SUPPLEMENTARY MATERIAL

S1. Full methodology

At the initial task force meeting, members contributed clinically relevant questions related to key aspects of the use of imaging in JIA. The research questions were agreed by consensus and 11 final research questions were selected which encompassed the role of imaging in making a diagnosis of JIA, detecting inflammation and damage, predicting outcome and response to treatment, the use of guided treatment, monitoring disease progression, and remission (see online supplementary text, research questions, S2).

A systematic search of articles was performed and the bibliographies of included papers were manually searched for evidence of other studies for inclusion. A hand search was performed of the conference proceedings for the American College of Rheumatology (ACR) and the European League against Rheumatism (EULAR) annual general meetings for 2012-13 to identify unpublished studies. Specific medical subject headings (MeSH) and additional keywords were used to identify all relevant studies (see online supplementary text, details of search strategy, S3).

Titles and abstracts of all citations identified were screened, and potentially relevant articles were reviewed in full text using predetermined inclusion and exclusion criteria. Studies, published in English, on the use of imaging in all patients with a clinical diagnosis of JIA were included. Imaging modalities included were X-ray described as conventional radiology (CR), ultrasound (US), magnetic resonance imaging (MRI), computed tomography (CT), scintigraphy and positron emission tomography (PET); study types included randomised controlled trials, controlled clinical trials, cohort studies, case-control studies, diagnostic studies and case series where n≥10. Studies were considered for inclusion when they provided information on the role of imaging in making a diagnosis of JIA, detecting inflammation and damage, predicting outcome and response to treatment, the use of guided treatment, monitoring disease progression, and remission. Included studies were evaluated for risk of bias and applicability using the Quality Assessment of Diagnostic Accuracy Studies (QUADAS)-2 tool.

Following presentation of the data from the literature review, the experts produced points to consider (the evidence was not deemed strong enough to produce recommendations) based on the 11 clinical questions with final agreement by a process of discussion and consensus. The available evidence for each recommendation was scored according to the Oxford Centre for Evidence-based medicine (CEBM) level of evidence, which gives studies a score for “level of evidence” (1a-5) and for “grade of recommendation” (A-D). The experts anonymously scored their perceived level of agreement for each proposition using a 0–10 numerical rating scale (0=do not agree at all, 10=fully agree). Scores reflected both research evidence and clinical expertise.

An agenda for future research was agreed by consensus following presentation of the literature review.

Given the unique challenges of asking children or young adults to attend consensus meetings in Zurich with the task force members, a separate Patient and Public Involvement (PPI) event was arranged following the second task force meeting where the process and results were presented and all comments were recorded. The meeting was attended by three patients (one child and two young adults with a diagnosis of JIA), two parents of children with JIA, two consultant rheumatologists including task force epidemiologist CJE and, one with a special interest in paediatric rheumatology, a paediatric rheumatology nurse specialist and a paediatric research senior nurse. At this meeting all proposed points to consider were reviewed by the patients and any alternations made as required.

S2. Research questions

Q1 - What is the evidence for the differential diagnostic value of individual imaging modalities for JIA?

Q2 - What is the evidence for the diagnostic value above clinical criteria of individual imaging modalities for JIA?

Q3 - What is the evidence for the added value (sensitivity, specificity etc) of individual imaging modalities in detecting inflammation (synovitis, tenosynovitis, osteitis, bursitis, enthesitis) above clinical evaluation according to age?

Q4 - What is the evidence for the added value above clinical examination for the comparative value (sensitivity, specificity etc) of individual imaging modalities in detecting age-related structural abnormalities and damage in JIA (bone, cartilage, tendons, ligaments)?

Q5 - What is the evidence for the prognostic (prediction of therapeutic response) value of individual imaging modalities for JIA?

Q6 - What is the evidence for the prognostic (prediction of outcome) value of individual imaging modalities for JIA?

Q7 - When (time), where (which joints), how often and with what imaging modality should we monitor JIA disease inflammation?

Q8 - When (time), where (which joints), how often and with what imaging modality should we monitor age-related structural abnormalities and damage in JIA?

Q9 - What is the role of imaging for the monitoring of systemic treatment (corticosteroids, synthetic and biological DMARDs) and the targeted delivery of local treatments such as intra-articular injections?

Q10- What is the relationship between individual imaging modalities and clinical remission in JIA?

