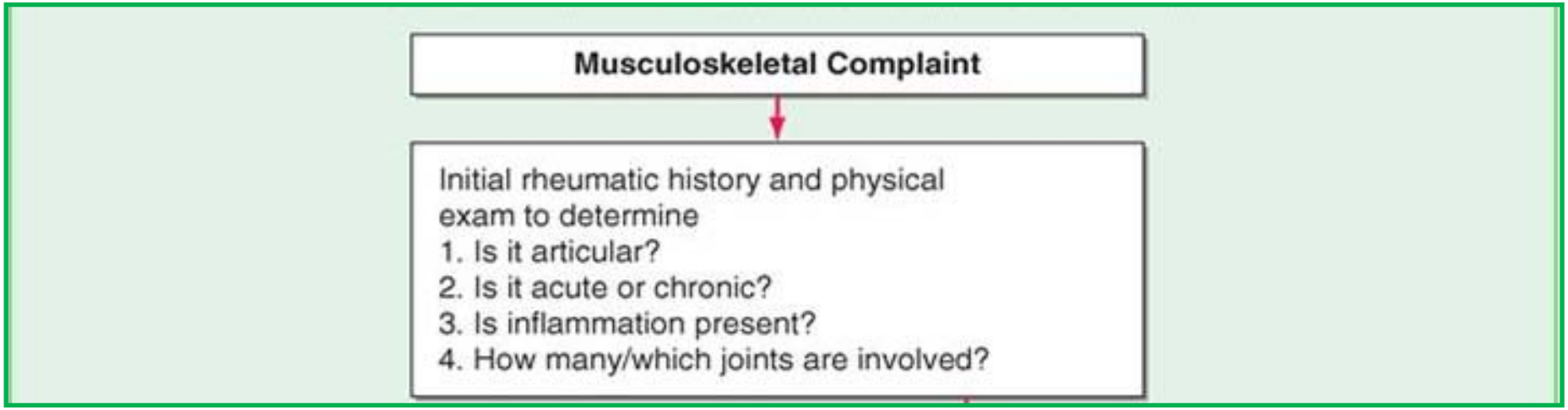
관절통 환자에 대한 초음파

동아대 류마티스내과
이상엽

순서

- 1. 관절염의 초음파 소견
- 2. 류마티스 관절염
- 3. 증례(류마티스 관절염: 진단, 예후)
- 4. 퇴행성 관절염
- 5. 통풍
- 6. 증례(류마티스 관절염+ 통풍+퇴행성 관절염)

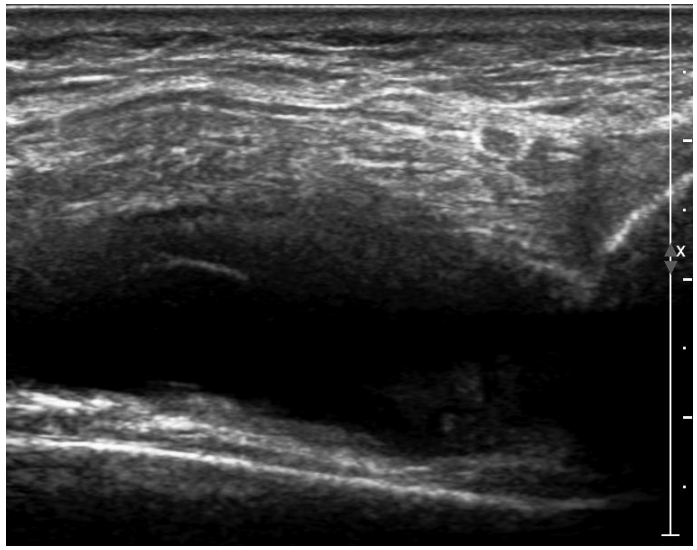
Algorithm for Musculoskeletal Complaints

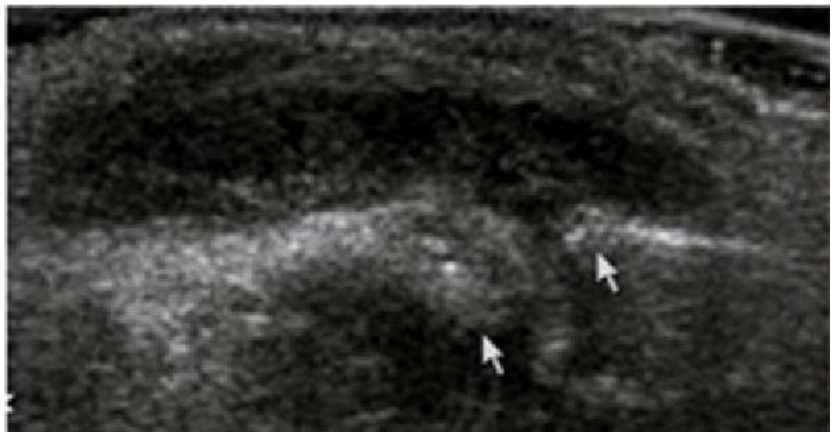


- Articular vs Non-articular?
- Inflammatory vs Non-inflammatory?

Synovial Effusion

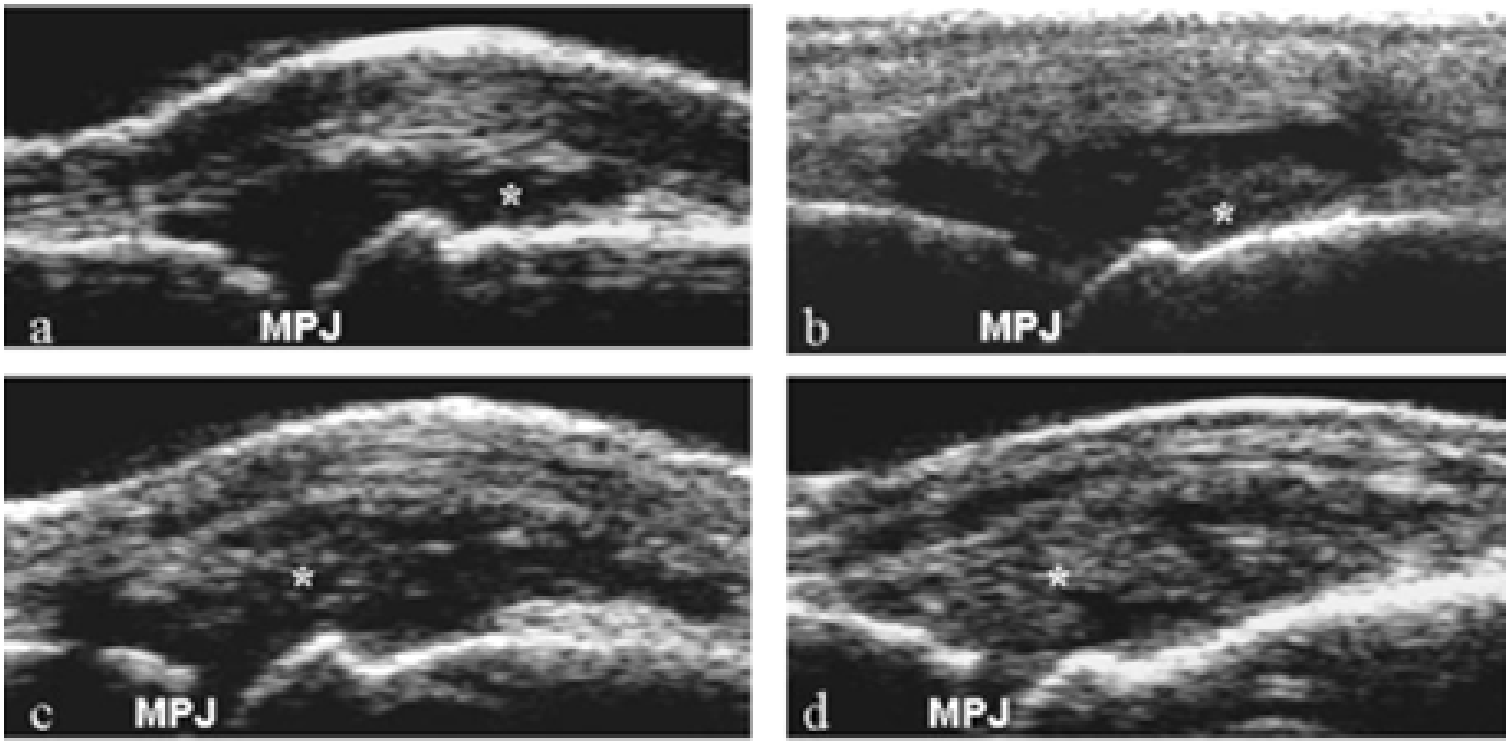
- Abnormal **hypoechoic or anechoic** (relative to subdermal fat, but sometimes may be isoechoic or hyperechoic) **intra-articular material** that is displaceable and compressible, but does not exhibit Doppler signal





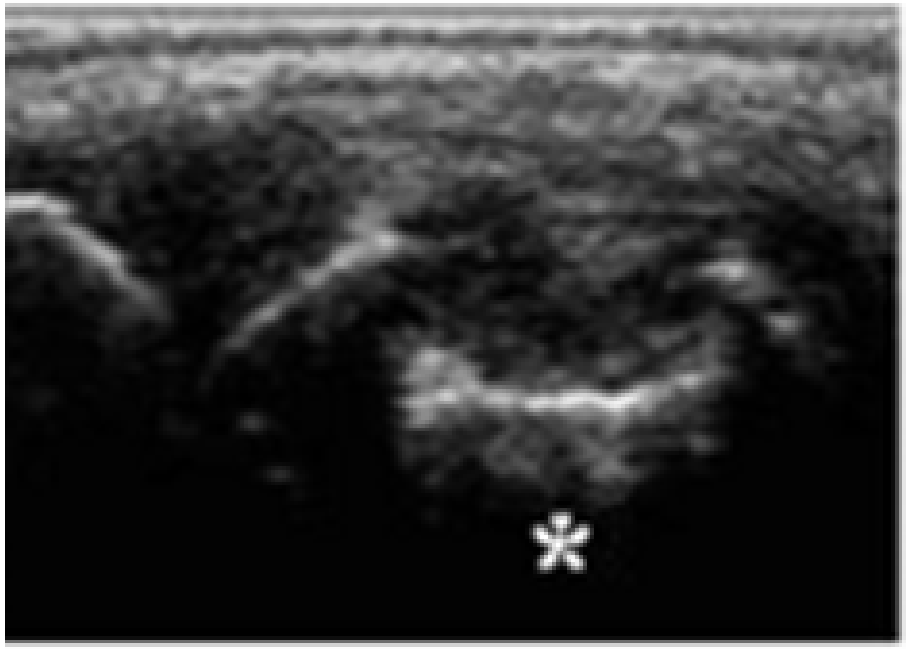
Synovial Hypertrophy/Proliferation

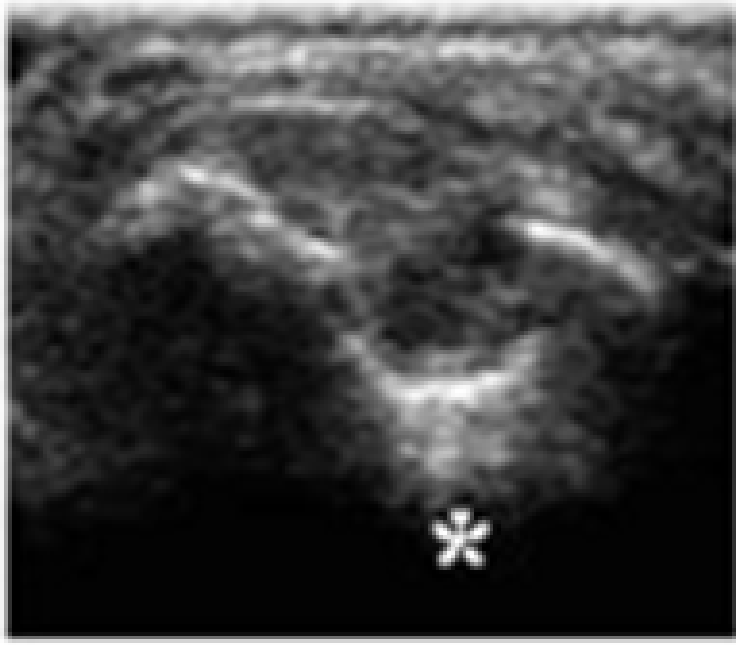
- Abnormal **hypoechoic** (relative to subdermal fat, but sometimes may be isoechoic or hyperechoic) intra-articular tissue that **is non-displaceable and poorly compressible**_and which may exhibit Doppler signal.



Bone Erosion

- An **intra-articular discontinuity** of the bone surface that is visible in 2 perpendicular planes.

