in SSc, but in lunate bone in RA pts. According to the MCP joints, the highest synovitis score was found on the second finger in SSc and RA, highest erosion score also on the second finger in SSc, but on the third finger in RA; The highest bone oedema score was found on the third finger in SSc, and also on the third and fifth finger in RA pts

Conclusion: MR inflammatory lesions in SSc are less frequent compared to that in RA but still in significant percentage, confirming the need for early detection and aggressive treatment of both, RA and SSc patients with joint involvement

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Disclosure of Interests: None declared

DOI: 10.1136/annrheumdis-2020-eular.5001

AB1131

STATISTICAL PROCESS CONTROL AND PROCESS MAPPING QUANTIFY THE EFFECTS OF HISTORICAL CHANGES TO THE CONNECTIVE TISSUE DISEASE TESTING ALGORITHM AND IDENTIFY AREAS FOR FUTURE IMPROVEMENT IN A LARGE DIAGNOSTIC IMMUNOLOGY SERVICE

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Background: Pathology test turnaround times (TATs) are a limiting factor in patient flow through rheumatology services. Quality improvement (QI) methodologies such as Lean use tools including statistical process control (SPC) and process mapping to study the performance of the whole of a clinical pipeline, expose unnecessary complexity (non-value-adding activity), and streamline processes and staff roles.

Objectives: Understand effects of changes made to CTD testing algorithm over last 12 years by measuring some of the effects on TATs. Model current processes and suggest changes to workflow to improve TAT.

Methods: High-level flow diagrams of the current testing algorithm, and low-level process maps of analyser and staff processes were drawn.

Activity and TATs (working days between report and booking date) for ANA, ENA, DNA and CCP tests were plotted as XmR control charts.

Results: **Finding 1:** Largest referral laboratory does not currently operate a separate DNA monitoring workflow, resulting in unnecessary ANA and ENA testing (figure 1).

Figure 1. Current testing strategy (left) and suggested improvement (right)

Finding 2: Samples are handed off between 3 different lab benches, each of which may be staffed by a different staff member on a different day, and results processing involves handoff to a further 2 different staff members.

Finding 3: ANA demand is close to capacity, ENA demand exceeds current capacity (table 1).

Table 1. Demand for ANA, ENA and DNA tests, compared to capacity

Test	Median Demand (tests/ day)	Approx. Capacity (tests/ day)	Notes
ANA	74	100	Close to 80% recommended by the ILGs
ENA	38	36	*Less capacity than demand!!
DNA	34	100	Plenty

Finding 4: Stopping screening DNA requests on ANA result increased the number of DNA tests performed by about 10 samples per day (30%), but decreased turnaround time by a similar proportion (3.3 to 2.3 days, figure 2). It also reduced turnaround times of ANA and ENA tests.

Figure 2. Control chart of average TAT of dsDNA antibodies by request date

Conclusion: Typically for a QI project, the initially simple CTD testing pipeline has accumulated many changes made without consideration of whole system performance, and is now a struggle to run.

Improvement ideas to be explored from this work include:

- Liaising with main referral lab to develop a DNA monitoring workflow to reduce unnecessary ANA and ENA testing
- Reduce handoffs, sample journey around lab analysers, and staff hands-on time by:
- changing ANA test methodology to same as DNA
- creating new staff roles (analyser operators to perform validation/ authorisation steps)
- Create more capacity for ENA testing by increasing the frequency of this test on the weekly rota
- Create more capacity for service expansion by running analysers at week-ends (staff consultation required)
- Reduce demand on service by engaging and educating requestors
- Improve TAT for DNA by:
- processing samples the day they are booked in, instead of 1 day later
- auto-validating runs
- ...using control charts to measure improvement

Disclosure of Interests: None declared

DOI: 10.1136/annrheumdis-2020-eular.438

AB1132

EFFECTIVENESS AND SAFETY OF ULTRASOUND-GUIDED FASCIA HYDRORELEASE ON METATARSALGIA WITHOUT SONOGRAPHIC EVIDENCE OF INFLAMMATION IN PATIENTS WITH RHEUMATOID ARTHRITIS.

