, pain in shoulders and knees. Symptoms unrelieved with Ibuprofen. On exam, hands 2,3 MCP's tender, wrists tender, without appreciate synovitis. Knees with crepitus. Completed evaluation with labs, xrays of bilateral hands, and follow up scheduled.

# Patient Case 2

**RTC- Telemedicine visit 10/1/2020**

- Reviewed positive rheumatoid factor RFIgG, RFIgA with negative RFIgM and CCP, negative ANA, ESR, 46, CRP 14.7, negative Hep B/C panel, QuantiFeron, uric acid 3.5. Normal TSH, PTH and SPEP without changes, and normal vitamin D.
- X rays of bilateral hands, degenerative changes. CXR, clear.
- Discussed a taper of steroids, DMARDs, initiation of Methotrexate with risks and benefits and supplemental folic acid. She was hesitant to begin Methotrexate. Discussed scheduling ultrasound to evaluate for inflammatory changes. Reviewed Prolia for osteoporosis.

# Patient Case 2

**RTC- Telemedicine visit 10/1/2020**

- Reviewed positive rheumatoid factor RFIgG, RFIgA with negative RFIgM and CCP, negative ANA, ESR, 46, CRP 14.7, negative Hep B/C panel, QuantiFeron, uric acid 3.5. Normal TSH, PTH and SPEP without changes, and normal vitamin D.
- X rays of bilateral hands, degenerative changes. CXR, clear.
- Discussed a taper of steroids, DMARDs, initiation of Methotrexate with risks and benefits and supplemental folic acid. She was hesitant to begin Methotrexate. Discussed scheduling ultrasound to evaluate for inflammatory changes. Reviewed Prolia for osteoporosis.

# Patient Case 2

**RTC- in office 10/22/2020**

- Patient completed prednisone taper, 100% better, and soon after discontinuing, severe return of symptoms with pain, swelling of hands and wrists.
- On exam, 2,3 MCPs tender with synovitis, bilateral wrists tender, synovitis, shoulders tender, mild reduced range of motion.
- Reviewed concerns of an aggressive inflammatory arthritis, beginning methotrexate and she agrees. Patient worried about knees and returning to orthopedist, and we discussed this as part of inflammatory process.

# Patient Case 2: Ultrasound of bilateral hands and wrists

- **Primary indication:** Joint Pain
- **Technique:** A high frequency probe was used in real time imaging of the longitudinal view of the radio-carpal and ulno-carpal joints as well as dorsal and volar views of the 2$^{nd}$, 3$^{rd}$, and 5$^{th}$ metocarpalphalangeal joints. Transverse views were also obtained of the distal ulna, scapho-lunate, and radio-ulnar joints. Power Doppler was used to assess for synovitis and tenosynovitis. Cross sectional evaluation of the median nerve was performed as well. All soft tissue structures in these views were evaluated. Provider may request additional views.

