Laboratory and Imaging Studies Used by French Rheumatologists to Evaluate Patients with Early Arthritis

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ABSTRACT. ***Objective.*** To conduct a practice survey of laboratory and imaging studies used by French rheumatologists to identify the cause of recent-onset arthritis.

Methods. We selected a random sample of 210 rheumatologists, who were asked to recruit all patients with recent-onset arthritis (at least one joint involved, for less than one year) during a 2 week period, and to record laboratory and imaging studies performed. Results were analyzed in the overall group, in diagnostic subgroups, and in clinical presentation subgroups.

Results. The 119 rheumatologists who participated recruited 104 patients. Investigations done in ≥ 75% of patients were blood cell counts; erythrocyte sedimentation rate; serum assays of C-reactive protein, rheumatoid factors, antinuclear antibodies; and hand radiographs. Investigations in 50% to 74% of patients were serum ASAT/ALAT, creatinine, and uric acid; and foot radiographs. Finally, 25% to 49% of patients were tested for proteinuria; antikeratin antibodies; hepatitis B, hepatitis C, and Lyme serologies; creatine phosphokinase; blood iron; HLA-B27; and radiographs of chest and pelvis. No differences were found between investigations in patients with suspected rheumatoid arthritis and/or undifferentiated arthritis and those in other patients. In contrast, suspected diagnoses and presence of extraarticular manifestations classically associated with specific diseases modified the selection of investigations.

Conclusion. Although considerable variability occurred, our study suggests that a limited panel of laboratory and imaging studies is performed in at least 25% of patients with recent-onset arthritis, regardless of clues suggesting a specific diagnosis. (First Release April 1 2006; J Rheumatol 2006;33:897–902)

Key Indexing Terms:
POLYARTHRITIS DIAGNOSTIC INVESTIGATIONS FRENCH RHEUMATOLOGISTS

The cause of recent-onset polyarthritis is difficult to identify, and there is no consensus regarding the laboratory tests and imaging studies that should be performed. A recent literature review by a French task force (Club Rheumatism and Inflammation) found fewer than 30 studies on the diagnostic value of laboratory and imaging studies in cohorts of patients with early arthritis[1]; most of these studies evaluated rheumatoid factors (RF), anticitrulline antibodies[2-5], HLA antigens[6,7], and hand and foot radiographs[8-19].

We previously used a fictional case scenario to determine which tests French rheumatologists recommend for diagnosing early polyarthritis[20]. We found wide variations across rheumatologists regarding the laboratory and imaging studies that are useful for identifying the cause of recent-onset polyarthritis. Nevertheless, at least 25% of the rheumatologists used a limited panel of laboratory and imaging studies [radiographs of the hands, feet, and knees; blood cell counts; antinuclear antibodies (ANA), RF, and antikeratin antibody (AKA); C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR); creatinine; ASAT and ALAT; proteinuria; and joint aspiration]; further, the presence of clues pointing to RA had little effect on the selection of laboratory and imaging studies. However, the influence of extraarticular manifestations or of suspected diagnoses was not evaluated in this study of opinions.

The objectives of our present investigation were to determine which laboratory and imaging studies are performed by French rheumatologists in their everyday practice for identifying the cause of early arthritis, and to evaluate the effect of the clinical presentation on the selection of laboratory and imaging studies.

MATERIALS AND METHODS

Respondent selection. We selected a random sample of rheumatologists from the list of members of the French Society for Rheumatology. Each rheumatologist in the sample was mailed an invitation to participate in the study and a questionnaire. Nonrespondents were contacted by telephone and/or were sent a second letter.

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Questionnaire. Each participating rheumatologist was asked to use the questionnaire to list all patients with recent-onset arthritis seen over a 2-week period. Recent-onset arthritis was defined as synovitis in one or more joints with onset within the last year. All musculoskeletal and other manifestations were to be listed, as well as all laboratory and imaging studies obtained previously or ordered during the study visit. Finally, rheumatologists were asked to list suspected diagnoses in decreasing order of likelihood, then to indicate their confidence in the first-ranked diagnosis on an analog scale from 0 to 10.

