IJIMM, Volume 2, Issue 11, 2024 ISSN: 2995-5319
http://medicaljournals.eu/index.php/IJIMM/issue/view/3

INTERNATIONAL JOURNAL OF INTEGRATIVE AND MODERN MEDICINE

Evaluation of Bone Mineral Density Change in Patients with Axial Spondyloarthritis

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Annotation: The aim of the study was to study the changes in bone mineral density (BMD) in patients with axial spondylarthritis (aksSpA).

Material and methods. For 4 years (2019-2023), 252 patients who applied for medical advice to the department of the specialized arthrological outpatient treatment course of the multidisciplinary clinic of the Tashkent Medical Academy were studied. In all patients, bone mineral density (BMD) was determined by dual-energy X-ray absorptiometry in g/cm2 and Z-criterion using a stationary dual-energy Lunar Prodigi Primo (USA, General Electric HEALTH CARE) bone X-ray densitometer.

Results. In patients with axSpA in both the lumbar spine and femoral neck, BMD was statically significantly reduced compared with the control group. In patients with axSpA, normal BMD indicators were detected in 38.9% of cases, osteopenic syndrome (OPS) – in 147 (58.3%) patients: osteopenia (OPe) – in 61 (24.2%) and osteoporosis (OP) – in 86 (34.1%), and in the control group normal BMD indicators were detected in 68.6% of cases, OPS in 22 (31.4%): OPe – in 17 (22.8%) and OP – in 6 (8.6%) subjects.

Keywords: axial spondyloarthritis, densitometry, osteoporosis.

Axial spondyloarthritis (axSpA) is a chronic inflammatory disease in the group of spondyloarthritis, characterized by forced damage to the sacroiliac joints and/or spine, resulting in the development of ankylosis and frequent involvement of entheses and peripheral joints in the pathological process [1]. The prevalence of aksSpA is 0.1-1.4%, the first symptoms appear before the age of 45 [1]. Damage to the musculoskeletal system in axSpA leads to a decrease in the quality of life of patients and disability [2-4].

Osteoporosis (OP) is a systemic disease of the skeleton, characterized by a decrease in bone mass and a violation of its quality (micro-architecture), which leads to bone fragility, which causes fractures even with minor injuries [7]. In axSpA and spondylo-arthritis (SpA), the risk of developing OP is high, and the loss of bone mass is detected in the early stages of the disease [2-4]. According to most authors, in early axial SpA (axSpA) in the spine, when the typical structural changes leading to immobilization of patients have not yet developed, the loss of bone mass is associated with the persistent inflammatory activity of the disease. [3].

The basis of the pathogenesis of aksSpA is bone remodeling (SR), which should be understood as the totality of the processes of osteoproliferation and osteoresorption (OR) and the imbalance between them. SR processes vary depending on different forms of aksSpA, different comorbidities, different disease activity and type of treatment [5-6]. In axSpA, excessive osteoproliferation often occurs in the spine with the formation of syndesmophytes and/or exostoses in the areas of enthesis. At the same time, bone tissue loss often occurs in the vertebral bodies [2-4].

As can be seen from the above, aksSpA is important among rheumatological diseases because it occurs mainly in young men and causes early disability. Therefore, early diagnosis of osteopenia (osteoporosis) and its treatment remain relevant.

To date, there has been little research examining the relationship between decreased bone mineral density (BMD) and inflammatory activity of the disease in patients with early axSpA.

The aim of this study was to investigate the correlation of SMZ with disease activity in patients with aksSpA.

Material and methods. For 4 years (2019-2023), patients who applied for a doctor's consultation to the department of the arthrological specialized outpatient treatment course of the multidisciplinary clinic of the Tashkent Medical Academy were studied. Patients between the ages of 18 and 45 who were willing to participate in the study and met the ASAS 2009 criteria, i.e., duration of inflammatory low back pain of more than 3 months and less than 5 years, were included.