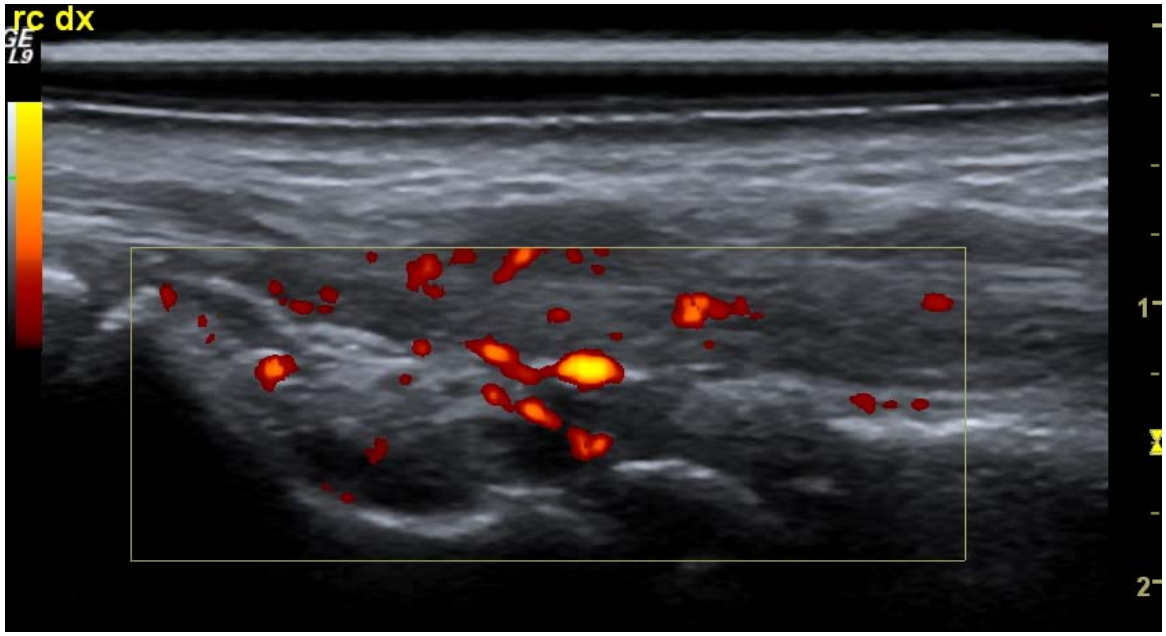




Synovitis

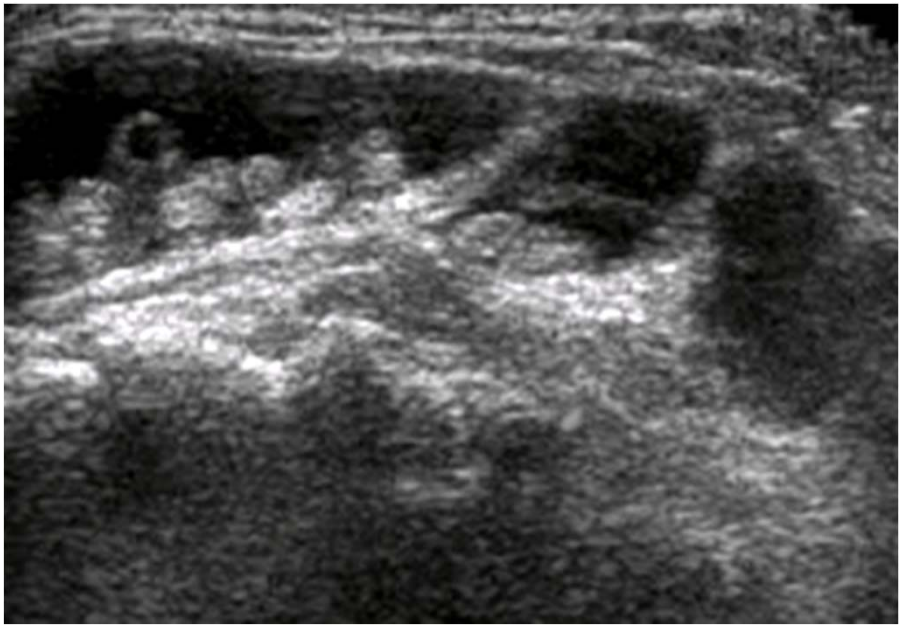
- Synovitis is the term for synovial hypertrophy and hyperemia as demonstrated by Doppler activity

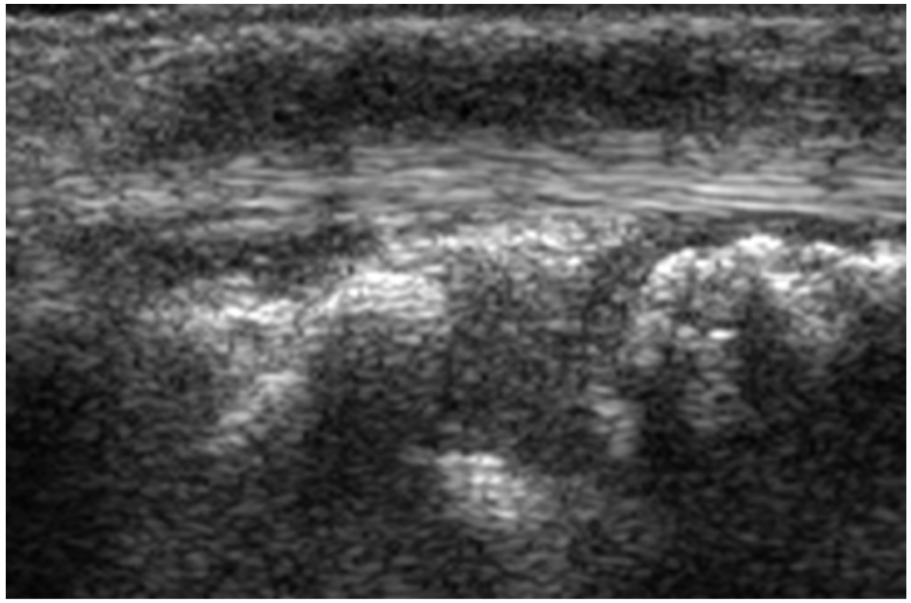
- Synovitis is key feature of arthritis and important in the diagnosis of any arthritic condition



Tenosynovitis

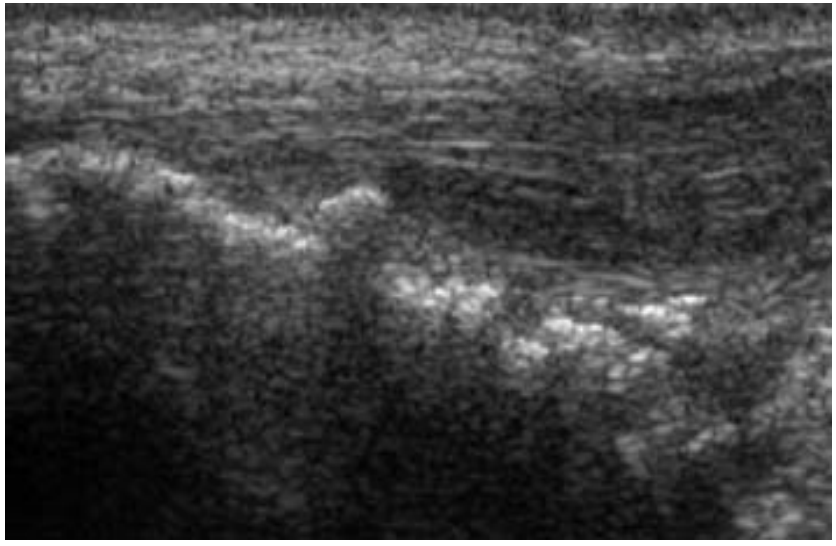
- Hypoechoic or anechoic thickened tissue with or without fluid within the tendon sheath, which is seen in 2 perpendicular planes and which may exhibit Doppler signal

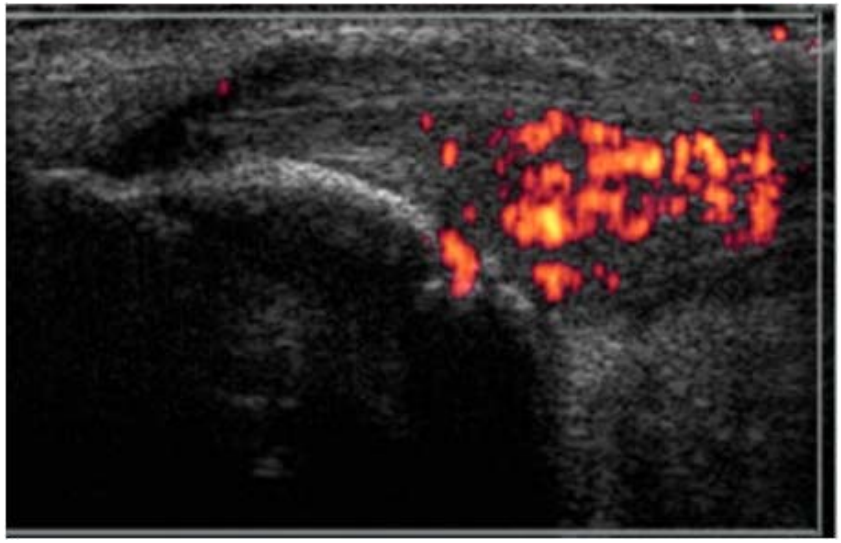




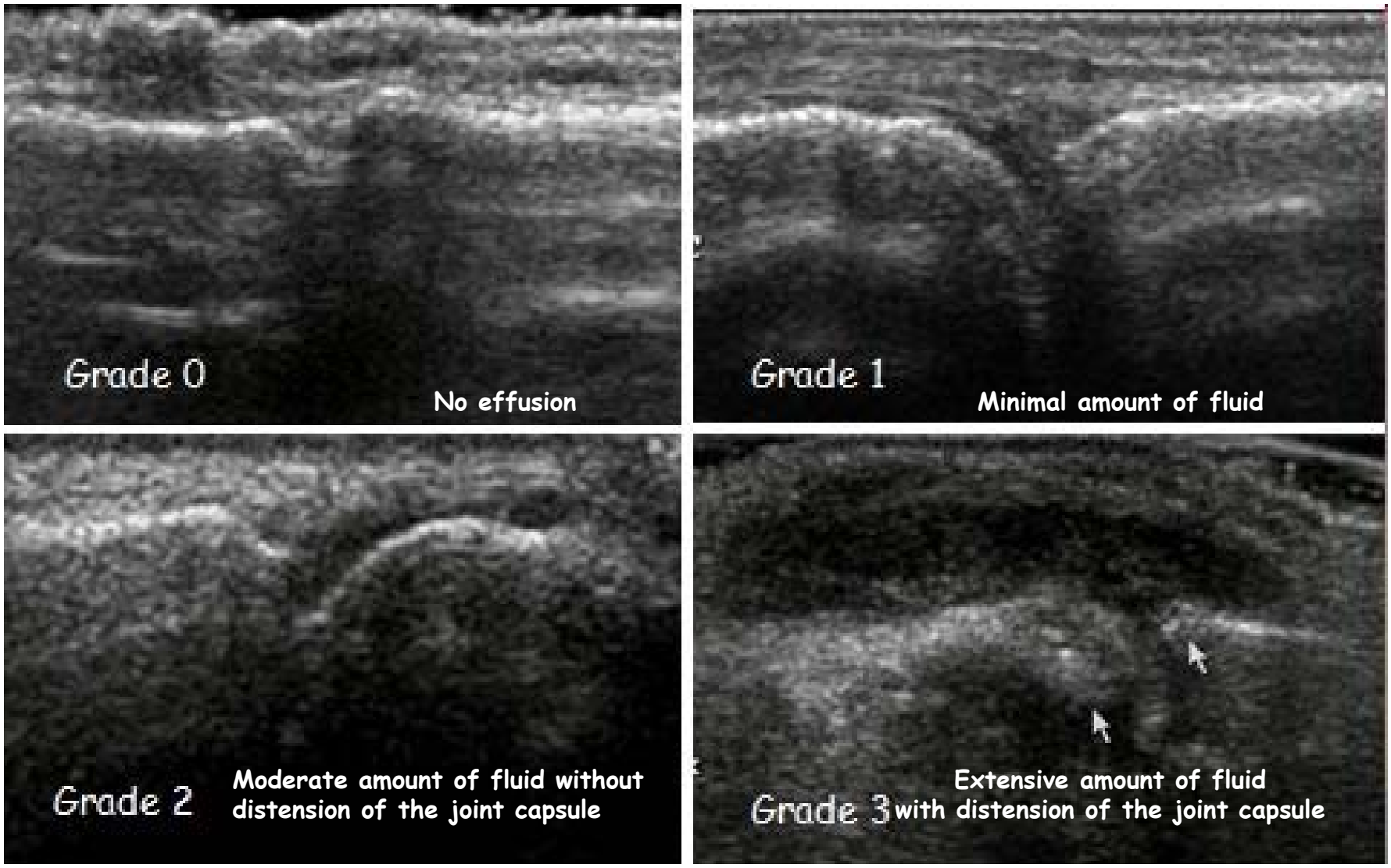
Enthesopathy

- Abnormally hypoechoic (loss of normal fibrillar architecture) and/or thickened tendon or ligament at its bony attachment (may occasionally contain hyperechoic foci consistent with calcification), seen in 2 perpendicular planes that may exhibit Doppler signal and/or bony changes including enthesophytes, erosions, or irregularity