Q11- What is the impact with respect to outcome of imaging-detected inflammation /damage in the patient in clinical remission?

S3. Details of search strategy performed using MEDLINE (1946 to November 2013); EMBASE (1980 to November 2013); and the Cochrane Central Register of Controlled Trials (CENTRAL, The Cochrane Library, third quarter 2013) without language restrictions. The Cochrane Database of Systematic Reviews (CDSR) and the Database of Abstracts of Reviews of Effects (DARE) were also searched to ensure all potential studies were identified.

Search Strategy, MEDLINE

1. exp Arthritis, Juvenile Rheumatoid/
2. (juvenile$ adj3 arthrit$).tw.
3. jia.tw.
4. or/1-3
5. exp ARTHRITIS/
6. arthrit$.tw.
7. (still$ adj disease).tw.
8. Oligoarthrit$.tw.
9. Polyarthrit$.tw.
10. or/5-9
11. exp Child/
12. Adolescent/
13. child$.tw.
14. adolesc$.tw.
15. juvenile$.tw.
16. teenage$.tw.
17. youth$.tw.
18. or/11-17
19. 10 and 18
20. 4 or 19
21. exp Diagnostic Imaging/
22. magnetic resonance.tw.
23. mri$.tw.
24. (ultrasonic adj (diagnos$ or tomography or imaging$)).tw.
25. echotomograph$.tw.
26. echograph$.tw.

27. ultrasonograph$.tw.

28. ultrasound.tw.

29. sonograph$.tw.

30. exp Contrast Media/

31. (computed adj2 tomography).tw.

32. cat scan$.tw.

33. ct.tw.

34. X-Rays/

35. (xray$ or x-ray$).tw.

36. Arthrograph$.tw.

37. radiograph$.tw.

38. radiolog$.tw.

39. (roentgen adj ray$).tw.

40. (Scintigraph$ or scintiphotograph$).tw.

41. ((gamma camera or radionuclide) adj imag$).tw.

42. radioisotope scan$.tw.

43. Positron emission tomograp$.tw.

44. (pet scan$ or pet-scan$).tw.

45. or/21-44

46. 20 and 45

Search Strategy, EMBASE

1. juvenile rheumatoid arthritis/

2. (juvenile$ adj3 arthrit$).tw.

3. jia.tw.

4. or/1-3

5. exp arthritis/

6. arthrit$.tw.

7. (still$ adj disease).tw.

8. Oligoarthrit$.tw.

9. Polyarthrit$.tw.

10. or/5-9

11. child/

12. adolescent/

13. child$.tw.

14. adolesc$.tw.

15. juvenile$.tw.

16. teenage$.tw.

17. youth$.tw.

18. or/11-17

19. 10 and 18

20. 4 or 19

21. exp diagnostic imaging/

22. exp joint radiography/

23. exp nuclear magnetic resonance imaging/

24. magnetic resonance.tw.

25. mri$.tw.

26. exp echography/

27. (ultrasonic adj (diagnos$ or tomography or imaging$)).tw.

28. echotomograph$.tw.

29. echograph$.tw.

30. ultrasonograph$.tw.

31. ultrasound.tw.

32. sonograph$.tw.

33. exp computer assisted tomography/

34. exp contrast medium/

35. (computed adj2 tomography).tw.

36. cat scan$.tw.

37. ct.tw.

38. X ray/

39. (xray$ or x-ray$).tw.

40. Arthrograph$.tw.

41. radiograph$.tw.

42. radiolog$.tw.

43. (roentgen adj ray$).tw.

44. scintiscanning/

45. (Scintigraph$ or scintiphotograph$).tw.

46. ((gamma camera or radionuclide) adj imag$).tw.

47. radioisotope scan$.tw.

48. positron emission tomography/

49. Positron emission tomograp$.tw.

50. (pet scan$ or pet-scan$).tw.