Out of 252 examined patients, 186 were men (73.8%), 66 were women (26.2%). The average age of the studied patients is 37.6 ± 4.1 years. The average age of onset of the disease is 26.7 ± 6.8 years, the average duration of the disease is 21.6 ± 12.8 years. Patients were divided into 2 groups: group 1 - 176 patients with radiographically clear sacroiliitis, that is, diagnosed with ankylosing spondylitis (AS), group 2 - 76 non-radiological SpA (nr-akSpA) patients. The diagnosis of AS was based on the presence of radiographic and at least one clinical sign according to the modified New York criteria (1984).

All patients underwent clinical and biochemical blood tests, magnetic resonance imaging (MRT) of the sacroiliac joints (SIJ) and spine. Patients with clinical signs of damage to the pelvic joints (PJ) (pain in the region of these joints at rest, during active and passive movements, and limitation of their movements are taken into account) also underwent an MRI examination of SIJ. MRI examination of the spine was examined in sagittal projections, inflammatory changes (ICh) were detected in sections with a thickness of 4 mm in the STIR mode [3,4]. In SIJ, spine and PJ, if there were signs of osteitis in at least 2 sections, or if more than two hyperintense foci of active inflammation were detected in one section, it was estimated that there was a ICh [4]. In addition to osteitis, excess fluid in the joint cavity was also taken into account when evaluating the MRI signs of coxitis [4].

Bone mineral density (BMD) was determined by dual-energy X-ray absorptiometry in g/cm2 and Z-criterion using a stationary dual-energy Lunar Prodigi Primo (General Electric HEALTH CARE, USA) bone X-ray densitometer. Since all patients in the study were under 50 years of age, the Z-criterion was used to evaluate BMD. The diagnosis of OP (in accordance with the recommendations of the International Society of Clinical Densitometry - ISCD) was made when the value of the Z-criterion was lower than -2.0 SD [10]. The Z-criterion was expressed in standard deviation (SD) values from the peak values of bone mass in healthy subjects. The result of densitometry was calculated according to the smallest value of the Z-criterion at certain points. The BMD index was evaluated in the femoral neck and lumbar spine.

Statistical analysis of data was performed using Statistics 6.0 software.

Rezults.

A statistically significant decrease in BMD was found in both the femoral neck and lumbar spine in patients with axSpA compared to the control group. Thus, in patients with axSpAl, the BMD of the femoral neck was 0.8103±0.02 g/cm2, according to the Z-criterion and -1.39±0.15 SD, while in the control group it was 0.9380 ±0.02 g/cm2, and -0.19 ± 0.15 SD ($p<0.001$ and $p<0.001$).

In the main group, the BMD in the lumbar spine was 0.9719 ± 0.03 g/cm2 and -0.79 ± 0.14 SD, while in the control group it was 1.1069 ± 0.02 g/cm2 and -0.15 ± 0.11 SD, compared with the indicators – ($p < 0.001$ and $p<0.001$; Fig. 1).