# Patient Case 2

**Findings:**

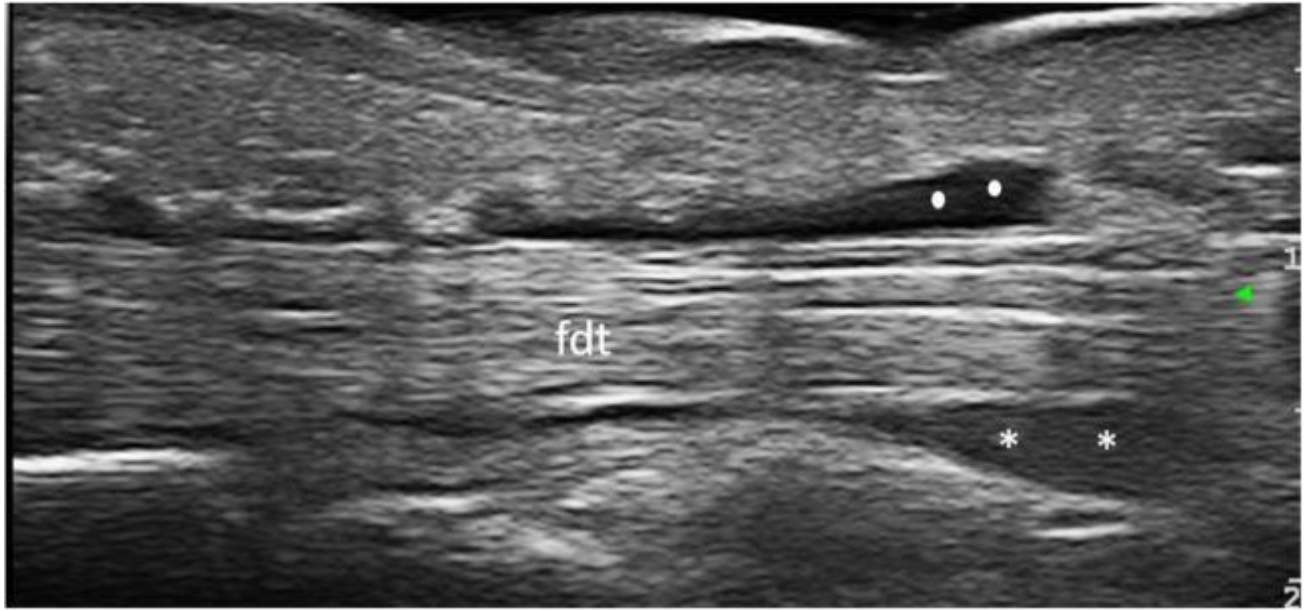
- Left hand and wrist: Synovial hypertrophy overlying the scaphoid, lunate and capitate with active power Doppler signal. Slight synovial hypertrophy in the distal radio-lunar joint. The visualized portions of the bones and soft tissues are otherwise normal appearing.
- Right hand and wrist: Synovial hypertrophy overlying the scaphoid with active power Doppler signal. Synovial hypertrophy overlying the lunate and capitate with significantly active power Doppler signal. Erosion on the dorsum of the distal ulna with significant synovial hypertrophy in the ulno-carpal joint with an erosion on the triquetrum. The visualized portions of the bones and soft tissues are otherwise normal appearing.

# Patient Case 2

**Impression:**

- Synovitis in the bilateral wrists, right greater than left, with erosions in the right wrist. No crystalline features are seen.
- Patient further treated with infusion biologic in addition to methotrexate

# Ultrasound Tenosynovitis Third Flexor Digitorum Tendons



Patient Case Study #3:

# Rheumatoid Arthritis- Seronegative

# Patient Case Study #3: Rheumatoid Arthritis- Seronegative

- DOC 2/17/16
- Patient was 54-year-old white male, construction worker-framer, history of DDD, s/p 3 spine surgeries and chronic back pain with 5-year history of right wrist pain and progressive arthralgias felt to be related to his job. Mother with “crippling arthritis”, brothers with gout. Patient drinks alcohol nightly. Symptoms responsive to Depomedrol injections with PCP. Progressed into symmetrical inflammatory arthritis, primarily bilateral wrists with negative RF3, CCP and ANA. Normal uric acid. Normal acute phase reactants. Vectra DA normal. Exams without synovitis, minimal tenderness at 2,3 MCPs, right wrist. X rays, bilateral hands and feet normal. Started Plaquenil 200 mg po bid.

# Patient Case Study #3: Rheumatoid Arthritis-Seronegative

- **Study:** Ultrasound bilateral hands and wrists
- **Primary indication:** Joint pain

**Findings:**

- Right hand: Mild joint space narrowing throughout the wrist with mild to moderate synovitis. The visualized portions of the muscle, tendon, and bone are otherwise normal appearing.
- Left hand: Moderate synovitis throughout the mid wrist. The visualized portions of the muscle, tendon, and bone are otherwise normal appearing.

# Patient Case Study #3: Rheumatoid Arthritis- Seronegative

- **Impression:** Inflammatory arthritis effecting the bilateral wrists. There is some joint space narrowing in mostly the right wrist, but no erosive changes. The MCPs are spared.

