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Association between clinical signs assessed by manual segmental examination and findings of the lumbar facet joints on magnetic resonance scans in subjects with and without current low back pain: A prospective, single-blind study ☆

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ABSTRACT

The relevance of magnetic resonance imaging (MRI) findings such as facet joint (FJ) effusion and edema in low back pain (LBP) is still unknown. Therefore, we prospectively evaluated the presence of these MRI findings in the lumbar spine (Th12-S1) and their association with pain evoked by manual segmental FJ provocation tests (spinal percussion, springing, and segmental rotation tests) in 75 subjects with current LBP ($\geqslant$30 days in the past 3 months) compared with 75 sex- and age-matched control subjects. FJs were considered painful, if $\geqslant$1 provocation test triggered LBP. FJs were classified as true positives, if the same FJ was painful and showed effusion and/or edema. FJs with effusion and/or edema and painful FJs were present significantly more frequently in subjects with LBP, but these conditions were also common in control subjects (27% vs 21% and 50% vs 12%, respectively). Effusion and/or edema were present in 65 subjects with LBP (87%) and in 56 control subjects (75%, not significant); painful FJs were present in 68 (91%) and 29 (39%) ($P < 0.01$) LBP and control subjects, respectively. True-positive findings occurred in 16% of LBP FJs and in 2% of control FJs ($P < 0.01$); 46 LBP subjects (61%) and 9 control subjects (12%, $P < 0.01$) had true-positive findings. Pain on provocation and FJ effusion and/or edema were significantly correlated only in patients with LBP. In conclusion, only true-positive findings (ie, concurrent effusion and/or edema and positive provocation test results in the same FJ) discriminate well enough between control subjects and subjects with current LBP, whereas neither effusion and/or edema nor FJ provocations tests alone are suitable to detect suspected FJ arthropathy.

1. Introduction

Facet joint (FJ) arthropathy is 1 possible cause of specific low back pain (LBP). However, the identification of patients with clinically relevant FJ arthropathy remains a challenge. The prevalent opinion is that controlled medial branch blocks (MBBs) are the gold standard in diagnosing pain stemming from FJs. By using this method, it was established that the prevalence of FJ involvement in lumbar spinal pain is age dependent and ranges from 18% to 44% [26]. However, even when properly conducted, an enormous false-positive rate ranging from 27% to 58% in single blocks is observed [25,26,32]. The poor outcome suggests that either FJ involvement in LBP generation is low or that FJ blocks are not sensitive enough to diagnose FJ-related LBP. On the other hand, FJ blocks are meant to be specific; the injected anesthetic does not spread to other relevant structures that might induce LBP [9]. Additionally, because FJ blocks are an invasive procedure, they might trigger chronification and consequently worsen the patient's prognosis. Based on these grounds, it seems more desirable to first identify patients with probable FJ arthropathy by noninvasive screening procedures. This approach was previously considered by several investigators [11,19,29]. These researchers proposed various criteria to be indicative of lumbar zygapophysial pain (eg, acute onset of pain associated with bending or twisting, pain

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increase by sitting and forward flexion, pain relief by walking, LBP associated with groin or thigh pain, and well-localized paraspinal tenderness). Nonetheless, subsequent studies failed to confirm improved outcome of FJ blocks in patients fulfilling these criteria [3,17,33]. Surprisingly, although commonly described in clinical manual diagnostics and physiotherapy textbooks [13] and often used in clinical practice, a detailed, manual segmental examination of the lower back FJs has not been investigated in a prospective, controlled study. Another approach for preselecting patients might be the identification of abnormal radiological findings. However, previous studies indicated no connection between osteoarthritis demonstrated by computed tomography or magnetic resonance imaging (MRI) and FJ block outcome [18,35]. However, FJ alterations on MRI have not been sufficiently studied. For example, it was recently postulated that FJ edema might cause LBP [12]. Likewise, to the best of our knowledge, FJ effusion, a likely sign of lumbar segmental instability [6,7,24], has not been studied prospectively. Therefore, we designed a controlled study focusing on the lumbar spine to investigate (a) the occurrence of painful FJs detected by manual segmental provocation tests, (b) the presence of MRI findings (effusion, edema, and hypertrophy), and (c) the association between pain and MRI findings on a segmental level.

