L’ecografia in reumatologia

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Ferrara, 16/06/2012

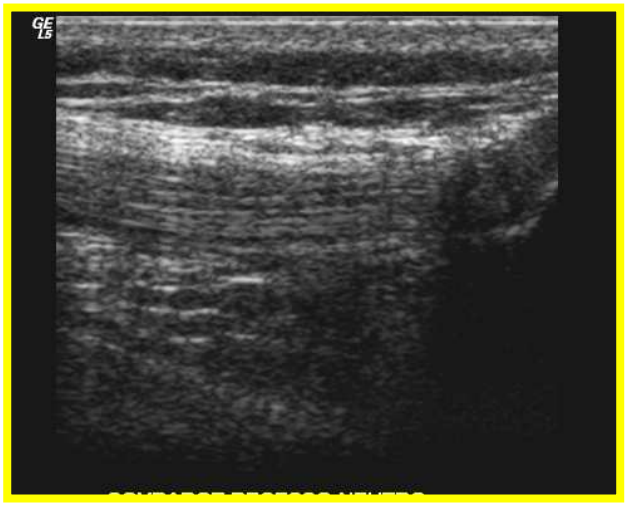
Ultrasonography (US) in Rheumatology

In the past decade the importance of US in rheumatology: ↑↑↑

main goal →

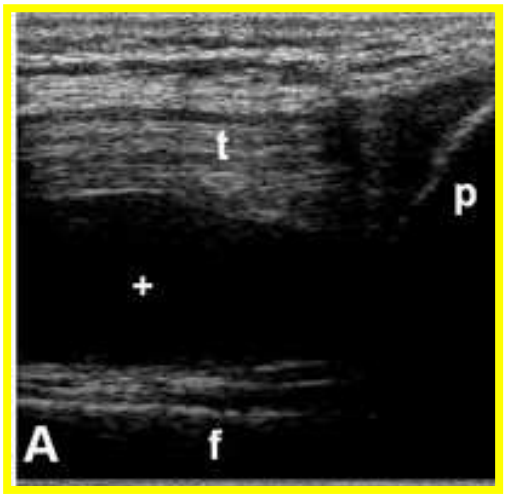
- **to distinguish between normal and inflamed joints**
- **clinical presentation ambivalent**

knee joint



Normal

US gray-scale



Exudative synovitis

Schmidt WA (2004) Doppler sonography in rheumatology. Best Pract Res Clin Rheumatol 18: 827–846

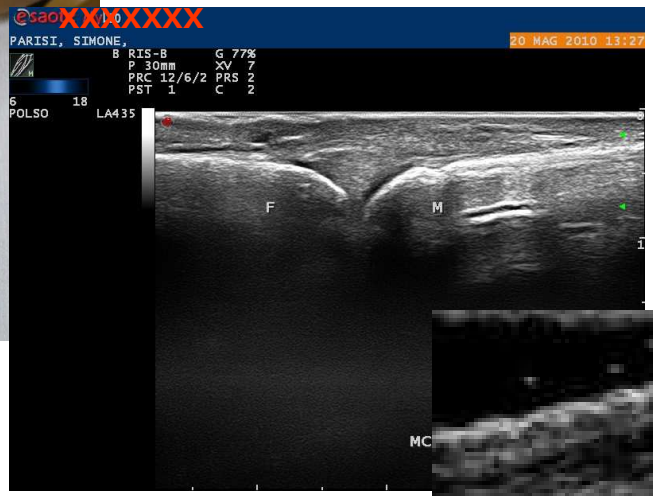
US in Rheumatology

US gray-scale →

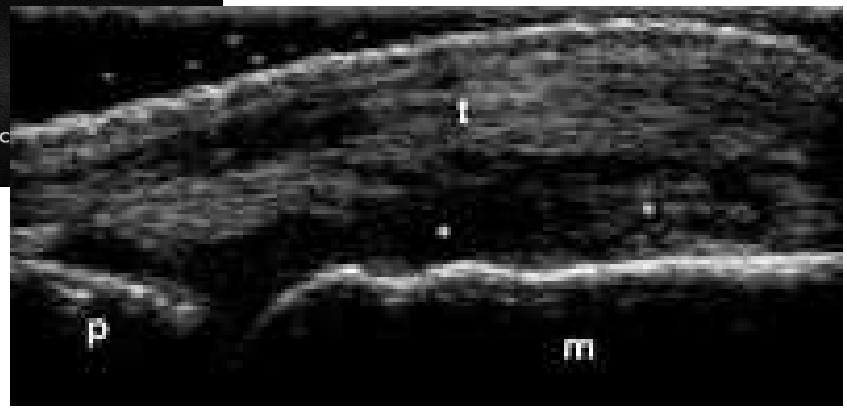
Morphology

(i.e.: standard distances between bone and joint capsules)

Normal



Exudative synovitis

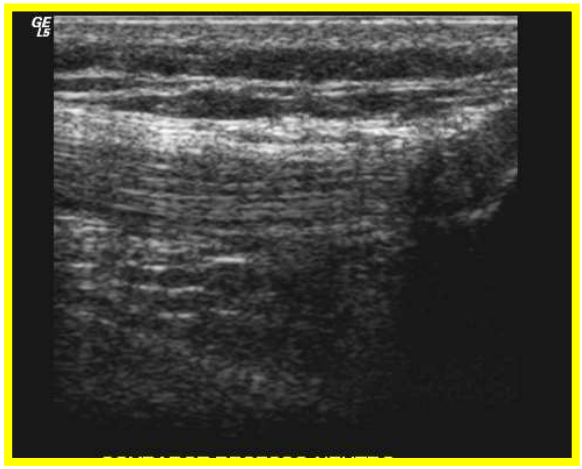


minor synovial thickening or effusion

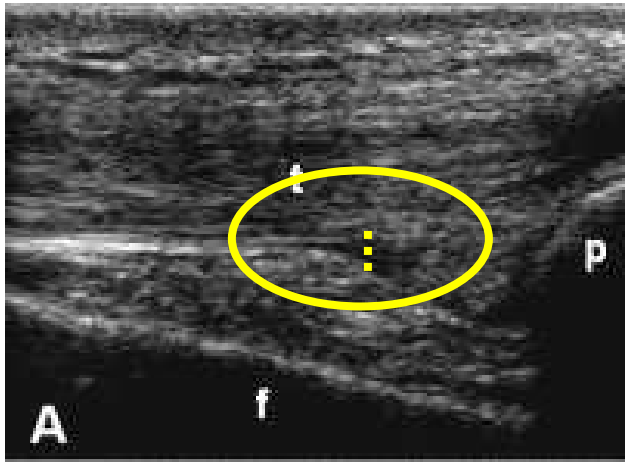
↓

difficult even for an experienced sonographer:

pathologic or not?

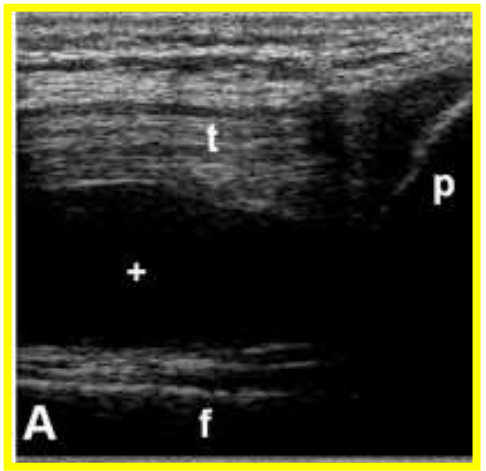


Normal



Minimal effusion

Exudative synovitis



Schmidt WA et al. Ann Rheum Dis 2004; 63: 988–994

US in Rheumatology

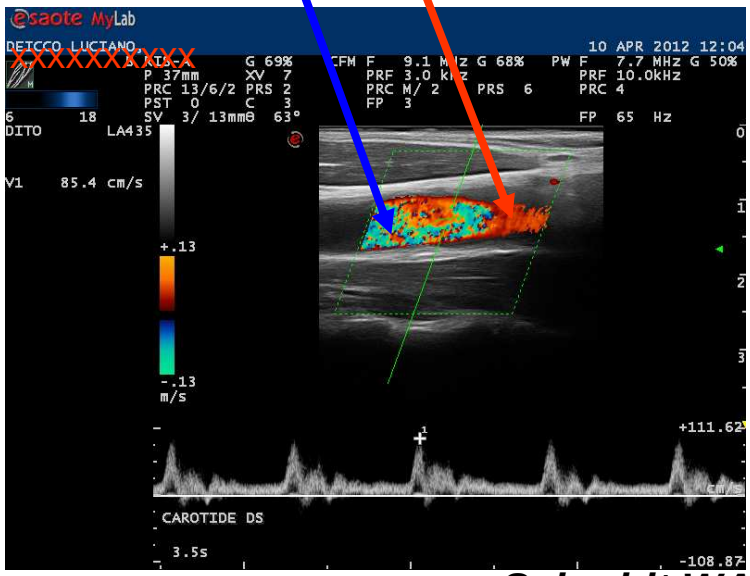
- Color Doppler
  (first described in 1994 in musculoskeletal US)

- Power Doppler

Schmidt WA (2004) Doppler sonography in rheumatology. Best Pract Res Clin Rheumatol 18: 827–846

Color Doppler US → **Large vessels high blood flow**

- the information from the Doppler ultrasonograph is integrated into the gray-scale image as a color signal
- red signal indicate flow that is directed towards the ultrasound probe
- blue signal indicate flow that is directed away from the probe

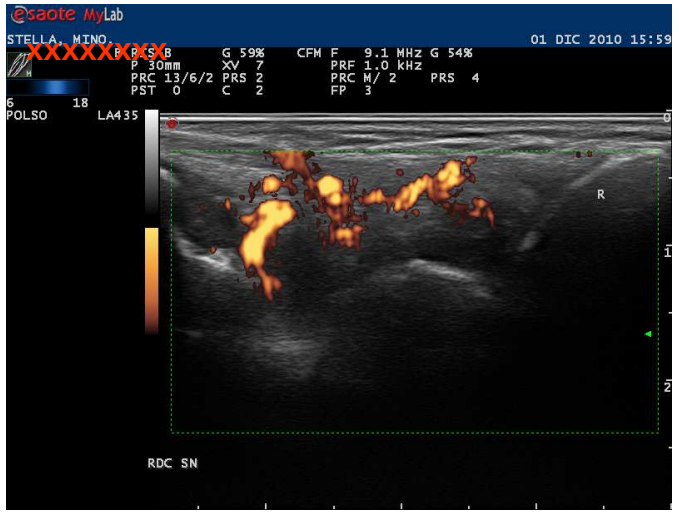


- to find the arteries more easily
- Vasculitis: to differentiate between the perfused lumen and the thickened wall

Schmidt WA (2004) Doppler sonography in rheumatology. Best Pract Res Clin Rheumatol 18: 827–846

Power Doppler US

- displayed in color
- increased sensitivity for detecting → **small vessels**
  slow blood flow



more sensitive than Color Doppler US: →

- Synovitis
- Tenosynovitis
- Enthesitis

Schmidt WA (2004) Doppler sonography in rheumatology. Best Pract Res Clin Rheumatol ***18:*** *827–846*

Power Doppler US

- displayed in color
- increased sensitivity for detecting → **small vessels**
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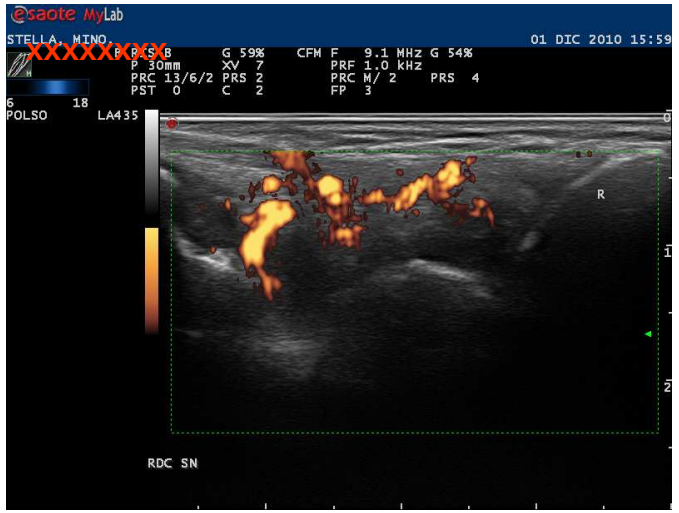


more sensitive than Color Doppler US: →
- Synovitis
- Tenosynovitis
- Enthesitis

less sensitive than color Doppler US → Vasculitis:
velocities higher in larger vessels

Schmidt WA (2004) Doppler sonography in rheumatology. Best Pract Res Clin Rheumatol ***18:*** *827–846*

US in Rheumatology

Inflammation → increased blood flow

- synovial tissue
- tendon insertions
- tendon sheaths
- bursae
- peri-articular tissue

