Online supplement to: Development of a Preliminary Ultrasonographic Enthesitis Score in Psoriatic Arthritis – GRAPPA Ultrasound Working Group. The Journal of Rheumatology. doi:10.3899/jrheum.171465

Supplement 1 – Atlas of sonographic elementary lesions

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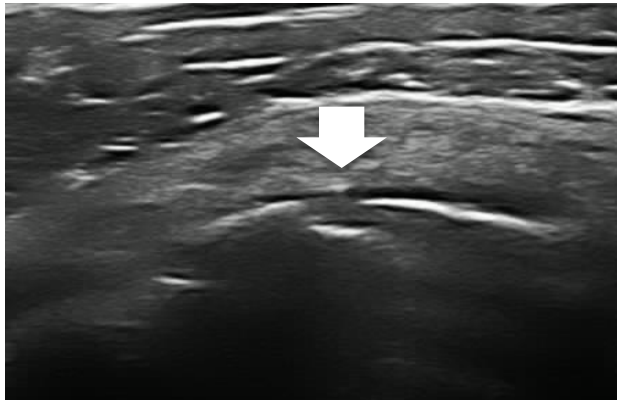
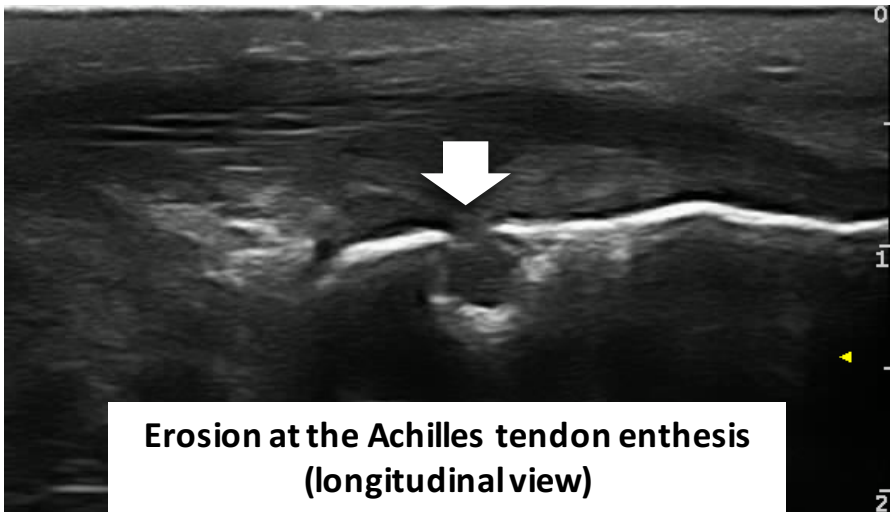
Erosion: cortical break with step down contour defect at the enthesis

Erosion along supraspinatus enthesis. Top- Longitudinal view; Bottom – Transverse view





Erosion at the Achilles tendon enthesis (longitudinal view)

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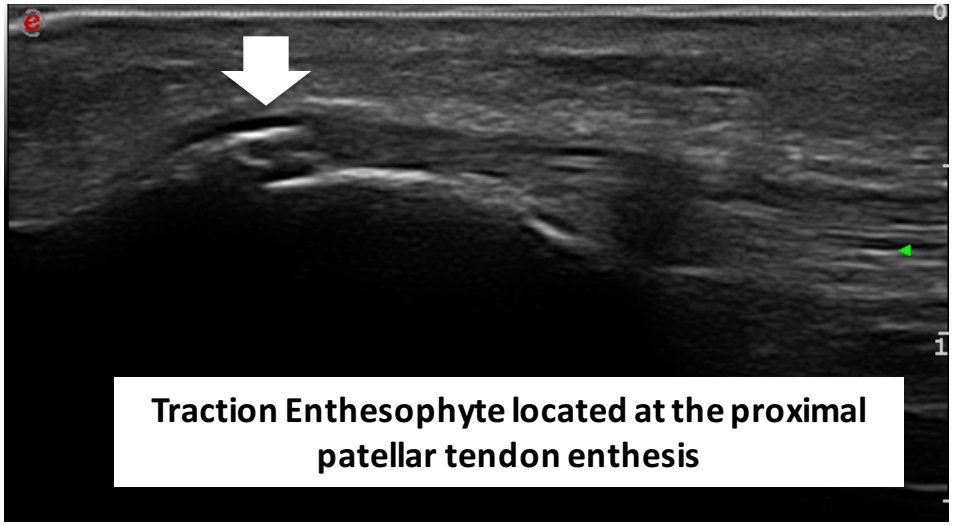
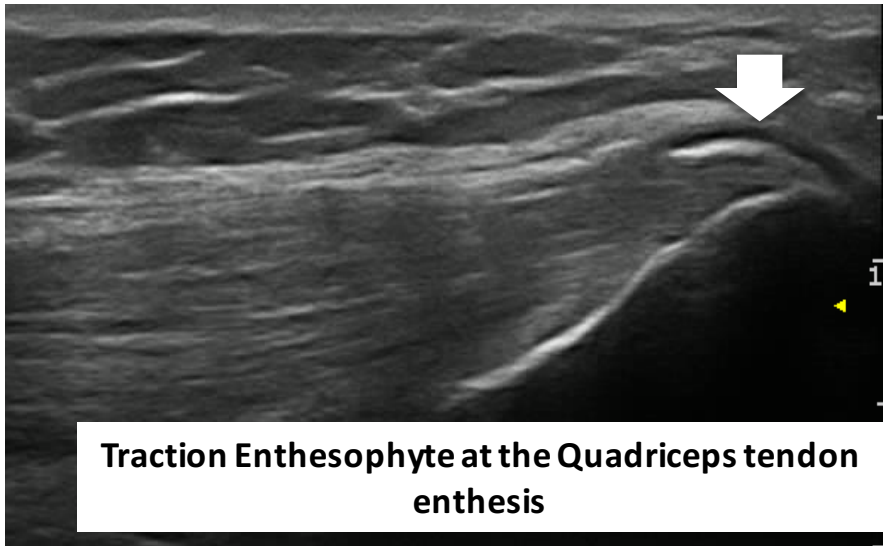
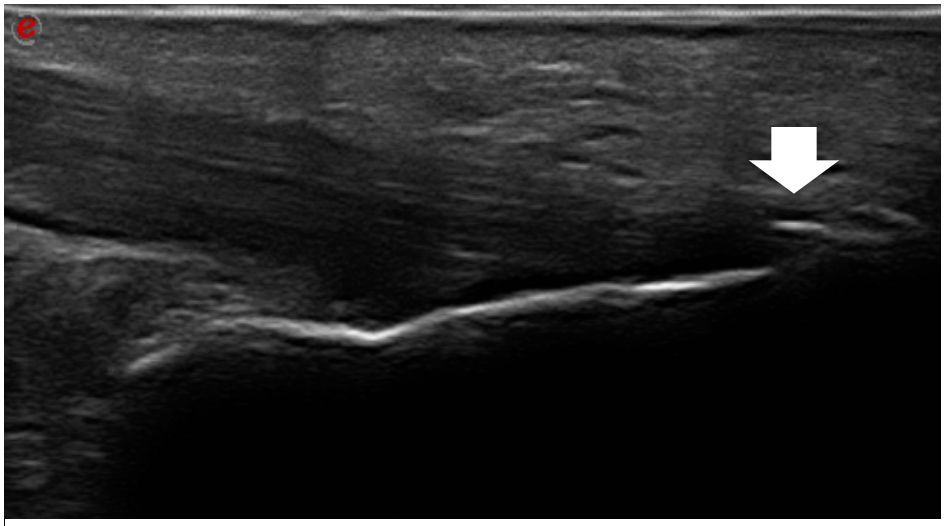
Traction Enthesophyte: A single enthesophyte originating from the most proximal or distal end of the enthesis (at attachment of tendon to bone)