**RTC 3/4/2016**

- Reviewed ultrasound results and seronegative RA diagnosis. Methotrexate was not initiated with alcohol use, tolerating Plaquenil, mild inflammatory symptoms. Vectra DA 34. Started outpatient SQ TNF. Discussed continued monitoring. Patient returned in office 10/2016, doing well, much better, stopped Plaquenil, improved RAPD 3, Vectra DA 26, continued outpatient SQ TNF.

# Patient Case Study #3: Rheumatoid Arthritis- Seronegative

**RTC 1/25/2017**

- Flare. Ultrasound since previous exam, there has been a dramatic expansion of synovitis. It is now quite significant in both hands and in tenosynovium. There remains no destructive changes. Discussions with patient on changing to infusion therapy with concerns of compliance. Patient changed outpatient SQ TNF. Repeat ultrasound 1/12/2018. The synovitis previously seen in MCPs has resolved, however there continues to be significant synovitis in the right wrist. Without destructive features. Discussed adding back Plaquenil. Patient continued in follow up doing well. Vectra DA 2/2019 normal.

# Patient Case Study #3: Rheumatoid Arthritis- Seronegative

**RTC 10/8/2020**

- Significant flare. He has been drinking more at night in COVID. Does not feel injection is helping any longer. Noticeable change on PE, synovitis bilateral wrists, 2,3 MCPs, and appearance of ulnar drift. Question compliance. He now says he is willing to change therapy. Repeat RF3 and CCP negative, normal CRP0.8 and ESR 2.

# Patient Case Study #3: Rheumatoid Arthritis- Seronegative

- **Study:** Ultrasound bilateral hands and wrists
- **Primary Indication:** Inflammatory Polyarthropathy
- **Technique:** A high frequency probe was used in real time imaging of the longitudinal view of the radio-carpal and ulno-carpal joints as well as dorsal and volar views of the 2$^{nd}$, 3$^{rd}$, and 5$^{th}$ metacarpophalangeal joints. Transverse views were also obtained of the distal ulna, scapho-lunate, and radio-ulnar joints. Power Doppler was used to assess for synovitis and tenosynovitis. Cross sectional evaluation of the median nerve was used to assess for synovitis and tenosynovitis. Cross sectional evaluation of the median nerve was performed as well. All soft tissue structures in these views were evaluated. Provider may request additional views.

# Patient Case Study #3: Rheumatoid Arthritis-Seronegative

**Findings:**

- Left hand and wrist: Erosion on the scaphoid with joint space narrowing and synovial hypertrophy. Joint space narrowing and subluxation of the carpus with significant overlying synovial hypertrophy and active power Doppler signal. Significant synovial hypertrophy in the ulno-carpal joint with erosions on the triquetrum. Synovial hypertrophy in the distal radio-ulnar joint. Synovial hypertrophy on the volar aspect of the 2$^{nd}$, 3$^{rd}$ and 5$^{th}$ MCPs. The visualized portions of the bones and soft tissues are otherwise normal appearing.

- Right hand and wrist: Synovial hypertrophy in the radio-scaphoid joint with active power Doppler signal. There is prominent subluxation of the lunate of the ECU tendon. Significant synovial hypertrophy in the distal radio-ulnar joint. Synovial hypertrophy in the 1$^{st}$ CMC. The visualized portions of the bones and sot tissues are otherwise normal appearing.

# Patient Case Study #3: Rheumatoid Arthritis- Seronegative

- Comparison: 1/12/2018
- **Impression:** Since previous exam, patient's synovitis has worsened even further and is now quite significant, and new destructive features are noted. Collectively, these findings suggest rheumatoid arthritis.
- Discussed medication change to JAK or in office infusion.