Arterial wall

Power Doppler US

➢ Articular inflammation
- Synovitis
- Tenosynovitis
- Enthesitis
- Bursitis

Color Doppler US

➢ Vascular inflammation

vasculitis

Schmidt WA. Best Pract Res Clin Rheumatol 2004; ***18:*** *827–846*
Terslev L et al.Ann Rheum Dis 2005; ***64:*** *824–827*

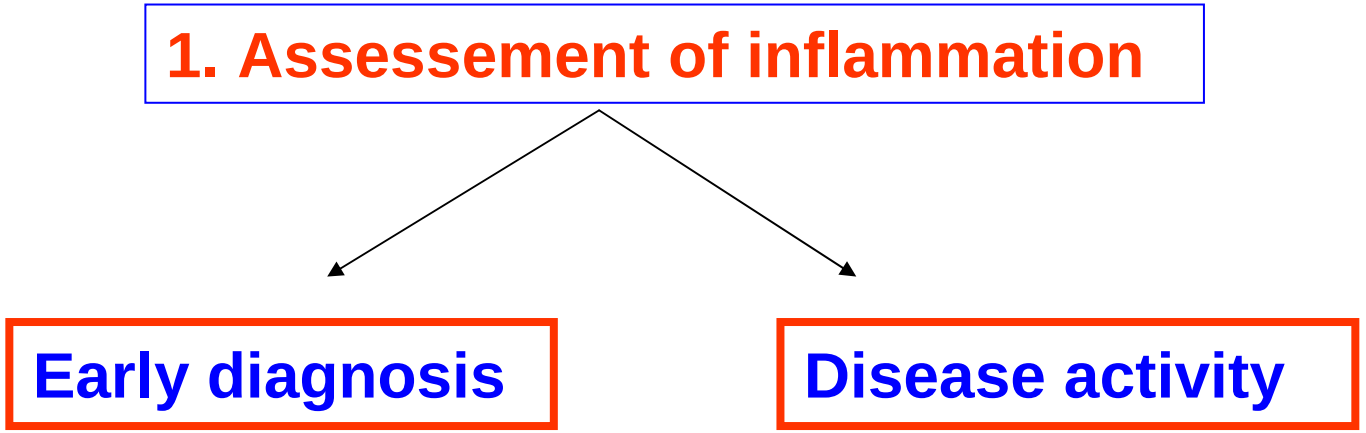
Power Doppler musculoskeletal US

Main goals

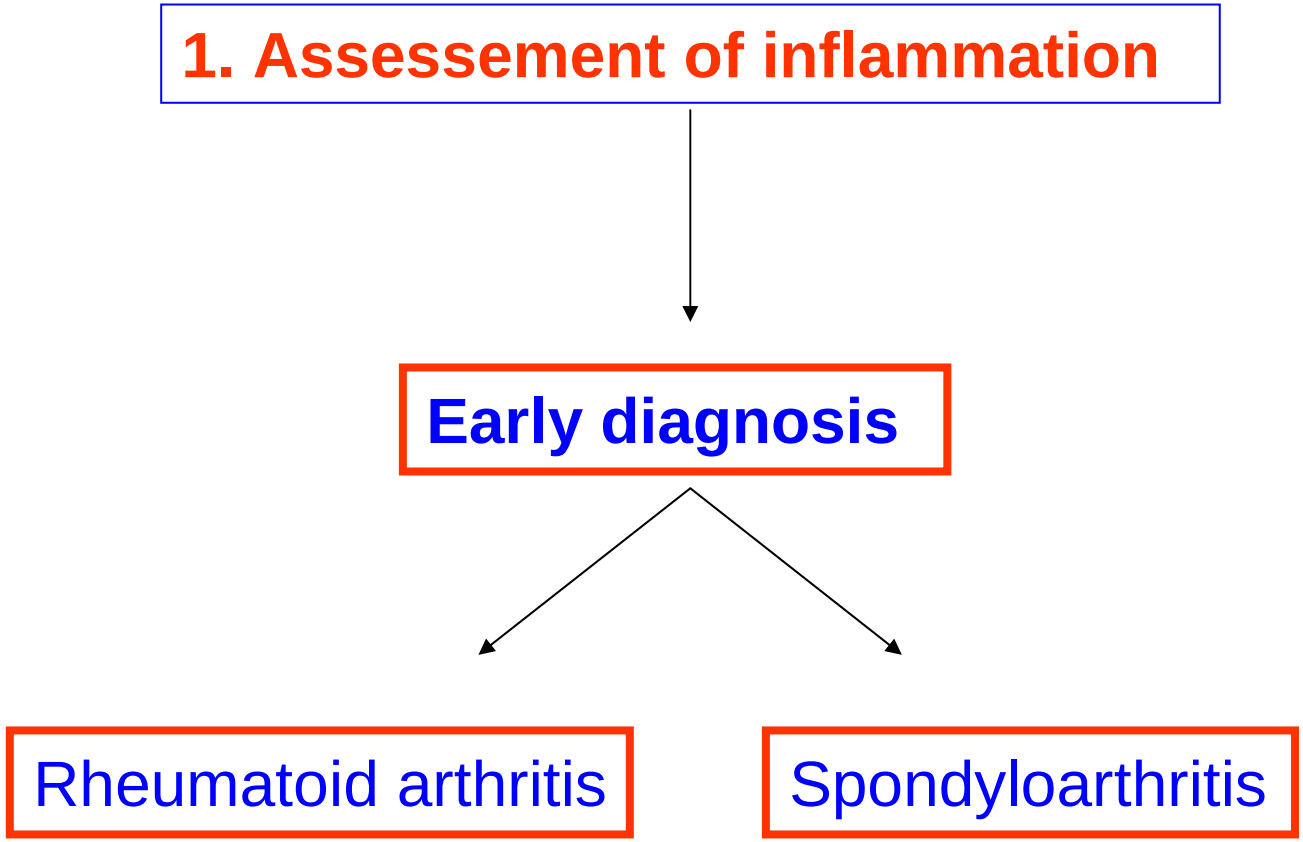
1. Assessement of inflammation

2. Evaluation of the effectiveness of therapy (follow-up)

3. Distinction between inflammatory and degenerative diseases



Szkudlarek M et al. Arthritis Rheum 2001; ***44:*** *2018–2023*
*Weidekamm C et al. Arthritis Rheum 2003;****48:*** *325–333*
Naredo E et al. Clin Exp Rheumatol 2005; ***23:*** *881–884*
D'Agostino MA et al. Arthritis Rheum 2003; ***48:*** *523–533*
Kiris A et al. Skeletal Radiol 2006; ***35:*** *522–528*



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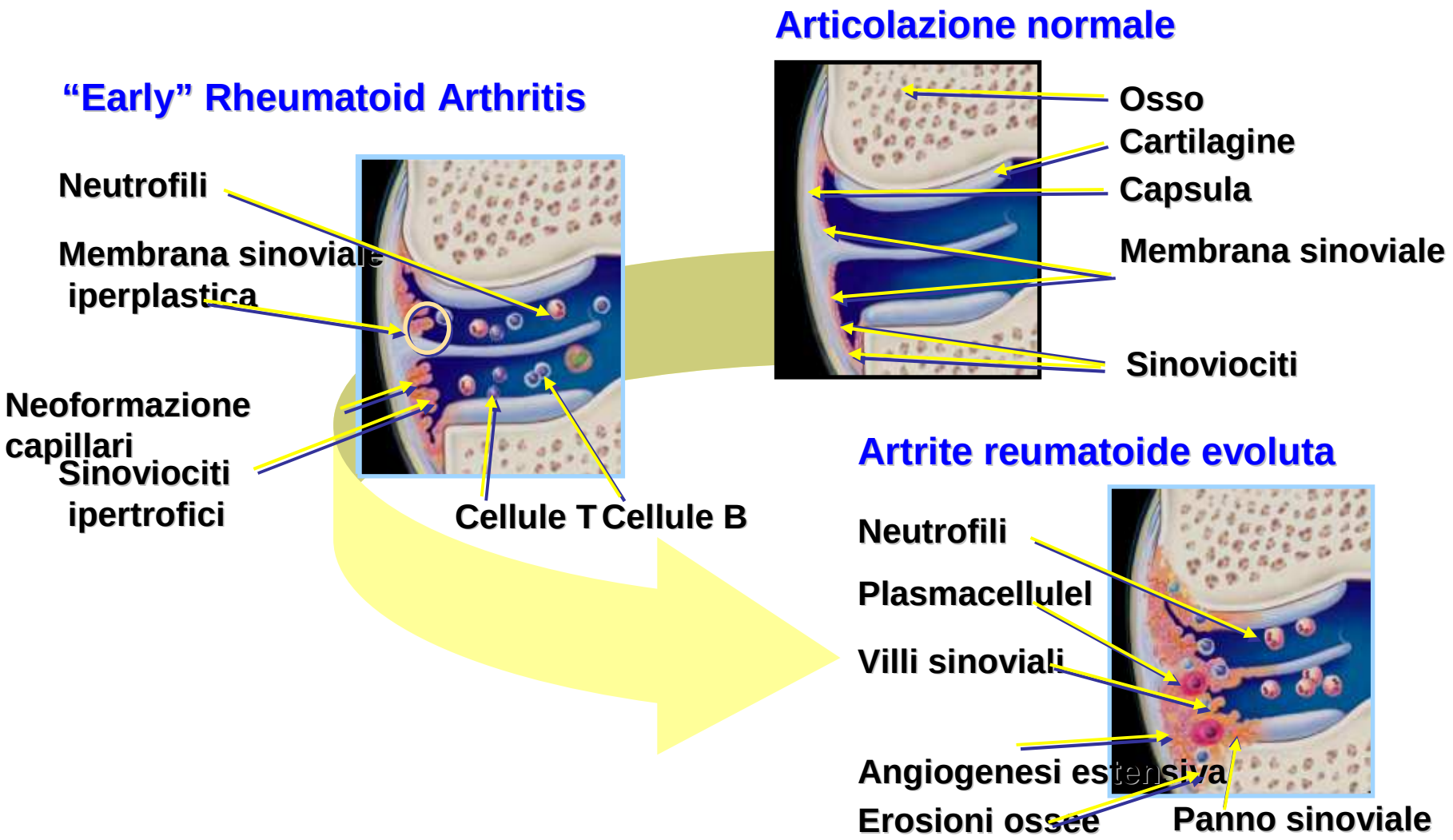
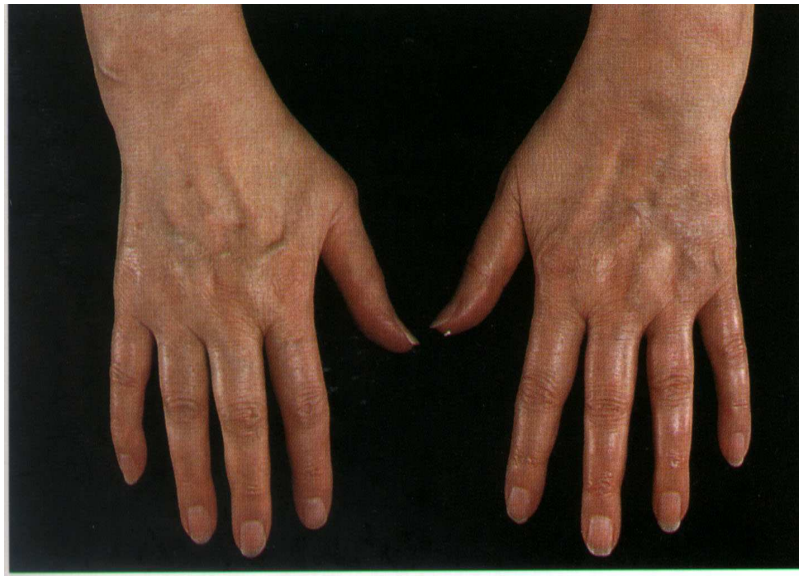
Kiris A et al. Skeletal Radiol 2006; ***35:*** *522–528*