Traction Enthesophyte located at the proximal patellar tendon enthesis



Traction Enthesophyte at the Quadriceps tendon enthesis



Traction Enthesophyte at the Achilles tendon enthesis

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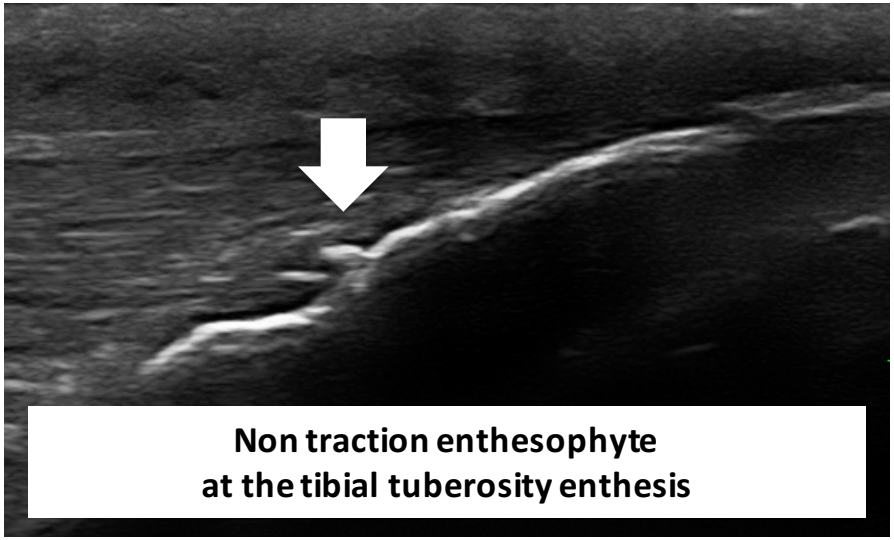
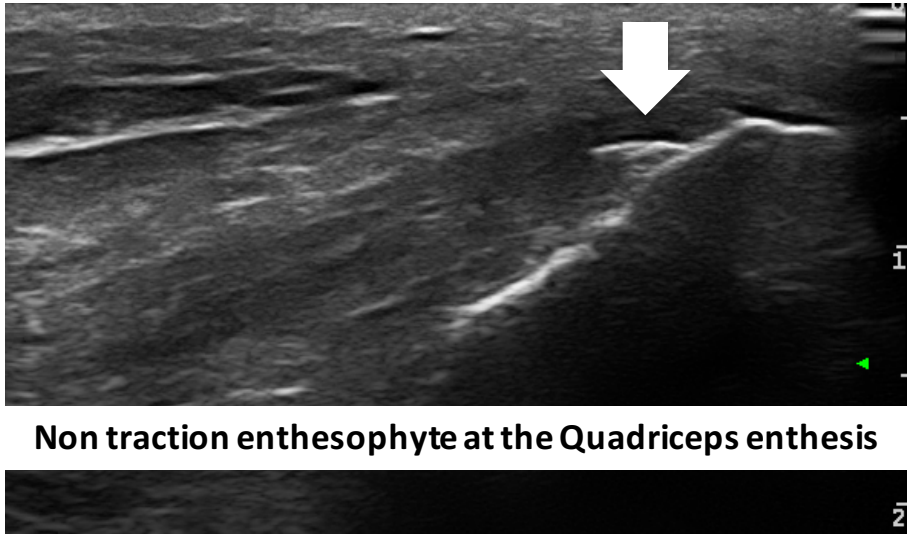
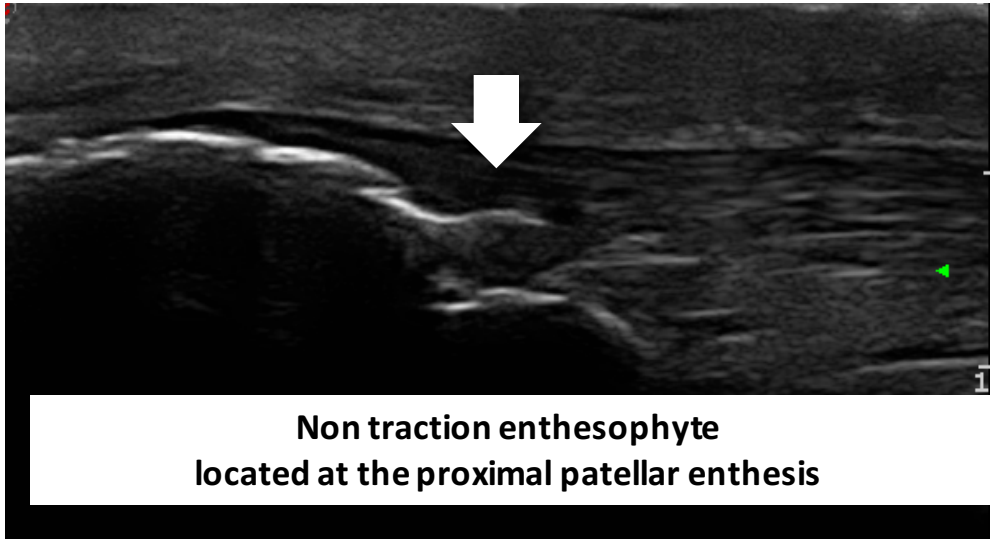
Non-Traction Enthesophyte: Enthesophyte located along the enthesis



Non traction enthesophyte at the tibial tuberosity enthesis



Non traction enthesophyte at the Quadriceps enthesis



Non traction enthesophyte located at the proximal patellar enthesis

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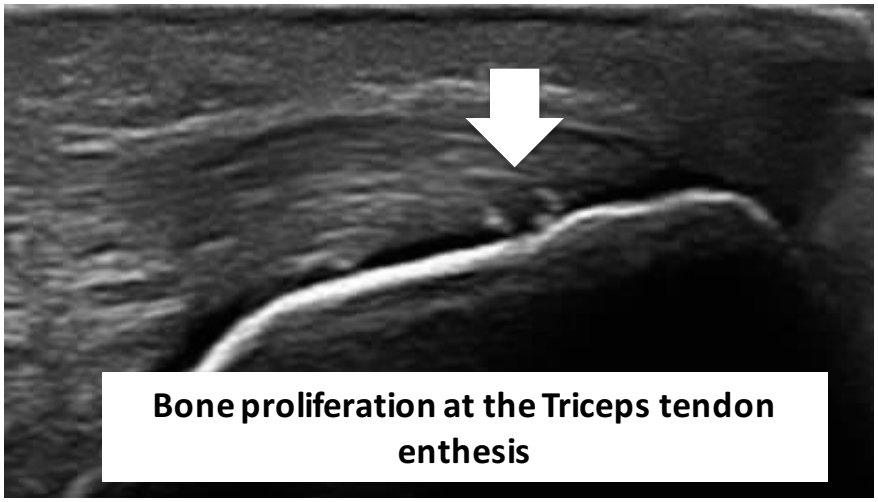
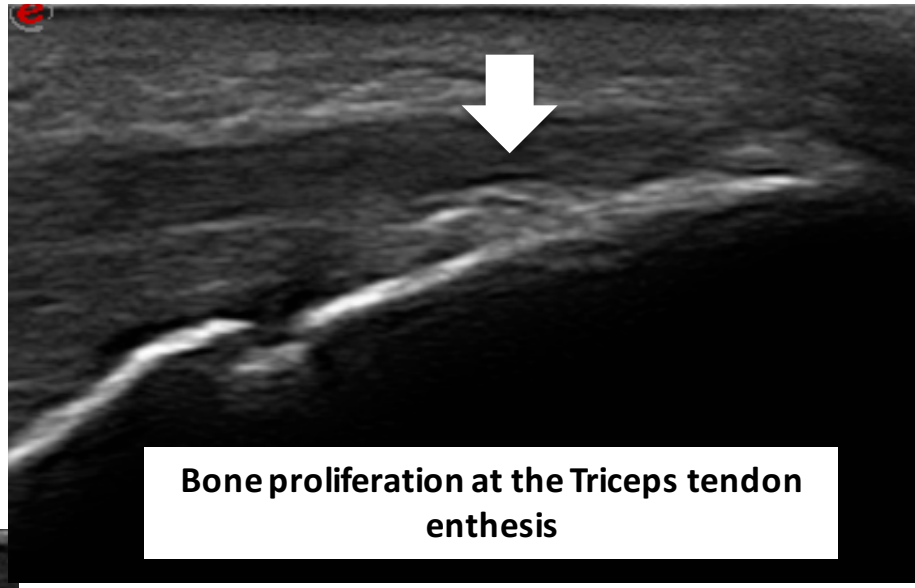
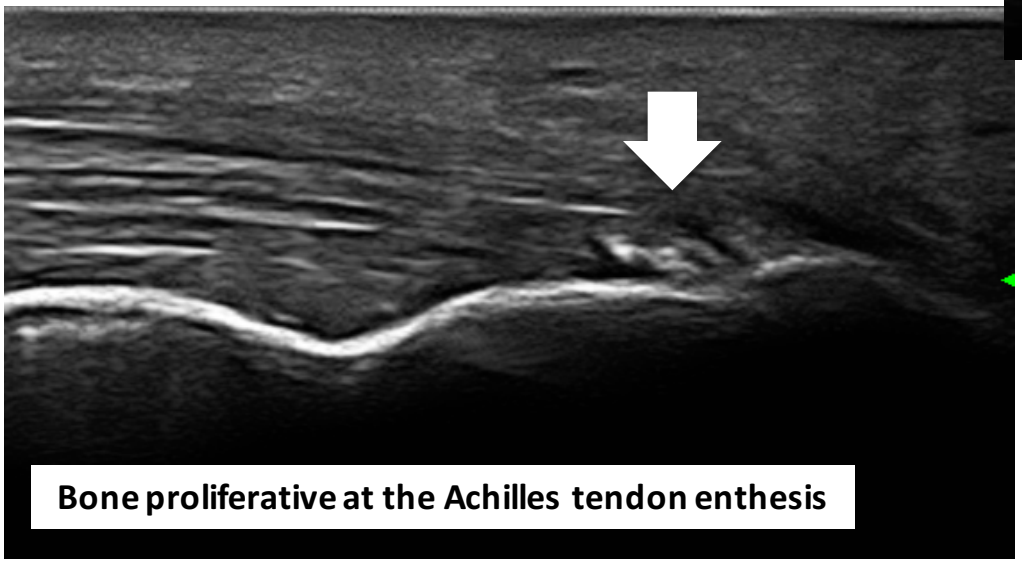
Bone irregularity: "Fluffy" hyperechoic bone projections originating from the bone along the enthesis



