Contrast enhanced ultrasound – musculoskeletal system

Andrea Šprláková – Puková

Alena Štouračová

Edita Pokorná, Alena Nováková

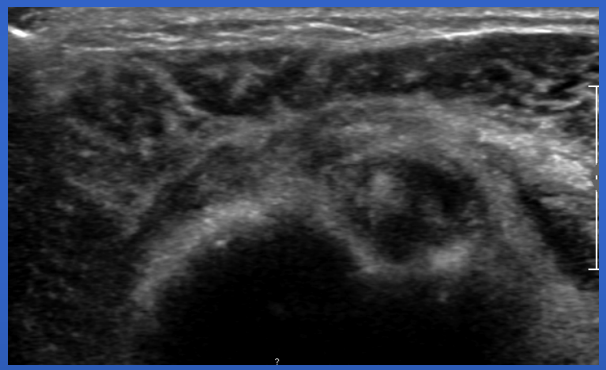
Department of Radiology
Head of the dept.: Prof. V.Válek

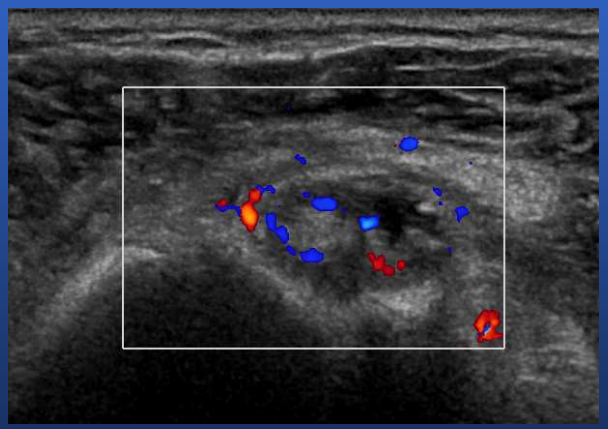
Masaryk University Hospital Brno

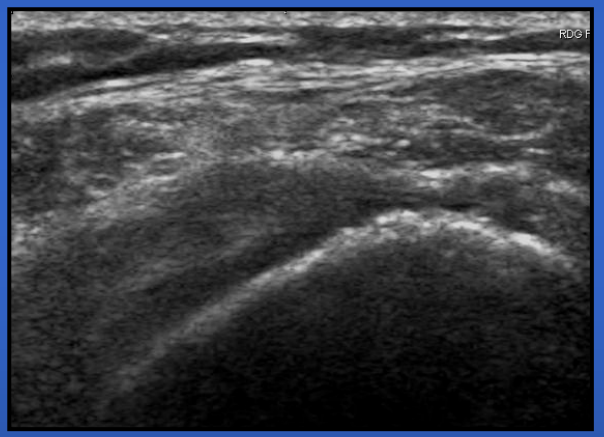
Czech Republic

- useful and valuable method in many types of injuries
- important role in the diagnostics of inflammatory diseases, focal lesions
- routine diagnostic method
- US is able to show musculoskeletal anatomy from a new and unique perspective

  Musculoskeletal Ultrasound, Marnix T.van Holsbeeck, Joseph H.Introcaso







Ultrasound – technique, equipment

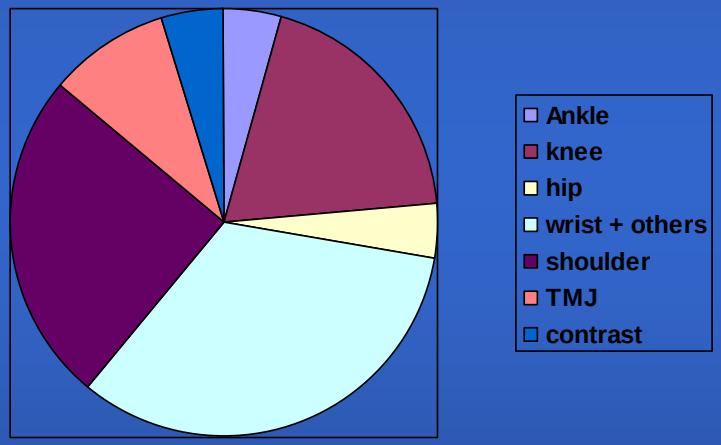
- equipment – high frequency linear transducer for superficial structures
- 5 MHz convex transducer to evaluate deeper structures (muscles)
- various planes – longitudinal, transversal
- side comparison
- compression – synovial thickness, fluid x focal lesion
- contraction or strain – detect musculotendineous or ligamentous lesions