51. or/21-50

52. 20 and 51

Search Strategy, The Cochrane Library

#1 MeSH descriptor: [Arthritis, Juvenile Rheumatoid] this term only

#2 juvenile* near/3 arthrit*:ti,ab

#3 jia:ti,ab

#4 #1 or #2 or #3

#5 MeSH descriptor: [Arthritis] explode all trees

#6 arthrit*:ti,ab

#7 "still* disease":ti,ab

#8 Oligoarthrit*:ti,ab

#9 Polyarthrit*:ti,ab

#10 #5 or #6 or #7 or #8 or #9

#11 MeSH descriptor: [Child] explode all trees

#12 MeSH descriptor: [Adolescent] this term only

#13 child*:ti,ab

#14 adolesc*:ti,ab

#15 juvenile:ti,ab

#16 teenage*:ti,ab

#17 youth*:ti,ab

#18 #11 or #12 or #13 or #14 or #15 or #16 or #17

#19 #10 and #18

#20 #4 or #19

#21 MeSH descriptor: [Diagnostic Imaging] explode all trees

#22 "magnetic resonance":ti,ab

#23 mri*:ti,ab

#24 (ultrasonic next (diagnos* or tomography or imaging*)):ti,ab

#25 echotomograph*:ti,ab

#26 echograph*:ti,ab

#27 ultrasonograph*:ti,ab

#28 ultrasound:ti,ab

#29 sonograph*:ti,ab

#30 MeSH descriptor: [Contrast Media] explode all trees

#31 computed near/2 tomography:ti,ab

#32 "cat scan*":ti,ab or cat-scan*:ti,ab

#33 ct:ti,ab

#34 MeSH descriptor: [X-Rays] this term only

#35 xray*:ti,ab or x-ray*:ti,ab

#36 Arthrograph*:ti,ab

#37 radiograph*:ti,ab

#38 radiolog*:ti,ab

#39 "roentgen ray*":ti,ab

#40 (Scintigraph* or scintiphotograph*):ti,ab

#41 (("gamma camera" or radionuclide) next imag*):ti,ab

#42 "radioisotope scan*":ti,ab

#43 "Positron emission tomograp*":ti,ab

#44 ("pet scan*" or pet-scan*):ti,ab

#45 #21 or #22 or #23 or #24 or #25 or #26 or #27 or #28 or #29 or #30 or #31 or #32 or #33 or #34 or #35 or #36 or #37 or #38 or #39 or #40 or #41 or #42 or #43 or #44

#46 #20 and #45

Figure S4. Flowchart showing the literature search of 13,277 articles, from which 433 articles were selected for detailed review; 204 articles met the inclusion criteria.