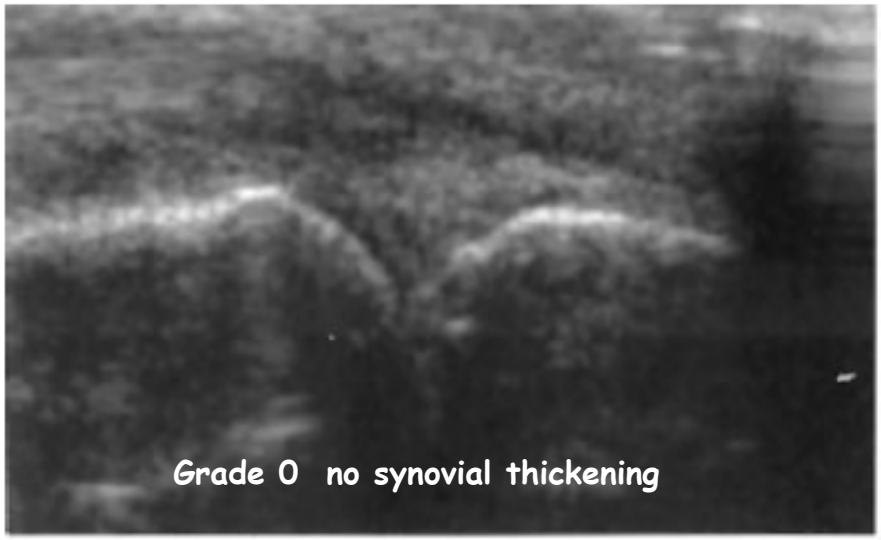




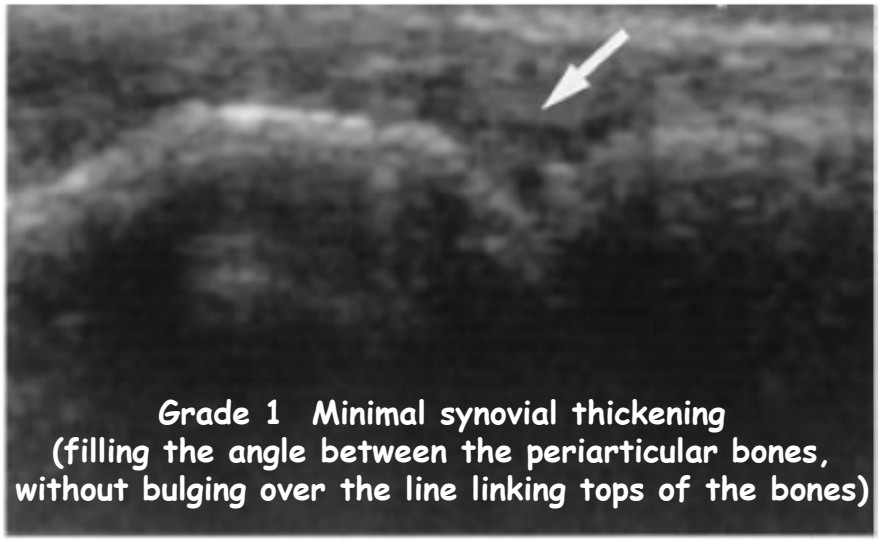
Synovial Effusion



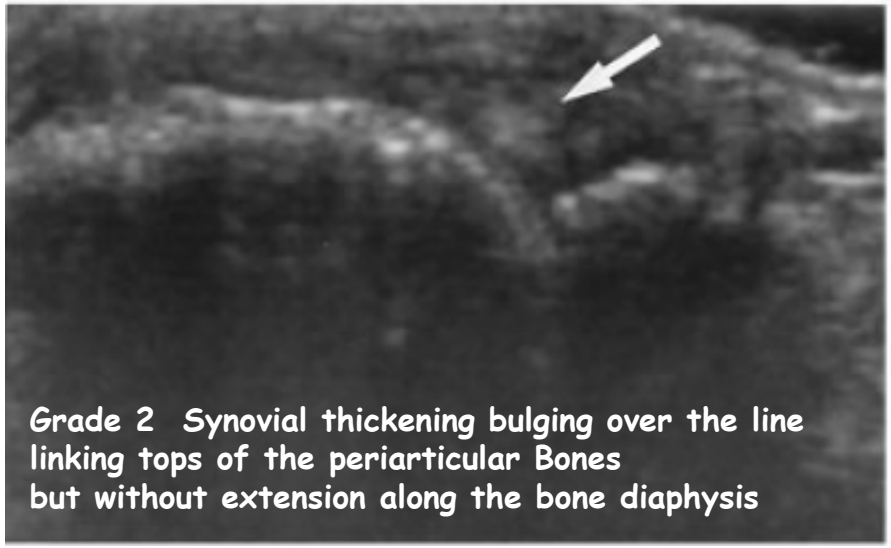
Synovial Hypertrophy



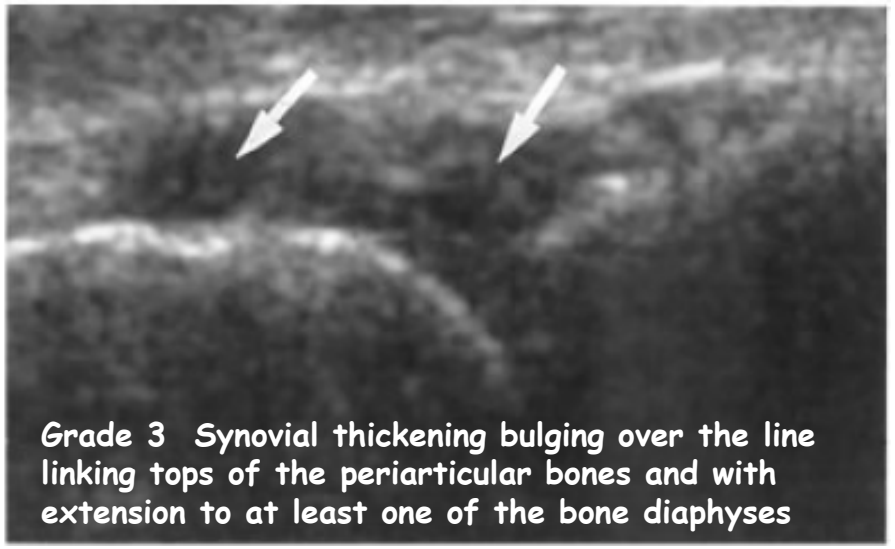
Grade 0 no synovial thickening



Grade 1 Minimal synovial thickening
(filling the angle between the periarticular bones,
without bulging over the line linking tops of the bones)

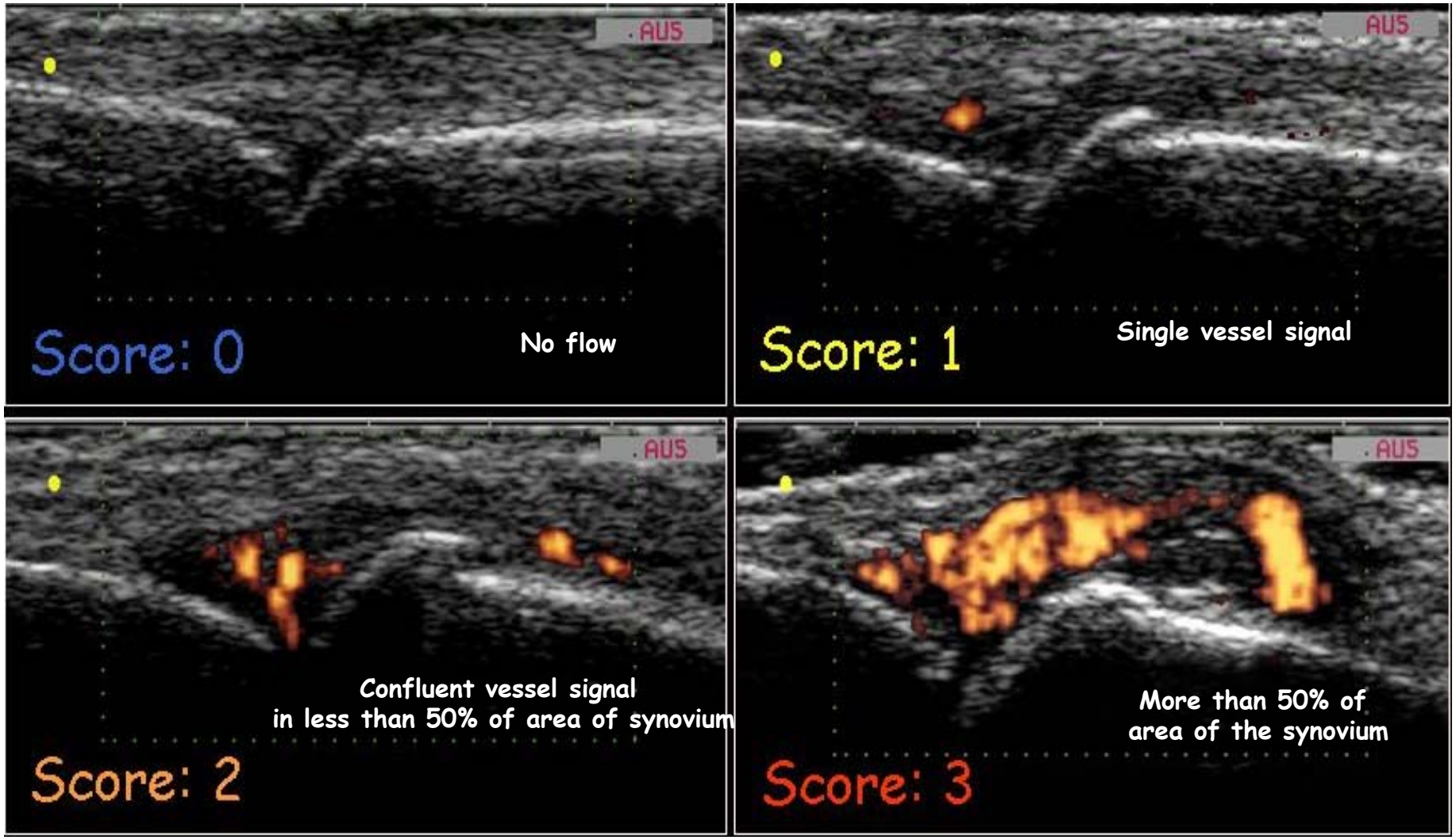


Grade 2 Synovial thickening bulging over the line
linking tops of the periarticular Bones
but without extension along the bone diaphysis



Grade 3 Synovial thickening bulging over the line
linking tops of the periarticular bones and with
extension to at least one of the bone diaphyses

Power Doppler Signal



Rheumatoid arthritis

- US has proven to be more sensitive than clinical examination in detecting synovitis in RA
- US has shown responsiveness to change in accordance with clinical and laboratory parameters after effective treatment
- US can be used to monitor the response to treatment and to predict relevant disease outcomes(ex. Erosive progression, disease flare)
- US has shown to be of particular help in the diagnostic workup of RA, in guiding treatment decision and in monitoring of disease activity and remission

Arthritis Rheum 1999
Ann Rheum Dis 2005
Arthritis Rheum 2008

Diagnosis of RA

- The detection rate of synovitis at hand and wrist using US was e useful than clinical examination

- US may be particularly useful for the differential diagnosis of RA

(ex. Joint inflammation, tenosynovitis, bursitis other soft tissue lesion)

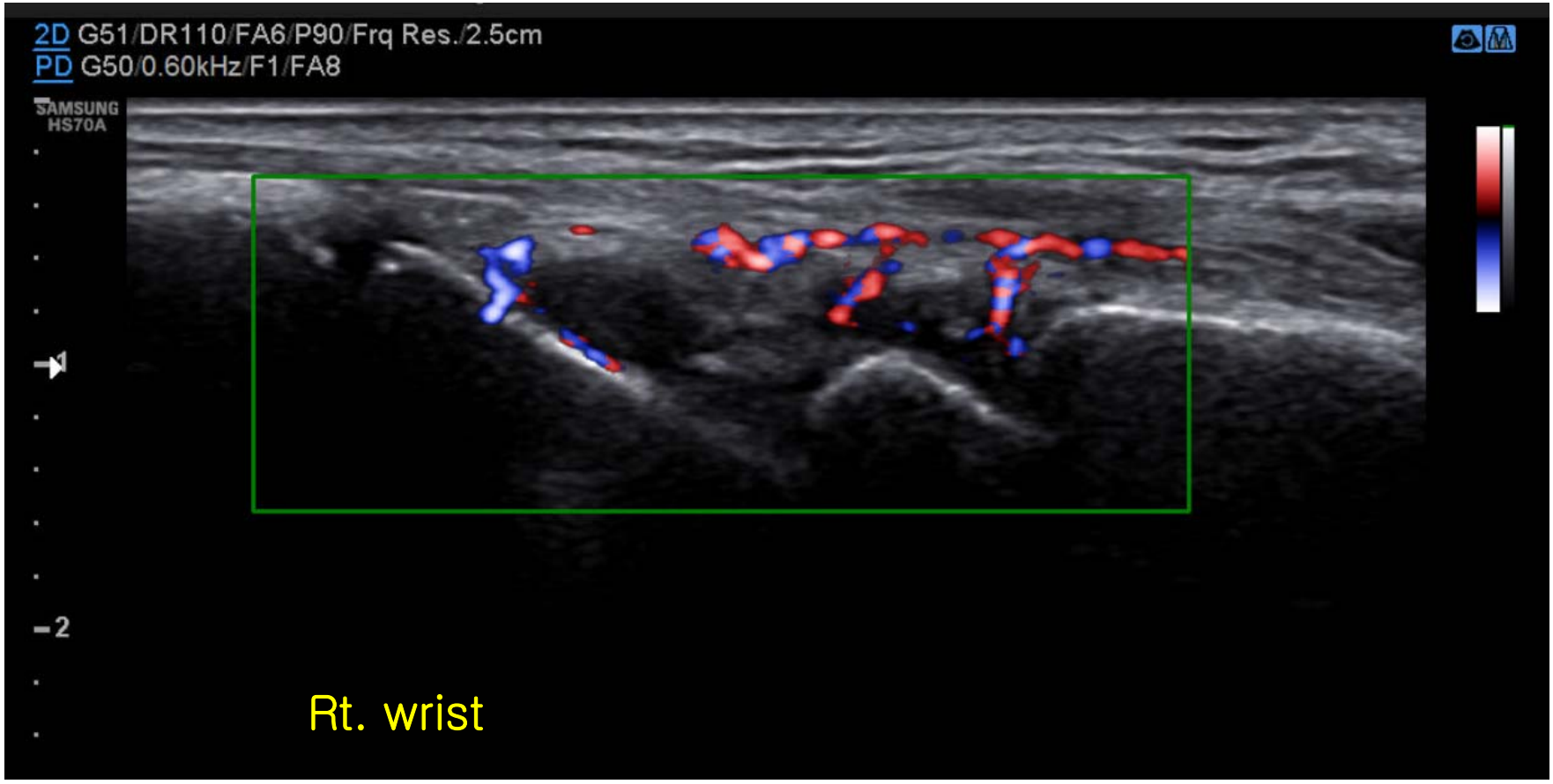
- Doppler US can detect subclinical RA in at-risk patients who are seropositive but who have not yet developed clinical signs of inflammation

Case I : RA (+)

- 여자
- 55세
- 러시아 사람
- 6 개월전부터 온몸이 아픔, 3 개월전부터 양측 손목이 붓고 아프다


R


2D G51/DR110/FA6/P90/Frq Res./2.5cm
PD G50/0.60kHz/F1/FA8
SAMSUNG
HS70A
LT WRIST


2D G51/DR110/FA6/P90/Frq Res./2.5cm
PD G50/0.60kHz/F1/FA8
SAMSUNG
HS70A
2
Rt. wrist