Bone proliferation at the Triceps tendon enthesis



Bone proliferation at the Triceps tendon enthesis



Bone proliferative at the Achilles tendon enthesis

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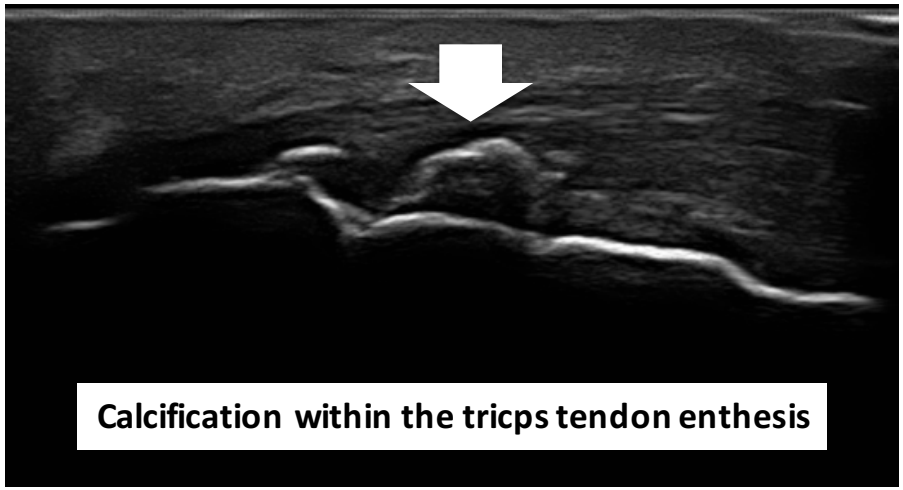
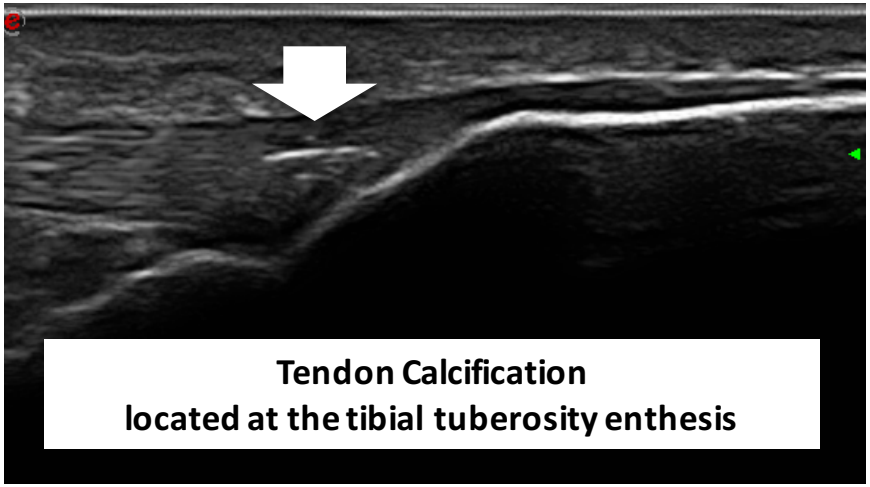
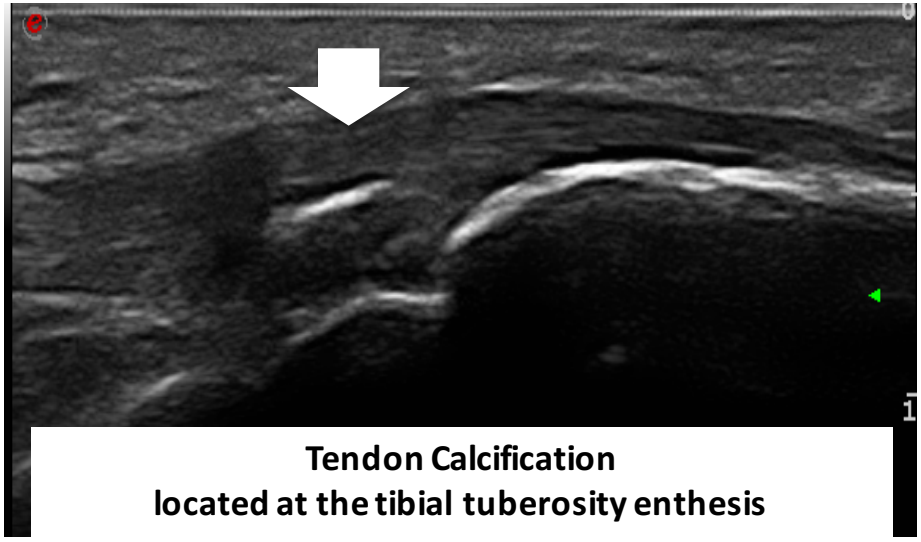
Calcifications: Hyperechoic linear structures located within tendon/ligament but with no congruency with bone



Calcification within the tricps tendon enthesis



Tendon Calcification
located at the tibial tuberosity enthesis



Tendon Calcification
located at the tibial tuberosity enthesis

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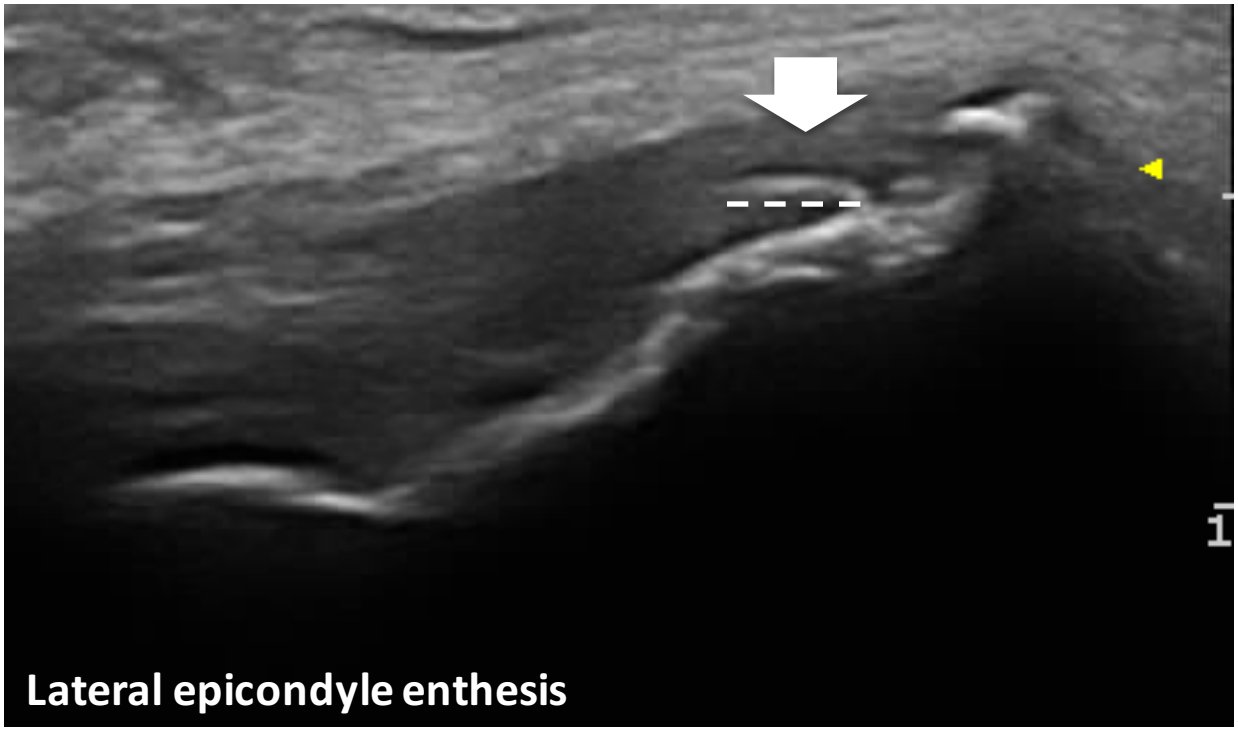
Enthesophyte Grading

- Linear measurement from most proximal to distal end of enthesophyte as parallel as possible to entheseal fibers
  Grade 1: < 3 mm length
  Grade 2: 3-5 mm length
  Grade 3: ≥ 5 mm length



