Power Doppler sonography: synovial tissue assessment in RA

We read with interest the paper by Carotti et al that appeared in the October issue of the *Annals of the Rheumatic Diseases.*1 The authors investigated the usefulness of contrast enhanced power Doppler ultrasonography (PDS) in determining the vascularisation rate of the synovial pannus of patients with rheumatoid arthritis (RA). After intravenous infusion of an echo contrast (Levovist, Schering, Germany) PDS was performed on the knee joints of 42 patients with RA, who had previously been classified as having active (n=15), moderately active (n=14), and inactive knee synovitis (n=13). The results were expressed as the area underlying time-intensity curves. Highest vascularisation scores were found in patients with active synovitis (216.2 (33.4), mean (SD)), whereas lower values were found in those with moderately active (186.8 (25.8)) and inactive synovitis (169.6 (20.6)). Significant difference (p<0.01) was found between the active and the inactive group only. Also, significant correlations were found between the vascularisation scores and some indices of the disease activity. The authors concluded that PDS may be a valuable method of distinguishing between inflammatory and non-inflammatory pannus of knee joints in RA and thus may have a clinical potential for both diagnostic and therapeutic purposes.

Unfortunately, Carotti et al did not provide any data on the sensitivity and specificity of the method used. Moreover, no figure showing distribution of the vascularisation scores in individual patients and/or confidence limits of the mean was available. This is a major problem and, in our opinion, the data presentation does not allow for any conclusions about how the PDS really performs in clinical settings. It should be emphasised that statistically significant (p<0.01) difference as the area underlying time-intensity curve, the sensitivity is 80.0% (95% CI 0.675 to 0.960). According to Swets et al, areas from 0.50 to about 0.70 represent poor accuracy, those from 0.70 to 0.90 as “useful for some purposes”, and higher values represent high accuracy. From the ROC curve fig 1 we computed the optimal cut point for the area under the time-intensity curve, the sensitivity is 80.0% and specificity is 84.6%. These findings have implications for both clinical practice and research purposes in assessment of disease activity in patients with RA. With regard to the sensitivity and specificity of the PDS technique, as far as we know no data have been reported. Our study has all the features of a preliminary investigation and, obviously, cannot answer all the questions on the topic. However, the receiver operating characteristic (ROC) curve was employed to describe how well various values of the area under the enhancement curves of the PDS can detect patients with RA with high low synovitis activity (fig 1). This analysis involves plotting the true positive rate (sensitivity) against the false positive rate (1–specificity) for possible cut off scores. Sensitivity and specificity (which constitute the discriminating ability of a test) were used in agreement with the current definitions of these terms. Moreover, we calculated 95% confidence intervals (CI) of sensitivity and specificity. Each point on the ROC plot represents a sensitivity/specificity pair corresponding to a particular decision threshold. The area under the ROC curve is used to evaluate the screening scale’s performance. For PDS, the mean (SEM) area under the curve is 0.859 (0.072); 95% CI 0.675 to 0.960. According to Swets et al, areas from 0.50 to about 0.70 represent poor accuracy, those from 0.70 to 0.90 are “useful for some purposes”, and higher values represent high accuracy. From the ROC curve fig 1 we computed the optimal cut point for the area under the time-intensity curve, the sensitivity is 80.0% and specificity is 84.6%. These findings have implications for both clinical practice and research purposes in assessment of disease activity in patients with RA.

Figure 1 shows the distribution of PDS scores in individual patients with active and inactive synovitis and the confidence limits of the mean. The mean (SD) values of the areas under the curves showed a significant difference (p<0.01) between the patients with active synovitis (216.2 (33.4); 95% CI 193.1 to 241.3) and patients with inactive synovitis (96.3 (20.6); 95% CI 78.6 to 114.0).