2. Materials and methods

2.1. Subjects

The local ethics committee of Ruhr University Bochum (Germany) approved this study in May 2009. From June to November 2009, subjects with treated or untreated LBP were recruited from among inpatients and outpatients of the Department of Pain Medicine at the University Hospital Bergmannsheil in Bochum (n = 32) and hospital staff (n = 12) and by distributing flyers in the University Hospital Bergmannsheil in Bochum (n = 31). Eligible subjects were first interviewed in person or over the phone. Subjects entered the study if they were willing to participate and did not meet any of the exclusion criteria (age younger than 18 years, pregnancy, acute malignant disease, metastasis of the spine, extreme osteoporosis, poor physical condition, claustrophobia, spondylodesis of the lumbar spine, acute radicular LBP, and the presence of metallic implants, which are not MRI compatible). A volunteer was considered to be a subject with current LBP if he or she stated that he or she had had frequent ($\geqslant$30 to 60 days) or daily ($\geqslant$60 to 90 days) LBP in the past 3 months. After the current LBP group of 75 subjects was identified, a control group was formed. Volunteers for this control group were mostly recruited by word-of-mouth and distributing flyers in the University Hospital Bergmannsheil in Bochum, local sports clubs, and fitness centers (n = 45) and from the hospital personnel (n = 27), including doctors, physiotherapists, and occupational therapists, as well as nursing and administration staff. A subject was eligible for the control group, if he or she had only occasionally ($\geqslant$1 to 30 days) experienced LBP in the past 3 months or did not experience LBP in the past 3 months at all. For each subject allocated to the current LBP group, a subject of the same sex and within the same age group (younger than 40, 40–49, 50–59, 60–69, or older than 70 years) was assigned to the control group. Informed consent was obtained from every study participant. Each subject received a CD including the MRI studies of his or her lower back. No other reimbursement was provided for participation in the study.

2.2. Special investigations

2.2.1. History assessment and questionnaires

Each subject's history was obtained with a standardized questionnaire by a single investigator (T.M.). General data regarding age, sex, height, weight, and marital status as well as information about education level, according to the 3 qualitatively different levels of education in Germany, current occupation and working hours, and the physical intensity of the occupation that the subject had performed the longest in his or her life were noted. For more specific information concerning LBP history in the past year, the subject was asked about the intensity of his or her previous, memorable LBP episode, whether the subject was not able to fulfill usual duties because of LBP (ie, going to work or taking care of the household in the case of retired subjects or housewives/husbands), and whether the subject was referred to a hospital because of LBP. The investigator also noted whether the subjects experienced memorable LBP episodes before the past year. Furthermore, the subjects were asked whether they had ever had a diagnosis of a disc herniation or whether they had ever undergone lumbar disc surgery. Each subject also completed the Hospital Anxiety and Depression Scale (HADS) and the Short-Form Health Survey-12. Additionally, current LBP subjects completed the Roland-Morris Disability Questionnaire, the Oswestry Disability Index (ODI), the Pain Disability Index, and the Chronic Pain Grade questionnaire.

2.2.2. Manual segmental examination

One investigator (T.M.) received intensive training in manual segmental examination techniques of the spine, with a main focus on segmental pain provocation tests for the lumbar FJs, from a long-term, experienced physiotherapist (J.A.). During the training phase, the investigator's accuracy was repeatedly tested by comparing her examination results for LBP patients and healthy volunteers with the physiotherapist's examination results for the same subjects. Once she achieved the same examination results, she examined each of the 150 study subjects. The examination was carried out after obtaining the patient's history and before or after, but always within 24 hours of, the MRI scan. The following 3 segmental FJ provocation tests were performed in each subject in the prone position for every 12 lumbar FJs per subject from Th12-L1 to L5-S1:

(1) Spinal percussion test: With a tapping motion on a spinous process, the lower adjacent FJs are stressed, ie, tapping on the spinous process L4 stresses the FJ L4-5 (Fig. 1).

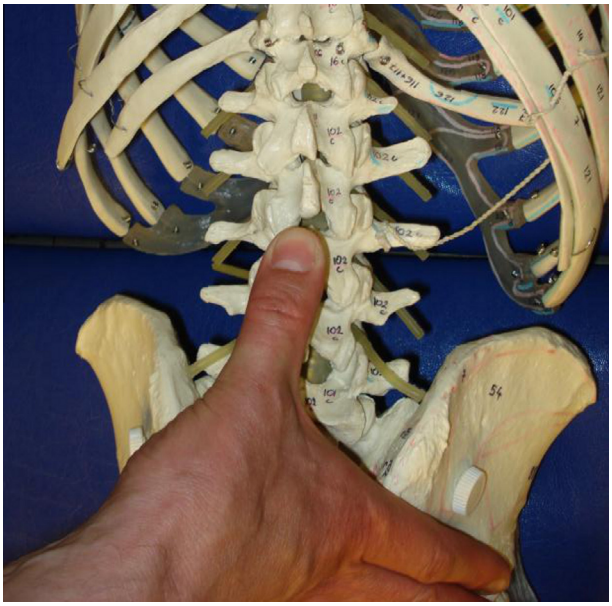

Fig. 1. Spinal percussion test.