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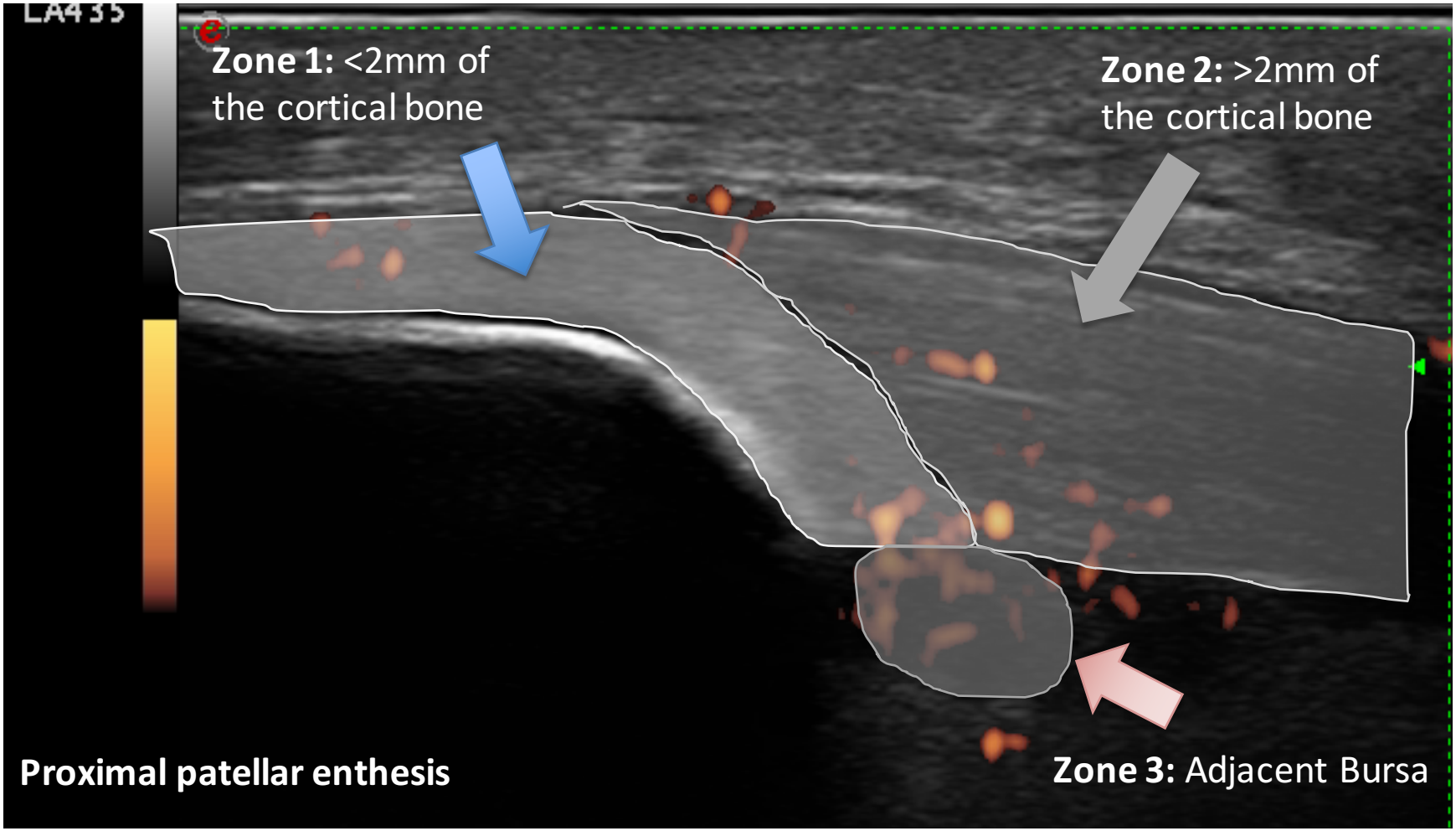
Doppler signal location:

Zone 1: <2mm of the cortical bone

Zone 2: >2mm of the cortical bone

Zone 3: Within the adjacent bursa



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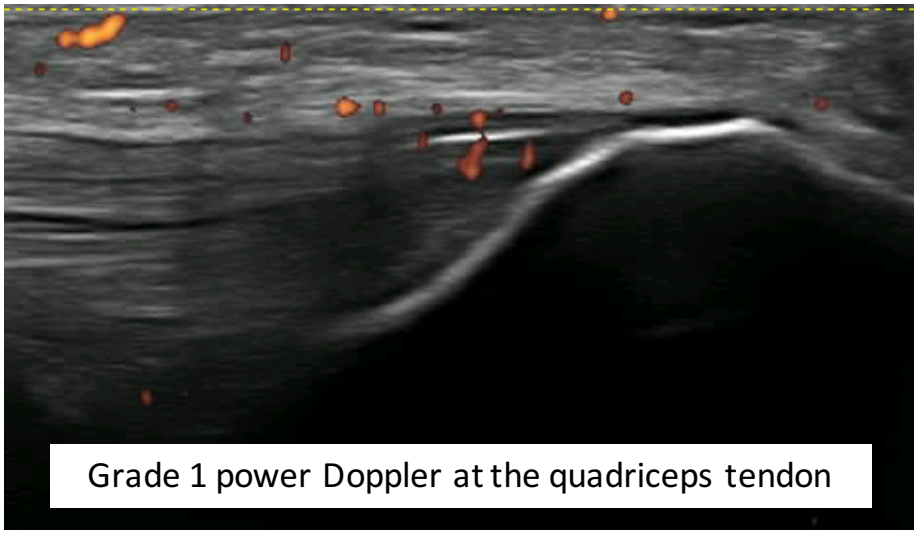
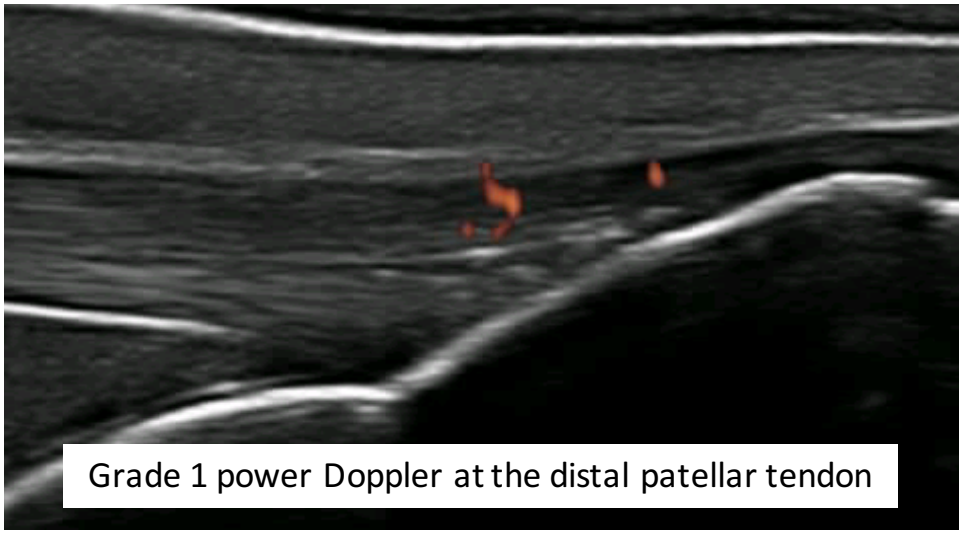
Doppler signal Intensity Grading

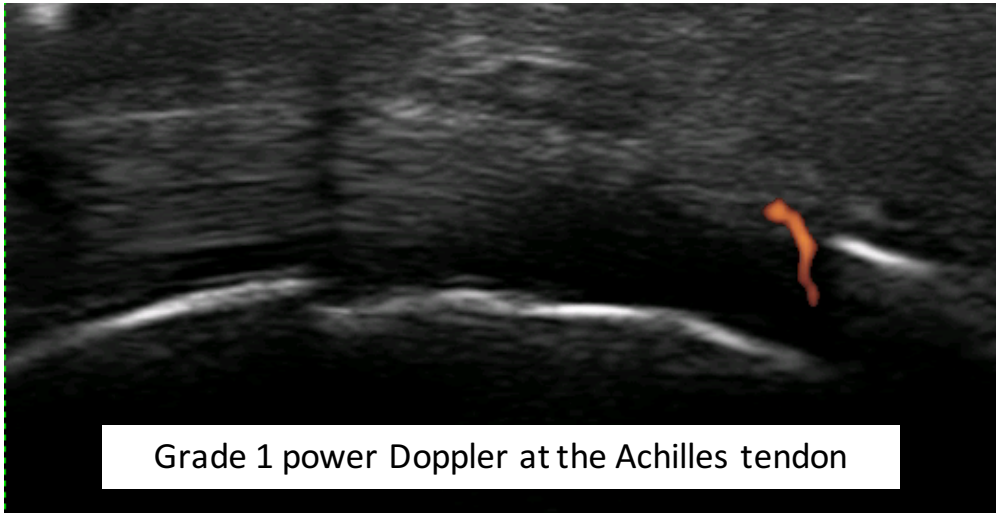
Grade 1: Up to 3 vessel signals at the enthesis