ARTRITE REUMATOIDE

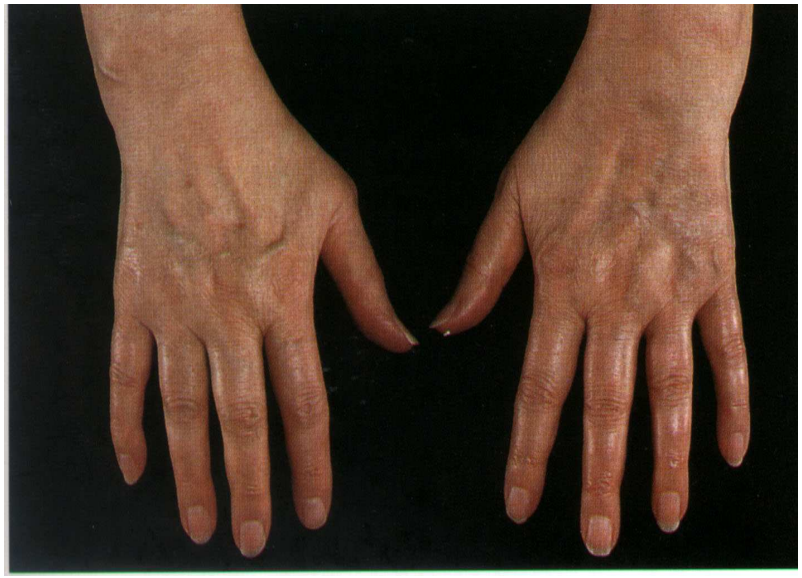


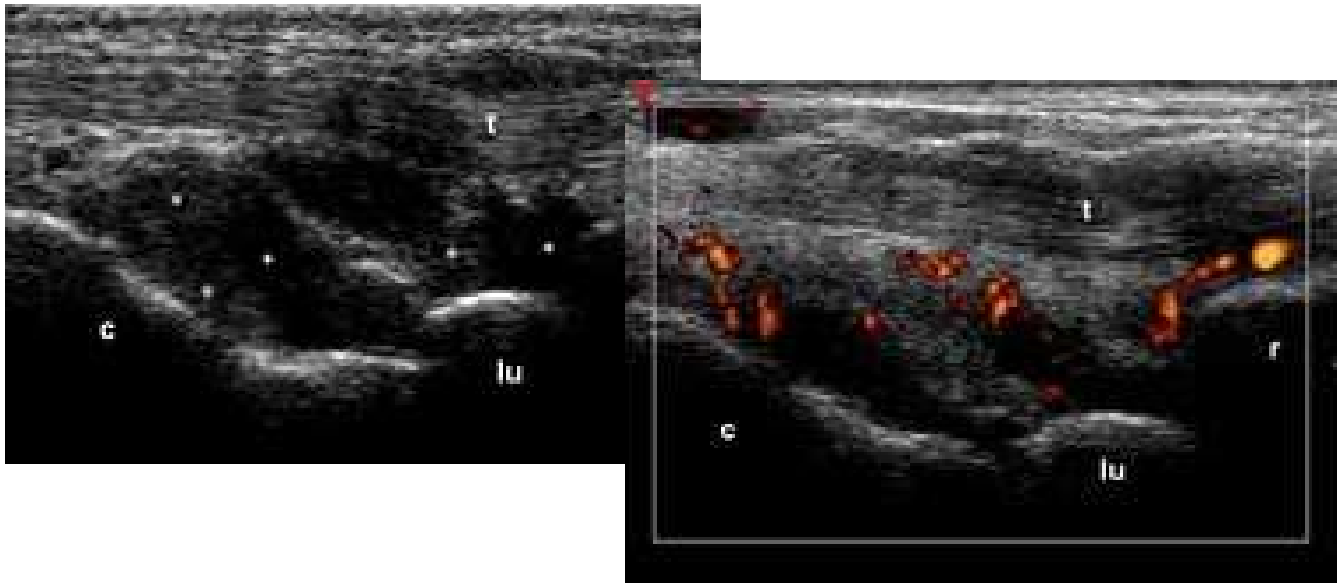
Choy EHS, Panayi GS. N Engl J Med. 2001;344:907–916

AR “Early”

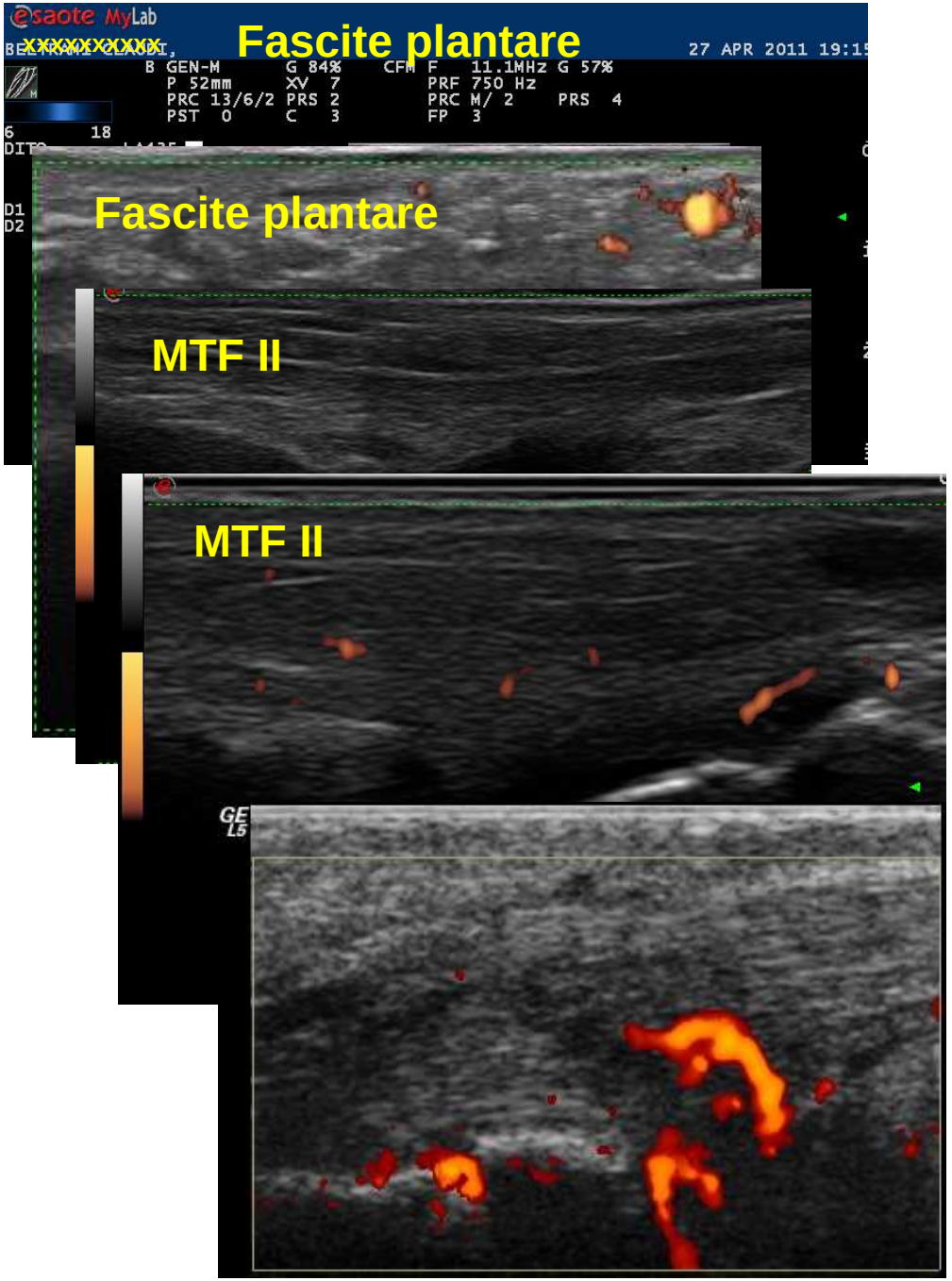


AR “Early”





Spondiloartrite “early”



1.Assessement of inflammation → **disease activity**

Rheumatoid arthritis

Active synovitis ⟷ ↑ intra-articular PD signal

PD-US should be used in the assessement of disease activity

Spondyloarthritis

Active enthesitis ⟷ ↑ enthesis PD signal

Szkudlarek M *et al. Arthritis Rheum 2001;* **44:** 2018–2023
Weidekamm C *et al. Arthritis Rheum 2003;***48:** 325–333
Naredo E *et al. Clin Exp Rheumatol 2005;* **23:** 881–884
D'Agostino MA *et al. Arthritis Rheum 2003;* **48:** 523–533
Kiris A *et al. Skeletal Radiol 2006;* **35:** 522–528

2. Evaluation of the effectiveness of therapy (follow-up)

- Rheumatoid Arthritis
- Psoriatic Arthritis

- corticosteroids
- TNF-antagonists

↓

anti-inflammatory effects

↓

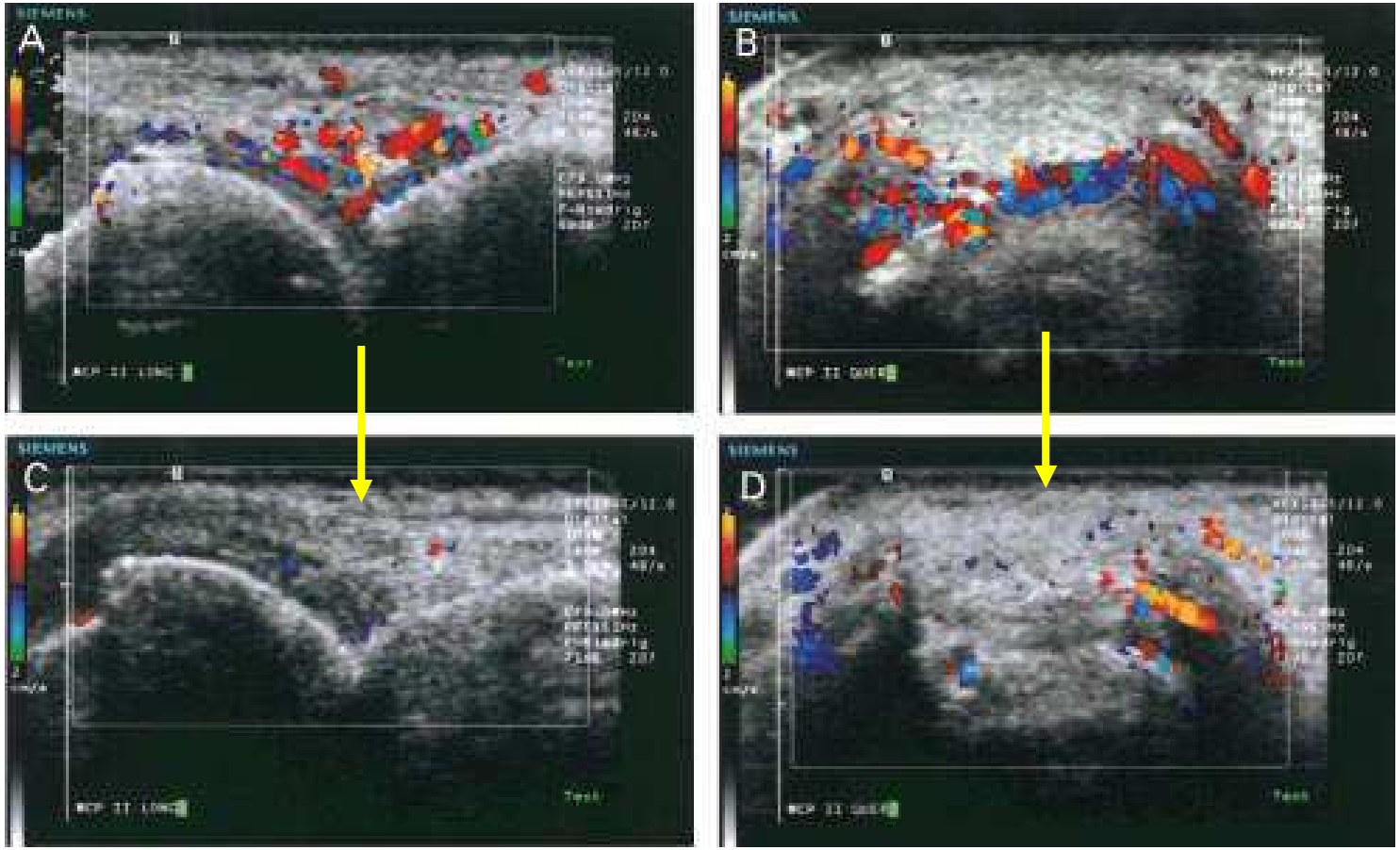
PD-US
reduction of intra-articular
color signals

Salaffi F et al. Clin Rheumatol 2004 ; ***23:*** *285–290*
Hau M et al. Ann Rheum Dis 2002; ***61:*** *55–58*
Terslev L et. Ann Rheum Dis 2003; ***62:*** *178–181*
Fiocco U et al.Ann Rheum Dis 2005; ***64:*** *899–905*
Taylor PC et al. Arthritis Rheum 2006; ***54:*** *47–53*

Rheumatoid Arthritis
MCPII joint of the right hand

Longitudinal scan

Transverse scan



before treatment with anti-TNF

29 days after treatment

Hau M et al. Ann Rheum Dis 2002; ***61:*** *55–58*

3. Distinction between inflammatory and degenerative diseases

very helpful:

-in differentiating between inflammatory and degenerative shoulder disease

Strunk J et al. Arthritis Rheum 2003; 48: 1828–1832

-in differentiating between knee rheumatoid arthritis and knee osteoarthritis

Schmidt WA et al. Clin Exp Rheumatol 2000; 18: 439–444

US in Rheumatology

Inflammation → increased blood flow

- synovial tissue
- tendon insertions
- tendon sheaths
- bursae
- peri-articular tissue

