Lumbar interspinous bursitis in active polymyalgia rheumatica

C. Salvarani[1], L. Barozzi[2], L. Boiardi[1], N. Pipitone[1], G.L. Bajocchi[1], P.L. Macchioni[1], M. Catanoso[1], G. Pazzola[1], M. Valentino[3], C. De Luca[2], G.G. Hunder[4]

[1]Rheumatology Unit, Department of Internal Medicine, Azienda Ospedaliera ASMN, Istituto di Ricovero e Cura a Carattere Scientifico, Reggio Emilia, Italy;
[2]Radiologia Diagnostica, Azienda Ospedaliera Universitaria S. Orsola-Malpighi, Bologna, Italy;
[3]Radiologia d'Urgenza, Azienda Ospedaliera Universitaria di Parma, Italy;
[4]Mayo Clinic, Rochester, MN, USA.

Abstract

Objective

To evaluate the inflammatory involvement of lumbar interspinous bursae in patients with polymyalgia rheumatica (PMR) using magnetic resonance imaging (MRI).

Methods

Ten consecutive, untreated new patients with PMR and pain in the shoulder and pelvic girdles were investigated. Seven patients with spondyloarthritis (4 with psoriatic spondyloarthrits, one with entheropatic spondyloarthritis, and 2 with ankylosing spondylitis) as well as 2 patients with spinal osteoarthritis and 2 patients with rheumatoid arthritis with lumbar pain served as controls. MRI of lumbar spine was performed in all PMR patients and controls. Nine patients (5 PMR patients and 4 controls) also had MRI of the thoracic spine.

Results

MRI evidence of interspinous lumbar bursitis was found in 9/10 patients with PMR and in 5/11 controls. A moderate to marked (grade ≥2 on a semiquantitative 0–3 scale) lumbar bursitis occurred significantly more frequently in patients with PMR than in control patients (60% vs. 9%, p=0.020). In most of the patients and controls lumbar bursitis was found at the L3-L5 interspaces. Only 2 patients had bursitis at a different level (one patient had widespread lumbar bursitis, and one control at L2-L4). No interspinous bursitis was demonstrated by MRI of the thoracic spine in patients and controls.

Conclusions

Inflammation of lumbar bursae may be responsible for the low back pain reported by patients with PMR. The prominent inflammatory involvement of bursae including those of the lumbar spine supports the hypothesis that PMR may be a disorder affecting predominantly extra-articular synovial structures.

Key words
polymyalgia rheumatica, MRI, lumbar bursitis

Carlo Salvarani, MD
Libero Barozzi, MD
Luigi Boiardi, MD, PhD
Nicolò Pipitone, MD, PhD
Gianluigi Bajocchi, MD
Pierluigi Macchioni, MD
Maria Grazia Catanoso, MD
Giulia Pazzola, MD
Massimo Valentino, MD
Carlo De Luca, MD
Gene G. Hunder, MD

Please address correspondence and reprint requests to:
Dr Carlo Salvarani,
Unità Operativa di Reumatologia,
Azienda Ospedaliera di Reggio Emilia,
IRCCS, Viale Risorgimento 80,
42123 Reggio Emilia, Italy.
E-mail: salvarani.carlo@asmn.re.it

Received on October 26, 2012; accepted in revised form on January 15, 2013.

Competing interests: none declared.

Introduction

Polymyalgia rheumatica (PMR) is an inflammatory disorder of unknown cause characterised by aching and morning stiffness in the cervical region and shoulder and pelvic girdles (1).

PMR is more frequent in female than in male, and it affects individuals aged >50 years, with an increasing incidence in those aged 70–80 years. PMR may present as an isolated condition or associated to GCA features (1-3).

Shoulder pain is the presenting finding in 70–95% of patients, whereas hips and neck are less frequently involved (50–70% of cases) (4). The prominent and diffuse shoulder and hip pain can only be partially explained by the mild synovitis observed in specimens of shoulder synovial membranes and other involved joints (5). In fact, imaging studies including magnetic resonance imaging (MRI) and ultrasonography (US) have shown that bilateral subacromial bursitis and trochanteric bursitis, rather than synovitis, are the most frequent lesions in patients with PMR who have pain in the shoulder and pelvic girdles, respectively (6-13). However, these findings do not adequately explain why a substantial number of patients with PMR experience pain in the neck and lumbar region (Fig. 1).

