

Incidence of Osteoporosis and the Risk of Fracture in Patients with Rheumatoid Arthritis Undergoing Corticosteroid Treatment

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Rheumatoid arthritis (RA) is the most widespread inflammatory rheumatic disease with about 10% of all rheumatic diseases and a global prevalence of about 1%. Through its features - joint proliferation, articular pain, articular cartilage degradation and bone erosion – RA has a destructive and disabling character and a major socio-economic impact. Osteoporosis is a bone system disease characterized by loss of bone mass and alteration of bone architecture, with consequences on bone fragility correlated with an increased fracture risk. With a major socio-economic impact, the World Health Organization (WHO) has declared osteoporosis as a public health problem, third on cardiovascular and oncological.

Key words: rheumatoid arthritis, osteoporosis, corticosteroids, bone mass reduction

Rheumatoid arthritis (RA) is an inflammatory disease characterized by joint destruction and which by its autoimmune character presents also a systemic affection with a strong impact on quality of life.

Recent years have brought many new ways to assess and treat RA and although studies show that early therapy of RA using a treat-to-target approach influence clinical outcomes significantly, RA remains an important disability disease that causes significant pain and joint destruction, in which patients have a mean reduction in life expectancy of between 5 and 10 years [1]. Furthermore, Ultrasound started to play an important role in the assessment of RA, being already widely accepted imaging technique in both clinical practice and in rheumatology research to assess joints and soft tissue [2].

Osteoporosis is defined as a bone cell deregulation, being characterized by a reduction of bone mass and bone tissue integrity, leading to bone fragility and decreased bone hardness. This loss of performance in bone cells leads to a higher risk of fractures, predominantly in the hip and spine [3].

Osteoporosis is a major public health problem. Its main clinical manifestation and complication are fragility fractures. The prevention of fragility fractures is the main goal of the osteoporosis treatment. For this, regular controls must be made, especially in people at risk of developing osteoporosis. If a fracture occurred, rapid and good quality healing (problematic in elderly patients with osteoporosis) is a very important desideratum [4]. In addition, the

incidence of hip fracture in women is almost two times (1.83) more frequent than in men, showing that femoral neck fractures due to osteoporosis are more frequent in women [5].

Bone mass loss in patients with RA is higher than in general population and is considered as a consequence of several favorable factors, including the activity and duration of the illness, physical disability and therapeutic scheme, involving high doses of corticosteroid therapy. Thus, RA patients are more prone to osteoporotic fractures, with a fracture risk almost double that of the general population [6].

Experimental part

The aim of the study

The aim of this study is to investigate the prevalence of osteoporosis and to evaluate the bone fracture risk in RA female patients receiving corticosteroids compared to a control group of female patients without RA

Material and methods

The conducted study was a prospective longitudinal study and included 62 female patients previously diagnosed with RA who received treatment with Prednisone <7.5mg / day ± Disease-modifying antirheumatic drugs (DMARDs) in the Medical Clinic of the Railway Clinical Hospital of Craiova from January 2017 to June 2018 and a control group consisting of 62 female patients comparable to age without RA.

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RA diagnosis was according to the 2010 American College of Rheumatology (ACR)/ European League Against Rheumatism (EULAR) classification criteria. Exclusion criteria were: untreated long-term hyperthyroidism, premature menopause (<45 years), clinical malnutrition, chronic kidney or liver disease.

The bone mineral density (BMD) assessment was performed at the time of inclusion in the study at 18 months after and was performed using dual beam X-ray osteodensitometry using the Digital 2D Densitometer LEXXOS SN 901-LX132. Bone mineral density was measured at L1-L4 vertebrae and femoral neck, and the results of T-score values were consistent with WHO criteria for diagnosing osteoporosis. During this time, all patients included in the study were treated with variable doses of corticosteroids $\pm$ DMARDs therapy, and in osteoporosis patients, antiresorbent therapy was given.

Also, for all the patients included in this study, demographic data were collected and blood samples were taken from which erythrocyte sedimentation rate (ESR), rheumatoid factor (RF), C-reactive protein (CRP), and anticyclic citrullinated peptide (anti-CCP) were tested.

Bone fracture risk was calculated for all the patients with femoral neck osteoporosis in both groups at the onset of the study and also after 18 months. For this, the Fracture Risk Assessment Tool (FRAX) Questionnaire was used.

The study was conducted according to the Declaration of Helsinki and local regulations. Ethical approval for the study was obtained from the local ethics committee and also, patients in both groups signed an informed consent.