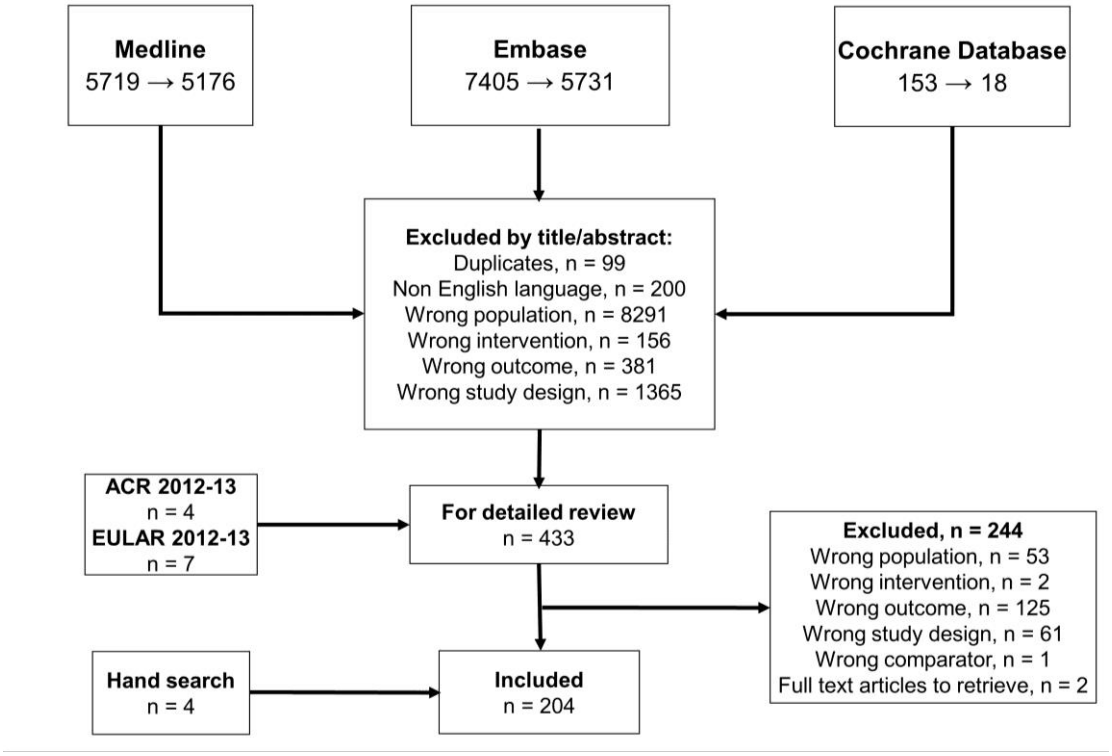

Table S5. Number of included articles per question

	No. of included articles
Q1 - What is the evidence for the differential diagnostic value of individual imaging modalities for JIA?	4
Q2 - What is the evidence for the diagnostic value above clinical criteria of individual imaging modalities for JIA?	2
Q3 - What is the evidence for the added value (sensitivity, specificity etc) of individual imaging modalities in detecting inflammation (synovitis, tenosynovitis, osteitis, bursitis, enthesitis) above clinical evaluation according to age?	65
Q4 - What is the evidence for the added value above clinical examination for the comparative value (sensitivity, specificity etc) of individual imaging modalities in detecting age-related structural abnormalities and damage in JIA (bone, cartilage, tendons, ligaments)?	37
Q5 - What is the evidence for the prognostic (prediction of therapeutic response) value of individual imaging modalities for JIA?	1
Q6 - What is the evidence for the prognostic (prediction of outcome) value of individual imaging modalities for JIA?	13
Q7 - When (time), where (which joints), how often and with what imaging modality should we monitor JIA disease inflammation?	39
Q8 - When (time), where (which joints), how often and with what imaging modality should we monitor age-related structural abnormalities and damage in JIA?	57
Q9 - What is the role of imaging for the monitoring of systemic treatment (corticosteroids, synthetic and biological DMARDs) and the targeted delivery of local treatments such as intra-articular injections?	40
Q10- What is the relationship between individual imaging modalities and clinical remission in JIA?	16
Q11- What is the impact with respect to outcome of imaging-detected inflammation /damage in the patient in clinical remission?	5

S6. Scores for risk of bias and applicability of the included studies according to QUADAS-2

Point to consider			RoB				Applicability		
			Patient selection	Index test	Reference standard	Flow and timing	Patient selection	Index test	Reference standard
1	US and MRI are superior to clinical examination in the evaluation of joint inflammation; these techniques should be considered for more accurate detection of inflammation, both in diagnosis and assessing extent of joint involvement.	Low (%)	43	41.5	95.4	53.8	97	92.3	92.3
		High (%)	0	6.2	1.5	0	0	0	4.6
		Unclear (%)	56.9	52.3	3.1	46.2	3.1	7.7	3.1
2	When there is clinical diagnostic doubt, CR, US or MRI can be used to improve the certainty of a diagnosis of JIA above clinical features alone.	Low (%)	50	50	50	50	66.7	66.7	66.7
		High (%)	0	0	16.7	0	0	0	0
		Unclear (%)	50	50	33.3	50	33.3	33.3	33.3
3	If detection of structural abnormalities or damage is required, CR can be used. However MRI or US may be used to detect damage at an earlier time point than CR.	Low (%)	46.8	41.5	85.1	43.6	96.8	93.6	93.6
		High (%)	0	0	1.1	0	0	1.1	2.1
		Unclear (%)	53.2	56.4	13.8	56.4	3.2	5.3	4.3
4	In JIA imaging may be of particular benefit over routine clinical evaluation when assessing certain joints, particularly the use of MRI in detecting inflammation of the TMJ and axial involvement	Low (%)	36.8	39.5	89.5	26.3	89.5	89.5	94.7
		High (%)	0	2.6	2.6	0	0	0	0
		Unclear (%)	63.2	57.9	7.9	73.7	10.5	10.5	5.3
5	Imaging in JIA may be considered for use as a prognostic indicator. Damage on CR can be used for the prediction of further joint damage. Persistent inflammation on US or MRI may be predictive of subsequent joint damage.	Low (%)	46.2	46.2	76.9	61.5	92.3	100	100
		High (%)	0	7.7	0	0	0	0	0
		Unclear (%)	53.8	46.2	23.1	3.8	7.7	0	0
6	In JIA, US and MRI can be useful in monitoring disease activity given their sensitivity over clinical examination and good responsiveness. MRI should be considered for monitoring axial disease and TMJ.	Low (%)	43.6	33.3	89.7	69.2	100	89.7	84.6
		High (%)	0	12.8	0	0	0	0	7.7
		Unclear (%)	56.4	53.4	10.3	30.8	0	10.3	7.7
7	The periodic evaluation of joint damage should be considered. The imaging modality used may be joint dependent.	Low (%)	49.1	45.6	78.9	54.4	98.2	93.0	91.2
		High (%)	0	3.5	1.8	0	0	1.8	3.5
		Unclear (%)	50.9	50.9	19.3	45.6	1.8	5.3	5.3
8	US can be used for accurate placement of intra-articular injections.	Low (%)	47.6	19.0	23.9	85.7	85.7	90.5	90.5
		High (%)	0	14.3	14.3	0	0	0	0
		Unclear (%)	52.4	66.7	61.9	14.3	14.3	9.5	9.5
9	US and MRI can detect inflammation when clinically inactive disease is present; this may have implications for monitoring.	Low (%)	29.4	58.9	100	35.3	100	100	100
		High (%)	0	5.9	0	0	0	0	0
		Unclear (%)	70.6	35.3	0	64.7	0	0	0