Arterial wall

Power Doppler US

➢ Articular inflammation

- Synovitis
- Tenosynovitis
- Enthesitis

Color Doppler US

➢ Vascular inflammation

vasculitis

Schmidt WA. Best Pract Res Clin Rheumatol 2004; ***18:*** *827–846*
Terslev L et al.Ann Rheum Dis 2005; ***64:*** *824–827*

Color Doppler US

Vasculitis

Large-vessel vasculitides:

- Giant Cell Arteritis: GCA
- Takayasu's arteritis

Detectable

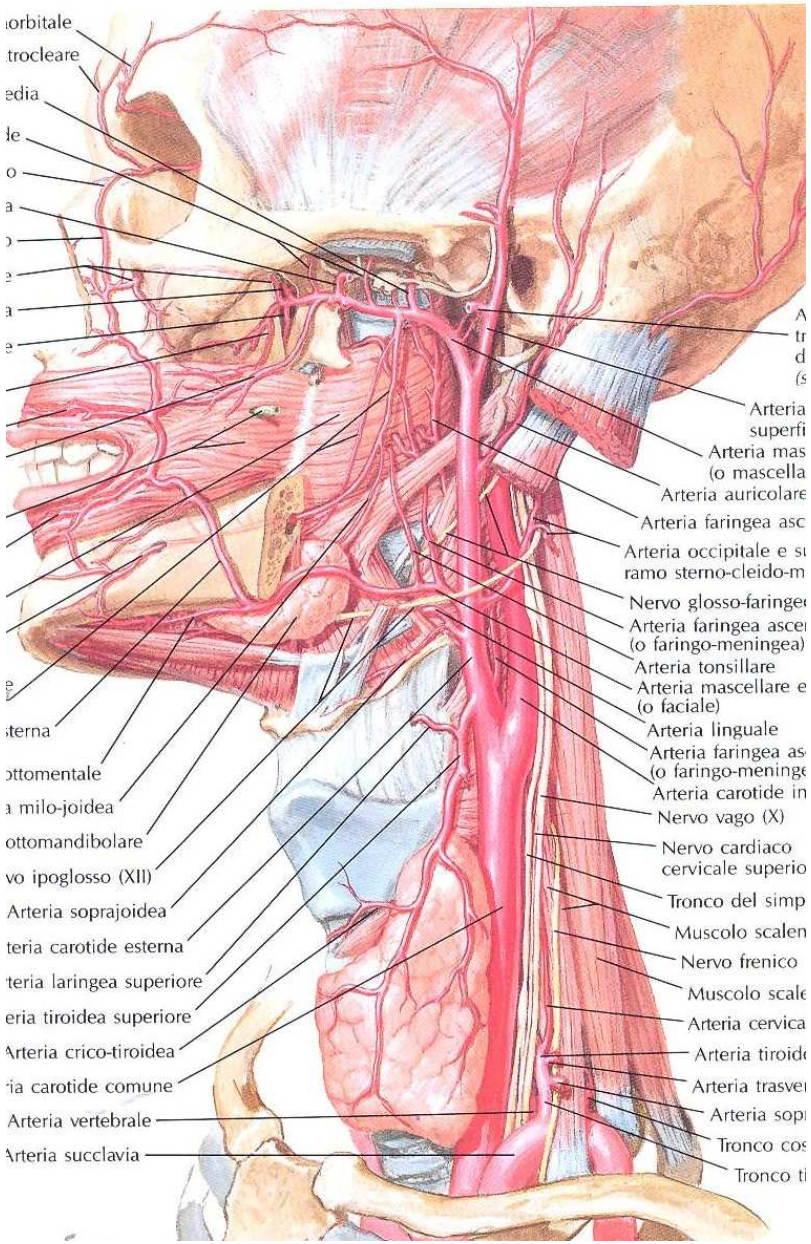
- temporal arteries (~0.7 mm)
- occipital arteries
- subclavian
- axillary
- common carotid
- abdominal aorta

Not detectable

- most parts of the thoracic aorta
- proximal left subclavian artery

GIANT CELL ARTERITIS

- primary systemic vasculitis affecting large and medium-sized arteries
- aorta and its main branches:carotid, axillary, iliac, femoral arteries
- More frequent involvement of extracranial arteries (extracranial branches of carotid)
- Involved with particular frequency the temporal artery (temporal arteritis)



-Febbre (febbricola)
-Mialgie
-Malessere generale
-Astenia
-Anemia
-Disappetenza
-Perdita di peso (anche rilevante)

MANIFESTAZIONI SISTEMICHE

MANIFESTAZIONI DISTRETTUALI

CUORE

- Miocardio (angina, infarto)
- Pericardio (pericardite essudativa)

SNC/SNP

- TIA
- Ictus
- Sordita'
- Paralisi nervi cranici
- Psicosi
- Demenza

- Mono-neuropatie
- Mononeuriti multiple
- Poli-neuropatie
- Plessopatie brachiali

APP.RESPIRATORIO

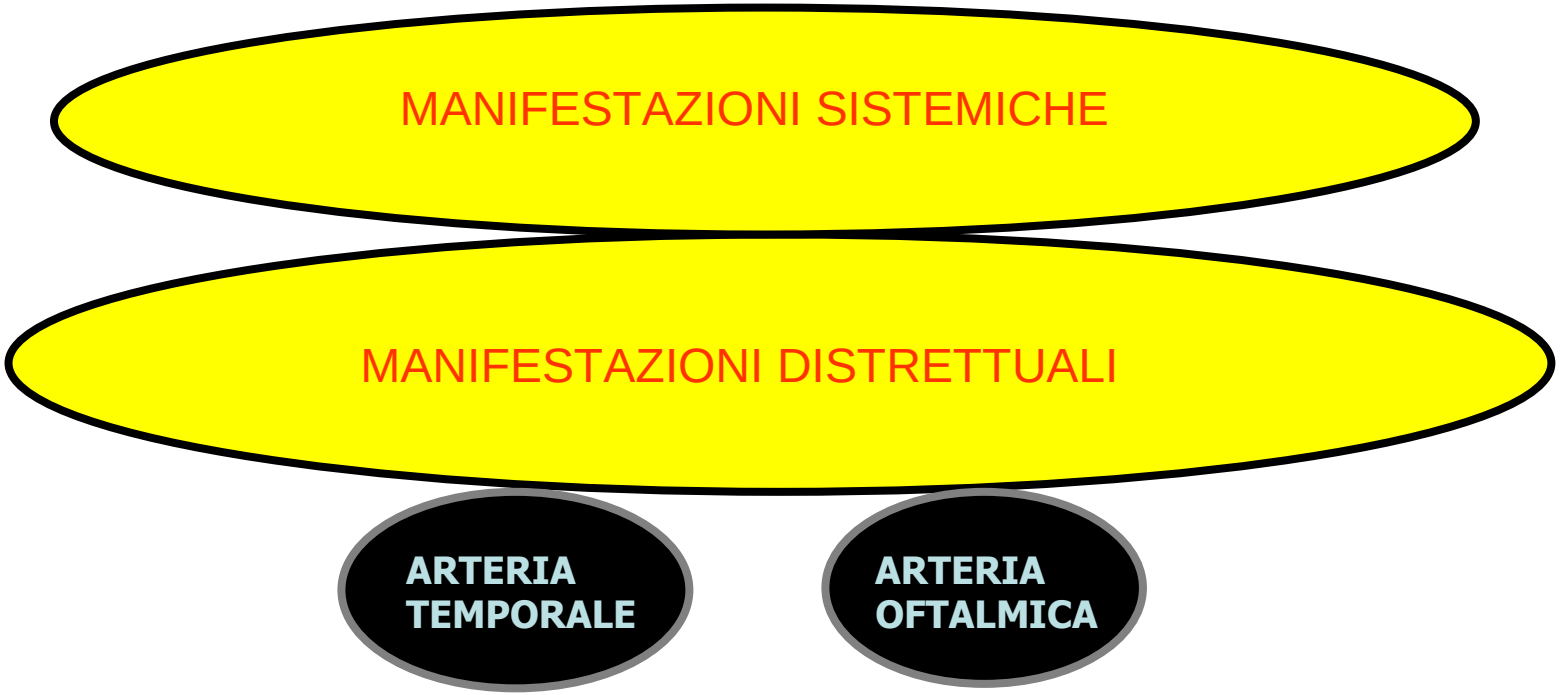
- Tosse secca
- Faringodinìa
- Raucedine
- Dispnea
- Dolore toracico
- Emottisi/emoftoe
- Pleurite
- Noduli polmonari
- Infiltrati interstiziali

RENE

Microematuria

VASI

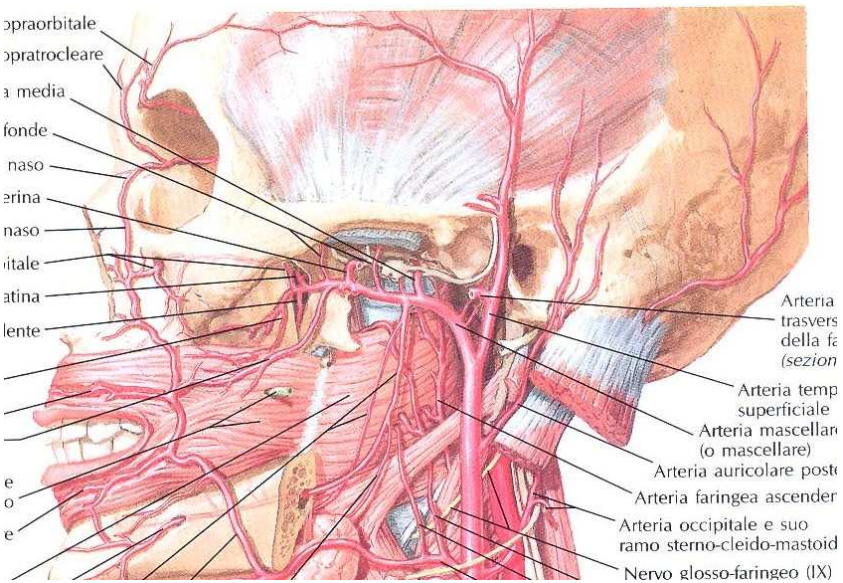
- Rottura di aneurismi
- Ipo-asfigmia dei polsi arteriosi periferici
- Claudicatio intermittens arti superiori e inferiori


MANIFESTAZIONI SISTEMICHE
MANIFESTAZIONI DISTRETTUALI
ARTERIA TEMPORALE
ARTERIA OFTALMICA

MANIFESTAZIONI SISTEMICHE

MANIFESTAZIONI DISTRETTUALI

ARTERIA TEMPORALE



Arterite temporale

- Cefalea ad esordio brusco
  - -temporale mono o bilaterale
  - -frontale
  - -occipitale

- Claudicatio masseteri

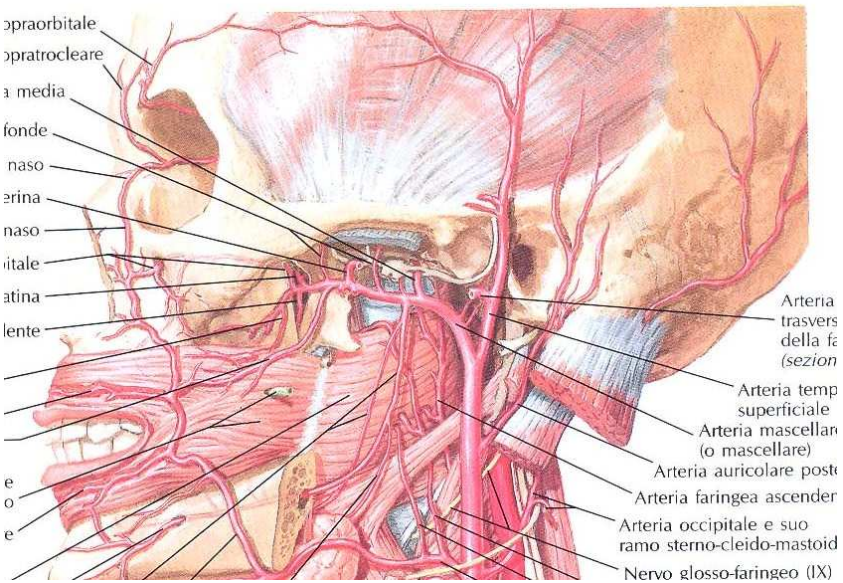
- Algie:
  - -facciali
  - -regioni orbitarie
  - -lingua
  - -denti
  - -orecchie
  - -odinofagia