**Authors’ reply**

We thank Drs Hrycaj and Lacki very much for their comments because they give us the opportunity to illustrate further details of our study. Recent papers have shown a very close relationship between the results of power Doppler sonography (PDS) and those of dynamic gadolinium (Gd) enhanced magnetic resonance imaging (MRI) in RA, a sensitivity of 88.8% and a specificity of 97.9%,3 and between PDS findings and histopathological findings4 of synovial membrane vascularity. It has also been shown that contrast enhanced PDS significantly improves the detection of intra-articular vascularity, compared with the unenhanced technique.4 Contrast enhanced PDS demonstrated significant difference in intra-articular colour flow signals between joints of patients with inactive RA and those with active RA, between joints of patients with inactive RA and those with moderately active RA, and between joints of patients with moderately active RA and those with active RA.5

Figure 1. The ROC curve illustrating the relation between sensitivity and complement of specificity (100–specificity) in rheumatoid patients for the PDS, with the index of synovitis activity as the external criterion (inactive synovitis v active synovitis). The triangle on the curve shows the optimal cut off point, corresponding to the highest sensitivity/specificity combination.

---

**Reference**


*Correspondence to: Dr P Hrycaj; phrycaj@icpnet.pl*

---


---

**Authors’ reply**

We thank Drs Hrycaj and Lacki very much for their comments because they give us the opportunity to illustrate further details of our study. Recent papers have shown a very close relationship between the results of power Doppler sonography (PDS) and those of dynamic gadolinium (Gd) enhanced magnetic resonance imaging (MRI) in RA, a sensitivity of 88.8% and a specificity of 97.9%,3 and between PDS findings and histopathological findings4 of synovial membrane vascularity. It has also been shown that contrast enhanced PDS significantly improves the detection of intra-articular vascularity, compared with the unenhanced technique.4 Contrast enhanced PDS demonstrated significant difference in intra-articular colour flow signals between joints of patients with inactive RA and those with active RA, between joints of patients with inactive RA and those with moderately active RA, and between joints of patients with moderately active RA and those with active RA.5

Figure 1. The ROC curve illustrating the relation between sensitivity and complement of specificity (100–specificity) in rheumatoid patients for the PDS, with the index of synovitis activity as the external criterion (inactive synovitis v active synovitis). The triangle on the curve shows the optimal cut off point, corresponding to the highest sensitivity/specificity combination.
of orbital fibroblasts, mediated by type 2 helper T cells and thyroid stimulating antibodies. Moreover, it is well established that ophthalmopathy may precede hyperthyroidism or occur after its resolution (particularly in smokers after treatment with radioactive iodine). GD can be found in association with other autoimmune disorders such as type 1 diabetes mellitus, Addison’s disease, vitiligo, pernicious anaemia, alopecia areata, rheumatoid arthritis, coeliac disease, systemic lupus erythematosus, Sjögren’s syndrome, and other HLA-DR3 associated diseases.

The association with rheumatoid arthritis is rarer, but recognised, even in multiple autoimmune syndromes. So where there is a concomitance with orbital involvement the absence of clinical hyperthyroidism should not rule out the diagnosis of GD.

Finally, the diagnosis of thyroid ophthalmopathy was unlikely because only one eye was affected. As suggested by the authors, magnetic resonance imaging is indicated to establish the correct diagnosis. This would show oedematous extraocular muscles with enlargement of the tendons in OM, and normal tendons in GD. Early response to systemic glucocorticoids confirms the diagnosis of OM.

Another disease that should be considered in the differential diagnosis is arteriovenous malformation, such as indirect carotid-cavernous fistula, which can develop spontaneously in older women. In this case the presence of a diffuse head murmur would be an important observation.

G P Fadini
University of Padua, Italy

Correspondence to: Dr G P Fadini, v. Turazza 48/A, 35100 Padova, Italy; Crnaoloalbid@hotmail.com

References

Authors’ reply
We thank Dr Fadini for his interest in our case report of orbital myositis in association with rheumatoid arthritis. He rightly discusses in some detail the possibility of thyroid ophthalmopathy occurring in the absence of a systemic hyperthyroid diathesis. As we made clear in our article, there is a considerable variety of presenting clinical features in this condition. We sought to present these as concisely as possible, with particular reference to the most common presentation.

The differential diagnosis of an arteriovenous malformation was not likely in the clinical setting outlined. We agree that, ultimately, the diagnosis was made on the
basis of typical magnetic resonance imaging findings and the prompt clinical response to corticosteroid treatment.