# Ultrasound MCP Active Inflammatory Process

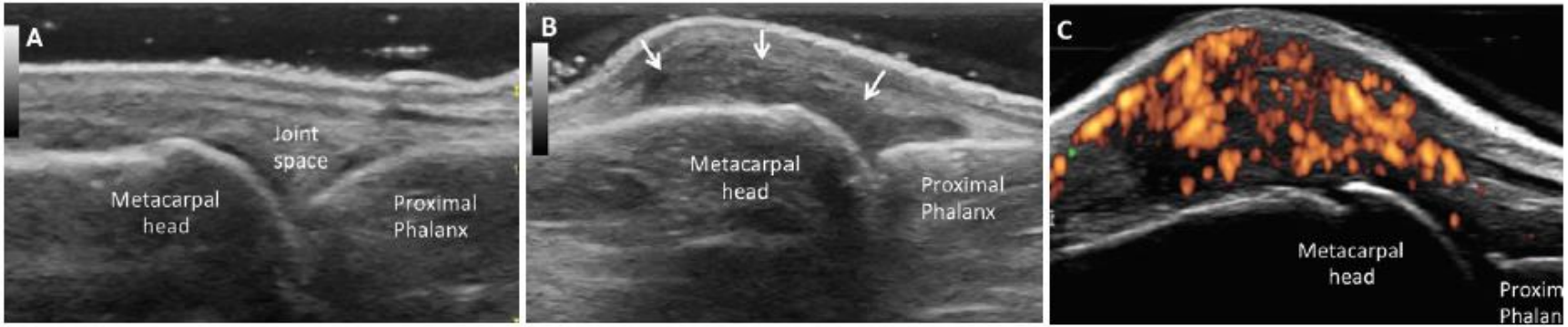



**Figure 1.** A, Ultrasound imaging of a normal metacarpophalangeal joint. B, Metacarpophalangeal joint; arrows showing synovial hypertrophy with widening of the of the joint cavity (arrows). C, Metacarpophalangeal joint with severe joint capsule distension and intense power Doppler signal within the joint cavity consistent with active inflammatory process.

Patient Case #4

# Crystalline Arthropathy – Pseudogout

# Patient Case #4
# Crystalline Arthropathy – Pseudogout

- DOC 6/6/2020 Telemedicine
- 73-year-old white male referred by orthopedic hand surgeon. Patient has a baseline history of osteoarthritis, s/p bilateral TKRs and foot surgeries. This year, increasing bilateral wrist pain, minimal swelling and mild bilateral foot pain, worse in the morning, feels improved with activity. Pain of his wrists is his main complaint. Not a good historian, he is active, works on his land with tractor. He initially felt his symptoms were related to his osteoarthritis, now more intense, limited range of motion and constant pain. Mild morning stiffness, less than an hour, however wrist symptoms never clear. Exam consistent with restriction of extension at wrists.

# Patient Case #4
# Crystalline Arthropathy – Pseudogout

- He has not responded to NSAIDs Ibuprofen and Mobic, topical, Hemp oil and herbals. He has responded to intraarticular injections with orthopedic hand specialist. Oral steroids have provided limited response. Initial radiographs mild degenerative changes. Schedule labs, negative RF3, CCP, uric acid 6.1, normal acute phase reactants. Patient brought into office in June for further evaluation (PE), labs, ultrasound of bilateral wrists and hands. Discussed concerns of a destructive inflammatory osteoarthritis, seronegative RA or CPPD.

- **Study:** Ultrasound bilateral hands and wrists
- **Primary Indication:** Inflammatory Polyarthropathy

# Patient Case #4

# Crystalline Arthropathy – Pseudogout

- **Technique:** A high frequency probe was used in real time imaging of the longitudinal view of the radio-carpal and ulno-carpal joints as well as dorsal and volar views of 2$^{nd}$, 3$^{rd}$, and 5$^{th}$ metacarpophalangeal joints. Transverse views were also obtained of the distal ulna, scapho-lunate, and radio-ulnar joints. Power Doppler was used to assess for synovitis and tenosynovitis. Cross sectional evaluation of the median nerve was performed as well. Provider may request additional vies.

# Patient Case #4
# Crystalline Arthropathy – Pseudogout

**Findings:**

- Left hand and wrist: Joint space narrowing of the radio-scaphoid joint. Joint space narrowing of the mid-wrist with synovial hypertrophy overlying the lunate and capitate. Hyperechoic deposits are embedded in the synovium overlying the lunate and capitate. Hyperechoic deposits throughout the TFCC. Joint space narrowing of the 2$^{nd}$ MCP with synovial hypertrophy. Large osteophyte on the dorsum of the 2$^{nd}$ metacarpal head and a faint double-contour sign. The visualized portions of the bone, muscle, tendon, joints and median nerve are otherwise normal appearing.