Statistical analysis. Laboratory and imaging studies were evaluated in the overall group of patients, in subsets defined by the first-ranked suspected diagnosis, and in subsets defined by the first- to third-ranked suspected diagnoses. To simplify the reporting of results, we divided the investigations into 4 groups based on whether they were obtained in 0%–24%, 25%–49%, 50%–74%, or 75%-100% of patients.

We also studied investigations according to the presence of at least one of the most common extraarticular manifestations identified by a panel of experts as associated with spondyloarthropathies (SpA; i.e., conjunctivitis, uveitis, psoriasis, diarrhea, enthesitis, sacroiliitis, inflammatory spinal pain), RA (family history of RA, nodules, cutaneous vasculitis, pericarditis, pleuritis), Sjögren's syndrome (SS; i.e., sicca symptoms), or systemic lupus erythematosus (SLE; i.e., photosensitivity, cutaneous lupus, alopecia, oral erosions, neurological involvement, pericarditis, and pleuritis).

We did not specifically study the influence of the clinical pattern of joint involvement on the prescription, but the diagnoses of RA and SpA are clearly associated with symmetrical arthritis and asymmetrical oligoarthritis, respectively.

Data were analyzed using the Statistical Package for the Social Sciences (SPSS 9.0, 1999). Comparisons of investigations were by chi-square test and Fisher's exact test.

Sample size calculation. Sample size calculations showed that 100 patients would have to be included to obtain at least 10% precision in determining investigation use rates, with the alpha risk set at 5% and good feasibility. Assuming a participation rate of about 50% among rheumatologists contacted for the study, and given that each rheumatologist was expected to recruit at least one patient, 210 rheumatologists were required for the study. This represented 10% of all rheumatologists practicing in France.

RESULTS

Of the 210 rheumatologists who were invited to participate, 22 were ineligible because they had never practiced (n = 19) or had stopped practicing (n = 3). In addition, 17 rheumatologists never saw patients with inflammatory joint disease, 6 declined to participate, and 46 accepted but failed to return the questionnaire. This left 119 participants, among whom 78 recruited 104 patients (no patients, n = 41; 1 patient, n = 50; 2–3 patients, n = 40; ≥ 4 patients, n = 14).

Description of cases. Of the 104 patients, 72 were women. Mean age was 51.6 ± 18 years (range 16–83 yrs) and mean disease duration was 5.95 ± 3.2 months. Mean number of joints with arthritis was 6.7 ± 2.9 (hands 85/104, 82%; feet 42/104, 40%; and knees 40/104, 38%). Table 1 lists the extraarticular signs reported by the rheumatologists. The first suspected diagnosis was RA in 50/104 patients (48%), following by undifferentiated arthritis (14%); other diagnoses ranked first in only 1% to 12.5% of patients (Tables 2A, 2B). After exclusion of undifferentiated arthritis, confidence in the first suspected diagnosis on the 0 to 10 scale was 7.4 ± 1.7 (range 4–10). Table 2B shows all suspected diagnoses ranked first, second, and third after exclusion of undifferentiated arthritis. RA, SpA, SLE, and SS were the most frequently suspected diagnoses. Given the low prevalence of the other arthritides and the absence of investigations specific for polymyalgia rheumatica, we investigated the overall patient population and the RA, SpA, SLE, and SS subgroups.

Table 1. Extraarticular signs reported by rheumatologists.