Contrast enhanced ultrasound

- Linear transducer 9/12 MHz, contrast side/side, R1,low MI (0,06/0,09)
- Intravenous aplication of contrast agent (5 ml) followed by physiological solution (20 ml)
- Recording time 2 min.
- Microvascularity assessment
- Inflammatory diseases – rheumatoid arthritis, focal lesions

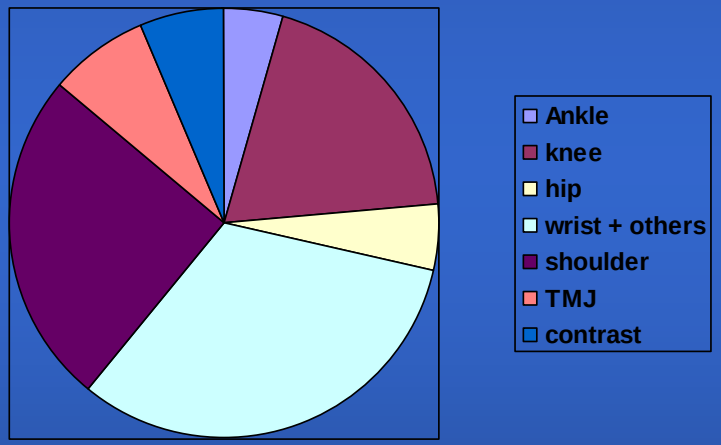
Contrast enhanced ultrasound – our experience MSK aplication

2008 – 1219 examinations
62 CEUS



2008

2009 – 1310 examinations
78 CEUS



2009

Rheumatoid Arthritis

- Chronic systemic disease
- Articular inflammation and destruction
- US – valuable method for the early diagnosis of RA
- Sensitive in detection intraarticular fluid and synovial proliferation prior to the marginal erosions development
- Increased intraarticular fluid – nonspecific sign – indicating an active joint disease
- Fluid separating the leafs of the synovia – not exceeding 3 mm in joint recesses

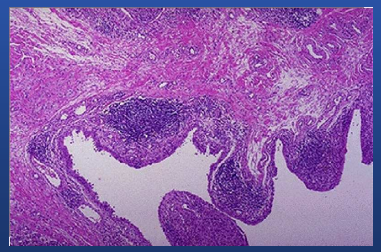
Pathogenesis

- Pro- inflammatory cytokines (interleukin, TNF alfa) initiate changes – that result in characteristic signs of inflammation
- TNF alfa promotes angiogenesis via its effect on endothelial growth factor
- 80% patients – normal X-rays – skeletal damage visible after 1 year

Clinical Identification and Treatment of a rapidly Progressing Disease State in Patients With Rheumatoid Arthritis – P.Emery, I.B.McInnes, R. van Vollenhoven, M.C.Kraan, Rheumatology 2008,47(4):392-398

Rheumatoid Arthritis

- Synovial membrane - connective tissue – lining the inner surface of joint capsule, tendon sheath and bursae
- Synovium – changes – formation of a synovial tissue mass = pannus, leads to the development of marginal erosions
- The most frequently affected joints – metacarpophalangeal, interphalangeal, wrist,shoulder