S7. Reference list of included articles per point to consider

PTC 1. US and MRI are superior to clinical examination in the evaluation of joint inflammation; these techniques should be considered for more accurate detection of inflammation, both in diagnosis and assessing extent of joint involvement.

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PTC 4. In JIA imaging may be of particular benefit over routine clinical evaluation when assessing certain joints, particularly the use of MRI in detecting inflammation of the TMJ and axial involvement.

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PTC 5. Imaging in JIA may be considered for use as a prognostic indicator. Damage on CR can be used for the prediction of further joint damage. Persistent inflammation on US or MRI may be predictive of subsequent joint damage.

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PTC 7. The periodic evaluation of joint damage should be considered. The imaging modality used may be joint dependent.

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PTC 8. US can be used for accurate placement of intra-articular injections.

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PTC 9. US and MRI can detect inflammation when clinically inactive disease is present; this may have implications for monitoring.

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S8. Summary of the comments given at the Patient and Public Involvement (PPI) meeting

Specific comments on PTC:
None given. Read all and discussed but thought all sounded reasonable but clearly they were not for patients.
General comments:
POSITIONING: Anything with JIA is very awkward and painful due to the positions you have to hold and for the length required
INFORMATION GIVING: Really important to be talked to as an adult and as someone with understanding of their illness; don't just speak to mum; appropriateness of going to Children's Outpatient Department surrounding by 'kids'; 'I like being talked to about my illness'
Understanding how a machine works makes it less scary
Best if imaging and rheumatology in the same physical space
Delay for appointments and travelling to hospital and within hospital is a problem so try to co-locate
Technology not worrying i.e. radiation from CR
Need dedicated imaging area for paediatrics
One stop shop is best to reduce time wasted
Always good to be shown scans (always shown US, sometimes CR, almost never shown MRI)
Need scanning to show joint inflammation as when you have pain for a long time you get used to it and may not notice it anymore
Having contrast (injection and needle) can be frightening
Position for CR and MRI can be painful particularly if you have to maintain the same position for a long time
Climbing onto couch for MRI or CR can be difficult/painful, as the couch is often at adult height.
CR and MRI environment can look very sparse and clinical for children
CR specific comments:
At least this is quick
Parents can be frightened by the risk of CR radiation
MRI specific comments:
It can take a long time to have an MRI and it is uncomfortable
Need clear information in advance about how long it will take, how noisy it is and what it looks like
Perceived high value of MRI for some joints (TMJ)
Music with MRI helps but is often not loud enough; noise of MRI very scary
MRI is often in an environment used by adults and children and can look frightening
You can sometimes see the faces of the MRI staff looking 'puzzled' at the pictures - this is a worrying experience for children/young people, especially as the staff don't give any information at the time/after the MRI - you have to wait for your next clinic appointment which causes prolonged worry
Sometimes it's difficult to even get up and off on the MRI 'bed', you need a wheelchair and they often don't have the right equipment to help you get on and off the bed.
PARENTAL PERSPECTIVE: Would be beneficial to learn about the 'loudness' of the noise; it was a shock when first heard the loudness of the MRI; first MRI was a 'traumatic experience' but needed to 'be brave for XXX'; some prior warning of just how loud it was would be very useful - perhaps an audio clip of the sound and of the scanner
US specific comments:
Good because they can show you what's going on at the time of the scan; you get instant feedback and they can show you the image and inflammation on the screen; even if that joint feels fine; it's very visual and instant
US made guided injections less worrying, helped
US is easy to understand
Saw benefit of US as showed inflammation when it was not detected by clinical examination
US is real time so you can discuss as you go along, often a doctor you know is doing the scan