	N (%)
Patients	
Age	55 (53)
Sex	54 (52)
Obesity	5 (5)
Treatment	2 (2)
Family history	
RA	6 (6)
Psoriasis	2 (2)
SLE	1 (1)
General health	
Anorexia and/or fever	13 (12)
Cutaneous	
Psoriasis	8 (8)
Raynaud's phenomenon	8 (8)
Photosensitivity	2 (2)
Lofgren's disease	2 (2)
Edema	2 (2)
Nodule	1 (1)
Alopecia	1 (1)
Mucous membranes	
Sicca syndrome	7 (7)
Conjuctivitis	4 (4)
Aphthous ulcers	3 (3)
Others	
Hepatitis	5 (5)
Muscle pain	4 (4)
Lymphadenopathy	3 (3)
Diarrhea	2 (2)
Neuropathy	1 (1)

Investigations in the overall group (Table 3). Investigations performed in ≥ 75% of patients were blood cell counts; ESR, serum CRP, RF, and ANA; and hand radiographs (in 97%, 98%, 89%, 92%, 82%, and 83% of patients, respectively). In 50% to 74% of patients, the following tests were ordered: ASAT/ALAT, serum creatinine, serum uric acid, and foot radiographs (66%, 66%, 53%, and 58% of patients, respectively). In 25% to 49% of patients, rheumatologists obtained results for proteinuria, antikeratin antibody (AKA), hepatitis and Lyme disease serology, creatine phosphokinase, blood iron, HLA-B270, and radiographs of the chest and pelvis (41%, 31%, 25%, 25%, 31%, 30%, 34%, 45% and 44%, respectively). Synovial fluid was examined in 17 patients overall, and in 14 (14/40, 30%) of the 40 (40/104, 38%) with past or present knee arthritis.

We did not observe any influence of the number of early arthritis patients seen (1 versus > 1) on the tests that were ordered (data not shown).

Investigations in diagnostic subgroups. Table 3 shows tests

Table 2. Diagnoses suspected by French rheumatologists in patients with early arthritis.
Table 2A. Diagnosis considered the most likely.

	N (%)
RA	50 (48)
Undifferentiated	15 (14)
SpA and/or PsA	13 (12)
Polymyalgia rheumatica	9 (9)
Sicca syndrome	5 (5)
SLE	5 (5)
Chondrocalcinosis	2 (2)
Gout	2 (2)
Hemochromatosis	1 (1)
Sacroidosis	1 (1)
Still disease	1 (1)

Table 2B. Diagnosis considered the first, second, or third most likely diagnosis (suspected undifferentiated arthritis was excluded).

	N (%)
RA	75 (72)
SpA and/or PsA	23 (22)
Polymyalgia rheumatica	13 (12)
SLE	13 (12)
Sicca syndrome	11 (11)
Chondrocalcinosis	9 (9)
Sarcoidosis	7 (7)
Gout	3 (3)
RS_3PE	2 (2)
Polymyositis	1 (1)
Hepatitis and/or viral disease	1 (1)

RA: rheumatoid arthritis; SLE: systemic lupus erythematosus; RS_3PE: remitting seronegative symmetrical synovitis with pitting edema; SpA: spondyloarthropathy; PsA: psoriatic arthritis.

performed in the subgroups defined by the first-ranked suspected diagnosis, and Table 4 shows those performed in subgroups defined by all suspected diagnoses (tests associated with suspected diagnoses were reported only if $p < 0.05$). Except for ANA, tests performed in patients with a first-ranked suspected diagnosis of RA or undifferentiated arthritis were not statistically different from those performed in patients with other first-ranked suspected diagnoses. Thus, the diagnosis believed by the rheumatologist to be the most likely one apparently had little influence on the selection of investigations. In contrast, suspected diagnoses (regardless of ranking) influenced decisions to order the following tests: HLA-B27 and pelvic radiographs for SpA; lip salivary gland biopsy for SS; and complement, antiphospholipid antibody, and cryoglobulinemia for SLE. Ophthalmologic examination was not statistically associated with suspected SS (4/11 versus 12/93; $p = 0.06$), but some rheumatologists may have performed a Schirmer test themselves. As the other causes of arthritis were suspected in fewer than 10 patients, we did not study the investigations ordered for their diagnosis.