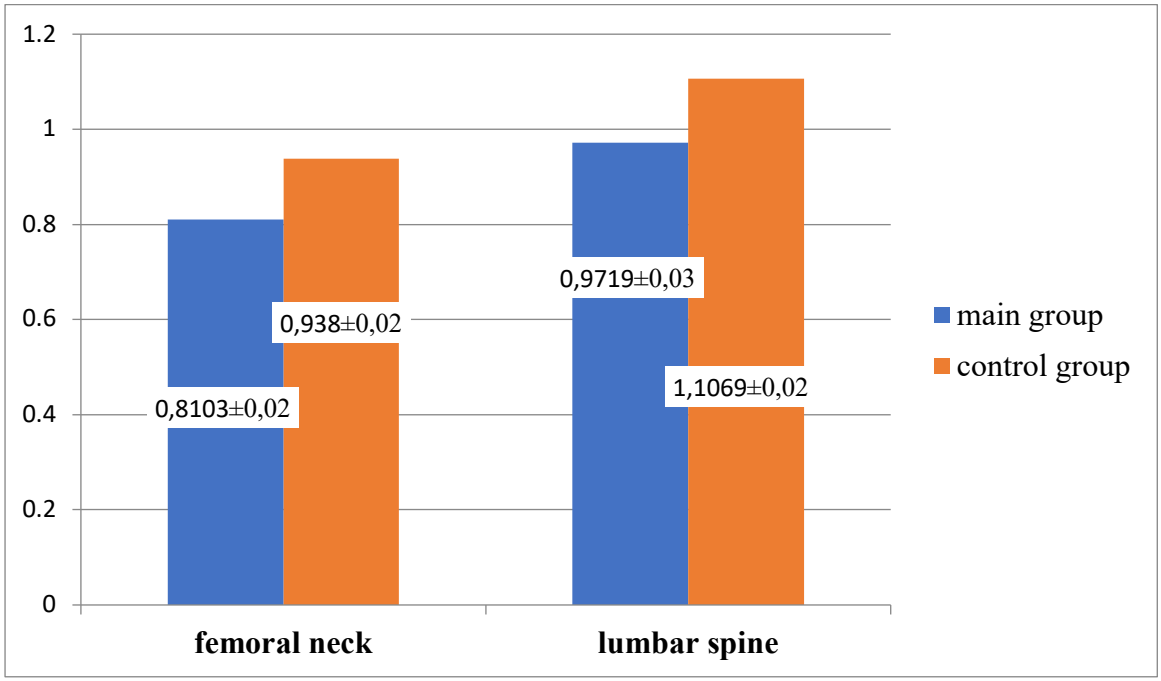
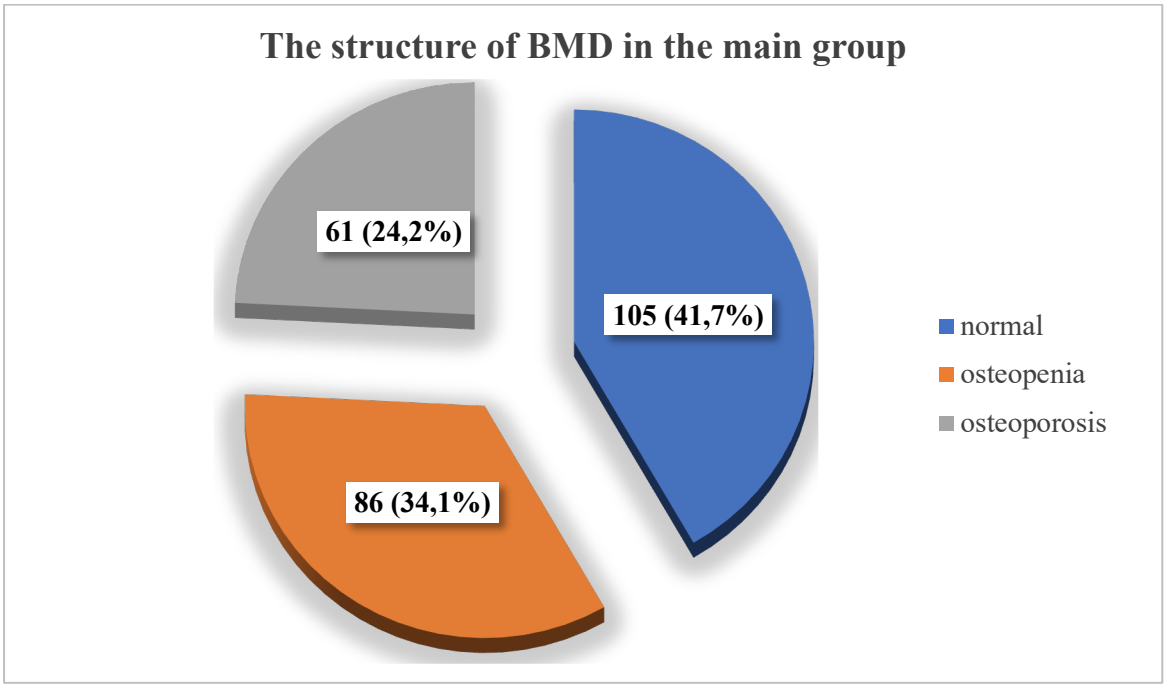