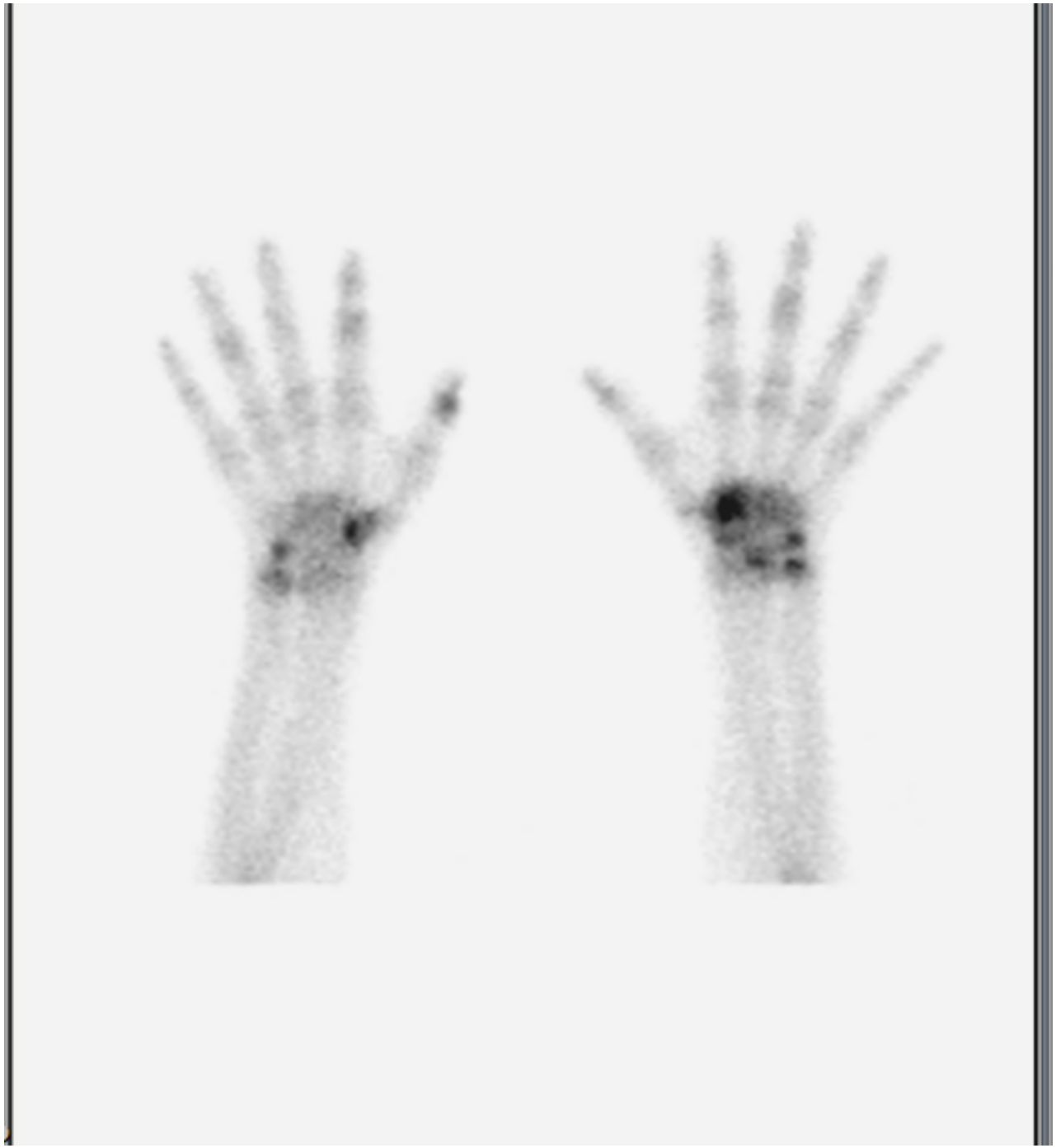

2D G50/DR115/FA11/P90/Frq Res./2.0cm
PD G50/0.60kHz/F1/FA7
SAMSUNG
HS70A
LT 2MCP
-1


2D G50/DR115/FA11/P90/Frq Res./2.0cm
PD G50/0.60kHz/F1/FA7
SAMSUNG
HS70A
RT 2MCP
-1

	검사명	H V	검사결과	S	단위	참고치	검체명	의사전달사항
1	Routine CBC (LM0131~38)						WB	
2	WBC		6.30		10*3/ul	3-9.3	WB	
3	RBC		4.02		10*6/ul	3.6-4.9	WB	
4	Hemoglobin		13.2		g/dl	11-15	WB	
5	Hematocrit		37.8		%	33-44	WB	
6	MCV		94.0		fl	79-98	WB	
7	MCH		32.8		pg	26-34	WB	
8	MCHC		34.9		g/dl	31-36	WB	
9	Platelet		238		10*3/ul	140-360	WB	
10	Diff. Count (LM0141~54)				%		WB	
11	Band Neutrophil				%	0-2	WB	
12	Seg. Neutrophil		52.7		%	40-70	WB	
13	Lymphocyte		31.7		%	20-47	WB	
14	Monocyte		9.4		%	3-10	WB	
15	Eosinophil		4.9		%	0-7	WB	
16	Basophil		1.3		%	0-2	WB	
17	At.Lymphocyte				%	0.0	WB	
18	Metamyelocyte				%	0.0	WB	
19	Myelocyte				%	0.0	WB	
20	Promyelocyte				%	0.0	WB	
21	Blast				%	0.0	WB	
22	Plasmocyte				%	0.0	WB	
23	N.RBC		0.0		/100WBC		WB	
24	Other				%	0-4%	WB	
25	ESR		18		mm/hr	0-30	WB	

	검사명	H V	검사결과	S	단위	참고치	검체명	의사전달사항
1	Anti-Cyclic Citrullinate		> 2776.8		U/ml	19.9	SERUM	

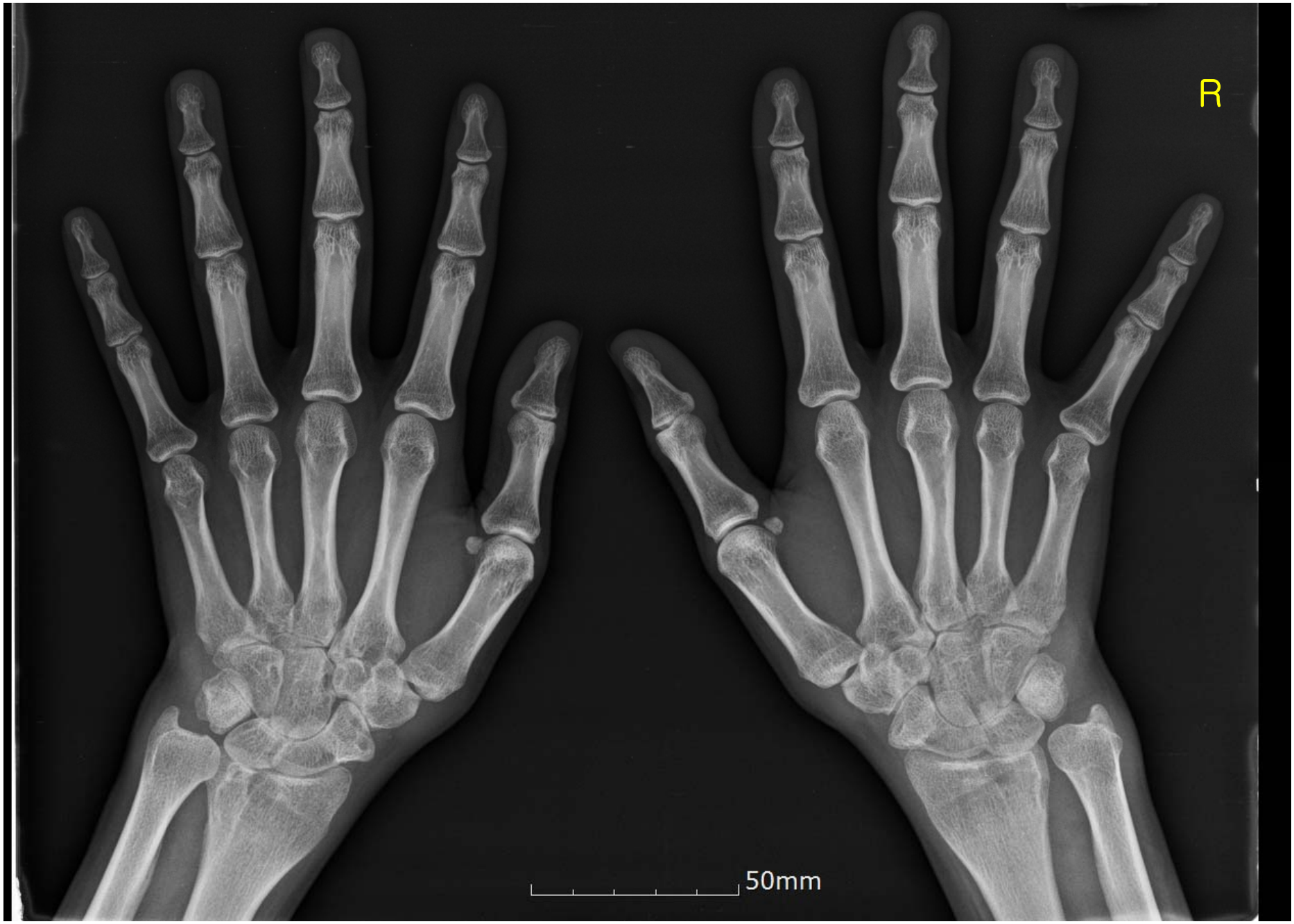
	검사명	H V	검사결과	S	단위	참고치	검체명	의사전달사항
1	RA	▲	128.1		IU/ml	0-14	SERUM	



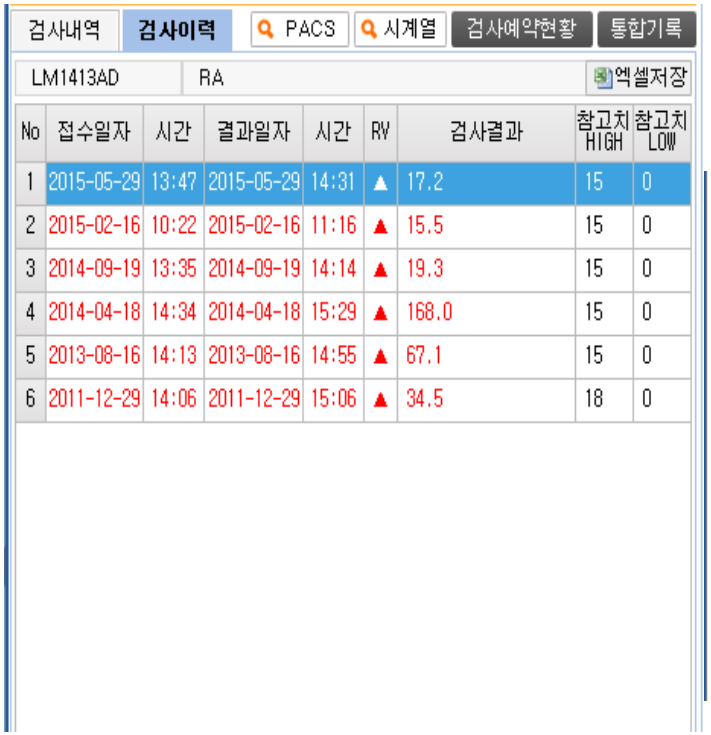
Case II : RA (+)

- 여자 34세

- 양손목과 손가락의 통증 : 3-4개월
- 류마티스 관절염 약제 투여 후 관절통 없음
- 일상 생활에서 움직이면 통증



2015-8-10



	검사명	RV	검사결과	S	단위	참고치	검체명	의사전달사항
1	RA	▲	15.5		IU/mL	0-15	SERUM	

Analytical method:

Enzyme immunoassay (ELISA)
Antigen : Purified synthetic cyclic peptide containing
modified arginine residues

Result of rheumatoid factor test

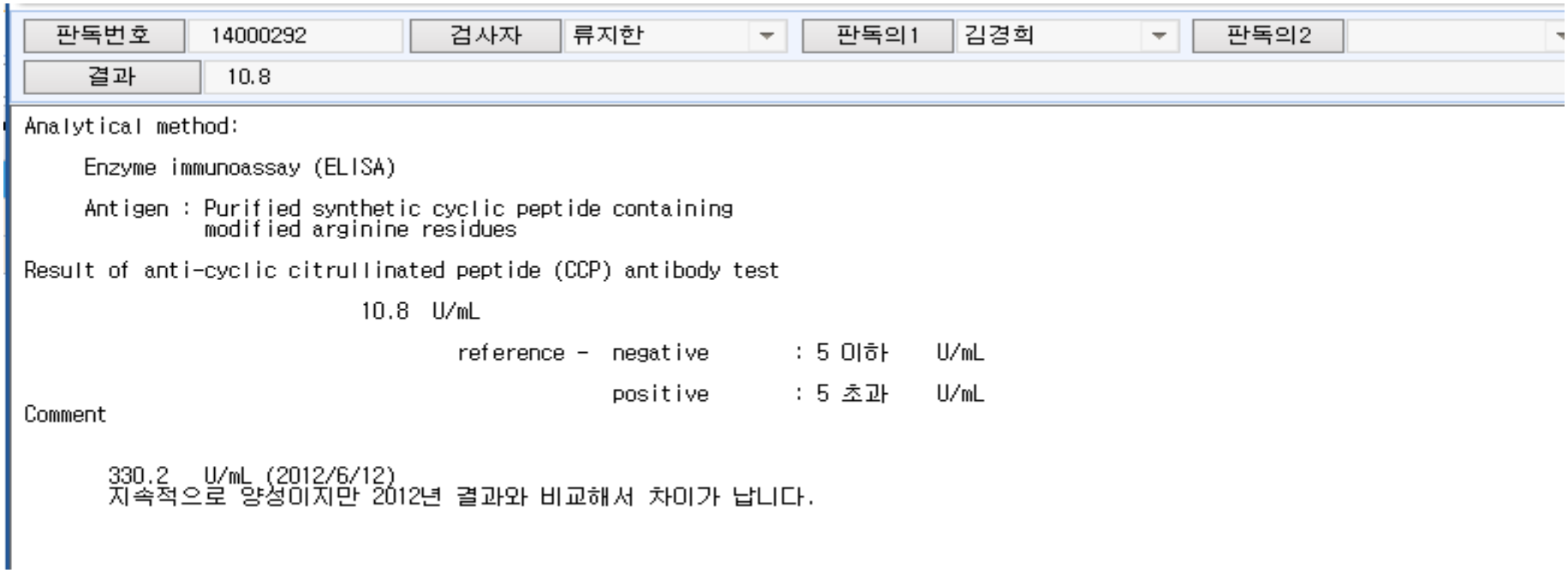
221.5 IU/mL

Result of anti-cyclic citrullinated peptide (CCP) antibody test

330.2 U/mL
reference - negative : 5 이하 U/mL
positive : 5 초과 U/mL

Comment

Make clinical correlation



■ 검사종류 : 일반혈액검사(2017-11-10)
■ 보고일자 : 2018-02-05 10:57 / 정호금 엑셀저장 인쇄
■ 검체종류 : WB
■ 검체일자 : 2018-02-05 10:12 (11802055387)
■ 검사실소견 :
■ (?)는 검사결과가 확정이 되지 않은 상태입니다.