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Background: Patients with rheumatoid arthritis (RA) who have metatarsophalangeal (MTP) joint involvement sometimes complain metatarsalgia without active sonographic inflammation¹. Treatment of non-inflammatory metatarsalgia in RA is challenging and the pain sometimes lasts for years even though systemic inflammation completely resolves. On the other hand, intervention to fascia has increasingly attracted attention as a management of non-inflammatory pain². Recently, we have invented a new technique called ultrasound-guided fascia hydrorelease (UGFHR), which injects fluid into "stacking fascia" (defined as high echoic and thickened fascia, often adhering to adjacent structures), making it unglued and instantaneously improving fascial pain.

Objectives: This study is aiming for prospective evaluation of effectiveness and safety of UGFHR on metatarsalgia in patients with RA.

Methods: We enrolled consecutive 11 patients with RA who came to rheumatology service in Suwa Central Hospital and satisfied the following inclusion and exclusion criteria:

Inclusion criteria were having at least one MTP joint pain on which the patient has tenderness on the extensor side.

Exclusion criteria were positive inflammation with ultrasound evaluation (defined as gray scale (GS) ≥ 2 and/or power doppler scale (PDS) ≥ 1) or having other cause of pain such as intermetacarpal bursitis, Morton's neuroma.

The patients received UGFHR on the fascia between the MTP joint capsule and the extensor tendon of the toe. We first searched for the stacking fascia between the two structures using ultrasound with longitudinal view of the extensor side of the MTP joint, and injected 2ml of normal saline into the stacking fascia, making it unglued (Fig. 1). If there was no stacking fascia, we injected on the fascia where the joint capsule and the extensor tendon became closest.

Figure 1. The procedure of ultrasound-guided fascia hydrorelease (UGFHR)

Numeric rating scale (NRS) of pain on walking and tenderness on the target MTP joint was measured on 3 occasions: before, immediately after, and one week after the UGFHR. Adverse events were also recorded.

The data were analyzed longitudinally, using Friedman test.

Results: The characteristics of the patients are shown in table 1. Female gender was dominant. Most of them were established RA. Simplified disease activity index (SDAI) were variable.

Table 1. The characteristics of the 11 patients.

Case	Age	Gender	RA duration (year)	deformity	SDAI	TJ	SJ	pVAS	dVAS	CRP (mg/dl)	ESR (mm/hr)	mHAQ	GS*	PDS**
1	81	female	6	no	0.12	0	0	0	0	0.12	16	0	0	0
2	69	female	14	no	7.02	2	1	2	2	0.02	11	0.125	0	0
3	72	female	10	yes	NA	0	0	NA	1	0.24	NA	NA	1	0
4	77	female	14	yes	22.45	4	4	6	5	0.45	18	0.25	1	0
5	53	male	4	no	4.03	0	0	3	1	0.03	NA	NA	0	0
6	49	female	1	no	4.12	2	0	1	1	0.12	5	0	0	0
7	61	male	0.5	no	6.03	1	1	2	3	0.03	2	0.125	0	0
8	57	female	4	yes	2.48	0	0	1	0.5	0.11	28	NA	0	0
9	49	female	1	yes	0.07	0	0	0	0	0.07	2	0	0	0
10	62	female	6	no	4.01	0	0	3	1	0.01	NA	0	0	0
11	76	female	7	no	7.02	0	0	3	1	0.02	6	NA	0	0

* GS: gray scale score on the target MTP joint, ** PDS: power doppler scale score on the target MTP joint

The changes in NRS from before to immediately after and one week after the UGFHR are described in figure 2.

Figure 2. The changes in NRS.

Pain on walking and tenderness on the target joint both significantly decreased immediately after the procedure (Δ NRS from before to immediately after the UGFHR: -3.45 (95% confidence interval (CI) -2.32 to -4.59, $p < .01$) and -2.45 (95% CI -1.32 to -3.59, $p < .01$) respectively), and the change was maintained until one week after the UGFHR (Δ NRS from before to one week after the UGFHR: -3.09 (95% CI -1.77 to -4.42, $p < .01$) and -3.27 (95% CI -1.80 to -4.75, $p < .01$) respectively).

In terms of safety, 7 out of 11 patients complained injection pain, all of which did not last for a week. Otherwise, there was no adverse event such as infection, nerve injury, bleeding, or tendon rupture.