Clues to the origin of the cervical and lumbar pain in PMR have been provided by autopsy and imaging studies. In 1982, Bywaters described the anatomy of cervical interspinous and lumbar interspinous bursae and their inflammatory involvement in arthritis (14, 15). Subsequently, Blockman *et al*. investigated by ^{18}F-Fluorodeoxyglucose (FDG) positron emission tomography (PET) patients with isolated PMR, and observed that half of the patients had increased FDG uptake around the spinous process of cervical and lumbar vertebrae (16). Taken together, these findings suggested that interspinous bursitis could be the source of cervical and lumbar pain in patients with cervical and lumbar pain, respectively. Indeed, in a previous study we provided MRI evidence of interspinous cervical bursitis in patients with PMR and cervical pain (17). In this study, we used MRI to study the involvement of the lumbar interspinous bursae in a series of patients with active PMR who reported pelvic girdle pain.

Patients and methods

Consecutive patients seen at the Reggio Emilia Rheumatology Unit, Italy, during a 12-month period and who satisfied the criteria for PMR (18) and had pelvic girdle pain were considered suitable candidates for the study. Ten patients were included in the study, 7 women and 3 men. Median age at diagnosis was 74 years (range 64–81). None of the patients had clinical or histological evidence of GCA or had previously been treated with glucocorticoids.

The control group consisted of 7 patients with spondyloarthritis (4 with psoriatic spondylitis, one with entheropatic spondylitis, and 2 with ankylosing spondylitis fulfilling the modified New York criteria) (19), 2 patients with spinal osteoarthritis, and 2 patients with rheumatoid arthritis seen consecutively in the same center after the patients with PMR. All controls had lumbar pain. All patients with spondyloarthritis had active disease and were not receiving biological agents.

MRI of lumbar spine was performed in all case patients and controls. Nine patients (5 PMR patients and 4 control patients) also had an MRI of the thoracic spine done.

MRI was performed using a 1.5 T superconductive magnet system (Signa HDxt; GE Medical Systems, Milwaukee, Wisconsin, USA). Patients were placed supine, in the standard position. Pulse sequences at thoracic and lumbar level included T2-weighted sagittal fast spin echo (repetition time ms/echo time ms, 3000/100) and T1-weighted sagittal and axial fast spin echo (500/20) with fat saturation before and after contrast medium scans. Section thickness was 3 mm with an intersection gap of 0.3 mm. The field of view was 24 cm and 32 cm and the matrix size was 512×512 and 384×224 at the thoracic and lumbar level, respectively. A bolus of 0.2 ml of gadoterate meglumine (Dotarem; Laboratoire Guerbet, Aulnay-sous-Bois, France) per kilogram of body weight was injected manually through a catheter inserted into an antecubital vein and

followed by the injection of 20 ml of saline solution. MRI images were examined by a radiologist (LB) who was blinded to the clinical findings and the diagnosis.

Lumbar bursae were evaluated for fluid collection. As shown in Figures 2 and 3, measurement of fluid accumulation was graded using a semiquantitative scale ranging from 0 to 3, where 0=no fluid accumulation; 1=sufficient fluid accumulation to allow visualisation of the bursae (mild bursitis), 2=moderate fluid accumulation (moderate bursitis) and 3=sufficient fluid amount to stretch the walls of the bursae (marked bursitis).

One PMR patient underwent ^{18}F-Fluorodeoxyglucose positron emission tomography (PET) in the suspicion of a malignancy, because he associated systemic manifestations (particularly fever).

The study was approved by the local ethics committee, and a written informed consent was obtained from patients and controls before study entry.

Statistical analysis was performed using the SPSS V.13 programme (SPSS Inc., Chicago, Illinois, USA). Fisher's exact test was used to compare the frequencies.