	검사명	H V	검사결과	S	단위	참고치	검체명	의사전달사항
1	Routine CBC (LM0131~38)						WB	
2	WBC		9.14		10*3/ul	3-9.3	WB	
3	RBC		3.73		10*6/ul	3.6-4.9	WB	
4	Hemoglobin		11.7		g/dl	11-15	WB	
5	Hematocrit		34.5		%	33-44	WB	
6	MCV		92.5		fl	79-98	WB	
7	MCH		31.4		pg	26-34	WB	
8	MCHC		33.9		g/dl	31-36	WB	
9	Platelet		254		10*3/ul	140-360	WB	
10	Diff. Count (LM0141~54)				%		WB	
11	Band Neutrophil				%	0-2	WB	
12	Seg. Neutrophil	▲	74.8		%	40-70	WB	
13	Lymphocyte	▼	15.4		%	20-47	WB	
14	Monocyte		8.2		%	3-10	WB	
15	Eosinophil		1.3		%	0-7	WB	
16	Basophil		0.3		%	0-2	WB	
17	At.Lymphocyte				%	0.0	WB	
18	Metamyelocyte				%	0.0	WB	
19	Myelocyte				%	0.0	WB	
20	Promyelocyte				%	0.0	WB	
21	Blast				%	0.0	WB	
22	Plasmocyte				%	0.0	WB	
23	N.RBC		0.0		/100WBC		WB	
24	Other				%	0-4%	WB	
25	RDW		12.4		%	11-14.8	WB	
26	PDW		11.3		fl	9-17.5	WB	
27	MPV		10.3		fl	8-13	WB	
28	ESR		18		mm/hr	0-30	WB	

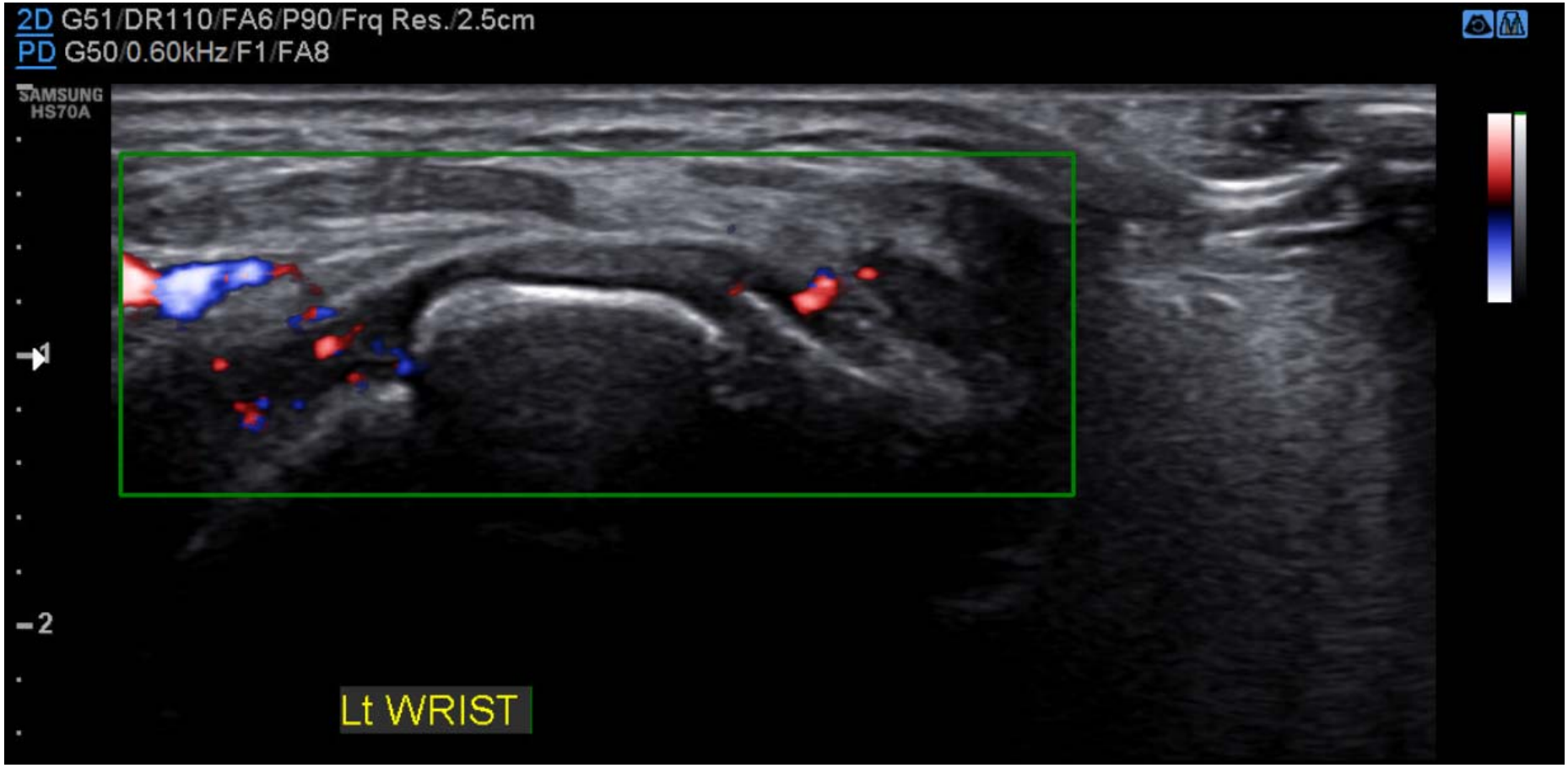
1.3

■ 검사종류 : 일반화학검사 (I)(2017-11-10)
■ 보고일자 : 2018-02-05 10:58 / 이동훈
■ 검체종류 : SERUM
■ 검체일자 : 2018-02-05 10:12 (11802055388)
■ 검사실소견 :
■ (?)는 검사결과가 확정이 되지 않은 상태입니다.

엑셀저장 인쇄

	검사명	H V	검사결과	S	단위	참고치	검체명	의사전달사항
1	Total calcium		9.2		mg/dL	8.2-10.5	SERUM	
2	Phosphorus		3.8		mg/dL	2.5-4.5	SERUM	
3	Glucose		79		mg/dL	74-106	SERUM	
4	BUN		12		mg/dL	7-20	SERUM	
5	Creatinine		0.67		mg/dL	0.51-0.95	SERUM	
6	MDRD eGFR		107.1		ml/min/1.7	>60	SERUM	
7	CKD EPI eGFR		114.7		ml/min/1.7	>60	SERUM	
8	Uric acid		3.4		mg/dL	2.4-6.4	SERUM	
9	Total cholesterol		166		mg/dL	0-200	SERUM	
10	T.protein		7.1		g/dL	6.6-8.3	SERUM	
11	Albumin		4.2		g/dL	3.5-5.2	SERUM	
12	A/G Ratio		1.4			1.17-1.52	SERUM	
13	AST (SGOT)		22		U/L	0-35	SERUM	
14	ALT (SGPT)		12		U/L	0-35	SERUM	
15	ALP		66		U/L	30-120	SERUM	
16	T.bilirubin		0.6		mg/dL	0.2-1.2	SERUM	
17	Sodium	▼	135		mmol/L	136-146	SERUM	
18	Potassium		4.0		mmol/L	3.5-5.1	SERUM	
19	Chloride		102		mmol/L	mmol/L 9	SERUM	
20	Triglyceride		51		mg/dl	150이하	SERUM	
21	HDL-C		67		mg/dl	40이상	SERUM	
22	LDL-C		95		mg/dl	55-150	SERUM	
23	CRP		0.31		mg/dl	0-0.5	SERUM	
24	Hemolysis		0				SERUM	
25	Icteric		0				SERUM	
26	Lipemic		0				SERUM	

2018-02-05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PD G50/0.60kHz/F1/FA8
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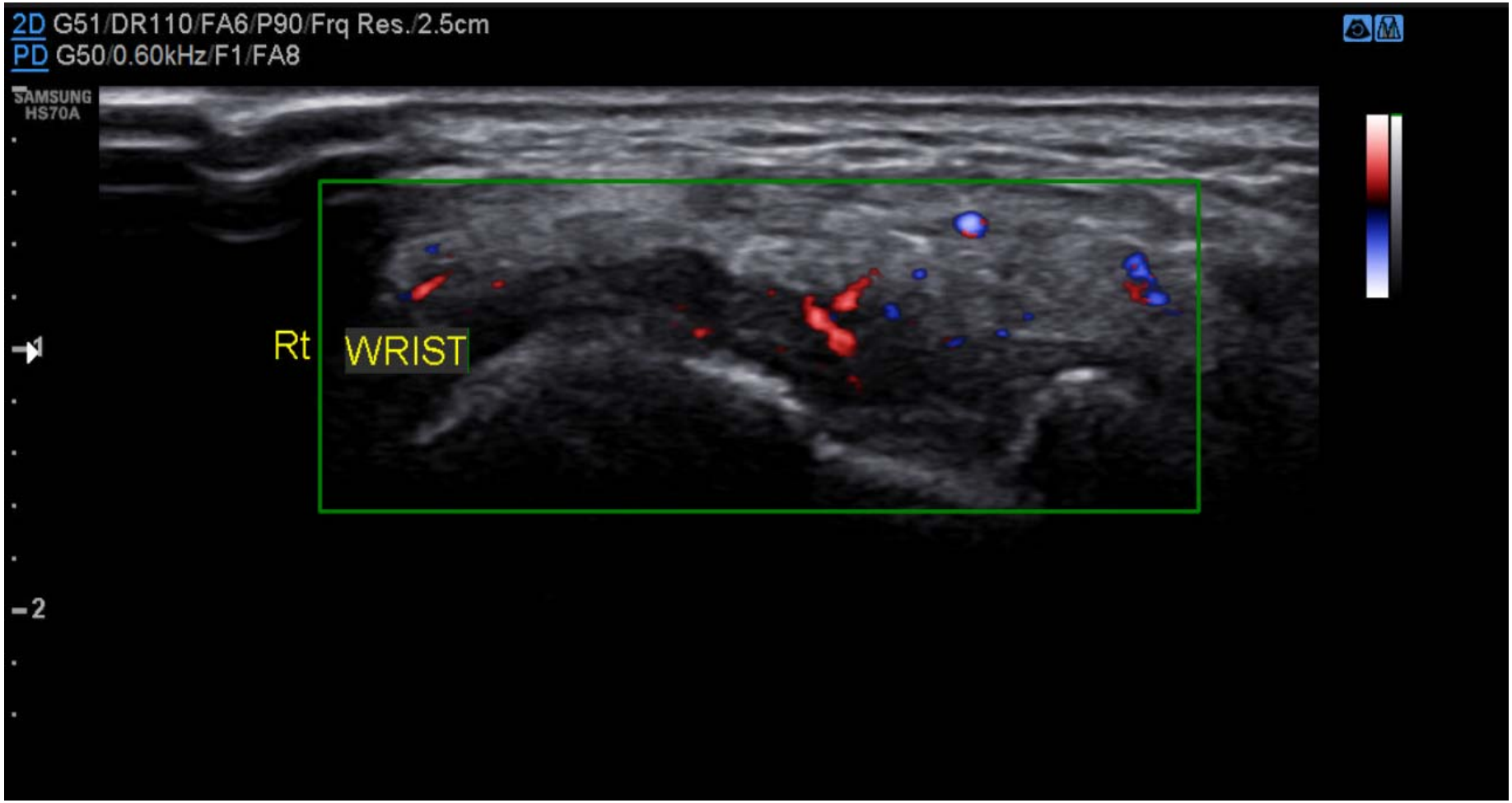
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SAMSUNG
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WRIST
2