Conclusion: Ultrasound-guided fascia hydrorelease on MTP joint can be an effective and safe treatment option in patients with RA who have metatarsalgia but no sonographic evidence of MTP inflammation.

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Disclosure of Interests: None declared

DOI: 10.1136/annrheumdis-2020-eular.3864

AB1133

BACK TO THE BASICS: UNDERSTANDING THE PROGNOSTIC VALUE OF RHEUMATOID FACTOR AND ANTI-CYCLIC CITRULLINATED PEPTIDE IN RHEUMATOID ARTHRITIS FROM A MUSCULOSKELETAL ULTRASOUND PERSPECTIVE

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Background: Anti-CCP and rheumatoid factor (RF), especially at high levels have been implicated as poor prognostic factors in rheumatoid arthritis (RA). With musculoskeletal ultrasound (US) being increasingly used for RA joint assessment, it is important to revisit the prognostic potential of these antibodies from an US perspective.

Objectives: To study the prognostic value of RF and anti-CCP for poor disease outcomes, by investigating possible associations with US detected joint inflammation and erosion.

Methods: In this cross sectional study, US power Doppler (PD) and grey scale (GS) joint inflammation were graded semi-quantitatively (0-3), while bone erosion was scored as either Yes=1 or No=0 at each joint recess. Patients disease activity was classified as either DAS28 < 3.2 or DAS28 ≥ 3.2 . Correlations of US variables with antibodies levels were quantified using the Pearson correlation coefficient. Simple linear regression was used to characterize relationships between variables and Receiver Operating Characteristic (ROC) analysis to determine statistically optimal cut-off values for identifying patients subgroups with US erosion scores > 25 th, > 50 th and > 75 th percentiles.

Results: 1080 joints and 1800 joint recesses from bilateral elbows, wrists, ankles and small joints of the hands and feet were scanned in 30 adult RA patients (76.7% Chinese and 93.3% female). Their baseline mean (SD) DAS28, disease duration, RF and anti-CCP levels were 3.58 (1.20), 70.3 (61.2) months, 142.1 (179.0) IU/ml and 135.4 (105.3) U/ml, respectively. Table 1 summarizes correlation coefficients of antibody levels with US variables. Among patients with DAS28 < 3.2 , there were no significant correlations between antibody levels with US variables. Among patients with DAS28 ≥ 3.2 , anti-CCP levels correlated significantly ($r = 0.46$, $P = 0.048$) and were predictive (coefficient (95%CI), 0.028 (0.002, 0.053); $R^2 = 0.21$; $P = 0.048$) of US erosion scores. Area under the ROC curve (AUC) for anti-CCP levels (table 2) as predictive of patients with US erosion score > 7 (75th percentile) was 0.72 (0.26, 0.97). For the anti-CCP level cutpoint of ≥ 95.2 , specificity=53.8%, sensitivity=83.3%, accuracy=63.2%, Negative Predictive Value=87.5% and Positive Predictive Value=45.5%.

Table 1. Correlation of RF and anti-CCP levels with ultrasound variables

DAS28<3.2 Ultrasound variables	Correlation with RF Correlation coefficient (95% CI)	P-value	Correlation with anti-CCP Correlation coefficient (95% CI)	P-value
Erosion	-0.18 (-0.71, 0.47)	0.593	-0.295 (-0.76, 0.37)	0.379
PD	0.38 (-0.29, 0.80)	0.249	-0.287 (-0.76, 0.38)	0.392
GS	0.381 (-0.28, 0.80)	0.247	-0.245 (-0.74, 0.42)	0.467
DAS28≥3.2 Ultrasound variables	Correlation with RF Correlation coefficient (95% CI)	P-value	Correlation with anti-CCP Correlation coefficient (95% CI)	P-value
Erosion	-0.03 (-0.48, 0.43)	0.908	0.46 (0.01, 0.76)	0.048*
PD	-0.26 (-0.64, 0.23)	0.291	-0.34 (-0.69, 0.14)	0.157
GS	-0.01 (-0.46, 0.45)	0.975	0.03 (-0.44, 0.47)	0.921

Statistically significant: * $p < 0.05$