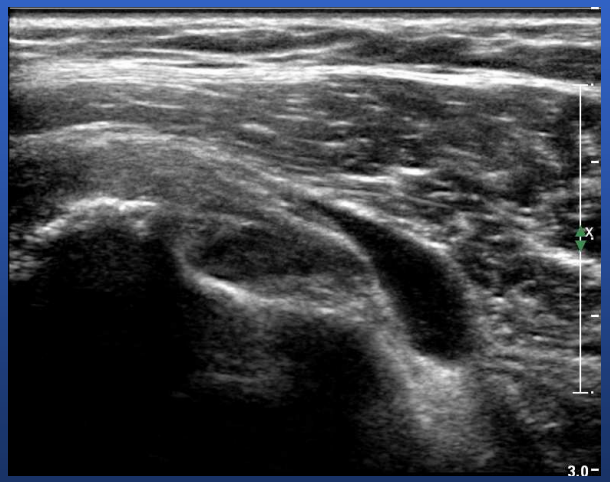


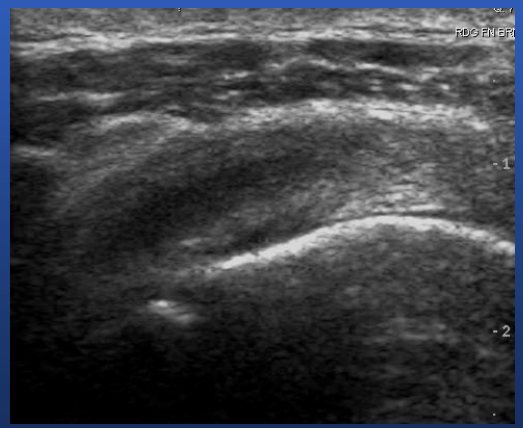
Shoulder – examination technique

- Supraspinatus tendon, SA bursa (internal rotation, hyperextension, dorsum of the hand behind the back, internal rotation alongside the thorax)
- Infraspinatus tendon , posterior recessus GH joint (hand touching contralateral shoulder)
- Subscapularis tendon (external rotation, elbow against the ipsilateral iliac crest)
- Biceps tendon (elbow 90degrees, forearm half pronated, fingers on the knee)

Shoulder – joint fluid

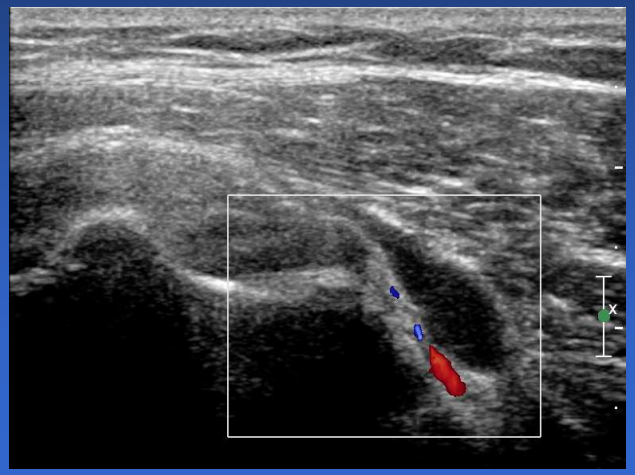
- nonspecific finding
- Within the biceps tendon sheath, in the posterior recess of GH joint
- Adhesive capsulitis, inflammatory arthropathy, trauma, infection, rotator cuff tear





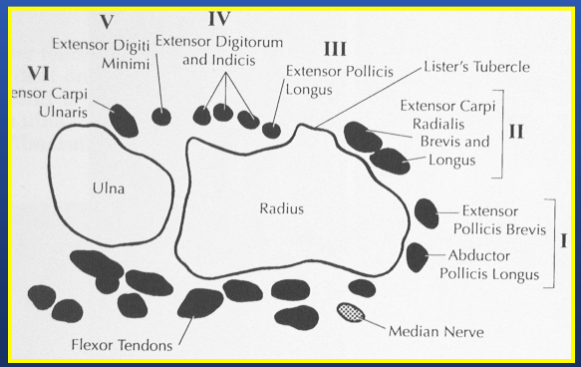
RA – contrast enhanced ultrasound

Women, 49 years old, paninful right shoulder, positive antiCCP, RF, low CRP



Wrist and hand

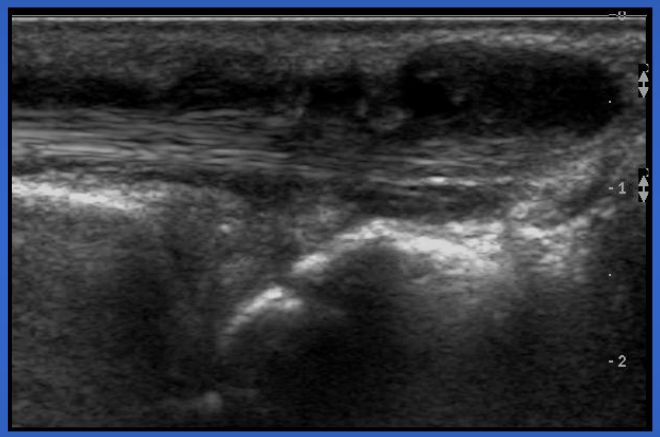
- Principal indications – tendon pathology, intraarticular fluid + synovitis– inflammatory disease, synovial cysts (ganglia), carpal tunnel syndrom - n. medianus
- Tendon – parallel running fascicles of collagen fibers, very subtle changes in the architecture – tendon degeneration, partial-thickness tear