Investigations in subsets defined by extraarticular manifestations. The extraarticular manifestations selected previously by a panel of experts as associated with the most common inflammatory joint diseases influenced the suspected diagnoses (regardless of rank). Extraarticular manifestations suggesting RA were present in 4 of the 29 patients without suspected RA, and in 26 of the 75 patients with suspected RA ($p = 0.03$). Similarly, extraarticular manifestations consistent with SpA were present in 6 of the 81 patients without suspected SpA and in 12 of 23 patients with suspected SpA ($p = 0.0001$). Extraarticular manifestations associated with connective tissue disease were observed in 12 of the 80 patients without and in 15 of the 28 patients with suspected connective tissue disease ($p = 0.0001$).

Investigations were associated with the presence of at least one of the extraarticular manifestations previously selected by a group of experts as useful for diagnosing the most common inflammatory joint diseases. Thus, AKA and radiographs of the hands and feet were more frequently obtained in patients with at least one extraarticular manifestation consistent with RA (17/30 vs 16/74, $p = 0.001$; 29/30 vs 59/74, $p = 0.01$; and 25/30 vs 37/74, $p = 0.001$, respectively). Similarly, HLA-B27 and radiographs of the pelvis were more often obtained in patients with extraarticular manifestations suggesting SpA (13/18 vs 31/86 $p = 0.005$; 13/18 vs 30/86, $p = 0.002$, respectively). Obtaining a lip salivary gland biopsy was associated with presence of extraarticular manifestations suggesting SS (6/11 vs 1/93, $p = 0.001$), whereas complement, activated partial thromboplastin time (APTT), and cryoglobulinemia were associated with extraarticular manifestations suggesting SLE (6/11 vs 14/93, $p = 0.002$; 6/11 vs 22/93, $p = 0.025$; 5/11 vs 10/93, $p = 0.002$). Finally, all tests recommended for specific diagnoses were also associated with presence of extraarticular manifestations suggesting the most common inflammatory joint diseases, except the antiphospholipid antibody assay, which was associated with a suspicion of SLE but not with clinical signs of SLE (2/11 vs 5/93, $p > 0.05$); APTT assay was associated with clinical signs of SLE.

DISCUSSION

Our goal was to determine which laboratory and imaging studies available to all rheumatologists and reimbursed by insurance are performed by French rheumatologists in their everyday practice to evaluate patients with early arthritis. Given the high prevalence of RA among patients with early arthritis, most laboratory tests are aimed at diagnosing RA, most notably in patients with no suggestive clinical signs (undifferentiated arthritis or isolated early arthritis). Therefore, we examined the investigations ordered in our overall group of patients with early arthritis, as well as in subsets defined by the suspected diagnosis or by the clinical presentation.

Extraarticular manifestations associated with specific diagnoses (e.g., photosensitivity in SLE) were uncommon in our population. Therefore, many diagnoses were suspected on the

Table 3. Diagnostic laboratory and imaging tests performed in patients with early arthritis.