Results

In 9/10 patients with PMR, MRI showed the presence of fluid in the lumbar interspinous bursae prevalently at the L3-L5 level consistent with bursitis (Fig. 2-3). Fluid accumulation in the lumbar interspinous bursae at the same level was also observed in 5 of the 11 controls (2 with psoriatic spondylitis, 1 with entheropatic spondylitis, and 2 with spinal osteoarthritis). However, moderate to marked (grade ≥2) lumbar bursitis occurred significantly more frequently in PMR patients than in controls (60% *vs*. 9%, p=0.020). Lumbar bursitis was found in most patients and controls at the L3-L5 lumbar interspaces. Only 2 patients had bursitis at a different level (one patient had widespread lumbar bursitis, and one control at L2-L4). No erosions of spinous processes on MRI were observed. No interspinous bursitis was demonstrated by MRI of the thoracic spine in the 5 patients and 4 controls in whom the thoracic spine was evaluated.

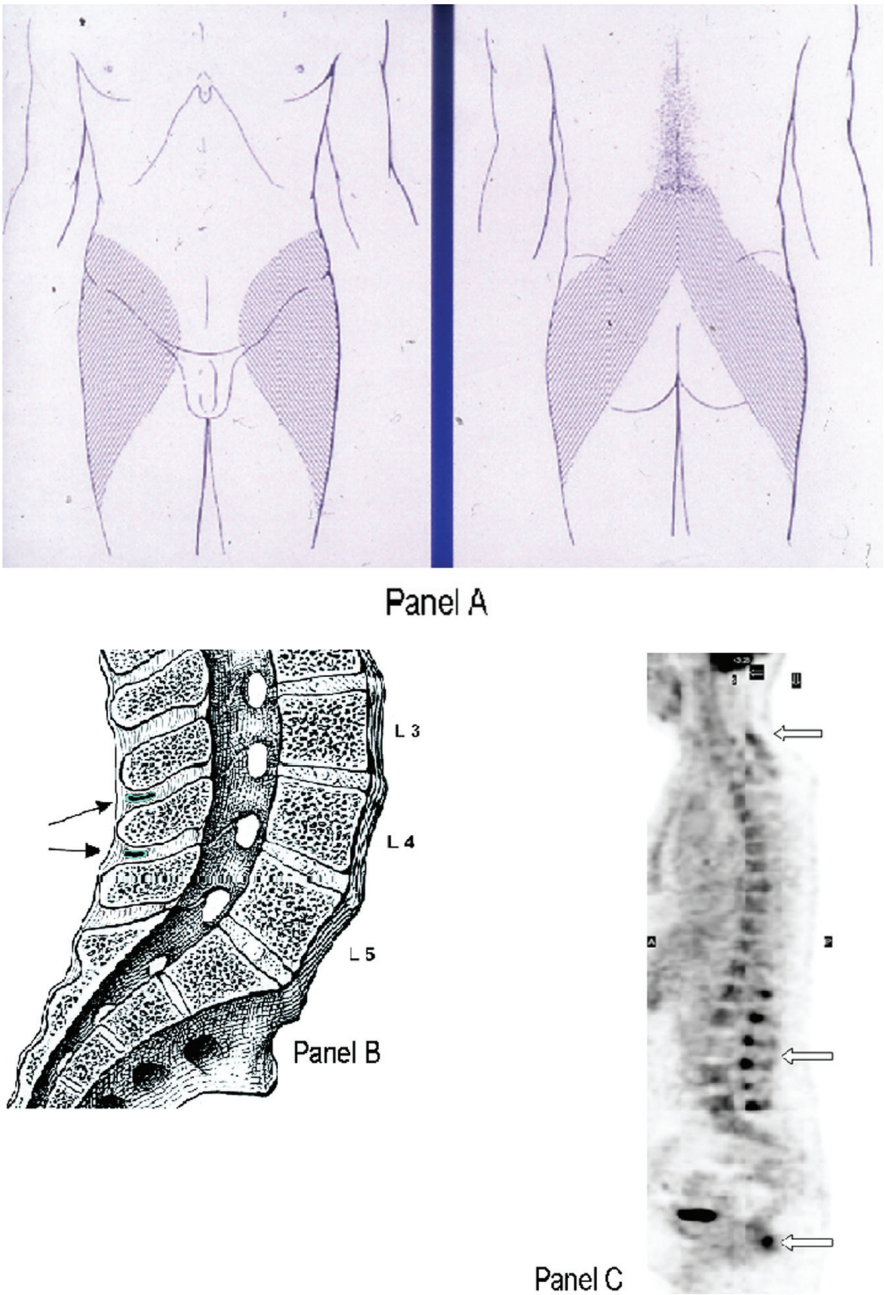

Fig. 1. Panel A. Pelvic girdle and low back pain distribution in polymyalgia rheumatica (reproduced by Ballabio CB, La polimialgia reumatica 1975). **Panel B**. Location of the lumbar interspinous bursae. Median sagittal section through L3-L5 of the vertebral column. Lumbar interspinous bursae lie posteriorly in L3-L5 interspinous spaces (arrows) (reproduced by Salvarani C *et al*., *Ann Rheum Dis* 2008; 67: 758-61). **Panel C**. Fluorodeoxyglucose PET/CT shows inflammatory fluorodeoxyglucose uptake in trochanteric, cervical and lumbar interspinous areas consistent with bursitis (arrows) and absence of vascular uptake.

PET performed in one patient with PMR showed inflammatory FDG uptake in trochanteric, cervical and lumbar interspinous areas consistent with bursitis (arrows) and absence of vascular uptake (Fig. 1).

Throughout the follow-up period (median: 14 months, range: 10–16 months), no patient with PMR fulfilled the American College of Rheumatology (ACR) 1987 criteria for rheumatoid arthritis (RA) (20) or developed other conditions.

Discussion

Polymyalgia rheumatica is characterised by pain and stiffness in the shoulder girdle and often in the neck and