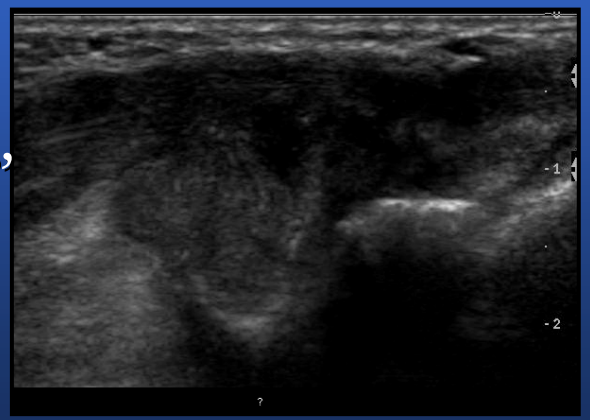
•Tendon rupture – predisposing lesion – inflammation

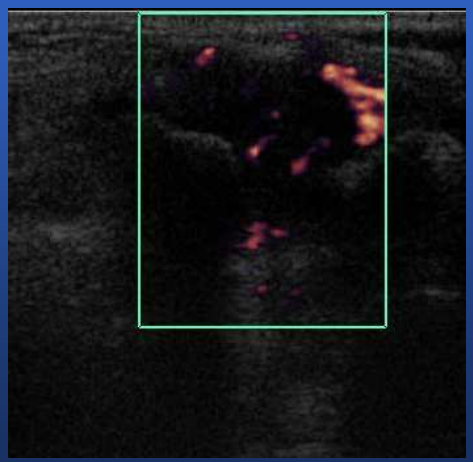
Longitudinal views – discontinuity of the fibrillar pattern

•Tendinitis – increased fluid content around the thickened tendon



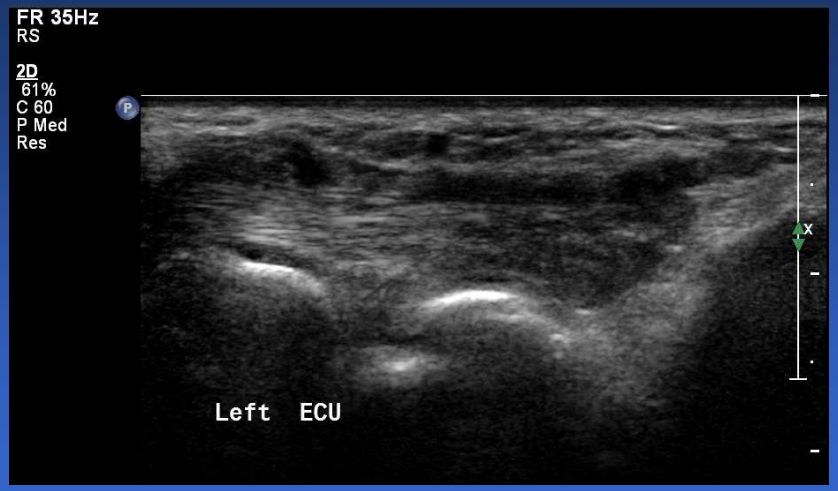
• RA – fluid, synovial thickening, proliferation - pannus