- Cuoio capelluto
  - -iperestesie
  - -dolorabilità
  - -ulcerazioni

MANIFESTAZIONI SISTEMICHE

MANIFESTAZIONI DISTRETTUALI

ARTERIA OFTALMICA



Arterite oftalmica

Disturbi visivi

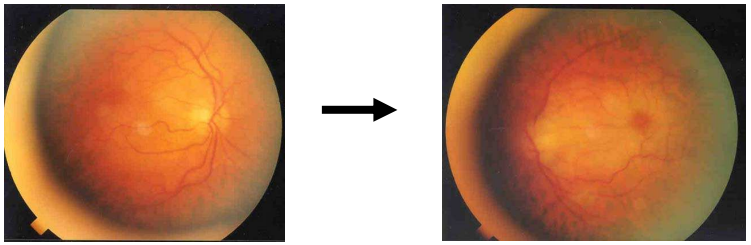
-amaurosis fugax

-difetti del campo visivo

-diplopia transitoria

-cecità mono o bioculare

EMERGENZA MEDICA



DIAGNOSI

Clinica

➢Esame obiettivo

-arteria temporale palpabile (cordone duro, tortuoso, dolente)

-a volte rossastro

-con riduzione o scomparsa della pulsatilità

Esami di laboratorio

•Elevati indici aspecifici di flogosi (VES e PCR, α-2-globuline, fibrinogeno)

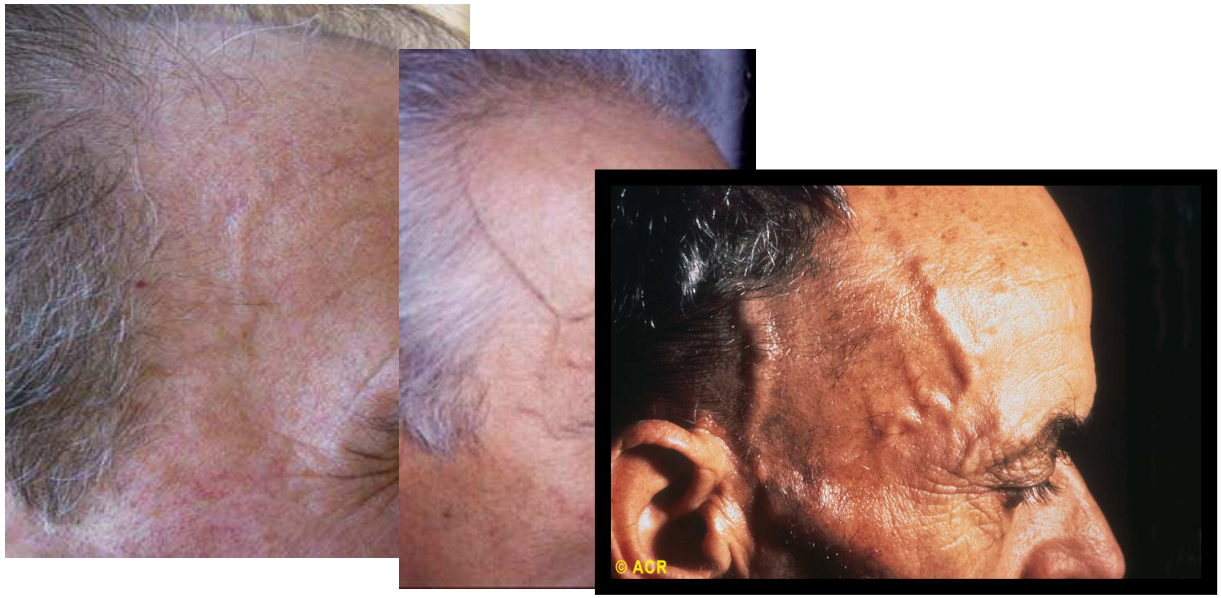
•Anemia ipocromica normocitica iposideremica

•Ferritina normale o aumentata

•Talora leucocitosi e piastrinosi

Mancanza di specificità

Biopsia dell'arteria temporale: gold standard diagnostico



Biopsia dell'arteria temporale: problematiche aperte

-distribuzione focale delle lesioni granulomatose ("skip lesions")

-Necessario prelevare un segmento di alcuni centimetri di un'arteria temporale

-se l'esame istologico è negativo, biopsia anche della controlaterale

-esame seriato di molte sezioni istologiche

-può risultare negativa nel 9-44% dei casi

-Per quanto considerata metodica poco invasiva, non tutti i pazienti gradiscono tale procedura

-Possibili complicanze:
- danni al nervo faciale
- necrosi cutanea
- stroke (interruzione di un circolo collaterale)

- ***Scott KR, Tse DT, Kronish JW. Temporal artery biopsy technique: a clinico-anatomical approach. Ophthalmic Surg 1991;22:519-25.***
- ***Siemssen SJ. On the occurrence of necrotising lesions in temporal arteritis:review of the literature with a note on the potential risk of a biopsy.Br J Plast Surg 1987;40:73-82.***
- ***Slavin ML. Brow droop after superficial temporal artery biopsy. Arch Ophthalmol 1986;104:1127.***

Eco-color doppler

-combinazione ultrasonografia B-mode/Doppler

-valutazione accurata di parete arteriosa/lume vasale/flusso arterioso

-nuove sonde ad alta frequenza: ottima visualizzazione dei vasi più superficiali come l'arteria temporale (3-4 mm sotto la superficie della pelle)

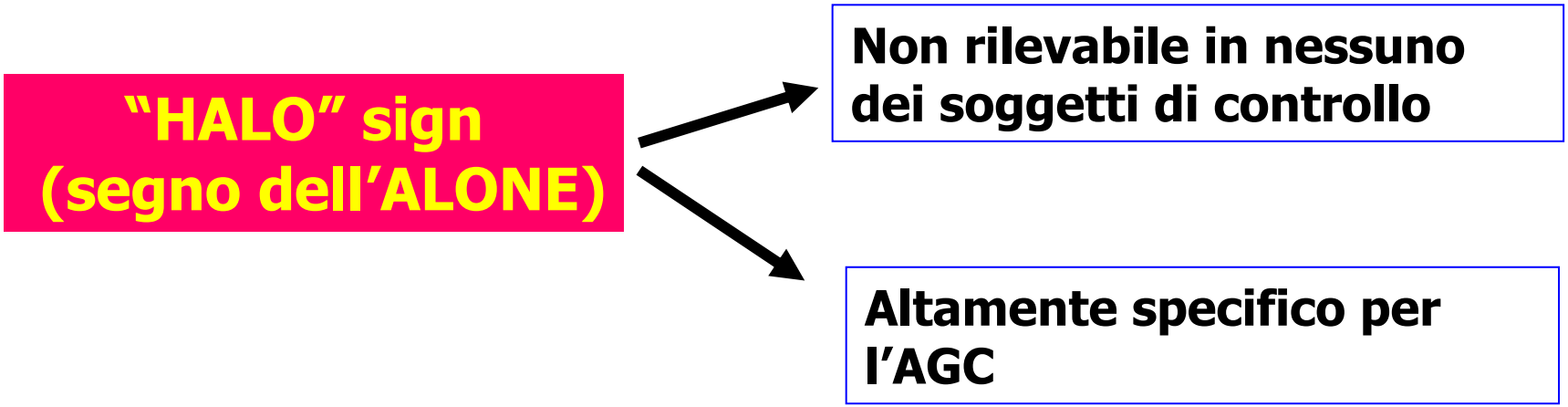
Negli ultimi anni numerosi studi hanno evidenziato le potenzialità diagnostiche dell'ecografia color-doppler nell'arterite di Horton

The New England Journal of Medicine

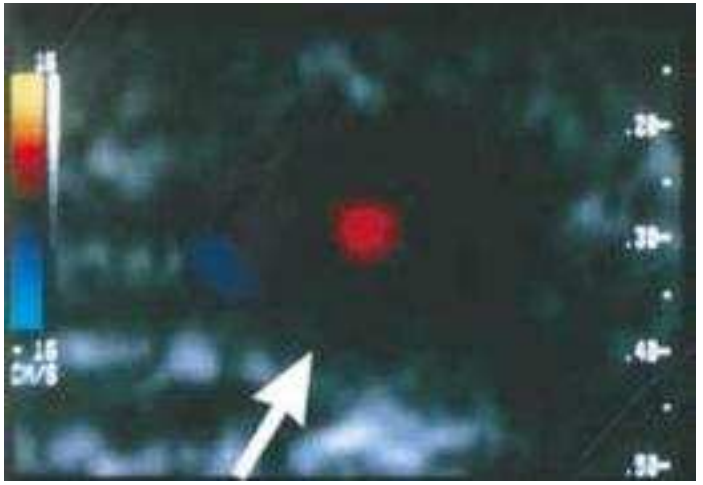
COLOR DUPLEX ULTRASONOGRAPHY IN THE DIAGNOSIS OF TEMPORAL ARTERITIS

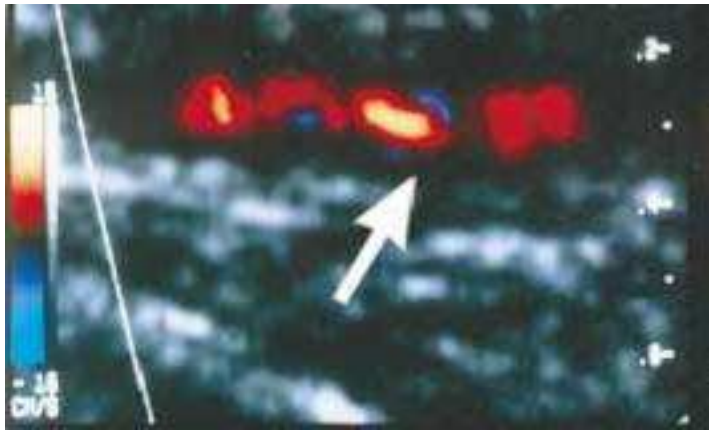
WOLFGANG A. SCHMIDT, M.D., HELGA E. KRAFT, M.D., KLAUS VORPAHL, M.D., LUTZ VÖLKER, M.D., AND ERIKA J. GROMNICA-IHLE, M.D.

➢Lo **spessore della parete arteriosa** risultava significativamente maggiore nei pazienti con AGC rispetto ai soggetti di controllo degli altri tre gruppi



“HALO”





-area ipo-anecogena circonferenziale intorno al lume vasale

-deve essere dimostrato in due scansioni (sagittale e trasversale)

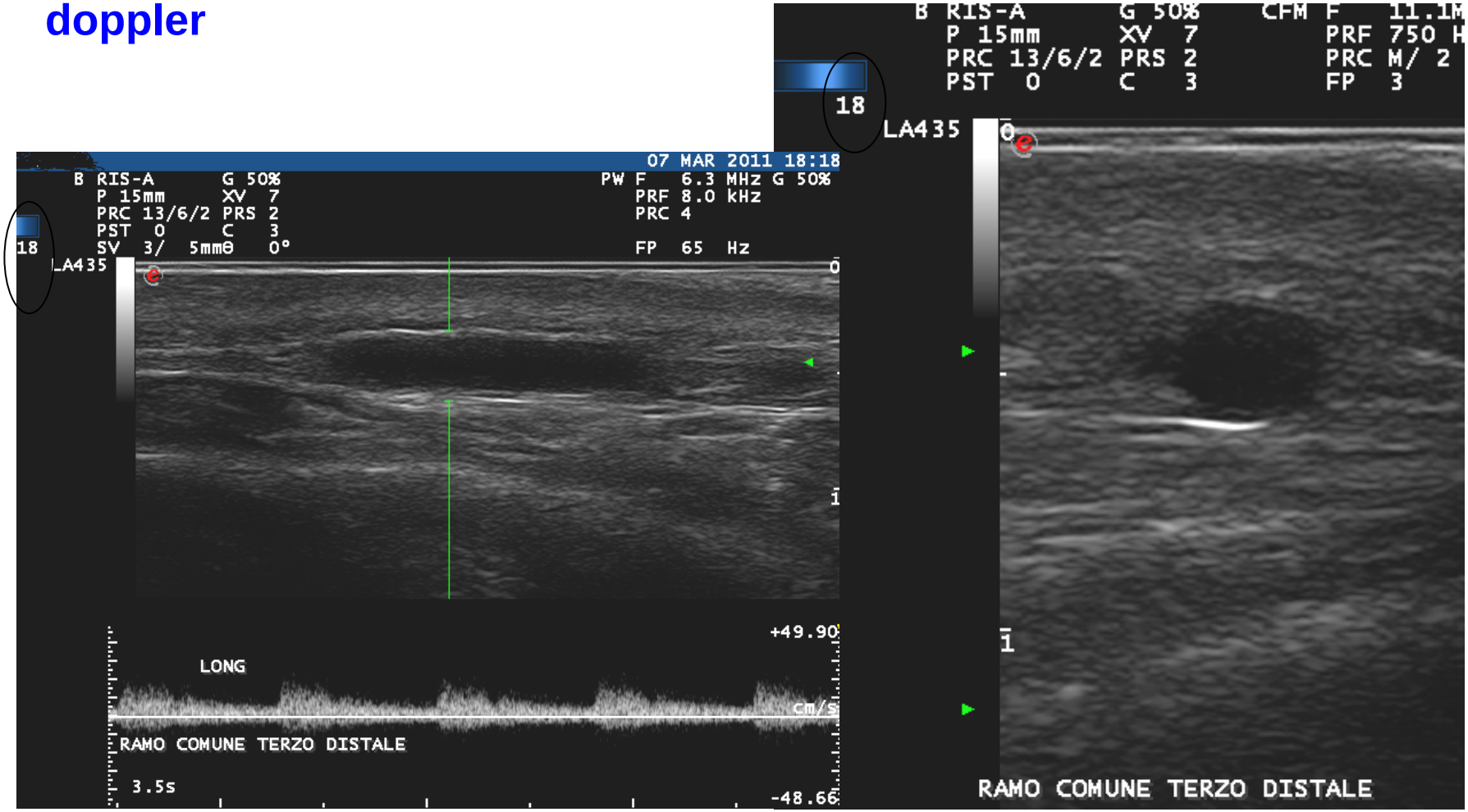
-conseguenza dell’edema della parete arteriosa