Grade 1 power Doppler at the quadriceps tendon



Grade 1 power Doppler at the distal patellar tendon



Grade 1 power Doppler at the Achilles tendon

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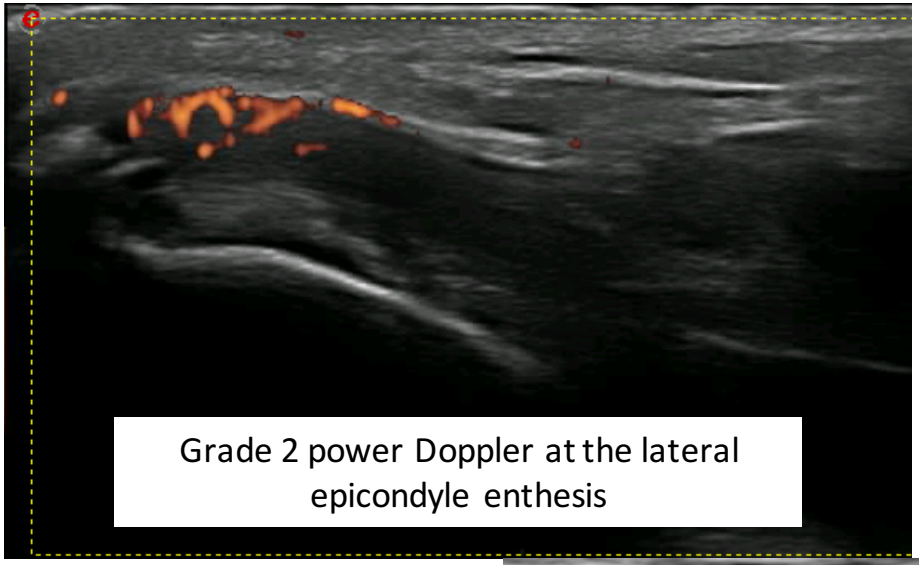
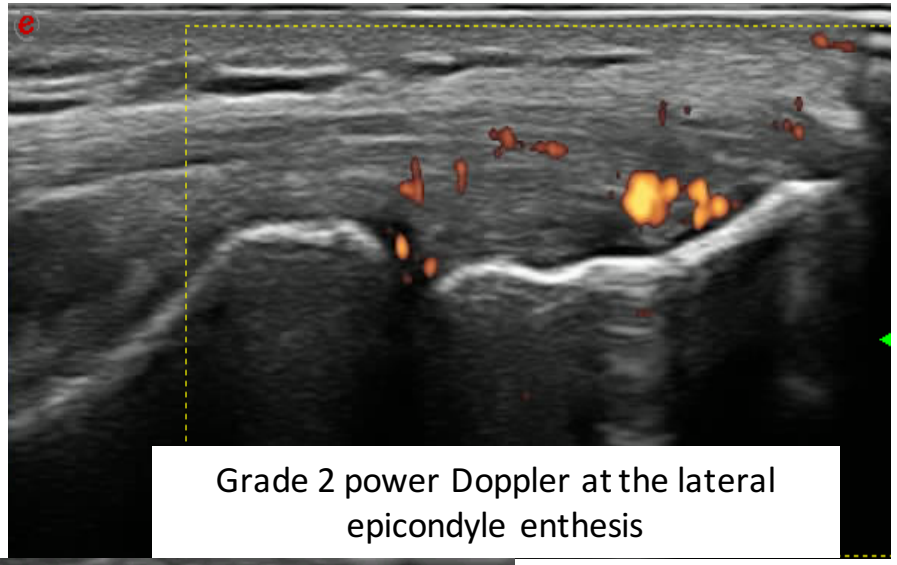
Doppler signal Intensity Grading

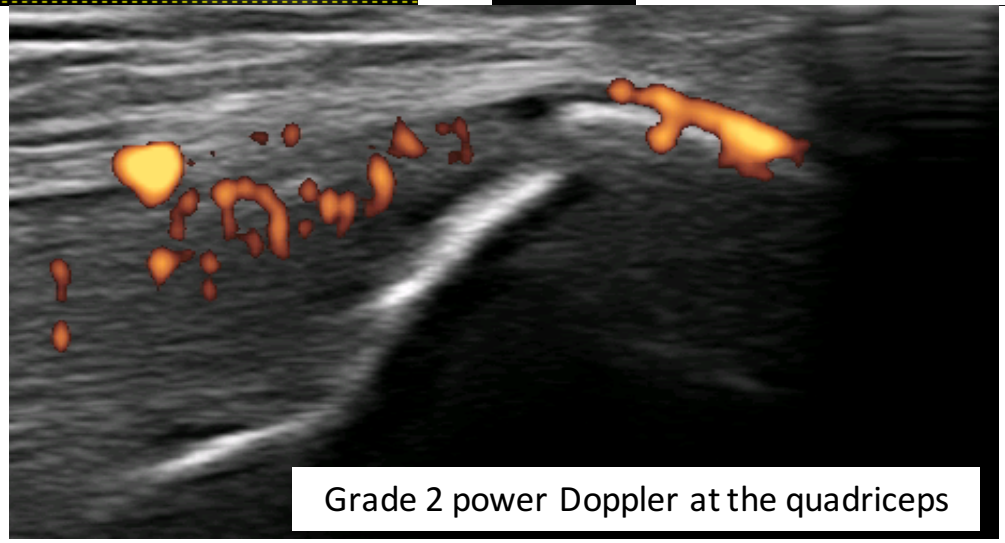
Grade 2: Confluent vessels signals in less than half of the area of the enthesis area



Grade 2 power Doppler at the lateral epicondyle enthesis



Grade 2 power Doppler at the lateral epicondyle enthesis



Grade 2 power Doppler at the quadriceps

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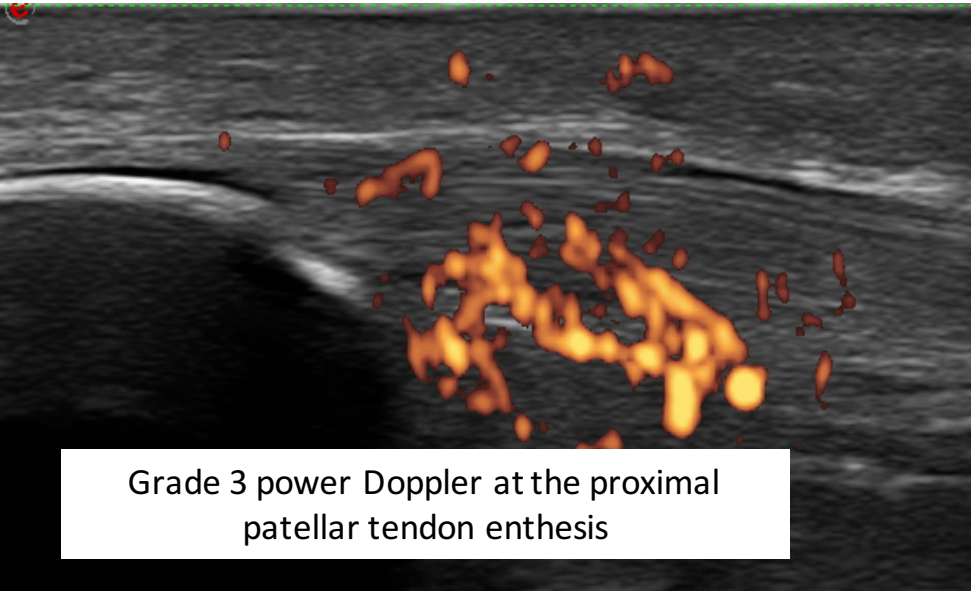
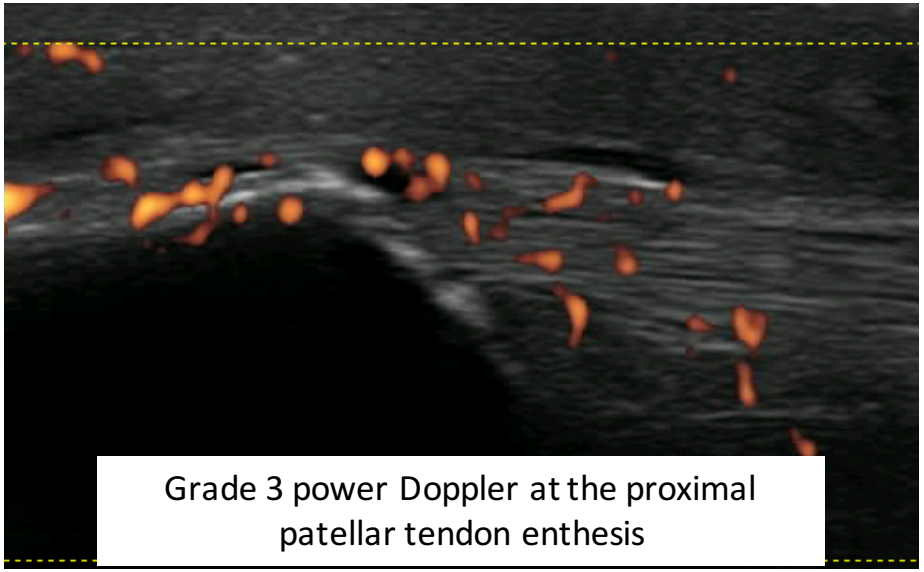
Doppler signal Intensity Grading

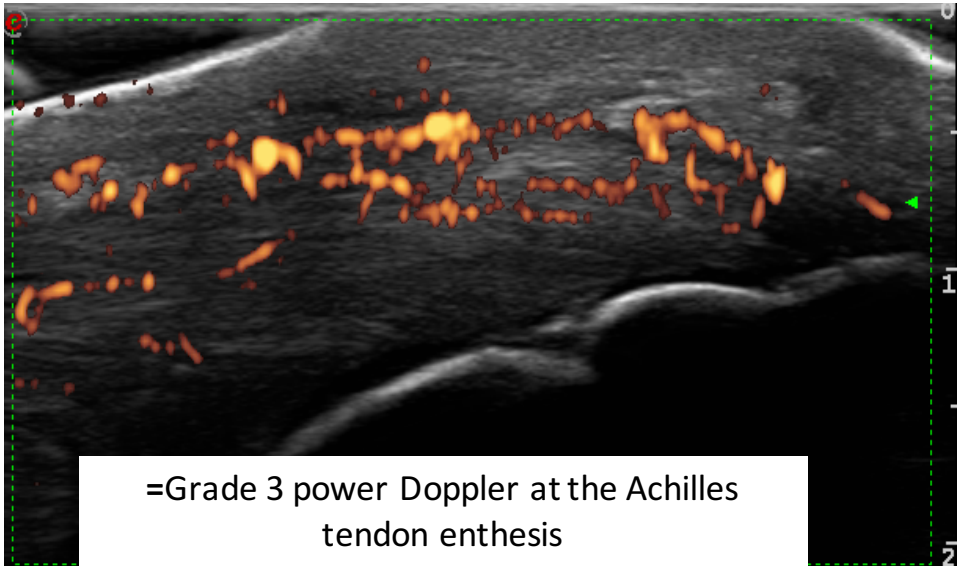
Grade 3: Vessel signals in more than half area of the enthesis