Fig 1. Average values of BMD (g/cm2) in patients with AxSpA

In the group of patients with AxSpA, normal indicators of BMD were found in 38.9% of cases, and in the control group - in 68.6% of cases. Osteopenic syndrome (OPe) in the main group was found in 147 (58.3%) patients: OPe – 61 (24.2%) and OP – 86 (34.1%) (Fig. 2). In the control group, OPS was detected in 22 (31.4%) of the participants in the study: OPe – in 17 (22.8%) and OP – in 6 (8.6%) cases (Fig. 2)



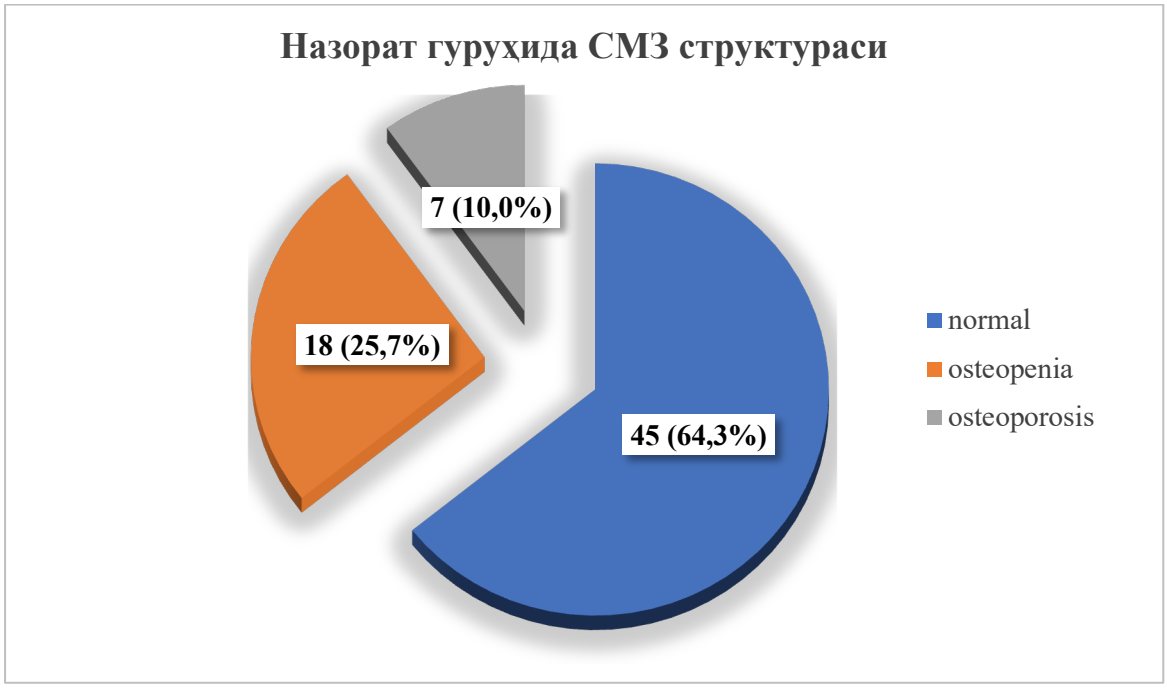


Fig 2. BMD indicators of the main and control groups

In the assessment of densitometric parameters, a significant decrease of BMD and Z-criterion of the femoral neck was found in all patients, regardless of the radiological stage of AS, compared to the control group.

When examining the indicators in the lumbar spine, BMD and Z-criteria in patients with X-ray stages II and III significantly decreased compared to the control group, while in stage IV, BMD and Z-criteria did not differ significantly from the indicators in the control group.

When densitometric parameters were compared according to X-ray stage in the group of patients, it was found that these parameters also increased depending on the development of X-ray changes in the lumbar spine (Fig. 3). No significant differences in densitometric parameters were obtained with increasing AS X-ray stage in the femoral neck.