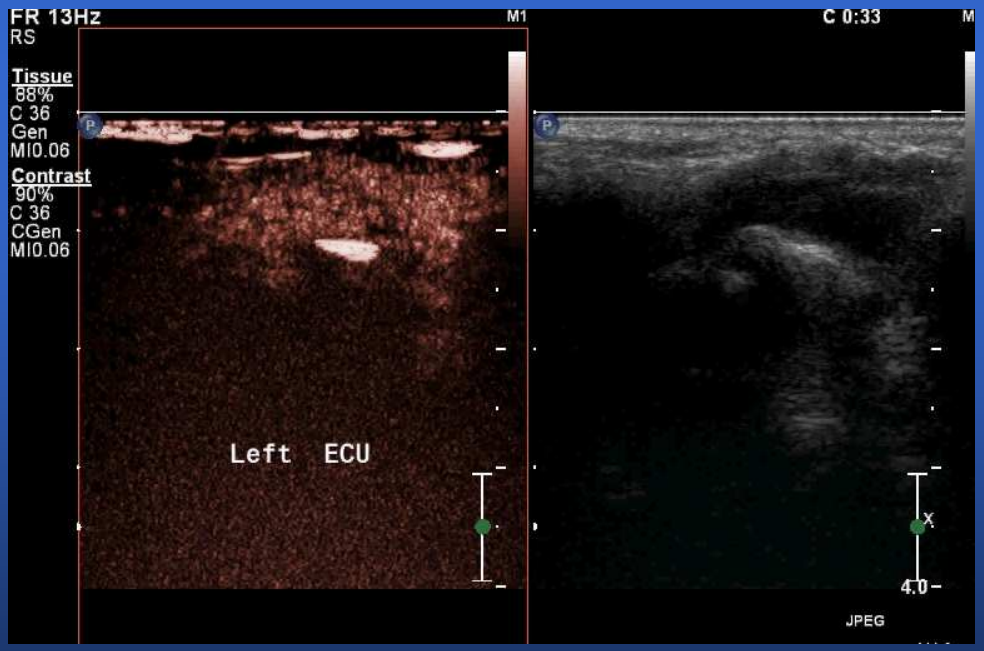




RA – contrast enhanced ultrasound

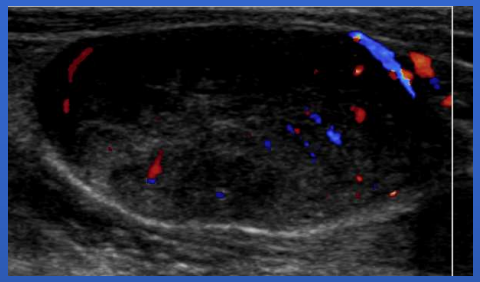
Women, 46 years old, chronic disease, acute stage, no response on MTX

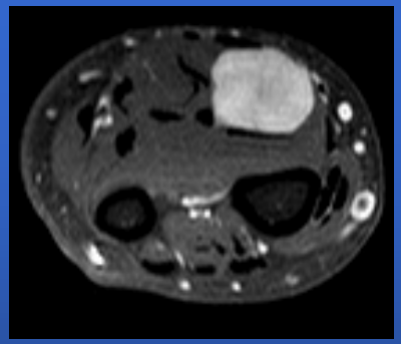


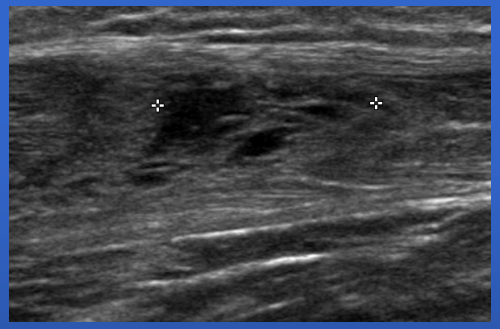


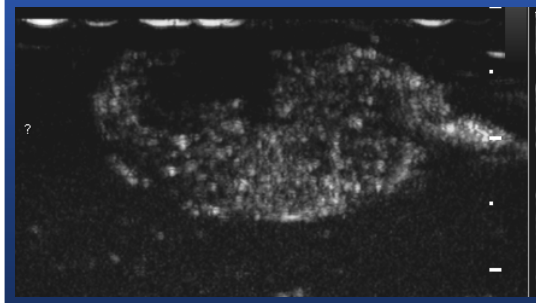
Focal lesions

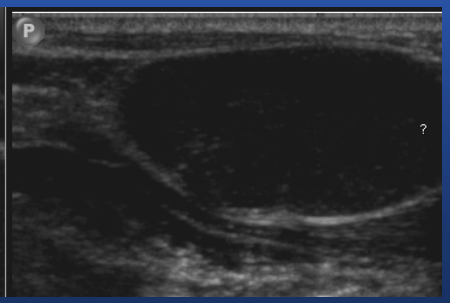
- Detection, characterization
- Tumor –enhancement assessment
- Trauma - Rupture of muscule / tendon - better evaluation of the damage extent, intramuscular hematoma – possible aspiration