-fortemente connesso alla fase acuta della malattia

-scompare con la terapia farmacologica

Sulla base di questi dati, l’ ECD dell'arteria temporale è stato proposto come uno strumento utile sia nella valutazione diagnostica di AGC sia nel follow-up terapeutico

Con le sonde lineari ad elevata frequenza è possibile localizzare agevolmente l'arteria temporale anche senza l'applicazione color-doppler

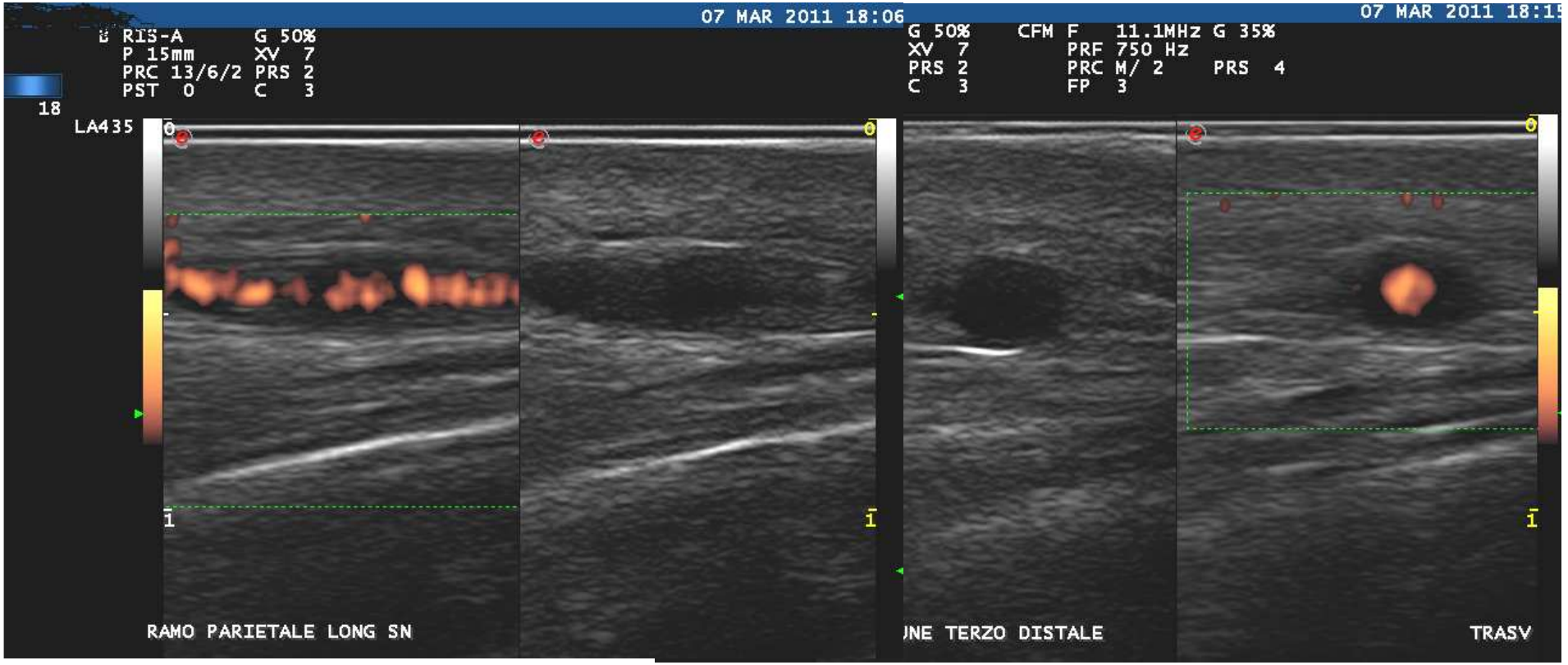


G.Ciancio,M.Bruschi,M.Govoni. Ultrasonography in diagnosis and follow-up of temporal arteritis:an update. Challenges in rheumatology.Ed:M.Harjacek.Intech Open access

Il color-doppler è però necessario per valutare:

-se il lume è regolarmente perfuso

-la presenza dell'halo



G.Ciancio,M.Bruschi,M.Govoni. Ultrasonography in diagnosis and follow-up of temporal arteritis:an update. Challenges in rheumatology.Ed:M.Harjacek.Intech Open access

Clinica

❖**30 consecutive patients** (18 F, 12 M; mean age 68.6, range 53–85 years)

➢All patients satisfied the ACR criteria for GCA

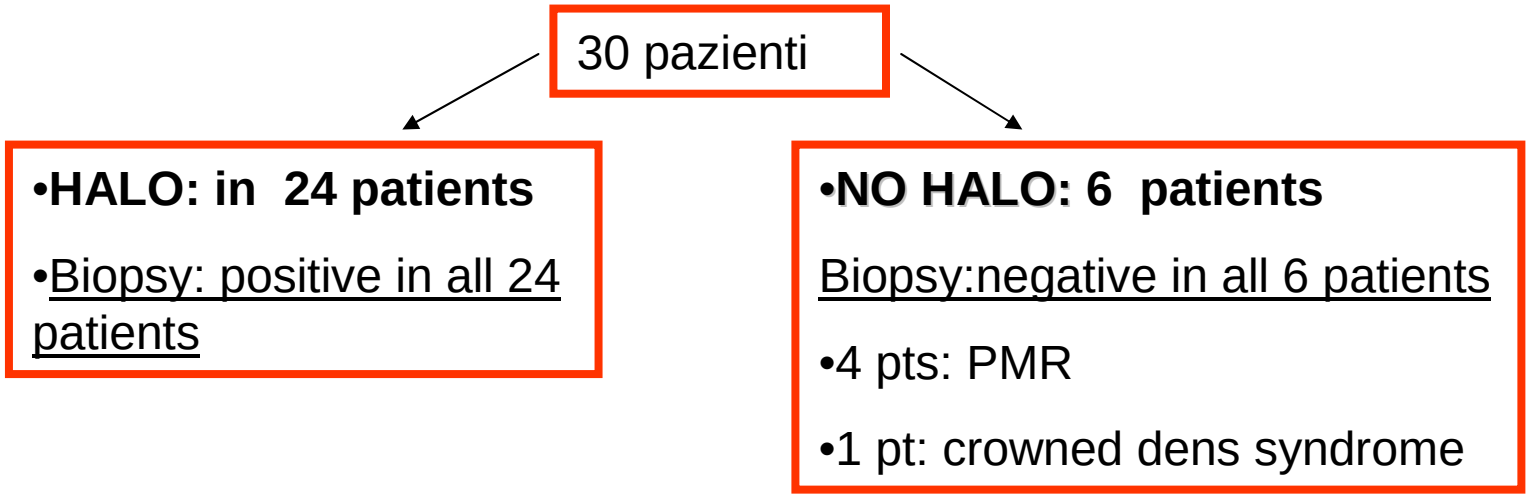
➢**Bilateral CD examination of TA**, ESR and CRP were performed at baseline and after 2, 4 and 6 weeks

➢**biopsy of the temporal artery :**

- unilateral
- performed within 3 to 7 days in all the 30 patients
-directed to a particular arterial segment in the cases with evidence of halo

➢10 age and gender-matched healthy controls were also examined

Ciancio G, Farina I, Bortoluzzi A, Giacuzzo S, Bruschi M, Occhionorelli S, Vanini A, Govoni M. Color doppler ultrasonography in the diagnosis and management of giant cell arteritis. Clin Drug Invest 2012, in press

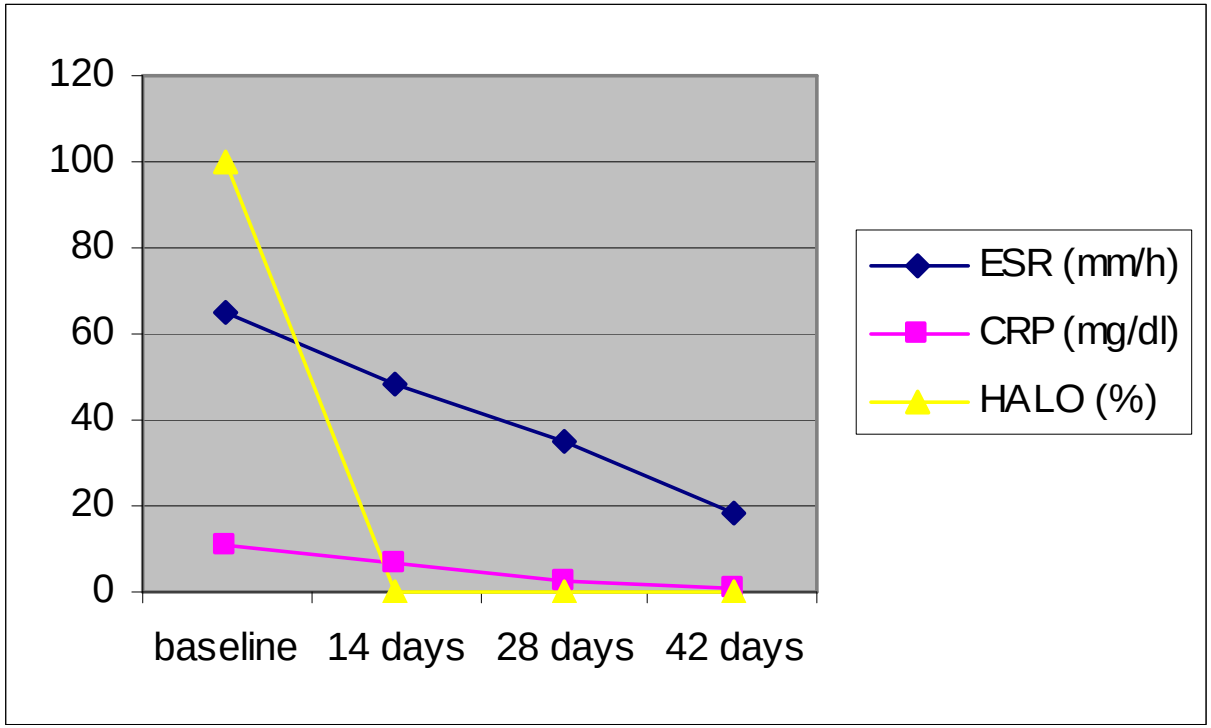


Follow-up:

-halo's thickness disappeared at the 2-weeks time point after starting therapy with glucocorticosteroids at appropriate dosage (0.5-1 mg/Kg/day)

-it returned to normal earlier than ESR and CRP

Ciancio G, Farina I, Bortoluzzi A, Giacuzzo S, Bruschi M, Occhionorelli S, Vanini A, Govoni M. Color doppler ultrasonography in the diagnosis and management of giant cell arteritis. Clin Drug Invest 2012, in press



Variation of the monitored parameters (ESR and CRP *vs* HALO) in the 30 patients with GCA. **ESR** and **CRP**: mean value among the 30 patient at each time point.