	Early Arthritis (Overall Group, n = 104) N (%)	First Suspected Diagnosis RA or Undifferentiated Arthritis (n = 65) N (%)
Radiographs		
Hands	86 (83)	58 (89)
Chest	47 (45)	29 (45)
Knees	25 (24)	16 (25)
Feet	60 (58)	43 (66)
Pelvis	46 (44)	27 (44)
Other imaging studies		
Radionuclide bone scanning	2 (2)	1 (2)
MRI hand-wrist	1 (1)	1 (2)
Echocardiography	1 (1)	0 (0)
Joint ultrasonography	0	1 (2)
HLA		
B27	35 (34)	21 (32)
A, B, DR	14 (13)	8 (12)
Routine tests		
ESR	102 (98)	64 (98)
CRP	92 (88)	60 (92)
Blood cell counts	101 (97)	64 (98)
ASAT/ALAT	69 (66)	46 (71)
Proteinuria	43 (41)	26 (40)
Creatinine	69 (66)	43 (66)
Serum uric acid	55 (53)	34 (52)
Ferritin	16 (15)	10 (15)
Iron	31 (30)	16 (25)
Fibrin	27 (26)	14 (21)
Creatine phosphokinase	32 (31)	22 (34)
APTT	28 (27)	15 (23)
Aldolase	19 (8)	12 (19)
Lactate dehydrogenase	23 (22)	13 (30)
Microbiological studies		
Genital tract	6 (6)	3 (5)
Stool	4 (4)	3 (5)
Blood	7 (7)	6 (9)
Serology		
Hepatitis C	26 (25)	16 (25)
Hepatitis B	25 (24)	16 (25)
Lyme	26 (25)	14 (21)
HIV	16 (15)	8 (12)
Parvovirus B19	11 (11)	8 (12)
Chlamydiae	15 (14)	9 (14)
Antistreptolysin O	7 (7)	4 (6)
Mycoplasma	5 (5)	4 (6)
Salmonella	2 (2)	1 (1)
Immunology		
ANA	85 (82)	59 (91)*
RF	95 (92)	63 (97)
AKA	32 (31)	23 (35)
Antiperinuclear factor	13 (12)	10 (15)
Complement	20 (19)	13 (20)
aPL	7 (7)	4 (6)
Cryoglobulinemia	15 (14)	8 (12)
ANCA	12 (11)	7 (11)
Anti-mitochondria	6 (6)	4 (6)
Joint aspiration (synovial fluid analysis)		
Overall	17 (16)	12 (19)
Knee arthritis (n = 40)	14/40 (35)	11/29 (38)
Biopsy		
Salivary gland	12 (11)	7 (6)
Synovial membrane	1 (1)	1 (2)
Ophthalmologic examination	7 (7)	5 (7)

MRI: magnetic resonance imaging; APTT: activated partial thromboplastin time; ASAT/ALAT: aspartate aminotransferase/alanine aminotransferase; HIV: human immunodeficiency virus; ANCA: antineutrophil cytoplasmic antibodies; ANA: antinuclear antibodies; RF: rheumatoid factor; AKA: antikeratin antibodies; aPL: antiphospholipid antibodies; * $p < 0.05$ RA or undifferentiated arthritis as the first suspected diagnosis versus other patients.

Table 4. Diagnostic laboratory and imaging studies performed in patients with early arthritis according to suspected diagnoses (only tests with $p < 0.05$ are reported).

Table 4A. Tests performed in patients with early arthritis according to whether RA was suspected.

	RA Suspected (%)		
	Yes	No	p
AKA	28/75 (37)	4/29 (14)	0.02
Hand radiographs	66/75 (88)	20/29 (69)	0.02
Foot radiographs	48/75 (64)	12/29 (41)	0.04

Table 4B. Tests performed in patients with early arthritis according to whether spondyloarthropathy (SpA) was suspected.

	SpA Suspected (%)		
	Yes	No	p
HLA-B27	19/23 (83)	24/81 (30)	< 0.001
Pelvic radiographs	20/23 (87)	26/81 (32)	< 0.001

Table 4C. Tests performed in patients with early arthritis according to whether Sjögren's syndrome (SS) was suspected.

	SS Suspected (%)		
	Yes	No	p
LSGB	5/11 (45)	7/93 (8)	0.003

Table 4D. Tests performed in patients with early arthritis according to whether SLE was suspected.

	SLE Suspected (%)		
	Yes	No	p
Complement	5/12 (42)	15/92 (16)	0.05
aPL	5/12 (42)	2/92 (2)	< 0.001
Cryoglobulinemia	4/12 (33)	11/92 (12)	0.05

AKA: antikeratin antibody; LSGB: lip salivary gland biopsy; aPL: antiphospholipid antibody.

basis of nonspecific symptoms. RA and undifferentiated arthritis were the most common first-ranking suspected diagnoses, although many other conditions (e.g., polymyalgia rheumatica, SLE, or SS) were ranked first to third among suspected diagnoses.