Grade 3 power Doppler at the proximal patellar tendon enthesis



Grade 3 power Doppler at the proximal patellar tendon enthesis



=Grade 3 power Doppler at the Achilles tendon enthesis

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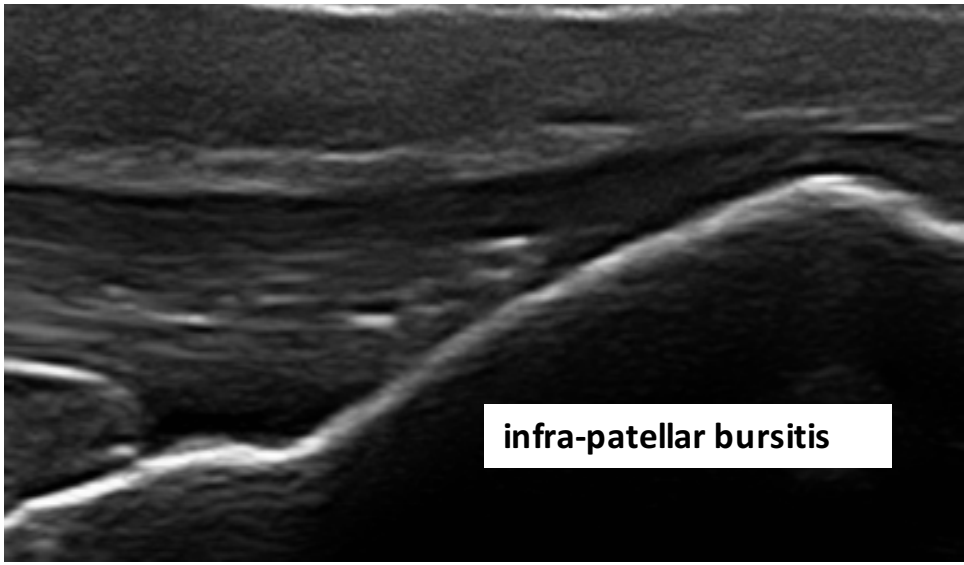
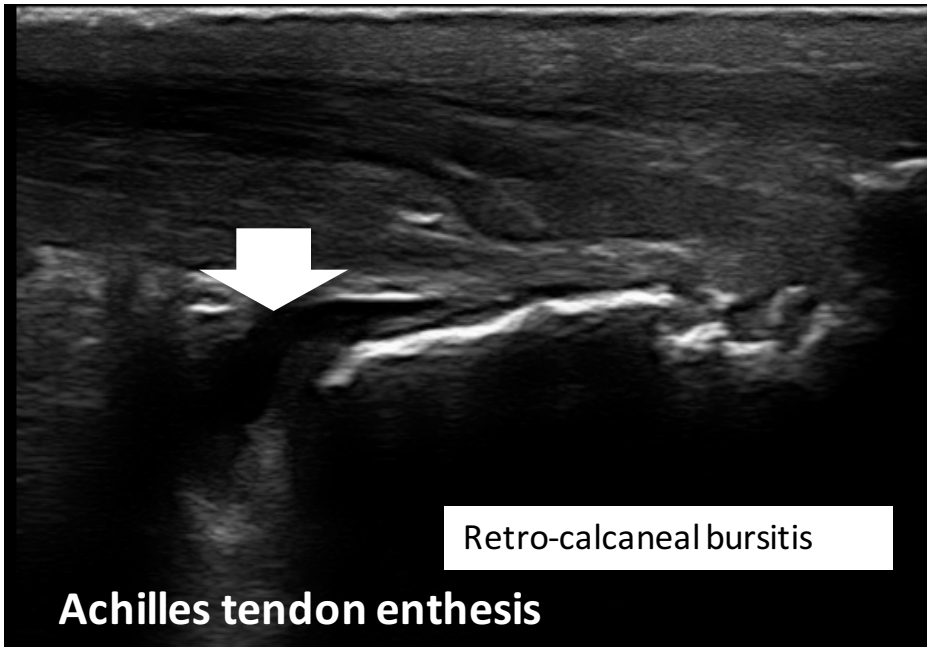
Bursitis: Hypoechoic area located within known anatomic bursa that is compressible with pressure





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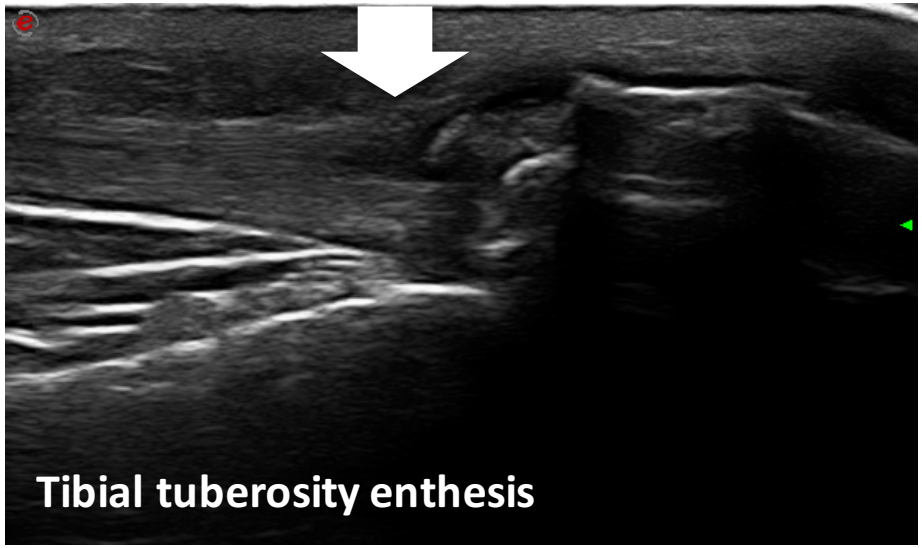
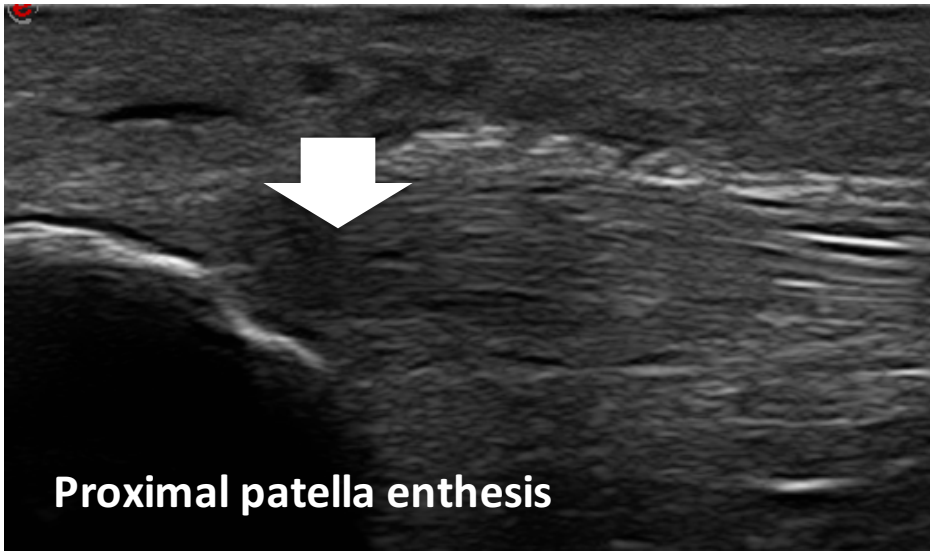
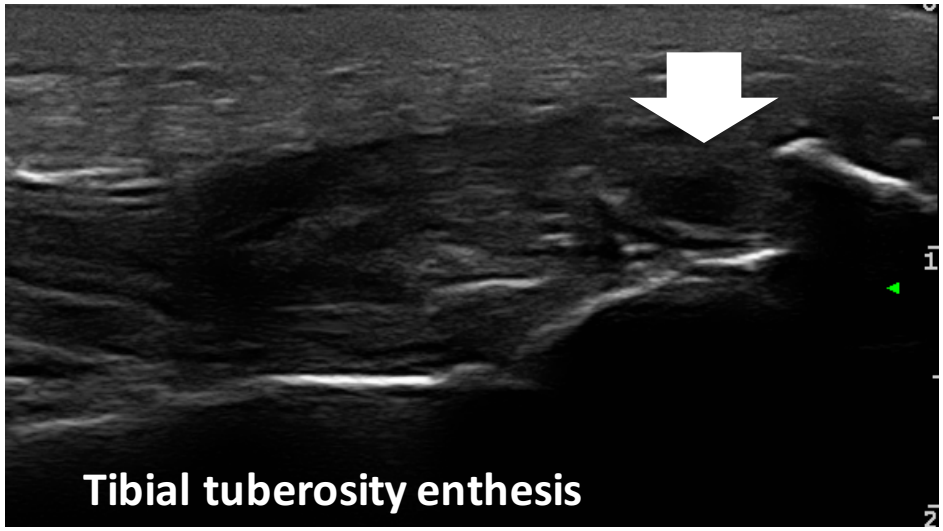
Hypoechogenicity: Hypoechoic areas (loss of fibrilar pattern) within the tendon/ligament at the enthesis not attributed to anisotropy