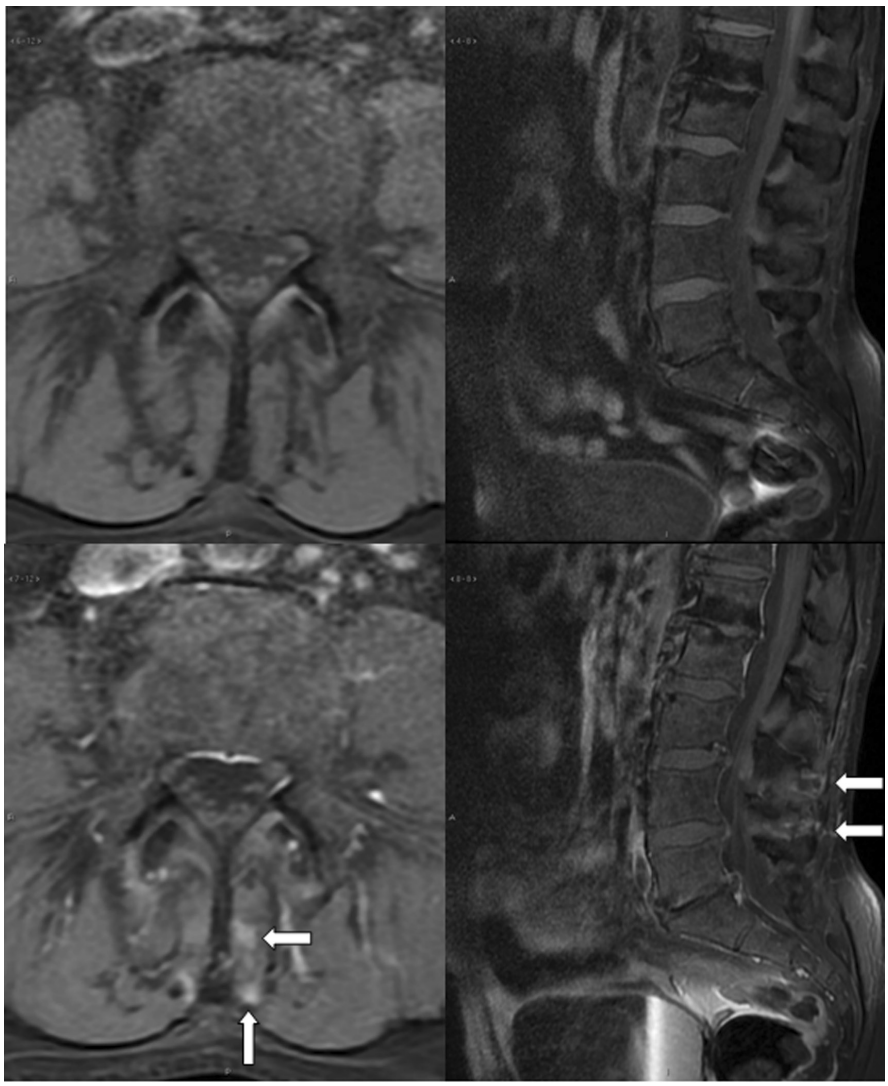

Fig. 2. Mild lumbar interspinous bursitis. T1-weighted axial and sagittal fast spin echo with fat saturation before and after contrast medium scans. Contrast enhancement at level of bursae (L3-L5 lumbar interspaces) (arrows).

pelvic girdle, that swiftly respond to glucocorticoids (1, 4, 21). Subachromial and trochanteric bursitis have been demonstrated with high frequencies in PMR patients with shoulder and hip pain, respectively, suggesting that pain in PMR primarily originates from these periarticular structures (6-13). However, these findings do not adequately explain why many patients with PMR also report pain in the cervical, lumbar region, or both (Fig. 1).

In a previous study, we provided MRI evidence of inflammation of cervical interspinous bursae in PMR patients with cervical pain, consistent with the concept that cervical pain in PMR could be due to cervical bursitis (17). Following onto this line of investigation, in this study we aimed to evaluate by MRI the presence of lumbar interspinous bursitis in a series of consecutive PMR patients with pain around the pelvic girdle. Our results demonstrated a close association between lumbar pain and lumbar interspinous bursitis in PMR, again in agreement with the hypothesis that spinal pain originates from inflamed extra-articular synovial structures, similarly to what has been found for peripheral manifestations (12, 22, 23). Specifically, we found that moderate to marked bursitis at the L3-L5 lumbar interspaces on MRI was significantly more frequent in patients with PMR than in controls with various inflammatory and non-inflammatory disorders.