# Patient Case #4
# Crystalline Arthropathy – Pseudogout

**Findings, continued**

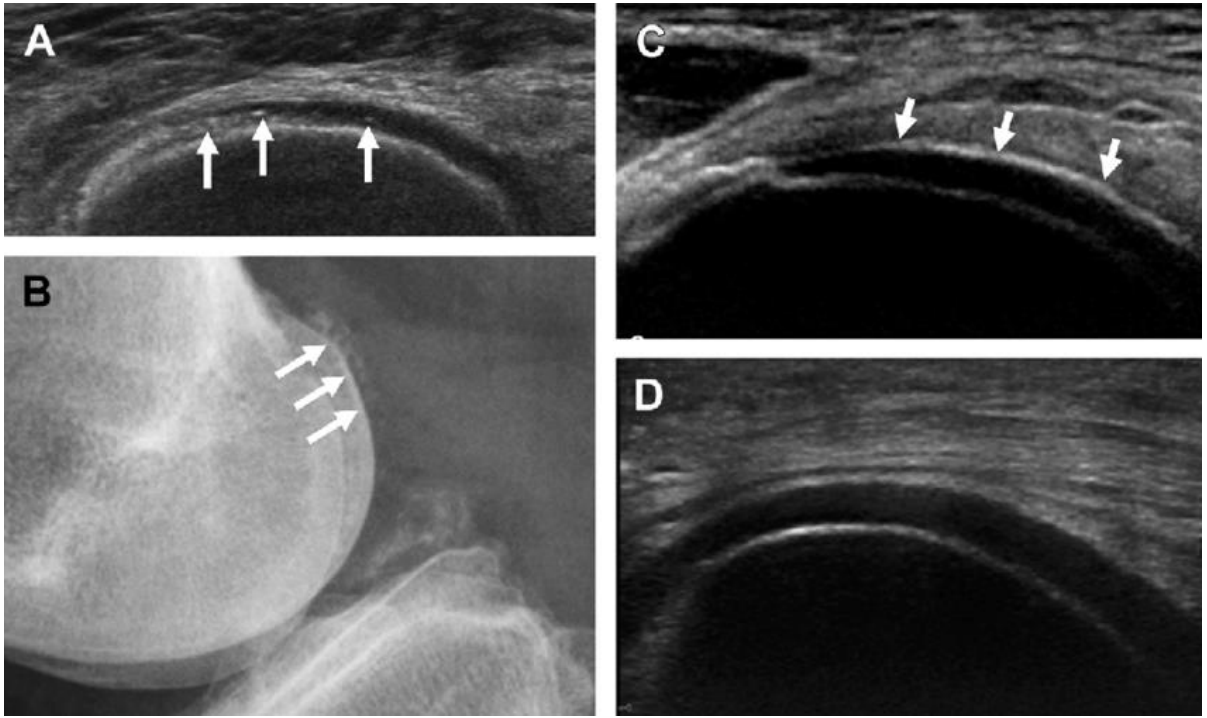
- Right hand and wrist: Subluxation of the scaphoid relative to the distal radius. Mild joint space narrowing in the right-wrist with significant synovial hypertrophy and 2/3 PDS. Hyperechoic deposits in the ulno-carpal joint and distal radio-ulnar joint. Joint space narrowing and osteophytosis of the 2$^{nd}$ MCP with synovial hypertrophy. Hyperechoic deposit is seen on the radial aspect of the 2$^{nd}$ metacarpal head. Osteophyte on the dorsum of the 3$^{rd}$ metacarpal head. The visualized portions of the bone, muscle, tendon, joints and median nerve are otherwise normal appearing.