PTC, points to consider; CR, conventional radiography; US, ultrasound MRI, magnetic resonance imaging; TMJ, temporomandibular joint

S9. PTC 4: Summary of the included studies comparing imaging and CE in the detection of TMJ damage and inflammation (references in S7, PTC 4)

<table>
<tr><th colspan="8">TMJ damage:</th></tr>
<tr><th colspan="2">US TMJ vs. CE
3 studies [21, 24, 30]</th><th colspan="2">MRI TMJ vs. CE
10 studies [1, 6, 9, 11, 12, 13, 20, 21, 23, 30]</th><th colspan="2">CR TMJ vs. CE
11 studies [3, 13-15, 17, 19, 23, 26-28, 31]</th><th colspan="2">CT TMJ vs. CE
3 studies [8, 10, 25]</th></tr>
<tr><th></th><th>Detection rate, mean (range)
US vs. CE</th><th></th><th>Detection rate, mean (range)
MRI vs. CE</th><th></th><th>Detection rate, mean (range)
CR vs. CE</th><th></th><th>Detection rate, mean (range)
CT vs. CE</th></tr>
<tr><td rowspan="9">Bony changes vs. abnormal CE
(2 studies) [21, 30]</td><td rowspan="9">0.52-fold
(0.35-0.69-fold)</td><td>Bony changes vs. abnormal CE
(3 studies) [9, 21, 30]</td><td>1.26-fold
(0.41-1.69-fold)

Condylar damage in 81.6% asymptomatic jt</td><td>Bony changes vs. abnormal CE
(4 studies) [3, 14, 27, 31]</td><td>1.54-fold
(1.13-1.78-fold)</td><td rowspan="6">Bony changes vs. abnormal CE
(2 studies) [8, 25]</td><td rowspan="6">0.86-fold
(0.72-1.0-fold)

Increase in % pt with symptoms with increasing severity of CT changes</td></tr>
<tr><td rowspan="5">Abnormal translation vs. facial asymmetry
(1 study) [6]</td><td rowspan="5">1.20-fold

All pt with asymmetry/micrognathia had abnormal MRI translation</td><td>Bony vs. functional changes
(1 study) [19]</td><td>1.0-fold
No significant correlation</td></tr>
<tr><td>Bony changes vs. chin deviation
(2 studies) [26, 28]</td><td>1.71-fold
(1.58-1.83)

OR 4.9, p 0.002</td></tr>
<tr><td>Bony changes vs. pain on movement
(1 study) [28]</td><td>4.89-fold
OR 5.2, p 0.04</td></tr>
<tr><td>Bony changes vs. absence of translation
(1 study) [28]</td><td>2.0-fold
OR 4.9, p 0.002</td></tr>
<tr><td>Bony changes vs. crepitation
(1 study) [28]</td><td>5.5-fold
OR 10.1, p 0.011</td></tr>
<tr><td rowspan="3">Bony changes vs. reduced MIO
(2 studies) [11, 23]</td><td rowspan="3">5.63-fold
p 0.002</td><td>Bony changes vs. reduced MIO
(4 studies) [15, 19, 23, 27]</td><td>1.75-fold
(1.39-2.40)
r -0.46, p<0.001</td><td rowspan="3">Bony changes vs. facial asymmetry
(1 study) [10]</td><td rowspan="3">Correlation: 0.303
p<0.05</td></tr>
<tr><td>Bony changes vs. tenderness
(1 study) [15]</td><td>1.07-fold
No significant correlation</td></tr>
<tr><td rowspan="2">Erosions vs. abnormal CE
(1 study) [24]</td><td rowspan="2">Agreement: 81.9%
kappa: 0.57</td><td rowspan="2">Erosions vs. abnormal CE
(5 studies) [1, 12, 13, 20, 21, 30]</td><td rowspan="2">0.86-fold
(0.63-1.0-fold)