PET studies also support the notion of predominantly bursal involvement in PMR. Blockman et al observed increased FDG uptake in the shoulders and hips of most patients with isolated PMR (*i.e.* without evidence of giant cell arteritis on temporal artery biopsy) (16). Half of the patients also had increased FDG uptake around the spinous processes of the cervical and lumbar vertebrae. However, PET was not able to identify the anatomical structures involved in the inflammatory process due to its low resolution. A subsequent study by Yamashita *et al.* used PET/computed tomography (PET/CT) to investigate areas of FDG accumulation in PMR, and to differentiate PMR from rheumatoid arthritis and other rheumatic conditions (24). PET/CT fusion images were used to locate the precise anatomical sites of PMR lesions, which are difficult to identify by PET images alone. In this study, PMR patients showed a higher frequency of FDG uptake in ischial tuberosites, greater trochanters, and lumbar spinous processes, which are all sites where bursae may be present. The authors also noted that increased uptake at two or more of these sites had a high sensitivity (85.7%) and specificity (88.2%) for the diagnosis of PMR. However, MRI confirmed bursitis in only 1 of the 5 patients that had increased FDG uptake around the lumbar spinous processes (24). The choice of MRI sequences and resolution of images, and criteria for patient selection may partially explain why bursitis was not confirmed by MRI in many cases.

Both aforesaid studies observed significant vascular uptake suggestive of a concomitant large vessel vasculitis in a minority of patients only (16, 24). These studies thus confirmed than bursitis, rather than vasculitis, is the cause of musculoskeletal manifestations in PMR.