Investigations in patients with a first-ranked suspected diagnosis of RA or undifferentiated arthritis were not statistically different from those in patients with other first-ranked suspected diagnoses. Thus, the diagnosis that seemed most likely to the rheumatologist had little influence on the selection of investigations. In contrast, associations were found between specific suspected diagnoses and specific tests: suspected SpA was associated with HLA-B27 determination and pelvic radiographs; suspected SS with lip salivary gland biopsy; and suspected connective tissue disease with antinuclear factor, antiphospholipid antibody, and cryoglobulinemia. The diagnostic values of these tests have not been validated in cohorts of patients presenting with early polyarthritis, but numerous studies suggest that they may be useful for confirming suspected diagnoses[21,22].

Table 5. Investigations suggested in a previous opinion study[20] and performed in the present study.

Patients with the Investigation, %	Previous Study[20]	Current Study
≥ 75%	RF, ANA, hand radiographs	BCC, ESR, CRP, RF, ANA, hand radiographs
50–74%	BCC, ESR, CRP, ASAT/ALAT, radiographs (feet, knees, chest)	ASAT/ALAT, creatinine, uric acid, foot radiographs
25–49%	Creatinine, proteinuria, HLA-B27, AKA, joint aspiration, pelvic radiographs	AKA, hepatitis serology, Lyme serology, CPK, iron, proteinuria, HLA-B27, chest radiographs, joint aspiration

RF: rheumatoid factor; ANA: antinuclear antibodies; BCC: blood cell counts; ESR: erythrocyte sedimentation rate; CRP: C-reactive protein; ASAT: aspartate aminotransferase; ALAT: alanine aminotransferase; AKA: antikeratin antibodies; CPK: creatine phosphokinase.

Tests previously validated as useful in diagnosing RA include RF, radiographs, and citrulline-containing peptides (called anti-citrulline antibodies, antiperinuclear factors, or AKA, according to the methods used to detect them; anti-citrulline antibody assays were not routinely available in France at the time of the study). Nevertheless, these tests were often ordered in the absence of a suspicion of RA, suggesting that they may be performed routinely by rheumatologists evaluating patients with early arthritis.

Very few studies have evaluated laboratory tests aimed at identifying joint diseases other than RA, such as infection, metabolic disorders, or systemic diseases. We found that some tests were associated with suspected RA, SpA, SS, or SLE, whereas other tests were ordered regardless of the clinical presentation or suspected diagnoses. The number of cases per rheumatologist was too small to look for variations across rheumatologists regarding tests ordered for a given suspected diagnosis. Such variations were found in our previous study done with a fictional case scenario[20].

We found wide variations in investigations ordered to evaluate patients with early arthritis, but our results indicate that a limited panel of laboratory and imaging studies (radiographs of hands, feet, and chest; blood cell counts; CRP, ESR, fibrin, creatinine, ASAT and ALAT; proteinuria; blood iron; CPK; hepatitis C and Lyme serologies; APTT; ANA, RF, and AKA or anti-CCP antibody; and HLA-B27) were performed by at least 25% of respondents, regardless of whether clues pointing to a specific diagnosis were present. These results are consistent with the findings from our study of opin-

ions[20] (Table 5). We also found that both the suspected diagnoses and the presence of extraarticular manifestations influenced the selection of laboratory and imaging studies. Thus, our findings suggest that some investigations may deserve to be performed routinely in patients with early arthritis, whereas others may need to be selected based on manifestations associated with specific diseases.