Erosions in 57.9% asymptomatic jt</td><td>Erosions vs. abnormal CE
(2 studies) [13, 17]</td><td>1.71-fold
(0.67-2.78-fold)</td></tr>
<tr><td>Clinical indicators of CR TMJ arthritis
(1 study) [26]</td><td>reduced MIO, mandibular asymmetry, mandibular deviation: positive discriminator when all 3 factors combined in 86%</td></tr>
</table>

TMJ inflammation:				
US TMJ vs. CE **3 studies [18, 21, 24]**		**MRI TMJ vs. CE** **8 studies [1, 2, 12, 13, 20, 21, 30, 32]**		
Synovitis/effusion (2 studies) [18, 21]	11.7-fold (0.35-23.0-fold)	**Synovitis** (6 studies) [12, 13, 20, 21, 30, 32]	2.46-fold (1.10-5.91-fold)	
		Synovitis vs. reduced MIO (4 studies) [1, 2, 20, 21]	Significantly correlated Reduced MIO best predictor of active MRI changes	
		Acute changes (1 study) [30]	71% asymptomatic 63% normal CE	

CE, clinical examination; CR, conventional radiography; MIO, maximal incisal opening; r, correlation coefficient

S10. Point to consider 8: Summary of included studies describing the role of imaging for guided IA steroid injections (references in S7, PTC 8)

Reference	No. of subjects	Duration of follow-up (months)	Intervention	Imaging modality	Outcome assessed	Outcome
Young 2012	198	Not specified	IA various joints	US-guided	Accuracy of needle placement	US allowed visualisation of point for injection for 1444 injections
Agarwal 2012	23	30	IA hip	US-guided	Clinical response	Clinical response in 71% after 1 injection Mean duration of response (range): 7 (4-15) months
Boehnke 1994	26	18	IA hip	US-guided	US remission	US remission in 32%
Neidel 2002	48	24	IA hip	US-guided	Clinical remission MRI remission	Clinical remission in 76.1% MRI remission in 76.1%
Tynjala 2004	13	12	IA hip	US	Clinical remission US remission	Clinical and US remission in 70% at 3 and 6 months, 50% at 12 months
Eich 1994	10	1	IA hip and knee	US MRI	US inflammation MRI inflammation	US: Hips – 100% improved; knees – no change MRI: Hips - 75% improved; knees - 63.6% improved
Laurell 2012	11	1	IA wrist	US-guided	Clinical response US response	Clinical response in 80%; US response in 91% US enabled precise location of inflamed compartment which could not be established clinically
Laurell 2011	30	1	IA ankle	US-guided	US inflammation	Improvement in 87% (resolution in 55%, regression in 32%) US enabled precise location of inflamed compartment which could not be established clinically
Savage 2012	20	3	IA ankle	US-guided	Clinical response US response	Clinical resolution in 81.6% US resolution in 92.1%
Parra 2010	83	None	IA TMJ	US-guided	Accuracy of needle placement by CT	Acceptable needle placement in 91% (75% required no adjustment, 16% minor adjustment) Unacceptable needle placement in 9% (i.e. required major readjustment)
Habibi 2012	39	2	IA TMJ	US-guided	Clinical response	Clinical response in 92.1%
Arabshahi 2005	14	6-12	IA TMJ	CT-guided	Clinical response MRI inflammation	Improvement in pain (77%), jaw locking (67%), MIO 43% Resolution of effusion in 48%