Results and discussions

The conducted study show no statistically significant differences regarding the patients ages in both groups. The 62 patients diagnosed with RA included in the study were aged between 34-69 years old with an average age of 48.33 ± 8.29 ; as for the control group, patients were aged between 39-73 years old, with an average age of 49.43 ± 8.24 .

Regarding the residence area, there are no statistically significant differences between the two studied lots. Thus, we observed that in the group of patients diagnosed with RA 36 patients (58.06%) came from urban areas compared to 34 patients (54.83%) from the control group.

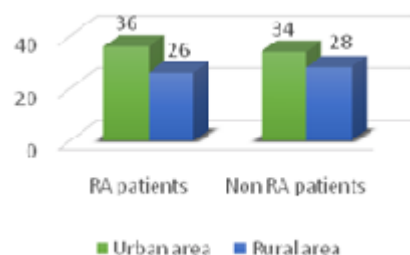


Fig. 1. Patients distribution according to residence area

The evaluation of BMD by osteodensitometry at the beginning of the study showed the following data: In the studied group, 32 patients (51.61%) had a T-score < -2.5, equivalent to the presence of osteoporosis, compared to only 13 patients (20.96%) from the control group ($p < 0.001$). In terms of osteopenia, the result showed its presence in 18 patients (29.03 %) in the study group compared to 19 patients (30.64%) in the control group (fig. 2).

The T-score evaluation reveals a lower mean T-score for patients diagnosed with RA (-2.082 ± 0.80154) compared to non RA patients (-1.424 ± 0.93) (table 1).

Analysis the osteoporosis localization of RA patients group at the onset of the study, reveals a higher incidence

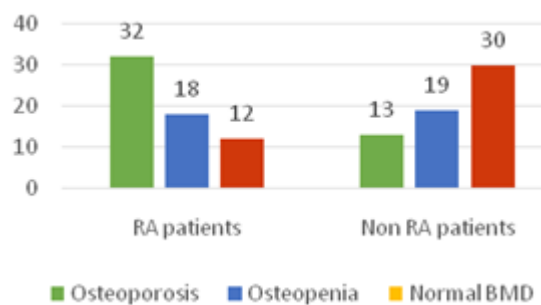


Fig. 2. Patients distribution on both groups based on BMD

Table 1
T-SCORE EVALUATION AT THE BEGINNING OF THE STUDY

	RA patients	Control
Min T- score	-3.1	-3.0
Max T-score	-0.7	-0.2
Mean T-score	-2.0726	-1.42
Standard Deviation	0.79	0.93
p	P<0.001 (p=0.00005)	

of osteoporosis in the lumbar spine (L1-L4) than in femoral neck. Thus, 20 patients (32.25%) had lumbar spine osteoporosis compared to 12 patients (19.35%) with femoral neck osteoporosis.

In comparison, for the control group, data were as follows: 8 patients (12.90%) had lumbar spine osteoporosis and 5 patients (8.06%) had femoral neck osteoporosis (fig. 3).

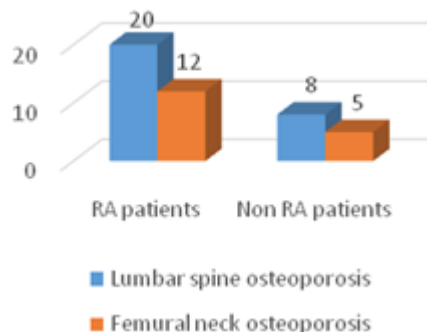


Fig. 3. Osteoporosis localization in both studied groups at the onset of the study

Table 2
T-SCORE ELEVATION IN RA PATIENTS ACCORDING TO OSTEOPOROSIS LOCALIZATION AT THE ONSET OF THE STUDY

	No. Of patients	Min T-score	Max T-score	Mean T-score	St. D.
Lumbar (L1-L4) spine osteoporosis	20	-3.1	-2.5	-2.77	0.178
Femoral neck osteoporosis	12	-3.0	-2.5	-2.741	0.162
P=0.656					

Table 3

T-SCORE ELEVATION IN NON RA PATIENTS ACCORDING TO OSTEOPOROSIS LOCALIZATION

	No. of patients	Min T-score	Max T-score	Mean T-score	St. D.
Lumbar (L1-L4) spine osteoporosis	8	-3.0	-2.5	-2.70	0.169
Femural neck osteoporosis	5	-2.9	-2.6	-2.74	0.114
<i>P=0.652</i>					