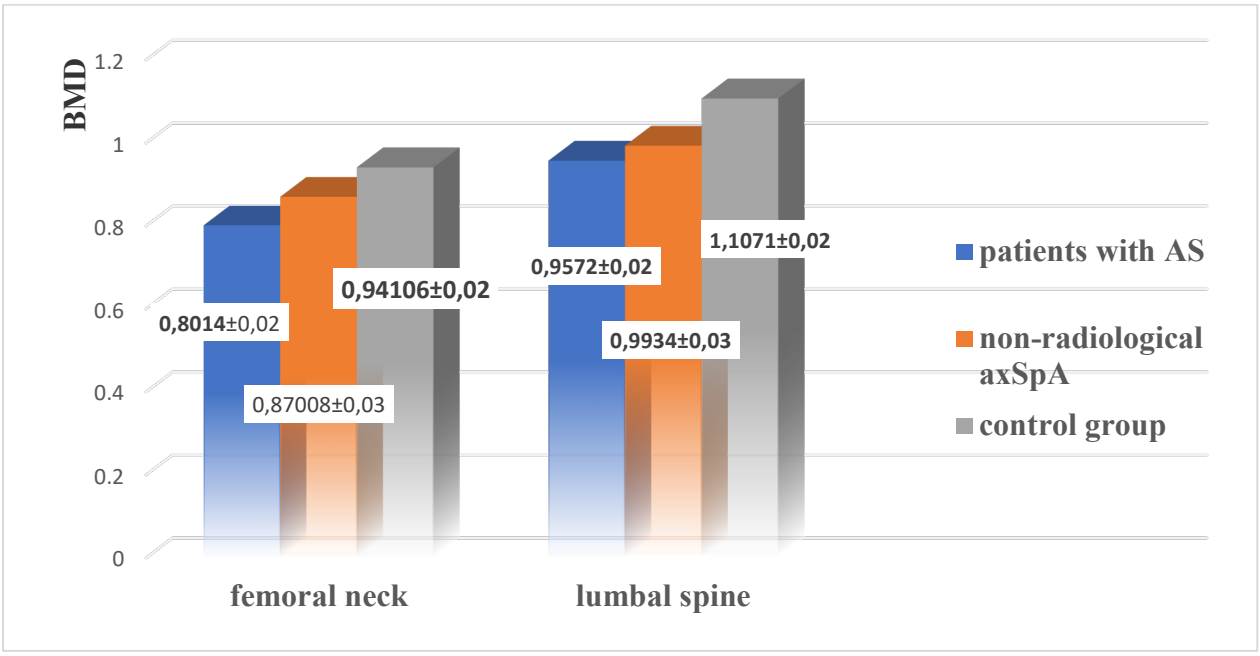


Fig 3. Change in BMD (g/cm2) depending on the AS X-ray stage

Thus, the lowest densitometric indicators in the lumbar spine were determined in the II radiological stage of AS and amounted to 0.8502 ± 0.03 g/cm2, the highest indicator in patients with the IV radiological stage of AS: 1.0191 ± 0.03 g/cm2 ($p<0.001$) or corresponding respectively - 1.58 ± 0.20 SD and -0.42 ± 0.17 SD ($p<0.001$).

In the neck of the femur, when these parameters were compared, the differences in the indicators were unreliable. Thus, in the II-radiological stage of AS, the lowest parameters in the neck of the femur were BMD 0.7802±0.03 g/cm2, and in the IV-radiological stage – 0.8408±0.02 g/cm2 ($p=0.071$), respectively -1.87±0.03 SD and -0.99±0.02 SD ($p=0.058$).

Debate. The results showed that BMD was significantly lower in both the femoral neck and the lumbar spine in patients with axSpA compared to the control group, which may be evidence that axSpA has a systemic negative effect on bone mass.

It was found that the level of BMD of the spine in patients with the late stage of AS is not significantly different from that of healthy people, which is consistent with the results of other studies [2, 5-7]. Thus, J.P. Devogelaer and commual. [6] In a radiological examination of 70 patients with AS, OP of the spine was detected in 69% of men and 50% of women, but in the assessment of bone density using two-photon absorptiometry in the same patients, the presence of a normal BMD in the lumbar region of the spine was noted in the late stage of AS. It was associated with two opposite processes - OP of vertebral bodies (confirmed by quantitative computed tomography (CT)) and ossification of paravertebral tissues.