# Patient Case #4
# Crystalline Arthropathy – Pseudogout

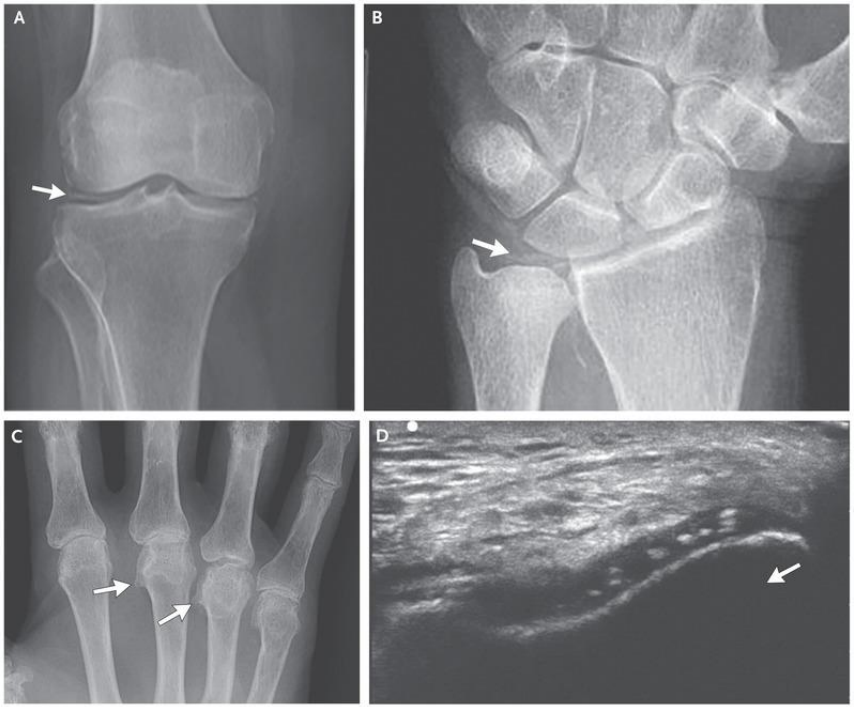
**Impression:**

- Significant crystalline arthropathy of the bilateral wrists and hands, producing active inflammation but no erosions. I strongly suspect pseudogout, though cannot entirely exclude the possibility of gout.
- Patient was prescribed a trial of Colchicine, NSAID changed to Celebrex. Symptoms continued and recent discussions on proceeding with a trial of Methotrexate, and potential return to orthopedic hand surgeon.

# Comparison of US Aspect



# Calcium Pyrophosphate Deposition Disease Ultrasound



Patient Case # 5

Ankylosing Spondylitis, Positive HLA-B27 with peripheral inflammatory arthritis
New Patient Consult

Patient Case # 5
Ankylosing Spondylitis, Positive HLA-B27 with peripheral inflammatory arthritis
New Patient Consult

**DOC 3/5/2020**

- Patient is a 37-year-old white male referred for evaluation. History of fractured left elbow, 10 months prior, “took a while to heel. Two months ago, developed left wrist pain, swelling, stiffness, hand, limited grip formation in morning. For several months he feels “very old and stiff when first getting out of bed and out of car. Early am low back and buttock pain, “difficult to straighten”. Fatigue. Denies any inflammatory eye or bowel disease, GU infections or psoriasis. History of elevations of acute phase reactants with PCP. Failed Ibuprofen and Naprosyn. Steroids helped peripheral symptoms. Exam mid-day, unrevealing. Shobers normal. Discussed ordering ultrasound today, left wrist/hand, lumbar spine and SI x-rays today, completing labs and a trial of Mobic.

# Patient Case 5

**RTC 3/18/2020**

- Patient was evaluated with inflammatory back pain and an asymmetrical inflammatory polyarthropathy suggestive of a spondyloarthropathy. Wife is with patient today and shares more information telling me how “very stiff and old” he is in the morning with his spine getting out of bed. Stiffness lasting over an hour, better with activity, worse with rest. I reviewed inflammatory back pain with wife for her understanding. Discussed patient’s enthesitis, Achilles tendonitis and left elbow enthesitis. Positive HLA-B27. Other labs elevated CRP, ESR, negative RF3 and CCP. Screening studies for therapy. Negative Hep B/C panel, QuantFeron and clear CXR.  X rays early SI joint changes. Reviewed tolerance and minimal relief with Mobic.

