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Axial spondyloarthritis: on the interface between healthy and diseased

OP0242

FATTY LESIONS DETECTED ON MRI SCANS IN PATIENTS WITH ANKYLOSING SPONDYLITIS ARE BASED ON THE DEPOSITION OF FAT IN THE VERTEBRAL BONE MARROW

X. Baraliakos¹, H. Boehm², A. Samir Barakat³, G. Schett⁴, J. Braun¹.

¹Rheumazentrum Ruhrgebiet, Herne; ²Clinic for spinal surgery, Zentralklinik, Bad Berka, Germany; ³Orthopedic and Traumatology Department, Cairo University, Cairo, Egypt; ⁴Med. Klinik 3, Friedrich Alexander University Erlangen-Nuremberg, Erlangen, Germany

Background: Fatty lesions (FL), similar to bone marrow oedema (BME) and sclerosis (SCL), are characteristic findings in MRI examinations of patients with ankylosing spondylitis (AS) and degenerative disc disease (DDD). It has recently been shown that FL are associated with syndesmophyte formation in AS. The anatomic correlate of FL has not been studied to date. Current assumptions are solely based on non-invasive data.

Objectives: To examine the cellular composition of FL in the edges of vertebral bodies of patients with AS or DDD by histology.

Methods: Patients with AS or DDD undergoing planned kyphosis correction surgery by spinal osteotomy (in AS) or surgery to correct spinal stenosis (in DDD) were included into this biopsy study. The spinal surgeon (HB) took all biopsies mainly in the area close to the vertebral edge in many of which FL had been seen by MRI (figure 1a for AS and 1b for DDD). Biopsies were decalcified, embedded in paraffin, cut and stained by hematoxylin and eosin. The marrow composition was analysed and the cellularity graded (% surface area) by two different investigators blinded to patients' diagnosis. Four different marrow compositions could be differentiated: (i) fat, (ii) fibrosis, (iii) inflammation and (iv) hematopoiesis (normal).

Results: A total of 60 biopsies mostly obtained from the lower thoracic spine and the lumbar spine of 21 AS patients (mean age 51.7 years, mean disease duration 24.6 years) and of the lumbar spine in 18 DDD patients (mean age 60.1 years) were available. On the patient level, the histological appearance of MRI-FL was different between the groups: fat marrow was present in biopsies of 19 AS (90%) but in only 5 DDD (28%) patients. Inflammatory marrow changes, resembling mononuclear infiltrates, were found in 8 AS (38.1%) and 14 DDD (77.8%) patients at areas with concomitant FL and BME on MRI, while marrow fibrosis was seen in 6 AS (28.6%) and 4 DDD (22.2%) patients at areas with concomitant FL and SCL on MRI. In the semiquantitative histopathological analysis, the mean distribution ($\pm$ standard deviation) of the various bone marrow tissue types in the biopsies differed between the AS vs DD in a similar way, with 43% ($\pm$ 26.3%) vs 16% ($\pm$ 30.3%) for fatty marrow, 11% ($\pm$ 15.5%) vs 55% ($\pm$ 42%) for inflammatory marrow and 9% ($\pm$ 16.1%) vs 13% ($\pm$ 27.8%) for fibrotic marrow, respectively.

Conclusions: The presence of FL on MRI corresponds to fat deposition in the bone marrow of patients with advanced AS. These data show that the MRI change termed 'fatty lesion' is indeed based on the deposition of fat in the vertebral bone marrow in AS. Since vertebral bone marrow is physiologically harbouring hematopoiesis, AS seems to lead to a change in the bone marrow microenvironment with local disruption of hematopoiesis and replacement by fat. The link between fat and new bone formation should be studied in earlier disease stages.

Disclosure of Interest: None declared

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OP0243

PREVALENCE OF INFLAMMATORY AND CHRONIC CHANGES SUGGESTIVE OF AXIAL SPONDYLOARTHRITIS IN MAGNETIC RESONANCE IMAGES OF THE AXIAL SKELETON IN INDIVIDUALS <45 YEARS IN THE GENERAL POPULATION AS PART OF A LARGE COMMUNITY STUDY (SHIP)

X. Baraliakos¹, D. Feldmann¹, A. Ott¹, C.O. Schmidt², M. Albers², A. Richter², J. Braun¹. ¹Rheumazentrum Ruhrgebiet, Herne; ²Institute for Community Medicine, University of Greifswald, Greifswald, Germany

Background: Magnetic resonance imaging (MRI) is crucial for classification and diagnosis of axial spondyloarthritis (axSpA). Characteristic MRI lesions of axSpA are bone marrow oedema (BME) or structural fatty lesions (FL) of the sacroiliac joints (SIJ) and spine. However, the specificity of these lesions has been questioned, since patients with chronic back pain but no axSpA may also have a positive MRI, as shown in recent cohort studies.

Objectives: To investigate the prevalence of BME and FL on MRI of the spine and the SIJ in the general population.

Methods: Volunteers <45 years of the population based Study of Health in Pomerania (SHIP)^{1,2} underwent MRI examinations of the spine (sagittal orientation, T1 and T2 MRI sequences) and the SIJ (coronal orientation, STIR sequences), independently of clinical symptoms. Two trained readers blinded for age and gender of the examined persons evaluated the prevalence of BME (SIJ and spine) and FL (spine) suggestive of axSpA using the ASAS definitions: a lesion in the SIJ was considered positive if located periarticularly and in the middle part of the joint and a lesion in the spine was considered positive if detected at the edge of the vertebral body. Clearly degenerative lesions involving the vertebral endplate or being accompanied by abnormalities of the intervertebral disc (protrusion or prolapse) were not counted.

Results: A total of 802 complete MRI sets (spine and SIJ) of 394 male (49.1%) and 408 female volunteers (50.9%) was evaluated. The mean age of all patients was 37.5 $\pm$ 6.2 years. BME in the SIJ suggestive of axSpA were found in 144 individuals (18%), with an equal distribution between males (n=74, 18.8%) and females (n=70, 17.2%). A similar pattern of BME was found in the spine, again with no differences between males and females. However, the location of the lesions was different: 9.5% had $\geq$ 1 lesion in the cervical, 18.6% in the thoracic and 7.4% in the lumbar spine. Overall, 88.6% male and 84.6% female volunteers were found to have $\geq$ 1% and 54.6% male and 46.1% female volunteers were found to have $\geq$ 3 positive spinal lesions in any spinal region. In comparison, the prevalence of FL was higher (36.7% volunteers in the cervical, 72.4% in the thoracic and 52.7% in the lumbar spine). Overall, 86.5% volunteers were found to have $\geq$ 1% and 50.2% volunteers were found to have $\geq$ 3 positive spinal lesions in any spinal segment.

Logistic regression analysis showed that age was the only demographic characteristic that independently contributed to the occurrence of both BME (RR=1.22, 95% CI: 1.03 to 1.46, p<0.025) or FL (RR=1.12, 95% CI: 1.07 to 1.19, p<0.001).

Conclusions: In this large population-based study with healthy volunteers a relatively high prevalence of inflammatory and structural MRI lesions was found. Whether these lesions are to be explained by mechanical stress needs to be further studied. The high prevalence of BME and FL in the axial skeleton in the general population indicates a limited diagnostic value of these MRI findings. Thus, those should be interpreted with caution in relation to diagnosis, classification and assessment of disease activity.

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