E.S. Meirelles et al. [10] examined 30 Brazilian AS patients using two-photon absorptiometry and found OP and OPe in 50% of patients in the spine and 86% in the hip. The authors also noted that false growth of BMD in the spine in the late stage of the disease is associated with calcification and ossification of paravertebral tissues.

A. Sivri et al. [5] found a decrease in bone density in the spine and femoral neck in patients with stage II AS compared to patients with stage I, and a paradoxical increase in BMD in the lumbar spine in late stages (III and IV) of AS, which the authors explained by the formation of syndesmophytes between the vertebral bodies.

There is evidence of a significant decrease in bone mass in patients with AS already in the early stages of the disease [1]. In our study, BMD was found to be decreased in both the femoral neck and the lumbar spine in patients with early stage AS. This is consistent with the data of other authors, who conducted a similar study in which patients with early AS had a higher incidence of OP and OPe in the lumbar spine (46.5%) compared to the femoral neck (26.8%) [6].

U. Lange et al. [8] measured BMD in the lumbar spine using quantitative CT in 58 AS patients and found OP in 39.6% of both early and late AS patients.

Summary. Thus, the research results presented in the literature do not give the same idea about the extent to which the state of the BMD changes in different clinical forms of axSpA. The results of our study showed an increase in densitometric parameters in the lumbar spine with the development of X-ray changes in patients with axSpA.

References:

1. Alexandrova E.N., Novikov A.A. Laboratory biomarkers of ankylosing spondylitis. Scientific and practical rheumatology. 2017;55(1):96-103.
2. Pulatova Sh.B., Nabieva D.A. Evaluation of the clinical-pathogenetic significance of mineral metabolism disorders in patients with ankylosing spondyloarthritis. Journal of Biomedicine and Practice. 2022;7(5):104-116.
3. Cherentsova I.A., Otteva E.N. Features of the course of ankylosing spondylitis at different stages in men and women. Sovremennaya rheumatology. 2019;13(2):73–79.
4. Erdes Sh.F., Badokin V.V., Bochkova A.G. and others. Terminology of spondyloarthritis.

Scientific and practical rheumatology. 2015;53(6):657-60

5. Bay-Jensen AC, Karsdal MA, Vassiliadis E, et al. Circulating citrullinated vimentin fragments reflect disease burden in ankylosing spondylitis and have prognostic capacity for radiographic progression. Arthritis Rheum. 2013;65(4):972-80. doi: 10.1002/art.37843
6. Capaci K, Hepguler S, Argin M, Tas I. Bone mineral density in mild and advancedwith ankylosing spondylitis. Yonsei Med J. 2003;44(3):379–84.
7. Kilic G, Kilic E, Ozgocmen S. Is there any gender-specific difference in the cut-off values of ankylosing spondylitis disease activity score in patients with axial spondyloarthritis? Int J Rheum Dis. 2017 Sep; 20(9):1201-1211. doi: 10.1111/1756- 185X.12885. Epub 2016 Jun 16. 30.
8. Lange U, Kluge A, Strunk J. Ankylosing spondylitis and bone mineral density – what is the ideal tool for measurement. Rheumatol Int. 2005;26(2):115–20. Epub 2004 Nov 5
9. Lubrano E, Perrotta FM, Manara M, et al. The sex influence on response to tumor necrosis factor-alpha inhibitors and remission in axial spondyloarthritis. J Rheumatol. 2017 Nov 15. pii: jrheum.17666. doi: 10.3899/jrheum.17666.
10. Pulatova Sh., Nabiyeva D., Abduazizova N., Mukhammadiyeva S. Er al. Isayeva B. Clinical and pathogenetic values of disorders of mineral metabolism in ankylosing spondylitis // Philosophical Readings XIII.4. – 2022. – PP. 20-28.