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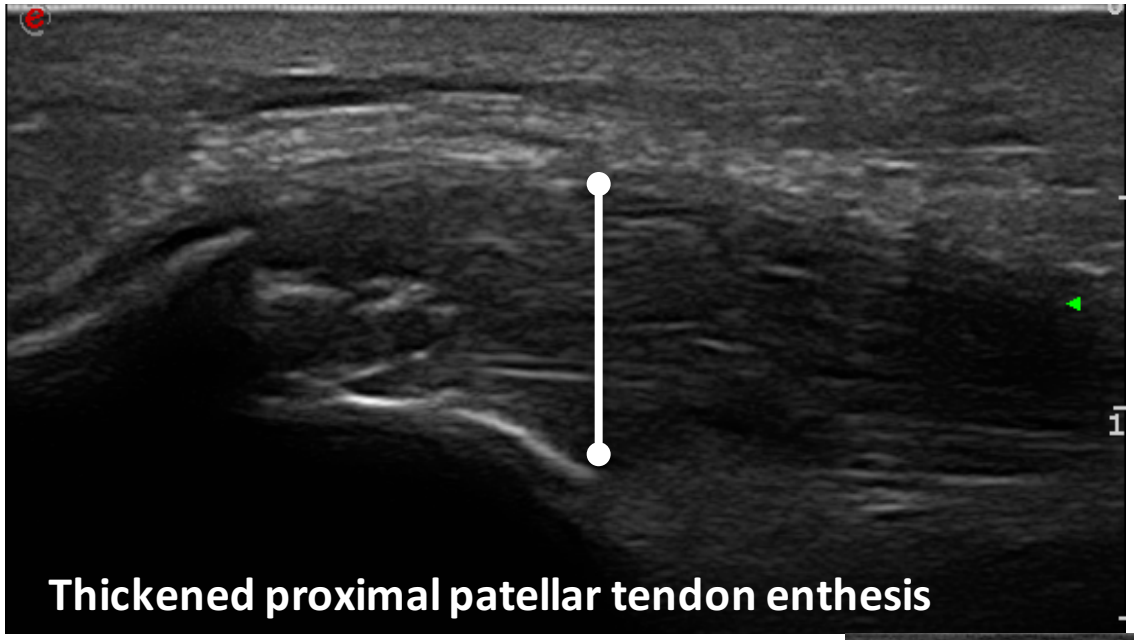
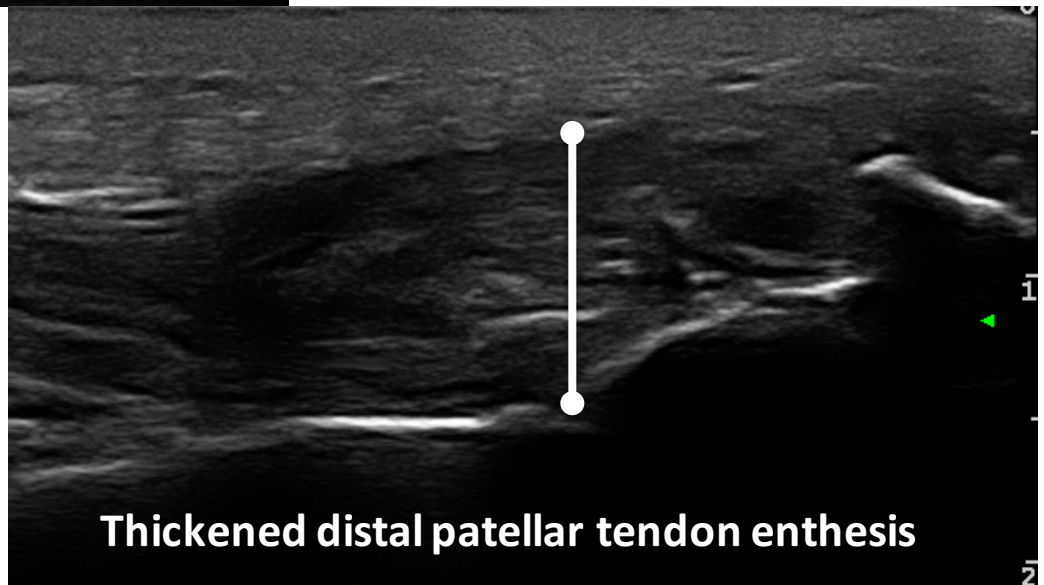
Thickening of the enthesis: Vertical measurement of enthesis in longitudinal axis at the widest section of enthesis.



Thickened proximal patellar tendon enthesis



Thickened distal patellar tendon enthesis

Supplementary Table 2A - Frequency of structural entheseal lesions (per of entheseal sites)					
	PsA N (%)	**Control N (%)**	**P value**	**Sensitivity**	**Specificity**
Quadriceps tendon	15 (30%)	7 (14%)	0.09	0.30	0.86
Proximal patellar ligament	6 (12%)	7 (14%)	0.11	0.12	0.98
Tibial tuberosity	11 (22%)	3 (6%)	0.04	0.22	0.94
Achilles tendon	4 (8%)	2 (4%)	0.68	0.08	0.96
Plantar fascia	9 (18%)	8 (16%)	1.00	0.18	0.84
Triceps tendon	15 (30%)	2 (4%)	0.001	0.30	0.96
Lateral epicondyle	29 (58%)	1 (2%)	<0.001	0.58	0.98
Medial epicondyle	5 (10%)	3 (6%)	0.71	0.10	0.94
Tibialis posterior	3 (6%)	1 (2%)	0.61	0.06	0.98
Deltoid	3 (6%)	1 (2%)	0.61	0.06	0.98
Supraspinatus	14 (28%)	12 (24%)	0.82	0.28	0.76

Supplementary Table 2B - Frequency of entheseal thickening (per of entheseal sites)					
	PsA N (%)	**Control N (%)**	**P value**	**Sensitivity**	**Specificity**
Quadriceps tendon	22 (44%)	15 (30%)	0.21	0.44	0.70
Proximal patellar ligament	15 (30%)	1 (2%)	<0.001	0.30	0.98
Tibial tuberosity	40 (80%)	24 (48%)	0.002	0.80	0.52
Achilles tendon	8 (16%)	5 (10%)	0.55	0.16	0.90
Plantar fascia	12 (24%)	2 (4%)	0.009	0.24	0.96

Supplementary Table 2C - Frequency of any enthesophyte (grade>0) (per of entheseal sites)					
	PsA N (%)	**Control N (%)**	**P value**	**Sensitivity**	**Specificity**
Quadriceps tendon	38 (76%)	26 (52%)	0.02	0.76	0.48
Proximal patellar ligament	20 (40%)	2 (4%)	<0.001	0.40	0.96
Tibial tuberosity	6 (12%)	4 (8%)	0.74	0.12	0.92
Achilles tendon	23 (66%)	31 (62%)	0.84	0.66	0.38
Plantar fascia	39 (78%)	44 (88%)	0.29	0.78	0.12
Triceps tendon	12 (24%)	7 (14%)	0.31	0.24	0.86
Lateral epicondyle	21 (42%)	9 (18%)	0.02	0.42	0.82
Medial epicondyle	10 (20%)	1 (2%)	0.01	0.20	0.98
Tibialis posterior	4 (8%)	3 (6%)	1.00	0.08	0.94
Deltoid	5 (10%)	1 (2%)	0.20	0.10	0.98
Supraspinatus	7 (14%)	7 (14%)	1.00	0.14	0.86

Supplementary Table 2D - Frequency of enthesophyte (grade>1) (per of entheseal sites)					
	PsA N (%)	**Control N (%)**	**P value**	**Sensitivity**	**Specificity**
Quadriceps tendon	33 (66%)	20 (40%)	0.02	0.66	0.60
Proximal patellar ligament	18 (36%)	1 (2%)	<0.001	0.36	0.98
Tibial tuberosity	4 (8%)	1 (2%)	0.36	0.08	0.98
Achilles tendon	29 (58%)	24 (48%)	0.42	0.58	0.52
Triceps tendon	5 (10%)	4 (8%)	1.00	0.1	0.92
Lateral epicondyle	6 (12%)	1 (2%)	0.11	0.12	0.98
Medial epicondyle	3 (6%)	0 (0%)	0.24	0.06	1.00
Tibialis posterior	0 (0%)	0 (0%)	1.00	0	1.00
Deltoid	0 (0%)	0 (0%)	1.00	0	1.00
Supraspinatus	4 (8%)	2 (4%)	0.67	0.08	0.96

Supplementary Table 2E - Frequency of enthesophyte (grade>2) (per of entheseal sites)					
	PsA N (%)	**Control N (%)**	**P value**	**Sensitivity**	**Specificity**
Quadriceps tendon	21 (42%)	12 (24%)	0.09	0.42	0.76
Proximal patellar ligament	11 (22%)	1 (2%)	0.006	0.22	0.98
Tibial tuberosity	1 (2%)	1 (2%)	1.00	0.02	0.98
Achilles tendon	13 (26%)	13 (26%)	1.00	0.26	0.74
Triceps tendon	4 (8%)	0 (0%)	0.13	0.08	1.00
Lateral epicondyle	0 (0%)	0 (0%)	1.00	0	1.00
Medial epicondyle	0 (0%)	0 (0%)	1.00	0	1.00
Tibialis posterior	0 (0%)	0 (0%)	1.00	0	1.00
Deltoid	0 (0%)	0 (0%)	1.00	0	1.00
Supraspinatus	0 (0%)	0 (0%)	1.00	0	1.00