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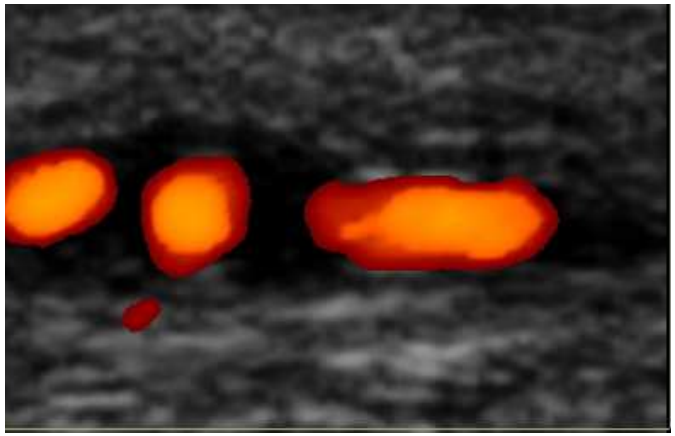

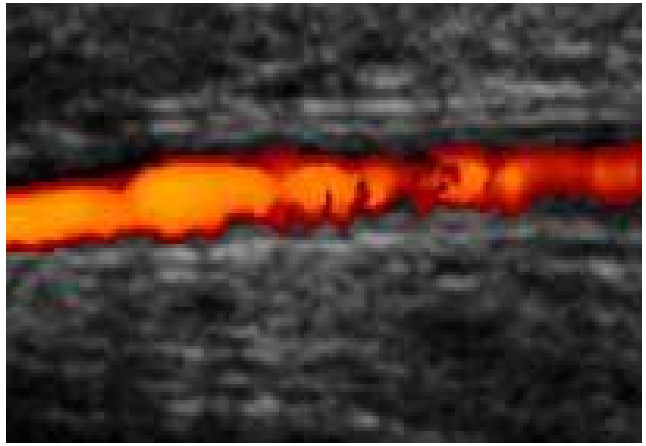

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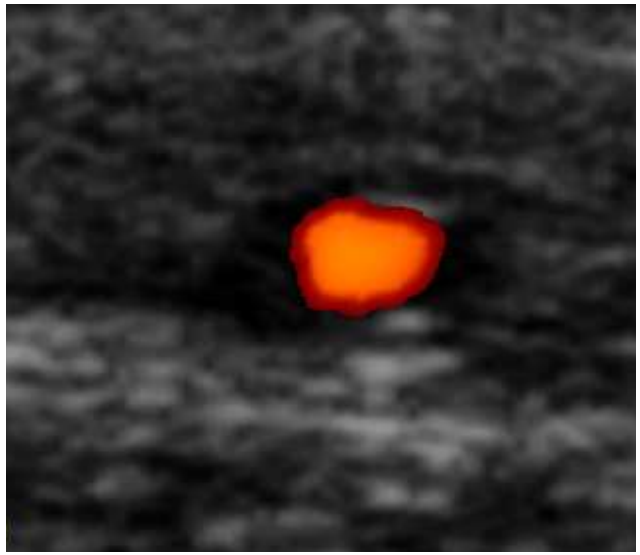

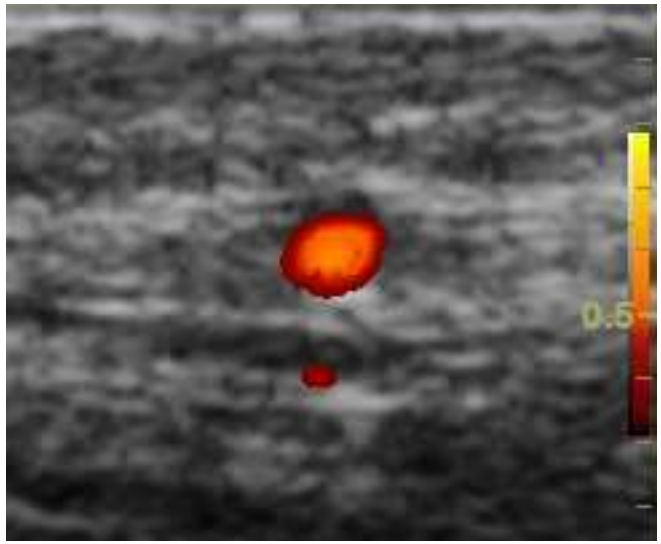

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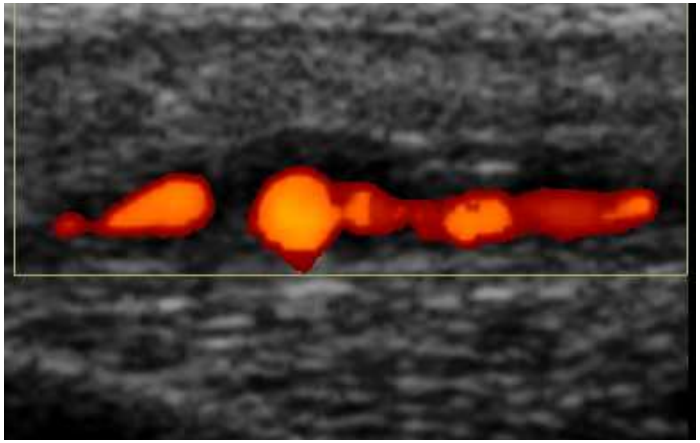

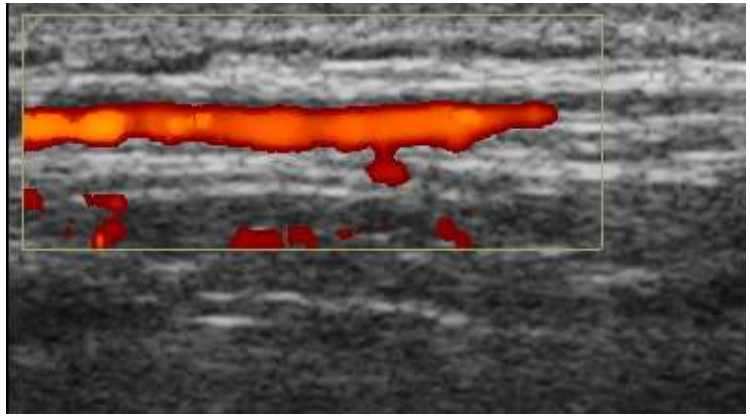

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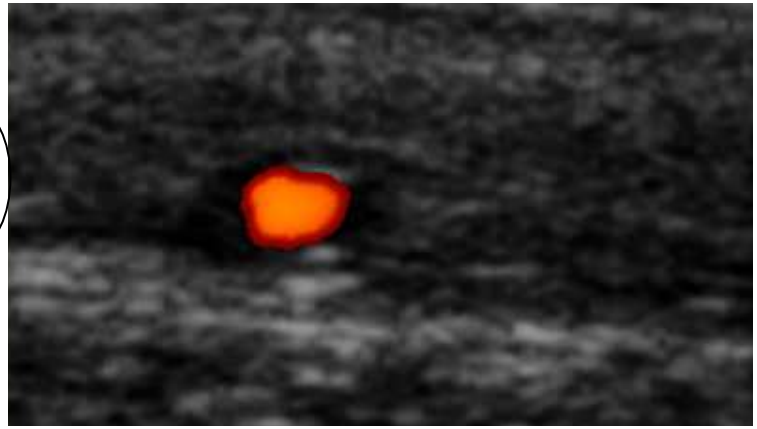

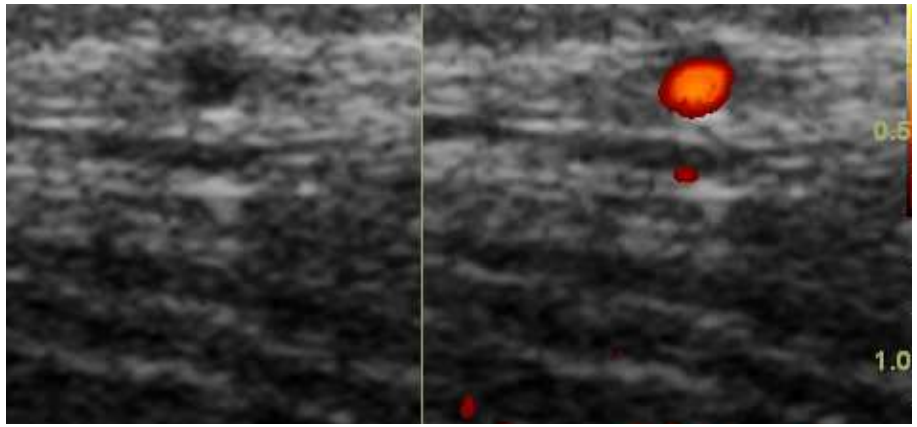

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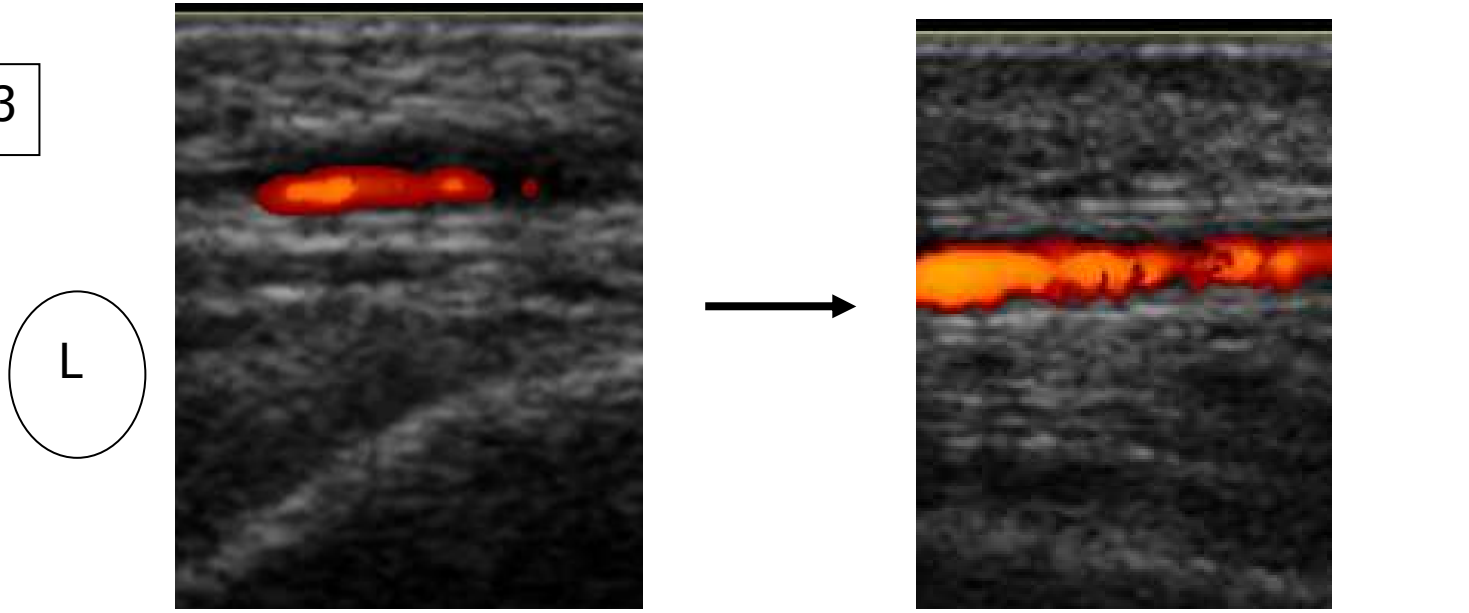
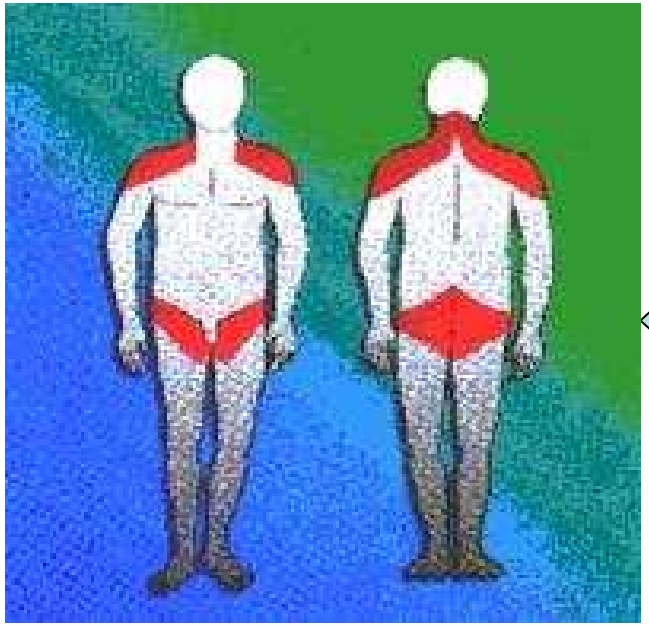
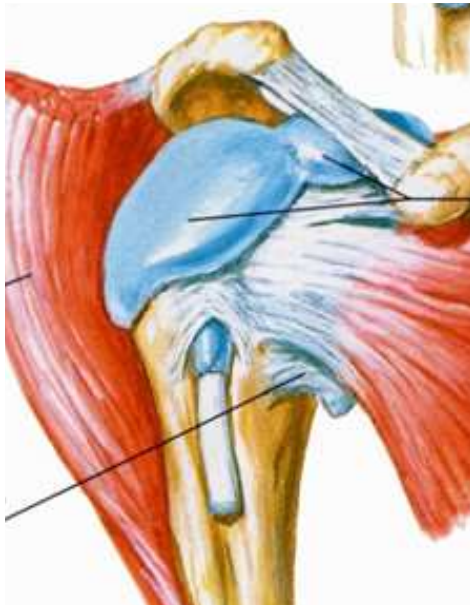
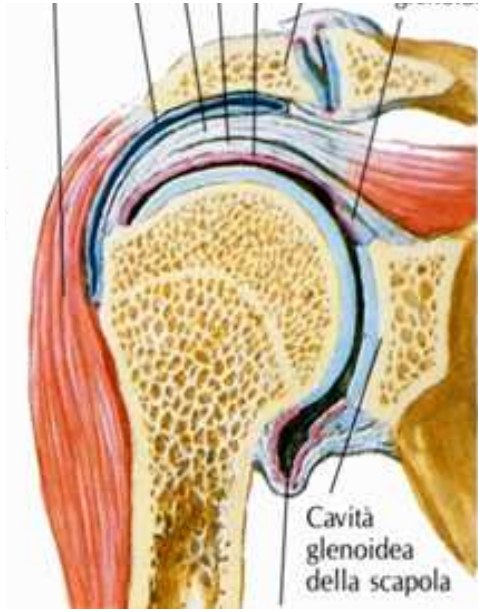