2018-2-5

2015-8-10

2018-2-5

Osteoarthritis

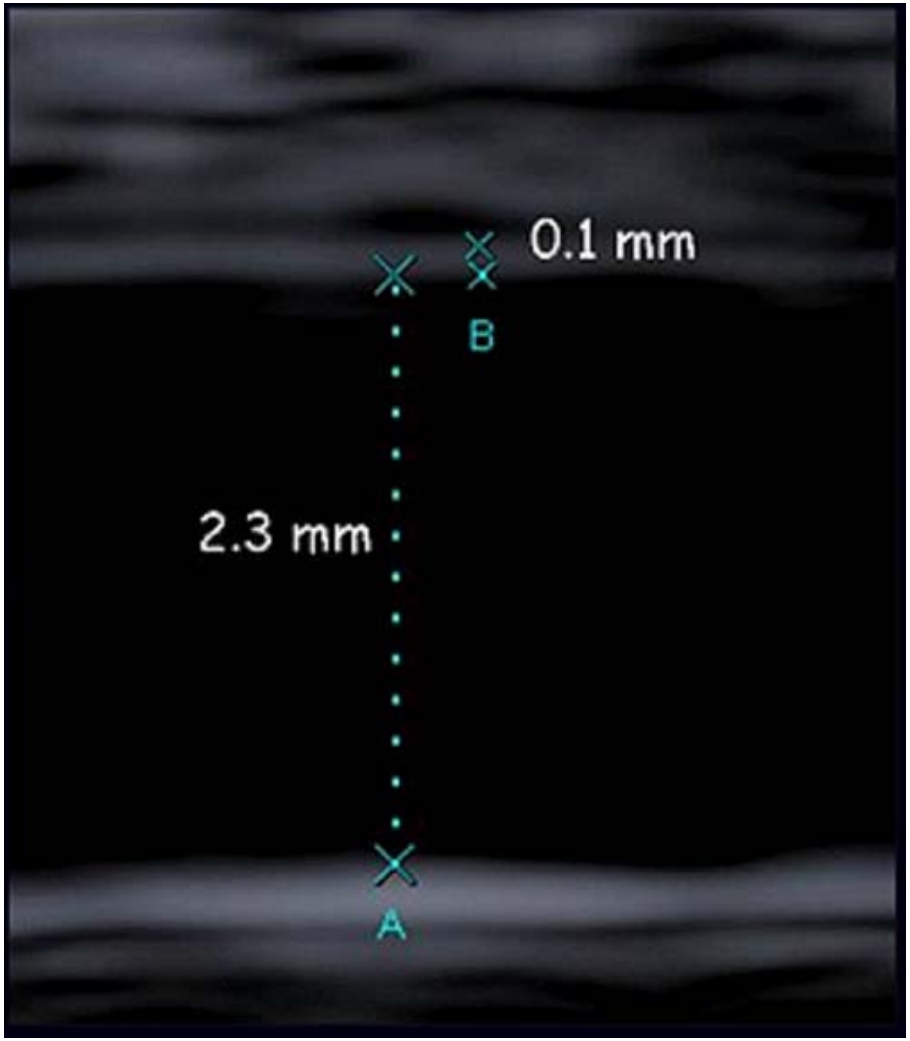
- Conventional radiography is the gold standard modality for imaging OA and detecting bony abnormalities

- However, it is unable to directly visualise hyaline cartilage as well as other joint and peri-articular soft tissues that may be affected in OA(ex, synovial recess, bursa)

Table I. Indications and clinical applications of US in OA.

Assessment of cartilage lesions
Detection of osteophytes
Detection of erosions (erosive hand OA)
Detection of joint effusion
Detection of synovial hypertrophy
Differentiation between active and inactive synovitis (Doppler modalities)
Assessment of periarticular soft tissues abnormalities in OA (bursitis)
Evaluation of mucous cysts (hand OA)
Execution of US guided procedures (aspiration of joint and periarticular effusion, injections, biopsy)
Monitoring of disease progression from early to late stages
Follow-up of the response to local and systemic therapies

Cartilage

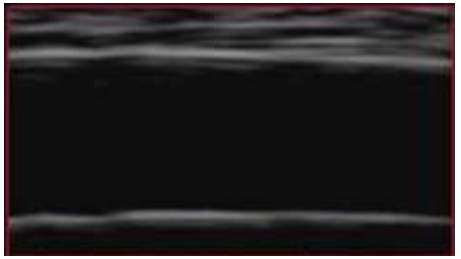


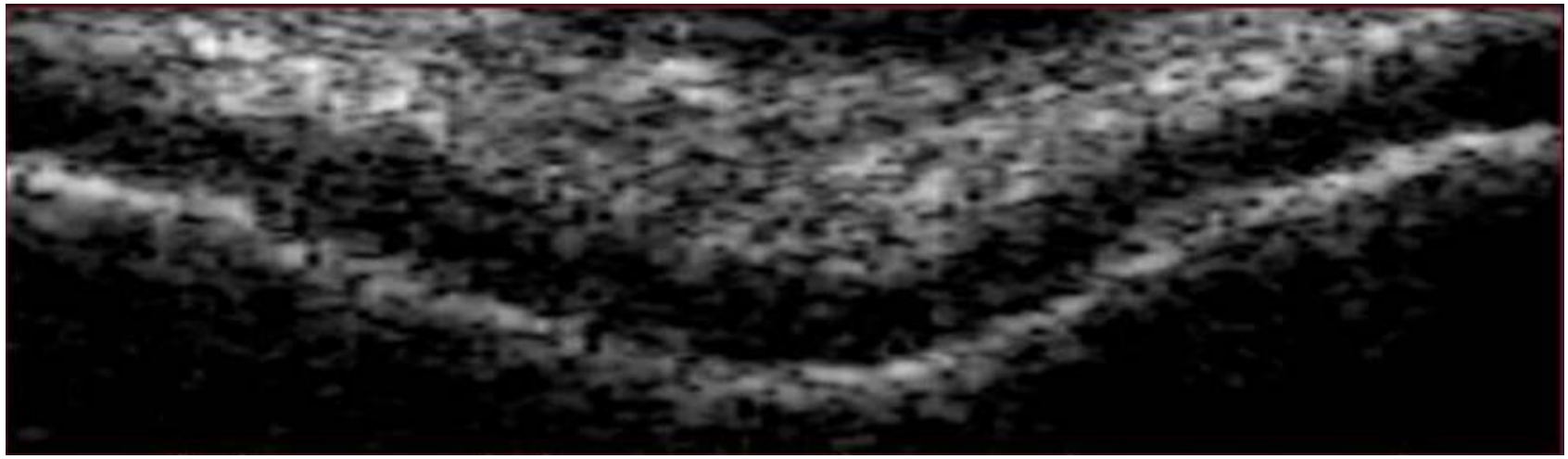
- In healthy subjects :Homogeneously hypoechoic band with sharply defined outer and inner interfaces

Sonographic features of OA cartilage

- Loss of the normal sharpenss of synovial space-cartilage interace
- Loss of clarity of the cartilagineous layer
- Narrowing of the joint cartilage
- Increased intensity of the posterior bone-cartilage interface

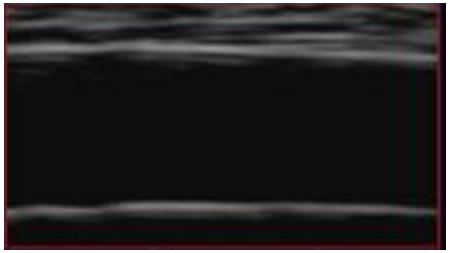
Loss of the normal sharpness of synovial space-cartilage interface

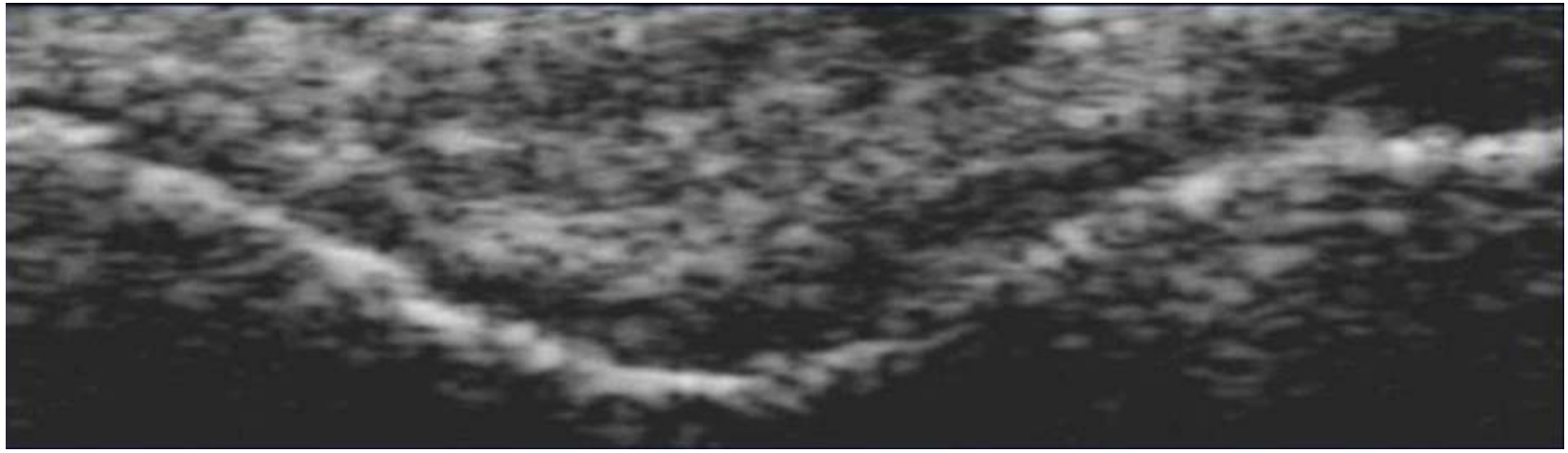




- One of the earlier feature of cartilage damage
- A blurred aspect of the anterior margin of the condylar cartilage is a typical fiding in patients with OA

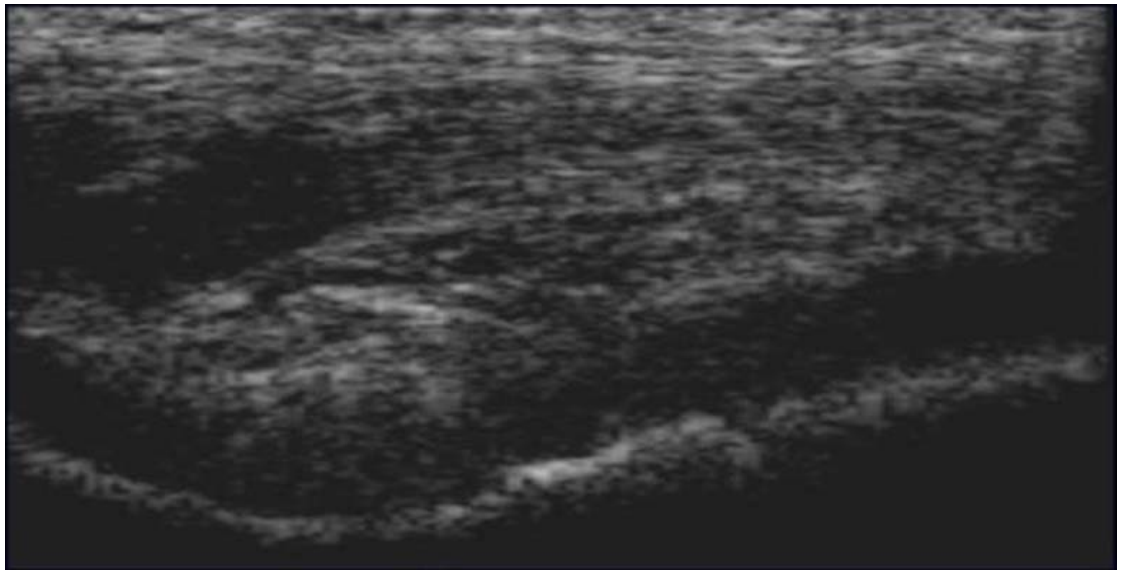
Increased intensity of the posterior bone-cartilage interface