Cahill 2007	15	15	IA TMJ	CT-guided	Clinical response MRI inflammation	Clinical response in 58.3% MRI improvement in 73%, stable in 20%, worse in 6.7%
Lochbuler 2013	33	6-12	IA vs. extra-articular TMJ	MRI	MRI inflammation	MRI improvement in 56% with IA injection, 17% with extra-articular injection
Saurenmann 2009	33	3	IA vs. extra-articular TMJ	MRI	MRI accuracy of needle placement MRI inflammation	MRI confirmed injection accurately placed IA in 65% MRI improvement in 73% with IA injection, 15% with extra-articular injection
Stoll 2012	31	5.3	IA TMJ	MRI	MRI response	MRI improvement in 38.7% (resolution in 14.5%), deterioration in 24.2%, stable changes 12.9%, stable normal 24.2%
Fritz 2011	14	22	IA SIJ	MRI-guided	Clinical response MRI inflammation	100% of injections were accurately located Clinical response in 79% MRI improvement in 59%
Huppertz 1995	21	13	IA knee, ankle, elbow	MRI	Clinical response MRI inflammation	At 7 weeks: clinical resolution in 76.2%, MRI improvement in 100%, resolution in 52.4% At 13 months: clinical resolution in 50%, MRI improvement in 100%
Beukelman 2006	38	1.5	IA ankle	Fluoroscopy-guided	Clinical response	Clinical response in 89%
Cahill 2007	38	1.5	IA ankle	Fluoroscopy-guided	Clinical response	Clinical response in 89%
Sparling 1990	30	42	IA various joints	CR	Deterioration in damage	CR deterioration after IA steroid was unusual, but most common at the hip (deterioration in 33% by 2+ grades)

IA, intra-articular; MIO, maximal incisal opening

S11. Point to consider 9: Summary of included studies describing imaging findings in clinical remission

(references in S7, PTC 9)

Reference	No. of subjects	Clinical assessment of remission	Imaging modality	Site	Outcome	
Collado 2012	44	CRM CR	US synovitis (GS, PD)	44-joints	GS synovitis: 84.1% jt PD activity: 48.6% jt More in CRM than CR, p NS	
Erik Nielsen 2013	62	Clinically inactive joints	US synovitis	Multiple	Subclinical synovitis: 56.1% pt	
Halbwachs 2012	13	Clinically inactive joints	US synovitis	Multiple	Subclinical synovitis: 94.1% jt	
Magni-Manzoni 2013	39	ID	US inflammation	Multiple	Synovial hyperplasia: 76.9% pt Effusion: 66.7% pt PD activity: 15.4% pt Tenosynovitis: 15.4% pt	
Donati 2012	100	Wallace ID	US inflammation (SH, effusion, PD)	72-joints	US inflammation: 23% pt, 43/7200 (0.06%) jt All 3 US changes: 17/43 (32%) jt	
Silva 2013	35	CRM CR	US synovitis (SH, PD)	17-joints	Subclinical US: 37.8% jt	
Rebollo-Pollo 2011	28	Clinical remission	US synovitis (GS, PD)	Wrist	**Pt with prior jt disease (%)**	**Pt with no prior jt disease (%)**
					GS: 57.1	GS: 50.0
					PD: 21.4	PD: 0
				Ankle	GS: 40	GS: 12.5
					PD: 6.7	PD: 0
Bugni Miotto E Silva 2013	36	Clinical remission	US synovitis (GS, PD)	Multiple	GS synovitis: 41.7% pt (3.1% jt) PD activity: 19.4% pt Subclinical synovitis more common with older disease onset (p 0.007), and in extended oligoarticular or pJIA (p 0.013)	
Parsa 2011	35	ID, CRM, CR	US inflammation	Knee	Inflammation: 35% pt in ID, CRM or CR	
Molina 2011	11	Clinical remission	US synovitis	Knee	Synovitis: 36% pt	
Doria 2001	22	Clinical remission vs. active disease	US effusion	Knee	Effusion in remission: 20% jt Effusion in active disease: 77.8%	
Hemke 2013	146	Clinically inactive joints	MRI inflammation	Knee	Synovitis: 35.9% pt BM changes: 33.3% pt	
Van Veenendaal 2012	16	CRM CR	MRI synovitis	Knee	Synovitis: 50% pt	
Van Veenendaal 2011	30	CRM CR	MRI synovitis	Knee	Synovitis, CRM: 30% pt Synovitis, CR: 25% pt	
Brown 2012	11	CRM CR	MRI inflammation	Hand/ wrist	Any MRI inflammation: 63% pt Synovitis: 45.5% pt BM oedema: 27.3% pt Tenosynovitis: 54.5%	
Zwir 2010	93	Active disease vs. CRM and CR	MRI synovitis	TMJ	Synovitis, active disease: 80% pt Synovitis, CRM: 70% pt Synovitis, CR: 65.6%	

CRM, clinical remission on medication; CR, clinical remission off medication; GS, grey scale; PD, power Doppler; NS, not significant; ID, inactive disease; SH, synovial hypertrophy; BM, bone marrow