Cervical and lumbar bursitis is not *per se* specific to PMR. In fact, Bywaters found evidence of bursitis at necroscopy in a variety of rheumatic disorders (14, 15). In addition, lumbar interspinous bursitis can also be due to chronic repetitive use and trauma, and its frequency increases with advancing

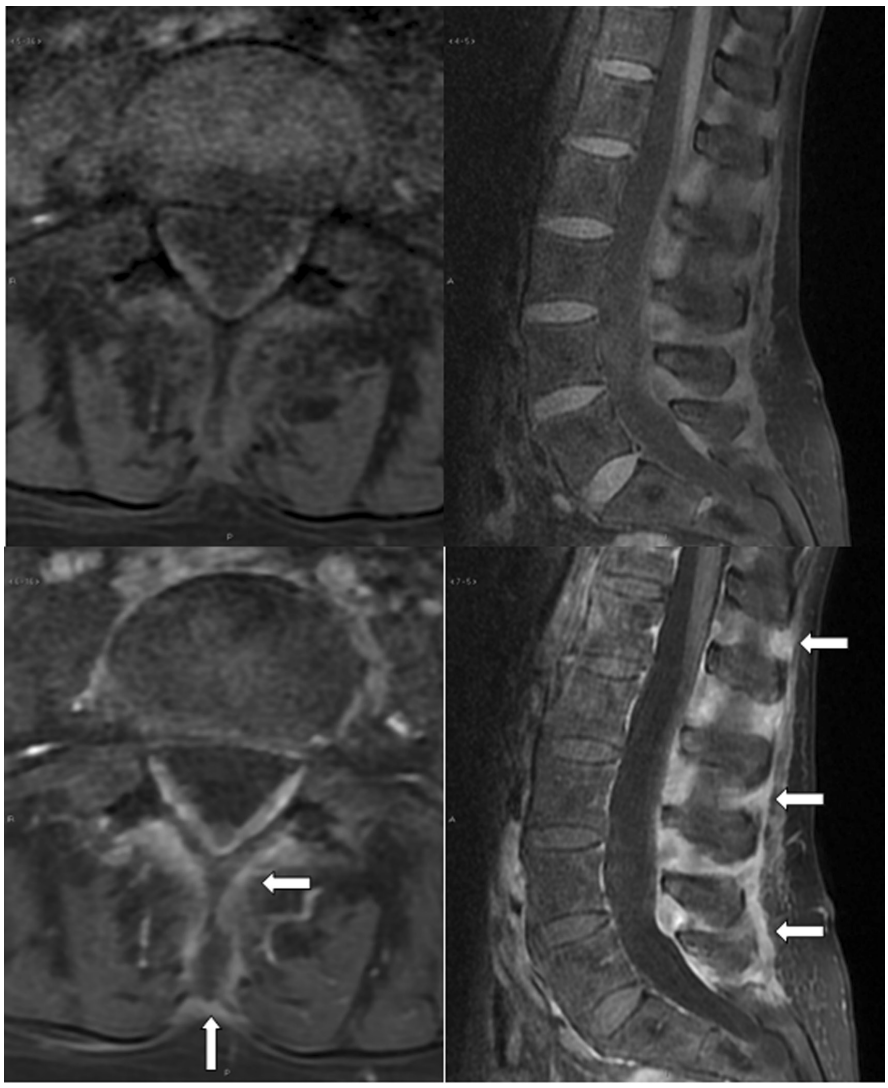

Fig. 3. Marked lumbar interspinous bursitis. T1-weighted axial and sagittal fast spin echo with fat saturation before and after contrast medium scans. Widespread lumbar high contrast enhancement at level of bursae (arrows).

age (25-27). L4-L5 is the interspinous space most frequently affected, followed by the L3-L4 level, similarly to what we found in PMR (Fig. 1). However, the inflammatory process affecting the bursae appears to be quite mild in conditions different from PMR (13). In keeping with these data, we showed that moderate to severe bursitis was far more common in patients with PMR than in controls. Because both bursitis and PMR occur more frequently in elderly subjects (25, 27), it may be tempting to speculate that PMR could manifest by exacerbating a pre-existing milder bursal inflammation. However, it is also possible that PMR induces *de novo* inflammation mainly in periarticular structures such as bursae.