Supplementary Table 2F - Frequency of non-traction enthesophyte (per of entheseal sites)					
	PsA N (%)	**Control N (%)**	**P value**	**Sensitivity**	**Specificity**
Quadriceps tendon	10 (20%)	4 (8%)	0.15	0.20	0.92
Proximal patellar ligament	3 (6%)	1 (2%)	0.61	0.06	0.98
Tibial tuberosity	2 (4%)	1 (2%)	1.00	0.04	0.98
Achilles tendon	0 (0%)	0 (0%)	1.00	0	1.00
Triceps tendon	2 (4%)	2 (4%)	1.00	0.04	0.96
Lateral epicondyle	7 (14%)	5 (10%)	0.76	0.14	0.90
Medial epicondyle	0 (0%)	0 (0%)	1.00	0	1.00
Tibialis posterior	1 (2%)	0 (0%)	1.00	0.02	1.00
Deltoid	1 (2%)	0 (0%)	1.00	0.02	1.00
Supraspinatus	5 (10%)	5 (10%)	1.00	0.12	0.90

Supplementary Table 2G - Frequency of calcifications (per of entheseal sites)					
	PsA N (%)	**Control N (%)**	**P value**	**Sensitivity**	**Specificity**
Quadriceps tendon	12 (24%)	8 (16%)	0.45	0.84	0.24
Proximal patellar ligament	6 (12%)	3 (6%)	0.49	0.12	0.94
Tibial tuberosity	2 (4%)	1 (2%)	1.00	0.04	0.98
Achilles tendon	4 (8%)	4 (8%)	1.00	0.08	0.92
Plantar fascia	1 (2%)	1 (2%)	1.00	0.02	0.98
Triceps tendon	3 (6%)	7 (14%)	0.32	0.06	0.86
Lateral epicondyle	7 (14%)	3 (6%)	0.32	0.14	0.94
Medial epicondyle	2 (4%)	1 (2%)	1.00	0.04	0.98
Tibialis posterior	0 (0%)	0 (0%)	1.00	0	1.00
Deltoid	0 (0%)	0 (0%)	1.00	0	1.00
Supraspinatus	5 (10%)	5 (10%)	1.00	0.10	0.90

Supplementary Table 2H - Frequency of erosions (per of entheseal sites)					
	PsA N (%)	**Control N (%)**	**P value**	**Sensitivity**	**Specificity**
Quadriceps tendon	2 (4%)	0 (0%)	0.49	0.04	1.00
Proximal patellar ligament	5 (0%)	0 (0%)	0.06	0.10	1.00
Tibial tuberosity	1 (2%)	0 (0%)	1.00	0.02	1.00
Achilles tendon	9 (18%)	1 (2%)	0.02	0.18	0.98
Plantar fascia	2 (4%)	0 (0%)	0.49	0.04	1.00
Triceps tendon	9 (18%)	1 (2%)	0.32	0.02	0.98
Lateral epicondyle	13 (36%)	2 (4%)	0.005	0.26	0.96
Medial epicondyle	1 (2%)	0 (0%)	1.00	0.02	1.00
Tibialis posterior	8 (16%)	1 (2%)	0.03	0.16	0.98
Deltoid	1 (2%)	1 (2%)	1.00	0.02	0.98
Supraspinatus	18 (36%)	4 (8%)	0.002	0.36	0.92

Supplementary Table 2I - Frequency of bone irregularity (per of entheseal sites)					
	PsA N (%)	**Control N (%)**	**P value**	**Sensitivity**	**Specificity**
Quadriceps tendon	3 (6%)	0 (0%)	0.24	0.06	1.00
Proximal patellar ligament	3 (6%)	1 (2%)	0.61	0.06	0.98
Tibial tuberosity	0 (0%)	1 (2%)	1.00	0	0.98
Achilles tendon	3 (6%)	0 (0%)	0.24	0.06	1.00
Plantar fascia	0 (0%)	0 (0%)	1.00	0	1.00
Triceps tendon	6 (12%)	0 (0%)	0.03	0.12	1.00
Lateral epicondyle	5 (10%)	0 (0%)	0.06	0.10	1.00
Medial epicondyle	3 (6%)	0 (0%)	0.24	0.06	1.00
Tibialis posterior	0 (0%)	2 (4%)	0.49	0	0.96
Deltoid	1 (2%)	0 (0%)	1.00	0.02	1.00
Supraspinatus	4 (8%)	1 (2%)	0.36	0.08	0.98

Supplementary Table 2J - Frequency of Doppler signal (grade>0) (per of entheseal sites)					
	PsA N (%)	**Control N (%)**	**P value**	**Sensitivity**	**Specificity**
Quadriceps tendon	8 (16%)	0 (0%)	0.006	0.16	1.00
Proximal patellar ligament	8 (16%)	0 (0%)	0.006	0.16	1.00
Tibial tuberosity	11 (22%)	1 (2%)	0.004	0.22	0.98
Achilles tendon	7 (14%)	4 (8%)	0.52	0.14	0.92
Plantar fascia	1 (2%)	0 (0%)	1.00	0.02	1.00
Triceps tendon	15 (30%)	4 (8%)	0.009	0.30	0.92
Lateral epicondyle	12 (24%)	2 (4%)	0.009	0.24	0.96
Medial epicondyle	3 (6%)	1 (2%)	0.61	0.06	0.98
Tibialis posterior	6 (12%)	0 (0%)	0.03	0.12	1.00
Deltoid	3 (6%)	1 (2%)	0.61	0.06	0.98
Supraspinatus	3 (6%)	1 (2%)	0.61	0.06	0.98

Supplementary Table 2K - Frequency of Doppler signal (grade>1) (per of entheseal sites)					
	PsA N (%)	**Control N (%)**	**P value**	**Sensitivity**	**Specificity**
Quadriceps tendon	2 (4%)	0 (0%)	0.48	0.04	1.00
Proximal patellar ligament	5 (10%)	0 (0%)	0.05	0.1	1.00
Tibial tuberosity	5 (10%)	0 (0%)	0.05	0.1	1.00
Achilles tendon	2 (4%)	1 (2%)	1.00	0.04	0.98
Plantar fascia	1 (2%)	0 (0%)	1.00	0.02	1.00
Triceps tendon	6 (12%)	1 (2%)	0.11	0.12	0.98
Lateral epicondyle	7 (14%)	0 (0%)	0.01	0.14	1.00
Medial epicondyle	2 (0%)	0 (0%)	0.48	0.04	1.00
Tibialis posterior	4 (8%)	0 (0%)	0.12	0.08	1.00
Deltoid	2 (4%)	0 (0%)	0.50	0.04	1.00
Supraspinatus	1 (2%)	0 (0%)	1.00	0.02	1.00

Supplementary Table 2L - Frequency of Doppler signal (grade>2) (per of entheseal sites)					
	PsA N (%)	**Control N (%)**	**P value**	**Sensitivity**	**Specificity**
Quadriceps tendon	0 (0%)	0 (0%)	1.00	0	1.00
Proximal patellar ligament	1 (2%)	0 (0%)	1.00	0.02	1.00
Tibial tuberosity	1 (2%)	0 (0%)	1.00	0.02	1.00
Achilles tendon	0 (0%)	0 (0%)	1.00	0	1.00
Plantar fascia	0 (0%)	0 (0%)	1.00	0	1.00
Triceps tendon	3 (6%)	1 (2%)	0.61	0.06	0.98
Lateral epicondyle	4 (8%)	0 (0%)	0.12	0.08	1.00
Medial epicondyle	0 (0%)	0 (0%)	1.00	0	1.00
Tibialis posterior	0 (0%)	0 (0%)	1.00	0	1.00
Deltoid	0 (0%)	0 (0%)	1.00	0	1.00
Supraspinatus	0 (0%)	0 (0%)	1.00	0	1.00

Supplementary Table 2M - Frequency of Doppler signal in zone 1 (per of entheseal sites)					
	PsA N (%)	**Control N (%)**	**P value**	**Sensitivity**	**Specificity**
Quadriceps tendon	7 (14%)	0 (0%)	0.02	0.14	1.00
Proximal patellar ligament	6 (12%)	0 (0%)	0.03	0.12	1.00
Tibial tuberosity	7 (14%)	1 (2%)	0.06	0.14	0.98
Achilles tendon	6 (12%)	3 (6%)	0.74	0.12	0.92
Plantar fascia	0 (0%)	0 (0%)	1.00	0	1.00
Triceps tendon	14 (28%)	2 (4%)	0.002	0.28	0.96
Lateral epicondyle	11 (22%)	1 (2%)	0.004	0.22	0.98
Medial epicondyle	3 (6%)	1 (2%)	0.62	0.06	0.98
Tibialis posterior	5 (10%)	0 (0%)	0.06	0.10	1.00
Deltoid	3 (6%)	1 (2%)	0.62	0.06	0.98
Supraspinatus	3 (6%)	1 (2%)	0.62	0.06	0.98

Supplementary Table 2N - Frequency of bursitis (per of entheseal sites)					
	PsA N (%)	**Control N (%)**	**P value**	**Sensitivity**	**Specificity**
Quadriceps tendon	3 (6%)	0 (0%)	0.24	0.06	1.00
Proximal patellar ligament	2 (4%)	0 (0%)	0.49	0.04	1.00
Tibial tuberosity	6 (12%)	8 (6%)	0.77	0.12	0.84
Achilles tendon	5 (10%)	2 (4%)	0.43	0.10	0.96
Triceps tendon	1 (2%)	1 (2%)	1.00	0.02	0.98
Supraspinatus	2 (4%)	0 (0%)	0.49	0.04	1.00