Table 4

T-SCORE EVALUATION AFTER 18 MONTHS

	RA patients	Control
Min T-score	-3.3	-3.1
Max T-score	-0.5	-0.2
Mean T-score	-2.37 ± 0.76	-1.72 ± 0.92
p	<i>P < 0.001 (p=0.000048)</i>	

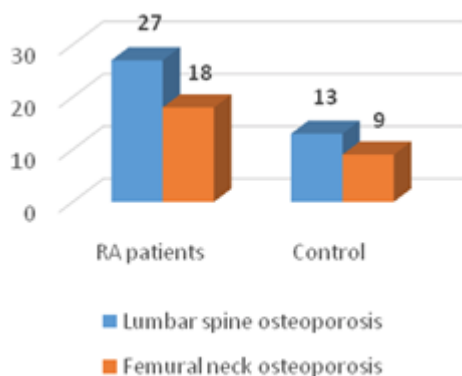


Fig. 4. Osteoporosis localization in both groups after 18 months

Regarding the T-score elevation, the conducted study showed no significant differences at the beginning of the study in the case of femoral neck osteoporosis compared to lumbar spine osteoporosis for both groups (table 2 and 3).

Patient evaluation at 18 months of inclusion showed an increased T-score both within the study group and in the control group (table 4).

Thus, the presence of osteoporosis at L1-L4 vertebrae was found in 27 patients (43.54%) of RA patients group compared to 13 patients (20.96%) in the control group. In case of femoral neck osteoporosis we found 18 patients (29.03%) in the group of patients with RA and 9 patients (14.51%) in the control group.

Regarding the T-score elevation after 18 months, we found no significant differences in the case of femoral neck osteoporosis compared to lumbar spine osteoporosis for both groups (table 5 and 6).

The assesment of bone fracture risk was calculated for both groups both at the onset of the study and at 18 months later.

At the beginning of the study the results showed a statistically significant difference ($p=0.031$; $p<0.05$) regarding a 10-year risk percentage of a major osteoporotic fracture between both groups. Also, we found a statistically significant difference ($p=0.0003$; $p<0.05$) for a 10-year risk percentage of a hip fracture in both groups (table 7).

Table 5

T-SCORE ELEVATION IN RA PATIENTS ACCORDING TO OSTEOPOROSIS LOCALIZATION AT 18 MONTHS

T-score elevation in RA patients according to osteoporosis localization at 18 months					
	No. of patients	Min T-score	Max T-score	Mean T-score	St. D.
Lumbar (L1-L4) spine osteoporosis	27	-3.3	-2.5	-2.766	0.406
Femural neck osteoporosis	18	-3.3	-2.5	-2.783	0.589
<i>P=0.811</i>					

Table 6

T-SCORE ELEVATION IN NON RA PATIENTS ACCORDING TO OSTEOPOROSIS LOCALIZATION AT 18 MONTHS

T-score elevation in control group according to osteoporosis localization at 18 months					
	No. of patients	Min T-score	Max T-score	Mean T-score	St. D.
Lumbar (L1-L4) spine osteoporosis	13	-3.1	-2.5	-2.73	0.184
Femural neck osteoporosis	8	-3	-2.5	-2.78	0.176
<i>P=0.468</i>					

Table 7

BONE FRACTURE RISK ASSESMENT WITHIN THE TWO GROUPS

THE ONSET OF THE STUDY	RA patients	Control group
Major osteoporotic fracture risk	21.00 ± 5.32	9.900 ± 3.09
<i>P < 0,05 (P=0,001)</i>		
Hip fracture risk	11.02 ± 3.19	4.920 ± 2.26
<i>P < 0.05 (p=0.002)</i>		

Table 8

BONE FRACTURE RISK ASSESMENT WITHIN THE TWO GROUPS AT THE END OF THE STUDY

AT THE END OF THE STUDY	RA patients	Control group
Major osteoporotic fracture risk	17.944 ± 4.13	11.044 ± 3.39
<i>P < 0.05 (P=0.000218)</i>		
Hip fracture risk	9.538 ± 2.62	4.200 ± 2.51
<i>P < 0.05 (p=0.000032)</i>		

At the end of the study, the bone fracture risk was evaluated for both groups. Thus, the conducted study shows a statistically significant difference ($p=0.033$; $p<0.05$) regarding a 10-year risk percentage of a major osteoporotic fracture for a 10-year risk percentage of a hip fracture ($p=0.024$; $p<0.05$) between both groups.

Conclusions

The conducted study found a higher incidence of osteoporosis and risk of fractures in RA patients compared to healthy individuals.

Rheumatoid arthritis continues to be a major public health problem worldwide especially due to its deforming development with a destructive character and a major socio-economic impact.

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