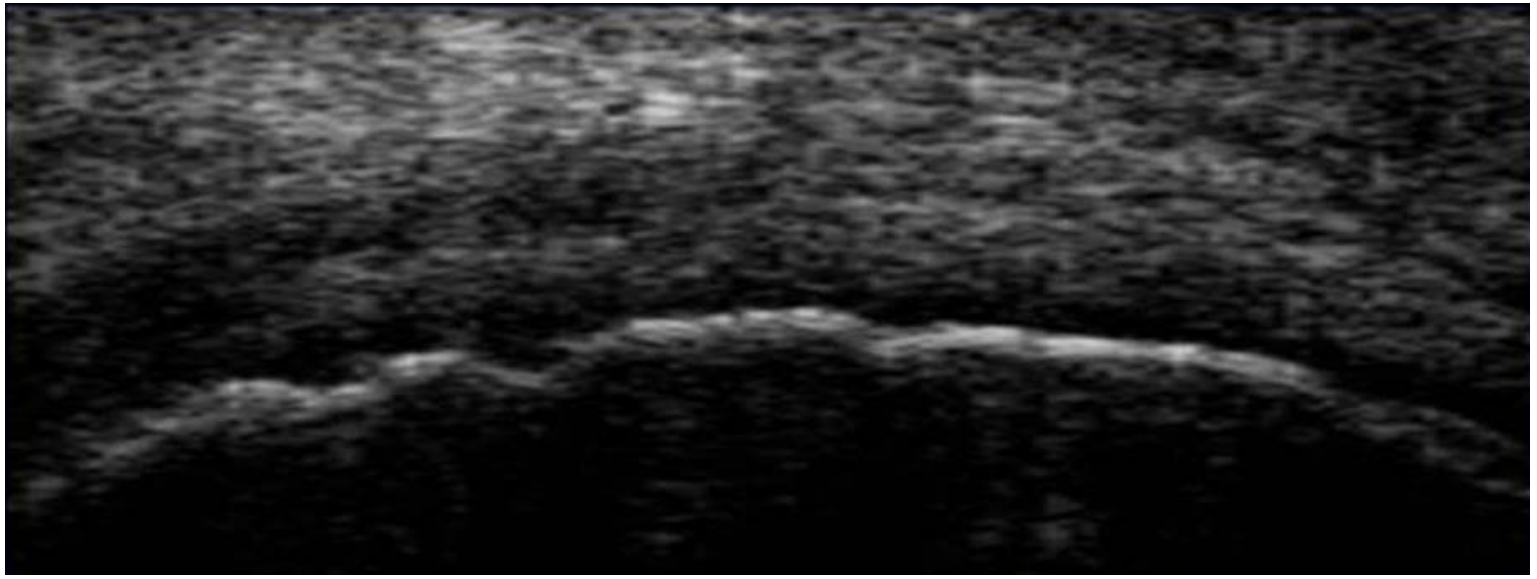




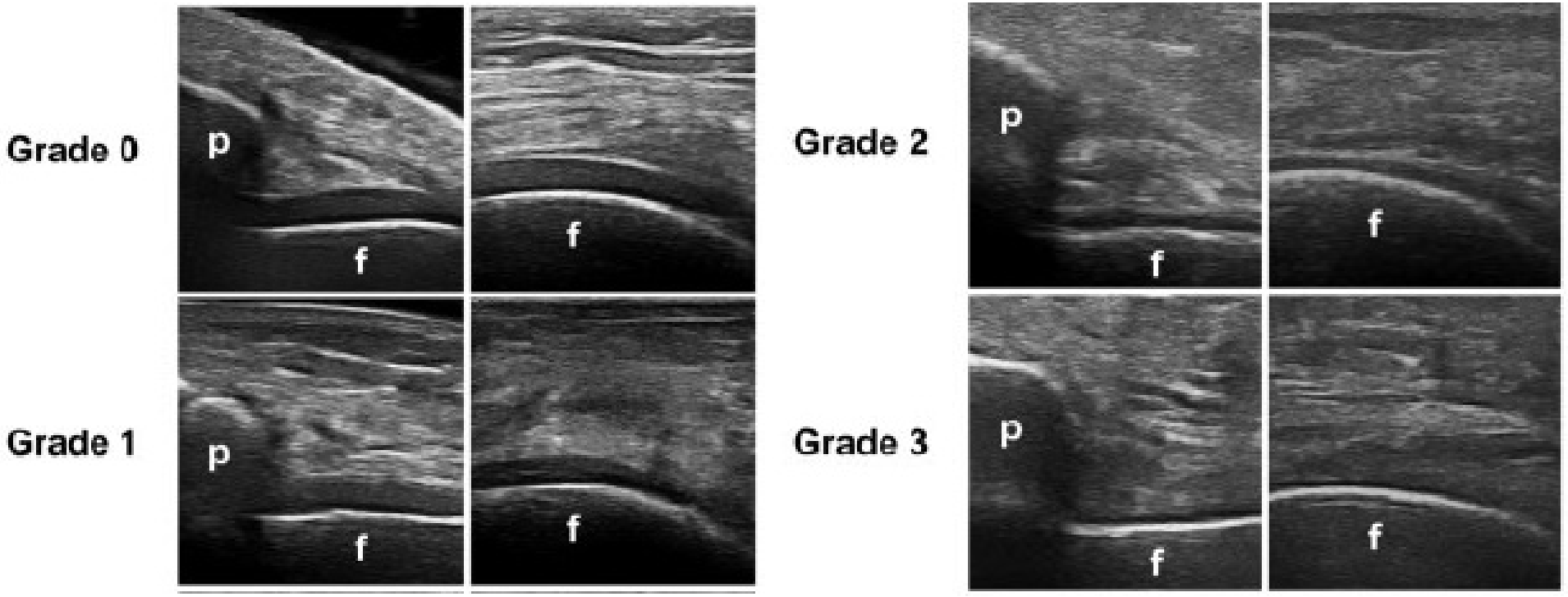
- Reflect subchondral bone sclerosis and/or loss of the overlying cartilage

Irregularity of the bone profile





Cartilage Damage



0 = normal hyaline cartilage with hyperechoic superficial margin of the cartilage;
1 = mild degenerative changes, with loss of the sharpness of the superficial margin of the hyaline cartilage and/or increased echogenicity of the cartilage;
2 = moderate degenerative changes, with local thinning of the cartilage layer;
3 = severe degenerative changes, with full-thickness defect of the cartilage layer, with or without subchondral bone damage

Osteophyte

0 = no osteophytes;
1 = small bony change <2mm;
2 = moderate bony change, with a size ranging from 2.1 to 4.0 mm;
3 = large bony change ≥4.1 mm.

Osteoarthritis

- US was found to be a sensitive imaging technique for revealing cartilage damage and even minimal osteophytes, especially in the early radiographic stages of knee OA

- US inflammatory findings correlated with advanced radiographic disease and with clinical signs and symptoms suggestive of an inflammatory flare

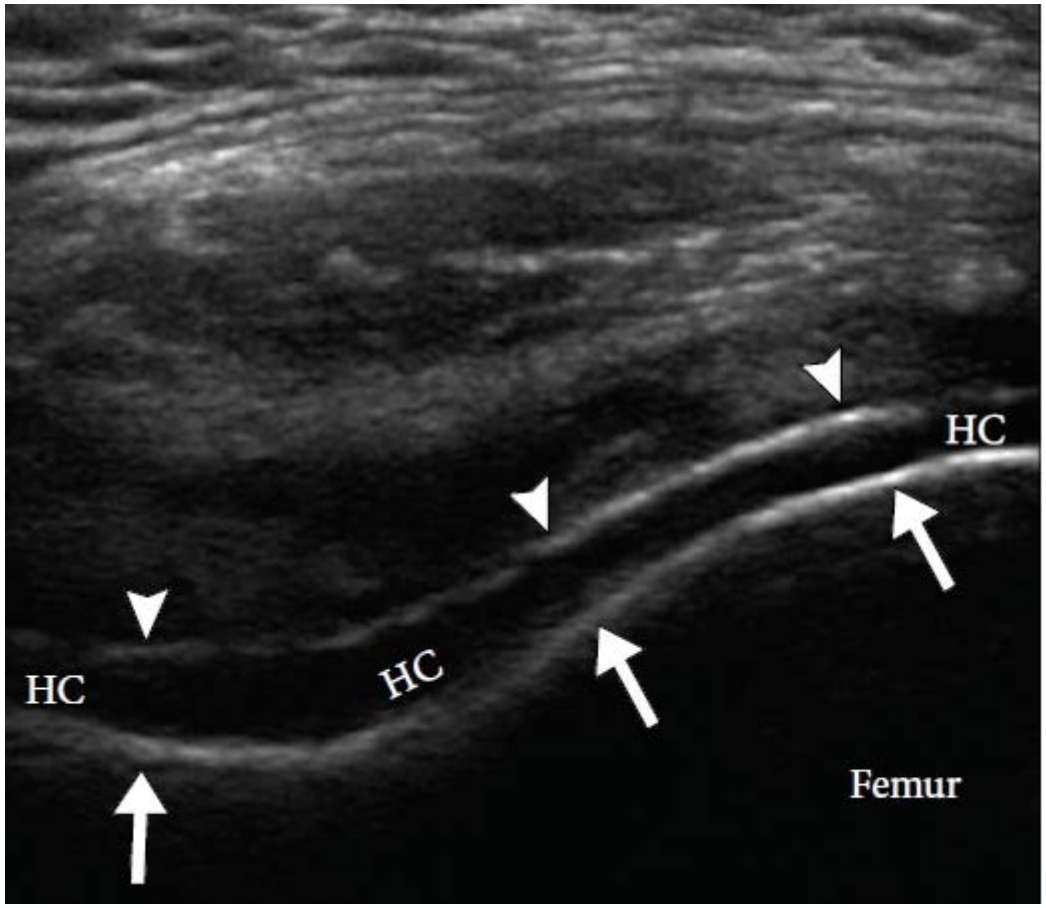
- Suprapatellar effusion and Baker's cyst are more frequent and seem to be risk factors of painful flare in OA of the knee

Rheumatology 2016
Ann Rheum Dis 2010
Osteoarthritis Cartilage 2006

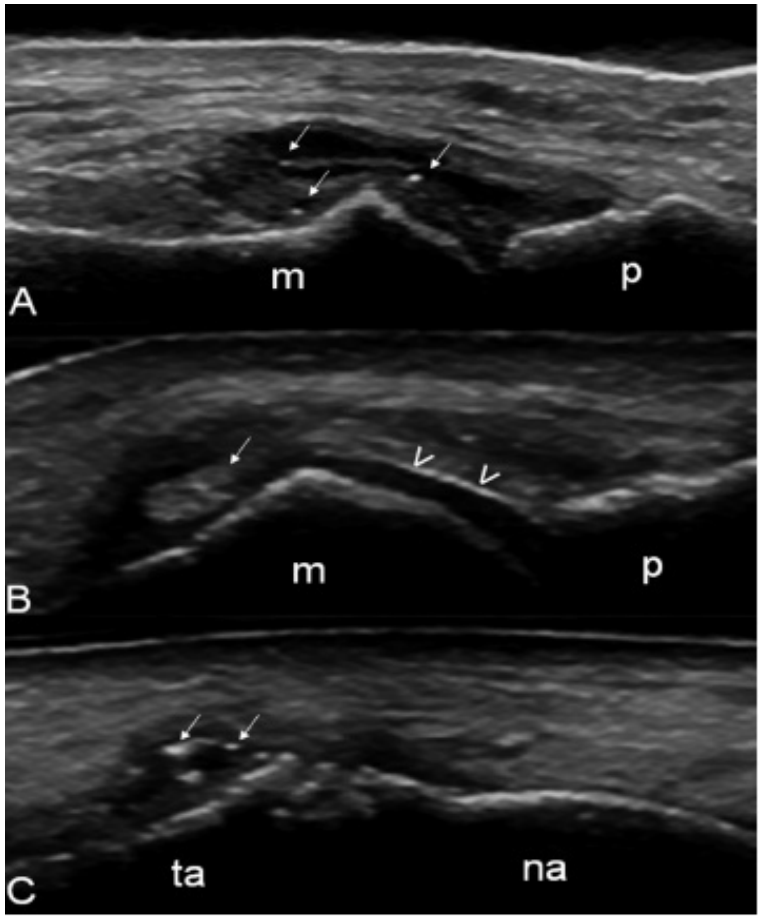
Gout

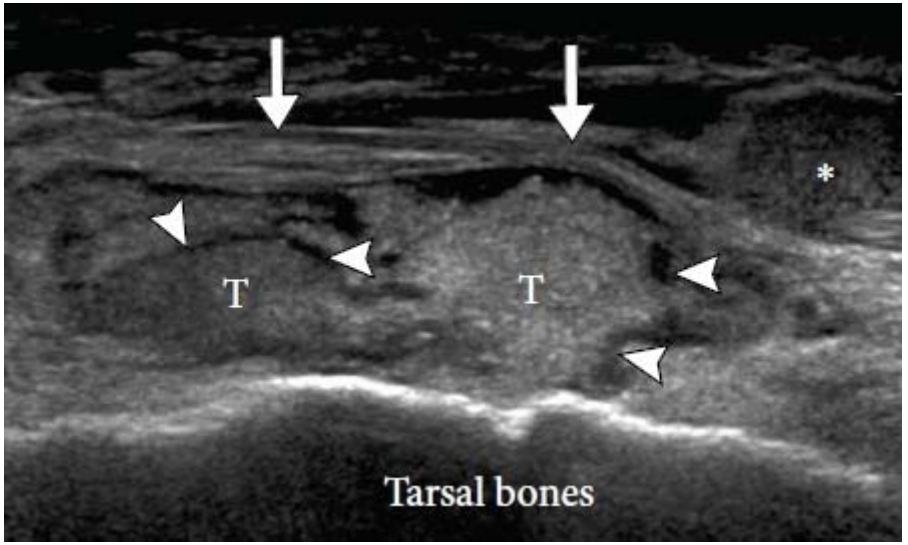
US finding	US definition
Double contour sign	A focal or diffuse enhancement of the superficial margin of the articular cartilage whose reflectivity is independent of the angle of insonation (1,4,5,11,12,17). A distinct and slightly irregular layer of hyperechoic material overlying the anechoic hyaline cartilage (2).
Hyperechoic spots	Spots, 1 mm in size with the same echogenicity of the bony cortex (1). Hyperechoic microparticles (2)
Soft tophus-like lesion	A deposit showing an inhomogeneously echoic "echotexture" (1). Hypoechoic to hyperechoic, inhomogenous appearance of "wet sugar clumps" (2). Hypoechogenic nodule surrounded by a hyperechogenic rim (13).
Hard tophus-like lesion	A deposit appearing as a hyperechoic band generating a posterior acoustic shadow (1).
Mixed tophus like lesion	A deposit showing ultrasound features of both soft and hard tophus (1).
Bright stippled foci and hyperechoic areas	monosodium urate deposits within the thickened hypoechoic synovia and the joint space (16).
"Snowstorm" appearance of the synovial fluid	Hyperechoic spots in the synovial fluid floating within the joint cavity in acute inflammation (11).