REFERENCES

1. Saraux A, Combe B, de Bandt M. Orientation diagnostique devant un rhumatisme inflammatoire débutant. Rev Rhum 2002;69:124-5.
2. Schellekens GA, Visser H, De Jong BAW, et al. The diagnostic properties of rheumatoid arthritis antibodies recognizing a cyclic citrullinated peptide. Arthritis Rheum 2000;43:155-63.
3. Visser H, le Cessie S, Vos K, Breedveld FC, Hazes JM. How to diagnose rheumatoid arthritis early: a prediction model for persistent (erosive) arthritis. Arthritis Rheum 2002;46:357-65.
4. Goldbach-Mansky R, Lee J, McCoy A, et al. Rheumatoid arthritis associated autoantibodies in patients with synovitis of recent onset. Arthritis Res 2000;2:236-43.
5. Saraux A, Berthelot JM, Chales G, et al. Value of laboratory tests in early prediction of rheumatoid arthritis. Arthritis Rheum 2002;47:155-65.
6. Zeidler H, Mau R, Mau W, Freyschmidt J, Majewski A, Deicher H. Evaluation of early diagnostic criteria including HLA-B27 for ankylosing spondylitis in a follow-up study. Z Rheumatol 1985;44:249-53.
7. El-Gabalawy HS, Goldbach-Mansky R, Smith D, et al. Association of HLA alleles and clinical features in patients with synovitis of recent onset. Arthritis Rheum 1999;42:1696-705.
8. Grote R, Rapp U, Rosenthal H, et al. Arthritic changes in small and large joints in digital and conventional x-ray images. Rofo 1992;156:277-81.
9. Okubo S, Lehtinen K, Isomaki H. Sensitivity of radiographic changes of hand and foot joints as a diagnostic criterion in patients with rheumatoid arthritis. Scand J Rheumatol 1992;21:145-7.
10. Mottonen T, Hannonen P, Jokinen I, Arvilommi M, Oka M. Relation between bone erosions and rheumatoid factor IgA and IgM isotypes in recent onset rheumatoid arthritis. Scand J Rheumatol Suppl 1988;75:244-9.
11. Moreland LW, Daniel WW, Alarcon GS. The value of the Norgaard view in the evaluation of erosive arthritis. J Rheumatol 1990;17:614-7.
12. van der Heijde DM, van Leeuwen MA, van Riel PL, et al. Biannual radiographic assessments of hands and feet in a three-year prospective followup of patients with early rheumatoid arthritis. Arthritis Rheum 1992;35:26-34.
13. Fex E, Jonsson K, Johnson U, Eberhardt K. Development of radiographic damage during the first 5-6 yr of rheumatoid arthritis. A prospective follow-up study of a Swedish cohort. Br J Rheumatol 1996;35:1106-15.
14. Limido G, Sessa V, Superchi A, et al. Radiographic diagnosis in the early recognition and evaluation of incapacity sequelae of advanced rheumatoid arthritis. Minerva Med 1985;76:119-24.
15. Paimela L, Laasonen L, Helve T, Leirisalo-Repo M. Comparison of the original and the modified Larsen methods and the Sharp method in scoring radiographic progression in early rheumatoid arthritis. J Rheumatol 1998;25:1063-6.
16. Kuper HH, van Leeuwen MA, van Riel PL, et al. Radiographic damage in large joints in early rheumatoid arthritis: relationship with radiographic damage in hands and feet, disease activity, and physical disability. Br J Rheumatol 1997;36:855-60.
17. van der Jagt EJ, Hofman S, Kraft BM, van Leeuwen MA. Can we see enough? A comparative study of film-screen vs digital radiographs in small lesions in rheumatoid arthritis. Eur Radiol 2000;10:304-7.
18. Devauchelle V, Saraux A, Berthelot JM, et al. Ability of the hand radiographs for predicting a further diagnosis of rheumatoid arthritis in patients with early arthritis. J Rheumatol 2002;28:2603-7.
19. Devauchelle-Pensec V, Saraux A, Berthelot JM, et al. Ability of foot radiographs to predict rheumatoid arthritis in patients with early arthritis. J Rheumatol 2004;31:66-70.
20. Saraux A, Maillefert JF, Fautrel B, et al. Laboratory and imaging studies used by French rheumatologists to determine the cause of recent-onset polyarthritis without extra-articular manifestation. Ann Rheum Dis 2002;61:626-9.
21. Manoussakis MN, Gharavi AE, Drosos AA, Kitridou RC, Moutsopoulos HM. Anticardiolipin antibodies in unselected autoimmune rheumatic disease patients. Clin Immunol Immunopathol 1987;44:297-307.
22. Lee M, Rutka JA, Slomovic AR, McComb J, Bailey DJ, Bookman AA. Establishing guidelines for the role of minor salivary gland biopsy in clinical practice for Sjogren's syndrome. J Rheumatol 1998;25:247-53.