S Nabili, D W McCarey, B Browne, H A Capell
Glasgow Royal Infirmary, Centre for Rheumatic Diseases, 84 Castle Street, Glasgow G4 0SF, UK

Correspondence to: Dr DW McCarey; gc1376@clinmed.gla.ac.uk

Reference

FORTHCOMING EVENTS

30th Annual Meeting of the International Society for the Study of the Lumbar Spine
13–17 May; Vancouver, Canada
Contact: Dr S Boden, Sunnybrook and Women’s Health Science Center, Room MG 323, 2075 Bayview Avenue, Toronto, Canada M4N 3M5
Tel: 416 480 4833
Fax: 416 480 6055
Email: shirley.fitgerald@swchsc.on.ca

4th European Congress of Rheumatology
18–21 June 2003; Lisbon, Portugal
Contact: Fred Wyss, Executive Secretary EULAR, Witikonstrasse 15, CH-8032, Zurich, Switzerland
Tel: +41 1 383 9690
Fax: +41 1 383 9810
Email: eular@bluewin.ch
Website: www.eular.org

25th Annual Meeting of the American Society for Bone and Mineral Research (ASBMR)
19–23 September 2003; Minneapolis, Minnesota, USA
Tel: +1 202 367 1161
Fax: +1 202 367 2161
Email: asbmr@dc.sba.com
Website: www.asbmr.org

7th EULAR Sonography Course
9–12 October, 2003; Rome, Italy
An introductory and practical course on musculoskeletal ultrasonography
Scientific secretariat: Professor Guido Valesini

Email: annamaria.iagrocco@uniroma1.it
Contact: Organising secretariat: Michela Civelli, EDRA Spa, Medical Publishing and News Media, Viale Monza, 133 - 20125, Milan, Italy
Tel: +39 (0)2 281 72300
Fax: +39 (0)2 281 72399
Email: edracongressi@dsmedigroup.com

OARSI World Congress on Osteoarthritis
12–15 October 2003; Berlin, Germany
Tel: +1 856 439 1385
Fax: +1 856 439 0525
Email: oarsi@oarsi.org
Website: www.oarsi.org

Fourth International Symposium on Clinical and Economic Aspects of Osteoporosis and Osteoarthritis
14–17 November 2003; Nice, France
Contact: Organisation Secretariat, YP Communication, 108 boulevard G Kleyer, 4000 Liège, Belgium
Tel: +32 (4) 254 12 25
Fax: +32 (4) 254 12 90
Email: yoland@piettecommunication.com
Website: http://nice.piettecommunication.com

XIIth International Conference on Behçet’s Disease
24–27 October 2004; Antalya, Turkey
Contact: Congress Secretariat, Figur Congress and Organization Services Ltd. STL Ayazmadresi Cad. Karadur Sok. No: 7 80088 Dikili, Istanbul
Tel: +90 (212) 258 60 20
Fax: +90 (212) 258 60 78
Email: behcet2004@figur.net
Website: www.behcet2004.org

Future EULAR congresses
9–12 June 2004; EULAR 2004; Berlin, Germany
8–11 June 2005; EULAR 2005; Vienna, Austria
21–24 June 2006; EULAR 2006; Amsterdam, The Netherlands

Future ACR meetings
24–28 October 2003; 67th Annual Scientific Meeting; Orlando, Florida
16–21 October 2004; 68th Annual Scientific Meeting; San Antonio, Texas
Power Doppler sonography: synovial tissue assessment in RA

P Hrycaj and J K Lacki

doi: 10.1136/ard.62.4.382

Updated information and services can be found at:
http://ard.bmj.com/content/62/4/382

**References**

This article cites 9 articles, 3 of which you can access for free at:
http://ard.bmj.com/content/62/4/382#BIBL

**Email alerting service**

Receive free email alerts when new articles cite this article. Sign up in the box at the top right corner of the online article.

**Notes**

To request permissions go to:
http://group.bmj.com/group/rights-licensing/permissions

To order reprints go to:
http://journals.bmj.com/cgi/reprintform

To subscribe to BMJ go to:
http://group.bmj.com/subscribe/