Spinal pain in PMR is limited to the cervical, lumbar area, or both. Indeed, none of our PMR patients had thoracic pain, nor MRI evidence of interspinous bursitis in the thoracic spine. The reason for the lack of involvement of the thoracic spine in PMR is probably due to the fact that interspinous bursae are only found in the lower cervical and lumbar area, *i.e.* at spinal sites characterised by greater mobility (15).

The limitations of our study include the relatively small number of patients enrolled and the lack of repeat examinations after onset of treatment. On the other hand, a strength of our work is the inclusion of a control group mainly consisting of patients with inflammatory arthropathies.

In conclusion, lumbar bursitis is likely to contribute to the discomfort and pain in the lower back reported by some PMR patients. The prominent inflammatory involvement of cervical and lumbar bursae confirms the hypothesis that PMR is primarily a periarticular, bursal-based disorder (6, 28).

Acknowledgements

We would like to thank Giliola Gamberini from the Scuola di Disegno Anatomico, Istituto Ortopedico Rizzoli, Bologna, Italy, for providing the anatomic figures showing the location of lumbar interspinous bursae.

References

1. SALVARANI C, CANTINI F, HUNDER GG: Polymyalgia rheumatica and giant-cell arteritis. *Lancet* 2008, 372: 234-45.
2. GONZALEZ-GAY MA, VAZQUEZ-RODRIGUEZ TR, LOPEZ-DIAZ MJ *et al*.: Epidemiology of giant cell arteritis and polymyalgia rheumatica. *Arthritis Rheum* 2009; 61: 1454-61.
3. GONZALEZ-GAY MA: Giant cell arteritis and polymyalgia rheumatica: two different but often overlapping conditions. *Semin Arthritis Rheum* 2004; 33: 289-93.
4. SALVARANI C, CANTINI F, BOIARDI L, HUNDER GG: Polimyalgia rheumatica. *Best Pract Res Clin Rheumatol* 2004; 18: 705-22.
5. MELICONI R, PULSATELLI L, UGUCCIONI M *et al*.: Leukocyte infiltration in synovial tissue from the shoulder of patients with polymyalgia rheumatica. Quantitative analysis and influence of corticosteroid treatment. *Arthritis Rheum* 1996; 39: 1199-207.
6. SALVARANI C, CANTINI F, OLIVIERI I, HUNDER GG: Polymyalgia rheumatica: a disorder of extraarticular synovial structures? *J Rheumatol* 1999; 26: 517-21.
7. SALVARANI C, CANTINI F, OLIVIERI I *et al*.: Proximal bursitis in active polymyalgia rheumatica. *Ann Intern Med* 1997; 27: 27-31.
8. CANTINI F, SALVARANI C, OLIVIERI I *et al*.: Shoulder ultrasonography in the diagnosis of polymyalgia rheumatica: a case-control study. *J Rheumatol* 2001; 28: 1049-55.
9. CANTINI F, NICCOLI L, NANNINI C *et al*.: Inflammatory changes of hip ynovial structures in polymyalgia reumatica. *Clin Exp Rheumatol* 2005; 23: 462-8.
10. MACCHIONI PL, CATANOSO MG, PIPITONE N, BOIARDI L, SALVARANI C: Longitudinal examination with shoulder ultrasound of patients with polymyalgia rheumatica. *Rheumatology* 2009; 48: 1566-9.
11. CAMELLINO D, CIMMINO MA: Imaging of polymyalgia reumatica: indications on its pathogenesis, diagnosis and prognosis. *Rheumatology* 2012; 51: 77-86.
12. MORI S, KOGA Y, ITO K: Clinical characteristics of polymyalgia rheumatic in Japanese patients: evidence of synovitis and extraca-