# Patient Case 5

**Ultrasound of left hand and wrist**

- **Primary indication:** Joint Pain
- **Technique:** A high frequency probe was used in real time imaging of the longitudinal view of the radio-carpal and ulno-carpal joints as well as dorsal volar views of the 2$^{nd}$, 3$^{rd}$, and 5$^{th}$ metacarpophalangeal joints. Transverse views were also obtained of the distal ulna, scapho-lunate, and radio-ulnar joints. Power Doppler was used to assess for synovitis and tenosynovitis. Cross sectional evaluation of the median nerve was performed as well. Provider may request additional views.

# Patient Case 5

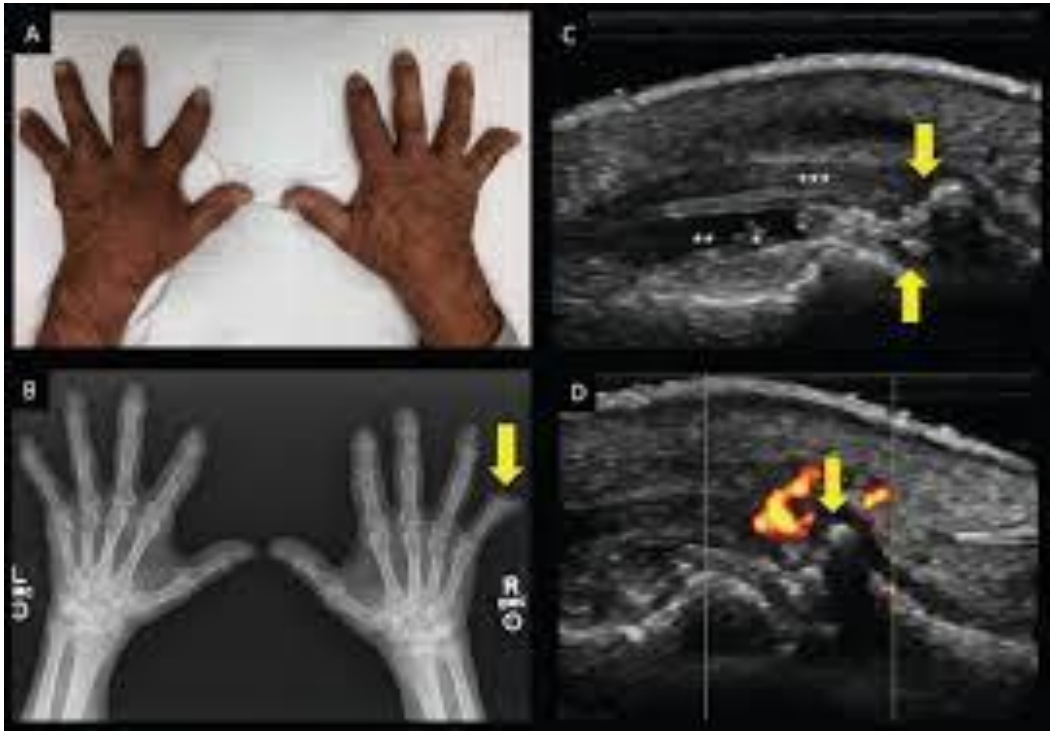
**Findings:**

- Left hand and wrist. Synovial hypertrophy overlying the scaphoid, lunate, and capitate with significantly active power Doppler signal. The visualized portions of the bone, muscle, tendon, joints and median nerve are otherwise normal appearing.

**Impression:**

- Significant synovitis in the wrist. No erosive or crystalline features noted.
- Patient agreed to begin outpatient SQ biologic

# Ultrasound Enthesitis



# Summary

- Ultrasound is useful in diagnosis of early RA when plain radiographs fail to show changes
- Ultrasound is useful in evaluating exacerbations and treatment failures
- Ultrasound is useful in identifying a new process layered on an established diagnosis
- Ultrasound continues to be a helpful imaging option in COVID -19

# References


- Personal patient case studies
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- SoundRheum Diagnositics
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# Questions?