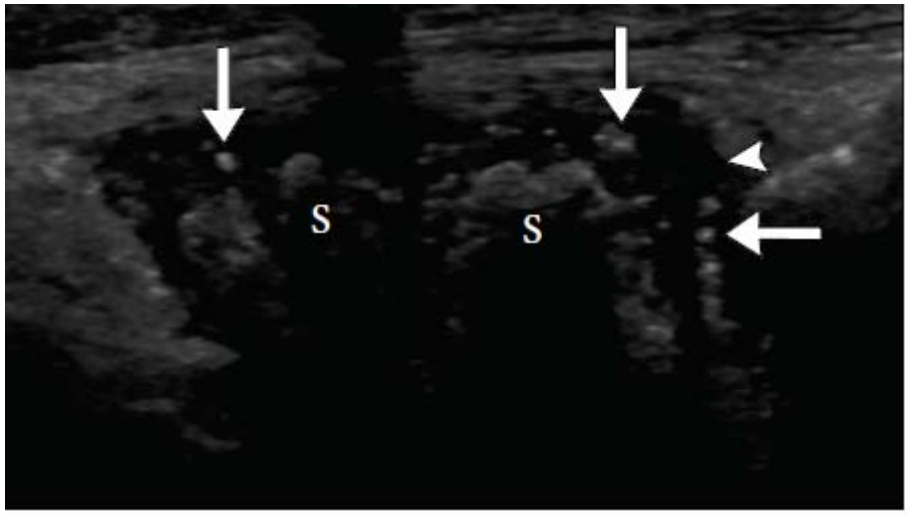
Double Contour sign



Gout







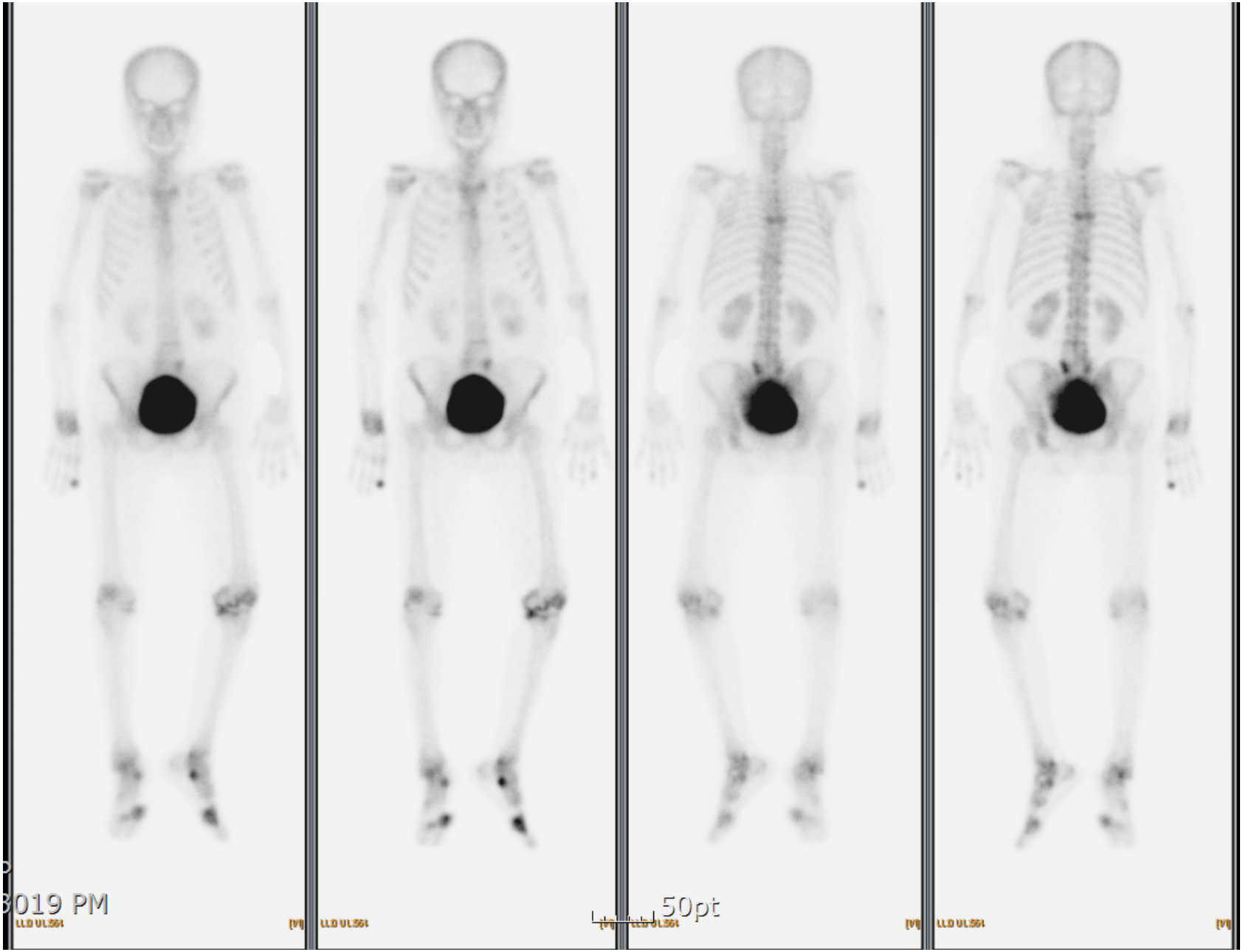
Case III : RA(+) with OA ? Gout ?

- 74 세 여자
- 양측 손목 무릎에 발생한 관절염으로 5년전 부터 진료중(류마티스관절염)
- 손목 관절통은 호전
- 양측 첫번째 발가락이 아프다 : 번갈아서


R

	검사명	H V	검사결과	S	단위	참고치	검체명	의사전달사항
1	Routine CBC (LM0131~38)						WB	
2	WBC		6.03		10*3/ul	3-9.3	WB	
3	RBC	▼	2.71		10*6/ul	3.6-4.9	WB	
4	Hemoglobin	▼	9.6		g/dl	11-15	WB	
5	Hematocrit	▼	28.6		%	33-44	WB	
6	MCV	▲	105.5		fl	79-98	WB	
7	MCH	▲	35.4		pg	26-34	WB	
8	MCHC		33.6		g/dl	31-36	WB	
9	Platelet		353		10*3/ul	140-360	WB	
10	Diff. Count (LM0141~54)				%		WB	
11	Band Neutrophil				%	0-2	WB	
12	Seg. Neutrophil		66.3		%	40-70	WB	
13	Lymphocyte	▼	17.6		%	20-47	WB	
14	Monocyte	▼	0		%	3-10	WB	
15	Eosinophil		5.6		%	0-7	WB	
16	Basophil		0.5		%	0-2	WB	
17	At.Lymphocyte				%	0.0	WB	
18	Metamyelocyte				%	0.0	WB	
19	Myelocyte				%	0.0	WB	
20	Promyelocyte				%	0.0	WB	
21	Blast				%	0.0	WB	
22	Plasmocyte				%	0.0	WB	
23	N.RBC				/100WBC		WB	
24	LUC				%	0-4%	WB	
25	ESR	▲	91		mm/hr	0-30	WB	

	검사명	H V	검사결과	S	단위	참고치	검체명	의사전달사항
1	BUN		9		mg/dL	8-26	SERUM	
2	Creatinine	▼	0.7		mg/dL	0.7-1.0	SERUM	
3	MDRD eGFR		87.7		ml/min/1.7	> 60	SERUM	
4	T.protein		6.7		g/dL	6.6-8.4	SERUM	
5	Albumin	▼	3.2		g/dL	3.8-5.2	SERUM	
6	A/G Ratio	▼	0.9			1.17-1.52	SERUM	
7	AST (SGOT)	▲	49		U/L	10-35	SERUM	
8	ALT (SGPT)		19		U/L	0-35	SERUM	
9	ALP		249		U/L	104-338	SERUM	
10	T.bilirubin		0.6		mg/dL	0.2-1.2	SERUM	
11	D.bilirubin		0.2		mg/dL	0-0.5	SERUM	
12	Sodium		138		mmol/L	135-145	SERUM	
13	Potassium		3.6		mmol/L	3.5-5.5	SERUM	
14	Chloride		102		mmol/L	98-110	SERUM	
15	CO2 Total		24		mmol/L	22-31	SERUM	
16	CRP	▲	3.91		mg/dl	0-0.5	SERUM	
17	RA	▲	121.0		IU/ml	0-15	SERUM	
18	Hemolysis		0				SERUM	
19	Icteric		0				SERUM	
20	Lipemic		0				SERUM	


3019 PM
50pt

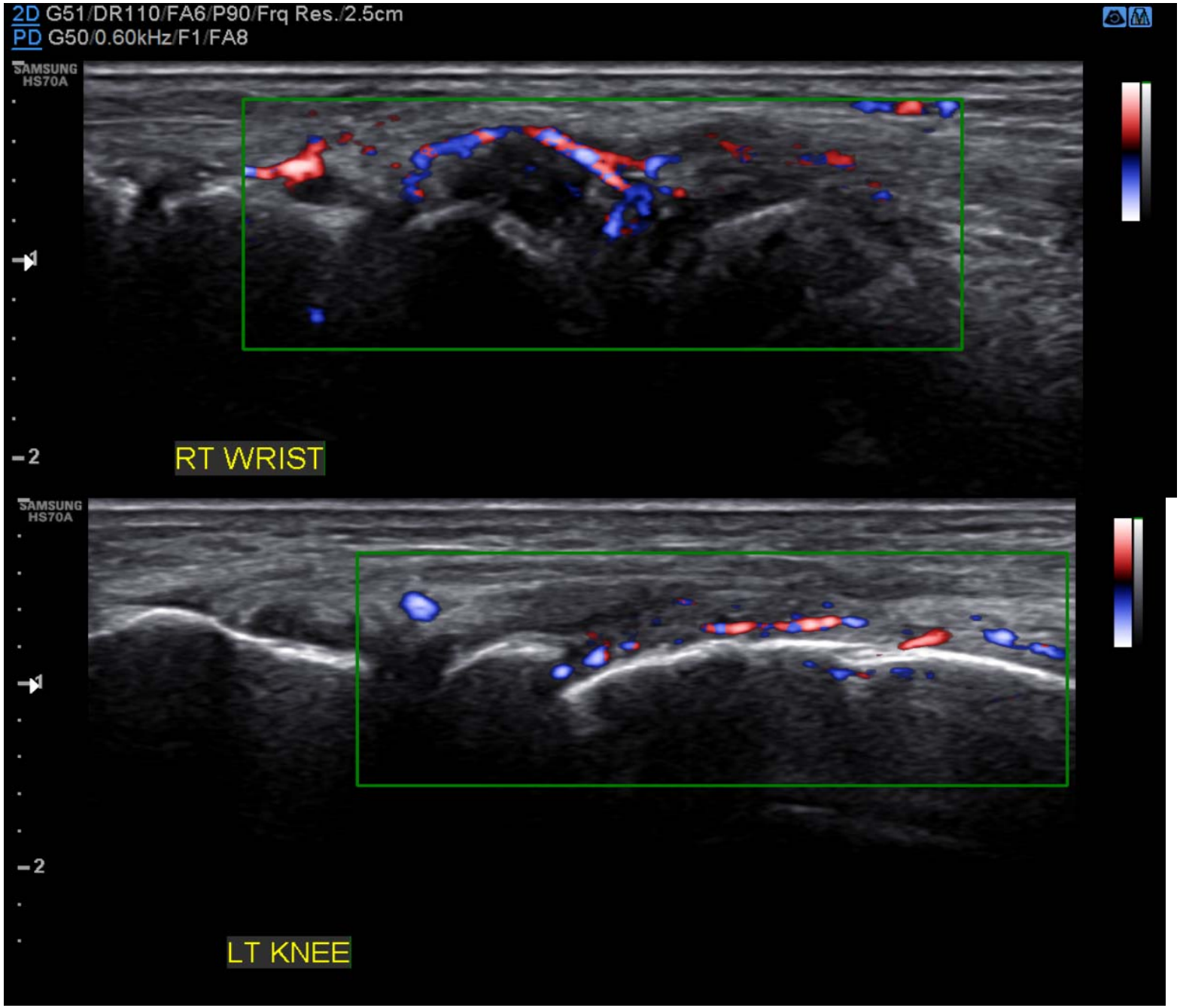

RT

검사내역 | **검사이력** | PACS | 시계열 | 검사예약현황 | 통합기록

LM1116AD | Uric acid | 엑셀저장

No	접수일자	시간	결과일자	시간	RV	검사결과	참고치 HIGH	참고치 LOW
1	2018-11-07	22:25	2018-11-07	23:16	▲	7.5	6.4	2.4
2	2018-09-17	08:44	2018-09-17	10:06		5.8	6.4	2.4
3	2018-09-13	10:04	2018-09-13	10:58		5.0	6.4	2.4
4	2018-09-06	09:52	2018-09-06	10:56		4.7	6.4	2.4
5	2018-09-03	09:48	2018-09-03	10:50		6.4	6.4	2.4
6	2018-08-28	07:35	2018-08-28	08:12	▲	10.3	6.4	2.4
7	2018-08-27	14:10	2018-08-27	15:25	▲	11.2	6.4	2.4
8	2017-09-22	12:01	2017-09-22	13:00	▲	11.5	6.4	2.4
9	2016-08-05	10:00	2016-08-05	10:59	▲	8.0	7	2.4
10	2016-05-13	10:40	2016-05-13	11:26	▲	11.3	7	2.4
11	2016-02-19	10:42	2016-02-19	11:30	▲	9.7	7	2.4
12	2015-11-27	11:01	2015-11-27	11:45	▲	11.6	7	2.4
13	2015-09-04	11:30	2015-09-04	12:12	▲	11.1	7	2.4
14	2015-06-04	10:12	2015-06-04	11:24	▲	7.3	7	2.4
15	2015-06-02	18:22	2015-06-02	18:40		5.7	7	2.4
16	2015-05-30	14:17	2015-05-30	14:55	▲	7.4	7	2.4

	검사명	RV	검사결과	S	단위	참고치	검체명	의사전달사항
1	Total calcium		9.6		mg/dL	8.2-10.5	SERUM	
2	Phosphorus		4.1		mg/dL	2.5-4.5	SERUM	
3	Glucose	▲	119		mg/dL	74-106	SERUM	
4	BUN		13		mg/dL	7-20	SERUM	
5	Creatinine		0.74		mg/dL	0.51-0.95	SERUM	
6	MDRD eGFR		81.5		ml/min/1.7	>60	SERUM	
7	CKD EPI eGFR		79.8		ml/min/1.7	>60	SERUM	
8	Uric acid	▲	11.5		mg/dL	2.4-6.4	SERUM	
9	Total cholesterol		124		mg/dL	0-200	SERUM	
10	T.protein		7.4		g/dL	6.6-8.3	SERUM	
11	Albumin		4.5		g/dL	3.5-5.2	SERUM	
12	A/G Ratio	▲	1.6			1.17-1.52	SERUM	
13	AST (SGOT)	▲	67		U/L	0-35	SERUM	
14	ALT (SGPT)	▲	39		U/L	0-35	SERUM	
15	ALP		74		U/L	30-120	SERUM	
16	T.bilirubin	▲	1.7		mg/dL	0.2-1.2	SERUM	
17	Hemolysis		0				SERUM	
18	Icteric		0				SERUM	
19	Lipemic		0				SERUM	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PD G50/0.60kHz/F1/FA8
SAMSUNG
HS70A
RT WRIST
SAMSUNG
HS70A
LT KNEE


SAMSUNG
HS70A
LT 1 MTP
2

Take home message