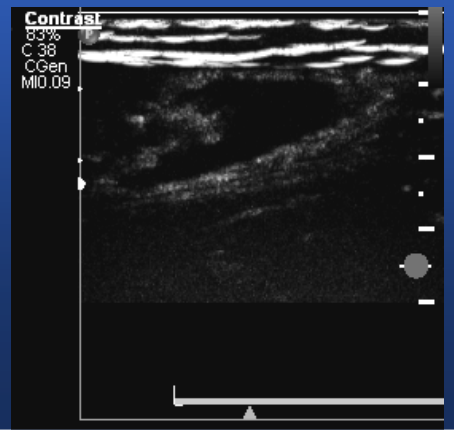










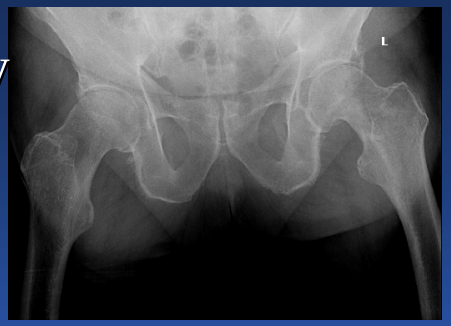


Focal lesion – contrast enhanced ultrasound

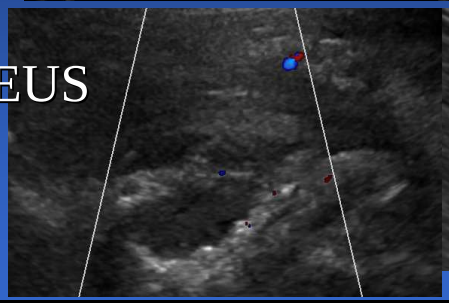
Extraosseal extension of myeloma

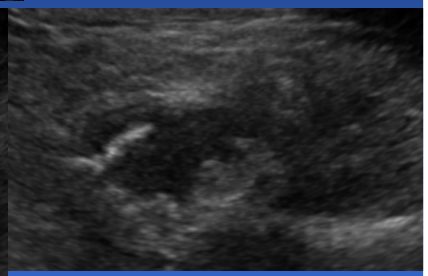
Man, 84 years old,
painful left hip
joint, susp.myeloma

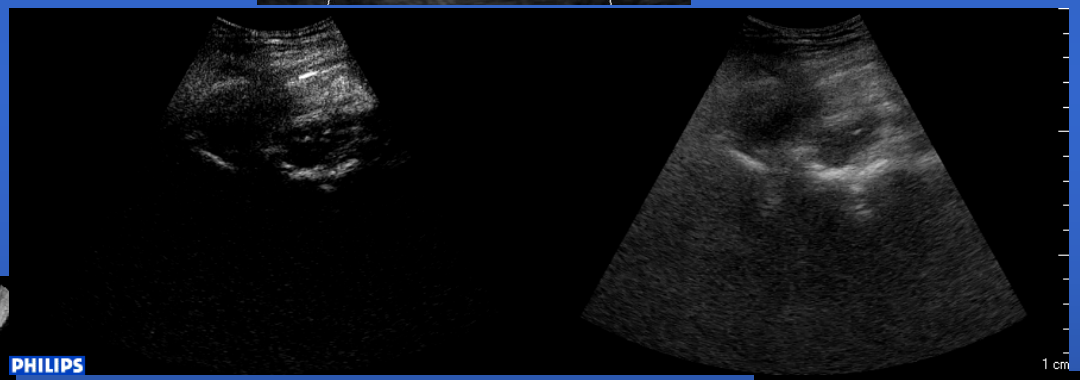
1. X ray



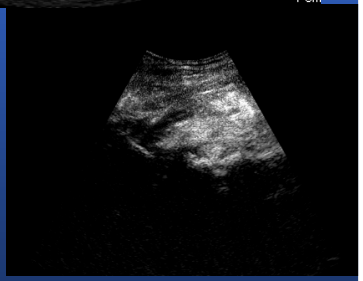
2.US + CEUS







3. MRI, 2
days later



Conclusion

- CEUS – useful and valuable method for the diagnosis of inflammatory joint disease and soft tissue focal lesions
- Differentiation between active – nonactive synovitis, fluid – synovitis, assessment of the response to treatment

  perfusion assessment of focal lesions
- 5 ml SonoVue.

Thank you for your attention.