psular inflammatory changes by fat suppression magnetic resonance imaging. *Mod Rheumatol* 2007: 17: 369-75.
13. CANTINI F, SALVARANI C, NICCOLI L *et al*.: Fat suppression magnetic resonance imaging in shoulders of patients with polymyalgia rheumatica. *J Rheumatol* 2004; 31: 120-4.
14. BYWATERS EGL: Rheumatoid and other diseases of the cervical interspinous bursae, and changes in the spinous processes. *Ann Rheum Dis* 1982; 41: 360-70.
15. BYWATERS EGL, EVANS S: The lumbar interspinous bursae and Baastrup's syndrome. An autopsy study. *Rheumatol Int* 1982; 2: 87-96.
16. BLOCKMANS D, DE CEUNINCK L, VANDERSCHUEREN S, KNOCKAERT D, MORTELMANS L, BOBBAERS H: Repetitive 18-fluorodeoxyglucose positron emission tomography in isolated polymyalgia rheumatica: a prospective study in 35 patients. *Rheumatology* (Oxford) 2007; 46: 672-7.
17. SALVARANI C, BAROZZI L, CANTINI F *et al*.: Cervical interspinous bursitis in active polymyalgia reumatica. *Ann Rheum Dis* 2008; 67: 758-61.
18. CHUANG TY, HUNDER GG, ILSTRUP DM, KURLAND LT: Polymyalgia rheumatica: a 10-year epidemiologic and clinical study. *Ann Intern Med* 1982; 97: 672-80.
19. VAN DER LINDEN S, VALKENBURG HA, CATS A: Evaluation of diagnostic criteria for ankylosing spondylitis: a proposal for modification of the New York criteria. *Arthritis Rheum* 1984; 27: 361-8.
20. ARNETT FC, EDWORTHY SM, BLOCH DA *et al*.: The American Rheumatism Association 1987 revised criteria for the classification of rheumatoid arthritis. *Arthritis Rheum* 1988; 31: 315-24.
21. CAPORALI R, CIMMINO MA, MONTECUCCO C, CUTOLO M: Glucocorticoid treatment of polymyalgia rheumatica. *Clin Exp Rheumatol* 2011; 29 (Suppl. 68): S143-7.
22. CIMMINO MA, PARODI M, ZAMPOGNA G, BARBIERI F, GARLASCHI G: Polymyalgia rheumatica is associated with extensor tendon tenosynovitis but not with synovitis of the hands: a magnetic resonance imaging study. *Rheumatology* 2011; 50: 494-9.
23. CANTINI F, SALVARANI C, OLIVIERI I *et al*.: Remitting seronegative symmetrical synovitis with pitting oedema (RS3PE) syndrome: a prospective follow up and magnetic resonance imaging study. *Ann Rheum Dis* 1999; 58: 230-6.
24. YAMASHITA H, KUBOTA K, TAKAHASHI Y *et al*.: Whole-body fluorodeoxyglucose positron emission tomography/computed tomography in patients with active polymyalgia rheumatic: evidence for distinctive bursitis and large-vessel vasculitis. *Mod Rheumatol* 2012; 22: 705-11.
25. SARTORIS DJ, RESNICK D, TYSON R, HAGHIGHI P: Age-related alterations in the vertebral spinous processes and intervening soft tissues: radiologic-pathologic correlation. *Am J Roentgenol* 1985; 145: 1025-30.
26. BAASTRUPT CI: Proc. spin. vert. lumb. und einige zwischen diesen liegende Gelenkbildungen mit pathologischen Prozessen in dieser Region. *ROFO* 1933; 48: 430-5.
27. RISSANEN PM: Comparison of pathologic change in intervertebral discs and interspinous ligaments of the lower part of the lumbar spine in the light of autopsy findings. *Acta Orthop Scand* 1964; 34: 54-65.
28. SALVARANI C, OLIVIERI I, CANTINI F, HUNDER GG; Classification of inflammatory arthritis: the place of polymyalgia rheumatica. *Lancet* 1998; 352: 1938.