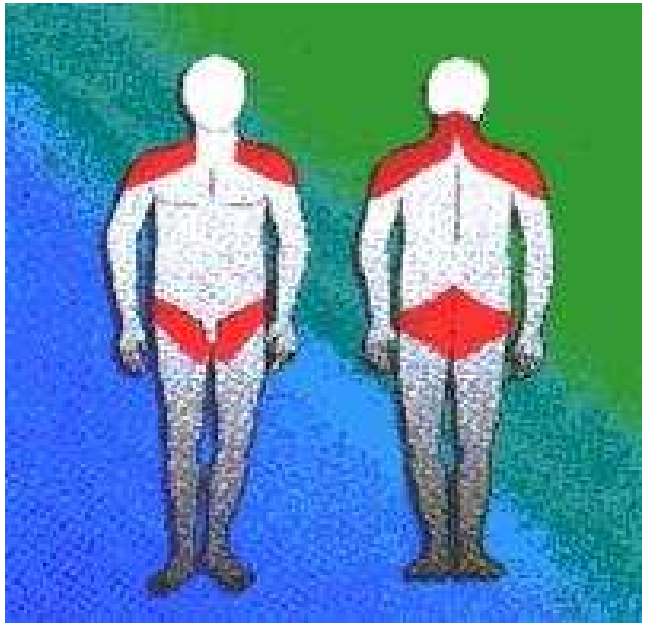


POLIMIALGIA REUMATICA

ARTERITE
GICANTOCELLULARE





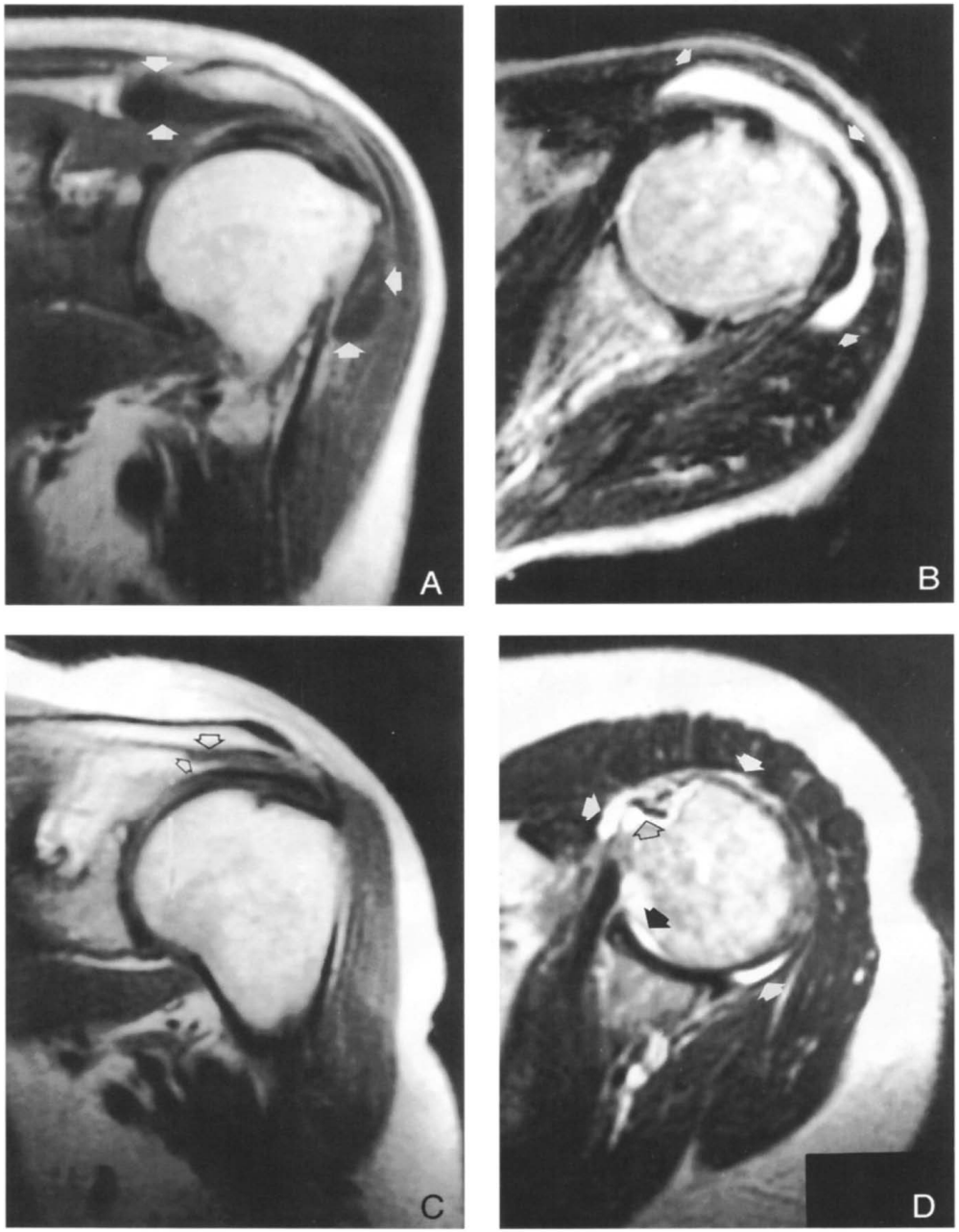


POLIMIALGIA REUMATICA

-Dolore muscolare,anche notturno, al collo e ai cingoli scapolare e pelvico

-Dolore estremamente intenso e invalidante con grave impotenza funzionale

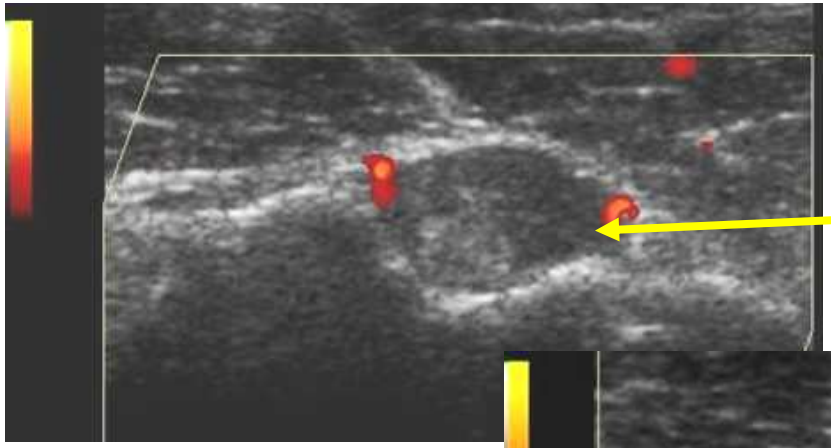
-Sintomi sistemici



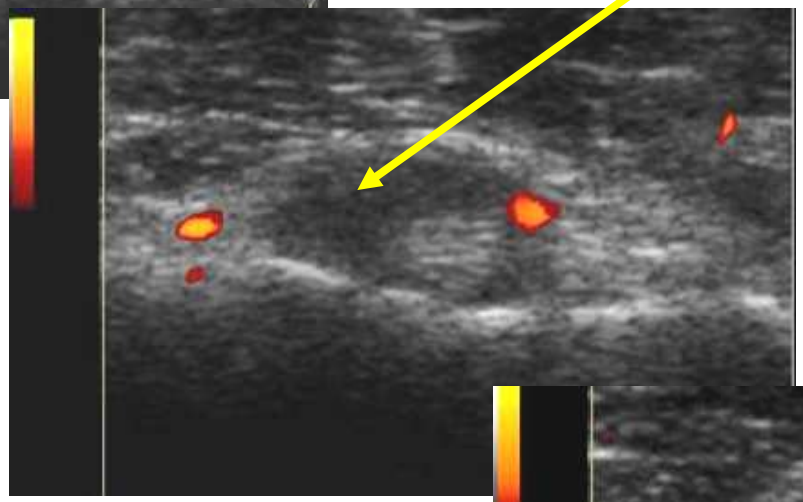
Magnetic resonance images of patients with polymyalgia rheumatica. Coronal T1-weighted *(A)* and axial T2-weighted *(B)* images of the left shoulder show severe subacromial and subdeltoid bursitis *(arrows).* Coronal T1 -weighted (C) image of the left shoulder shows mild subacromial bursitis *(arrows).* Axial T2-weighted *(D)* image of the left shoulder shows moderate subdeltoid bursitis *(solid white arrows),* mild joint effusion *(solid black arrow),* and severe tenosynovitis of the long head of the biceps *(open black arrow).*

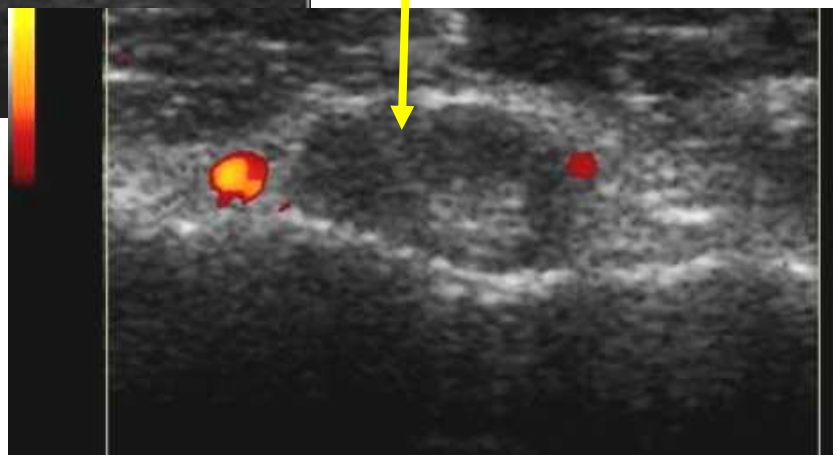
Salvarani C. et al;
Proximal Bursitis in Active Polymyalgia Rheumatica *Ann Intern Med.* 1997;127:27-31.

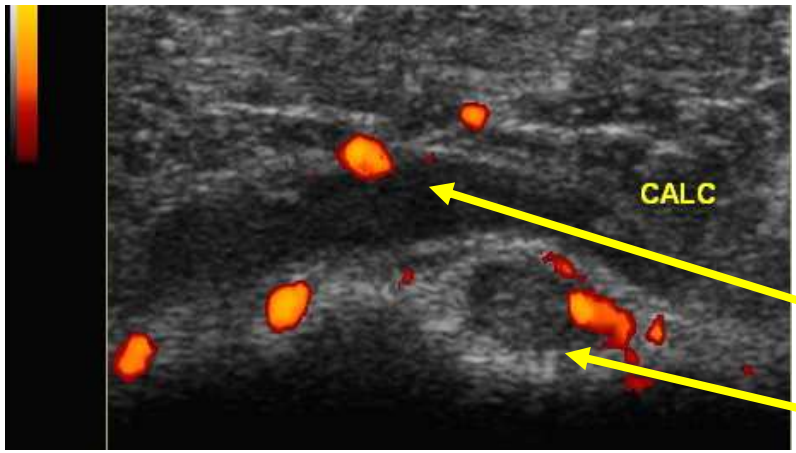
POLIMIALGIA REUMATICA



TENOSINOVITE
CAPO LUNGO
DEL BICIPITE







BORSITE S.A.D.

TENOSINOVITE C.L.B.

US in Rheumatology

Advantages

➢Excellent evaluation of articular/periarticular/vascular inflammation

-Synovitis
-Entesithis
-Tenosynovitis
-Bursitis
-Dactylitis
-Capsulitis
-Vasculitis

➢Good tool in evaluation short- and mid-term treatment effects

➢More sensitive than clinical examination and MRI in detecting early inflammation

➢inexpensive investigation

Limits

➢bone marrow edema not appreciable

➢difficulty in introducing into everyday clinical practice

➢dependence on operator expertise

- *D'Agostino MA et al.Arthritis Rheum 2003*
- *Kamel M et al. J Rheumatol 2003*


Grazie