

The radiological, osteodesitometrical and inflammatory parameters aspects in experimentally induced chronic arthritis

Mihaiela Chicu¹, Oana Ciureanu¹, Gabriela Dogaru²

1. University of Medicine and Pharmacy "Gr. T. Popa" Iasi

2. University of Medicine and Pharmacy "Iuliu Hatieganu" Cluj Napoca
Clinical Rehabilitation Hospital Cluj-Napoca

ABSTRACT

Introduction. Chronic inflammatory rheumatic diseases currently comprise over 250 diseases mainly affecting young people and are accompanied by a high degree of physical and mental disabilities. Despite numerous attempts to identify the etiology, they still remain unknown. They were incriminated many factors: genetic, environmental, endocrinological, infectious - without specifying exactly what agent could trigger the disease. In the evolution of joint destruction were highlighted three stages: inflammatory synovitis, osteochondral destruction and fibrosis. **Methods:** Based on these preliminary data, the paper has proposed to make an experimental model of chronic arthritis in laboratory animals - rats Wistar, young and adults - and determine the dynamic evolution of radiographic, osteodensitometry and inflammatory parameters. **Results.** Young animals have presented higher radiological scores compare with the adultes; parameters of bone densitometry (T-score and Z, DEXA, BMD) at the beginning and at the end of the experiment indicated a higher level of bone destruction in group of young animals compared to the adult, while inflammatory parameters (fibrinogen, cervuloplasmina, uric acid) were equal for both groups of animals. **Conclusions.** Osteodensitometrical, radiological and laboratory parameters constitute the basic indicators in assessing inflammatory diseases, highlighting the intensity of the distructive osteo-articular phenomena.

Keywords: arthritis, DEXA, RX.

Introduction

Radiological parameters (radiological scores Sharp, Van der Heyde, Larsen) used in the quantitative assessment of bone and cartilage destruction in RA were adapted to an experimental model of arthritis in laboratory animals - being used rats of the Wistar, young and adult female, considering that inflammatory diseases mainly affects female subjects and have a more severe evolution in young compared to adult patients.

Osteodensitometry parameters: DEXA, respective T and Z scores, BMD (Bone Mineral Density) they also can identify the changes in bone mineral density, bone loss being correlated with the local synovitis.

Inflammatory parameters were determined in the dynamic throughout the experiment.

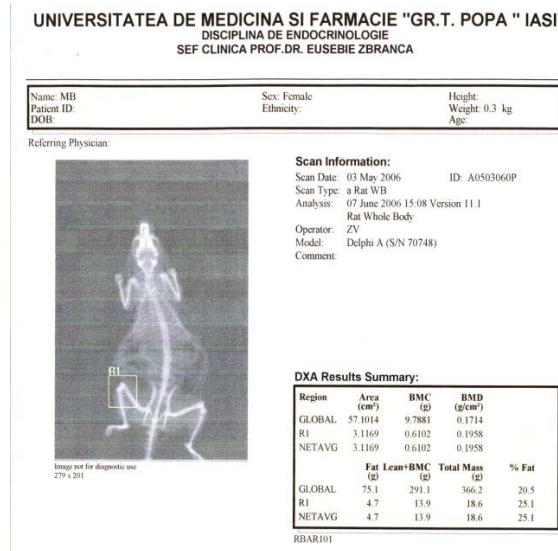
Material and method. The experimental study was conducted over a period of eight weeks, on Wistar rats young and adult female, which was induced arthritis by injecting tibial-femoral joint with 1% carrageenan, 0.02 ml, 3 times/week. The animals received standard food and were properly hydrated. During the experiment, the fibrinogen, cervuloplasmin and uric acid levels were determined in the dynamic. Radiological examination was conducted in Semiologically and Radiology Clinic (leader prof. dr. Vasile Vulpe) of University of Agricultural Sciences and Veterinary Medicine "Ion Ionescu de la Brad" Iasi, and the bone densitometry at the Endocrinology Clinic

of University Hospital „St. Spiridon” Iasi - using Helicon 100 (made in USA).

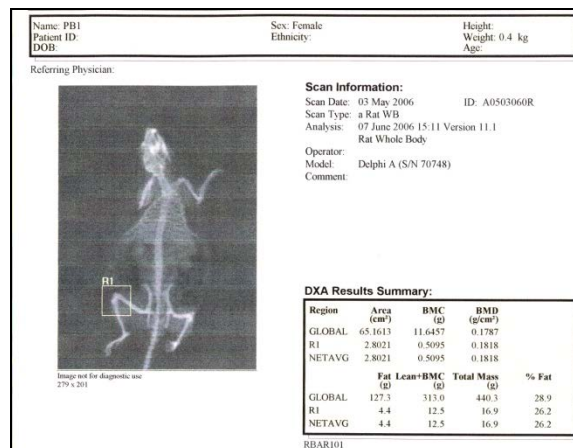
Results. Regarding on Larsen radiological scores valid to human (0 to 5), we have tried to develop similar scores in

laboratory animals as follows: score 0 - normal aspect of the tibial-femoral joint; score 1 - 25% destruction; score 2 - 50% destruction; score 3 - stiffen marrow.

Bone densitometry examination



Young rat witness



Adult rat with arthritis (may investigation)

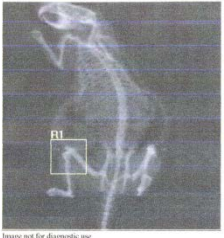
Name: PB1 Patient ID: DOB:	Sex: Female Ethnicity:	Height: Weight: 0.4 kg Age:		
Referring Physician:				
	Scan Information:			
	Scan Date: 10 July 2006 ID: A0710060H Scan Type: a Rat WB Analysis: 15 August 2006 14:56 Version 11.1 Rat Whole Body Operator: ZV Model: Delphi A (S/N 70748) Comment:			
DXA Results Summary:				
Region	Area (cm²)	BMC (g)	BMD (g/cm³)	
GLOBAL	62.8945	12.0087	0.1909	
R1	3.3583	0.6988	0.2081	
NETAVG	3.3583	0.6988	0.2081	
	Fat (g)	Lean+BMC (g)	Total Mass (g)	% Fat
GLOBAL	114.5	344.5	459.1	25.0
R1	7.6	18.3	25.9	29.4
NETAVG	7.6	18.3	25.9	29.4

Image not for diagnostic use
279 x 148

RBAR101

Adult rat with arthritis (july investigation)

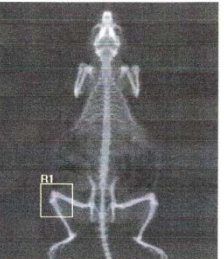
Name: PB2 Patient ID: DOB:	Sex: Female Ethnicity:	Height: Weight: 0.3 kg Age:		
Referring Physician:				
	Scan Information:			
	Scan Date: 03 May 2006 ID: A0503060L Scan Type: a Rat WB Analysis: 07 June 2006 15:14 Version 11.1 Rat Whole Body Operator: ZV Model: Delphi A (S/N 70748) Comment:			
DXA Results Summary:				
Region	Area (cm²)	BMC (g)	BMD (g/cm³)	
GLOBAL	59.0219	10.0623	0.1705	
R1	3.1274	0.5617	0.1796	
NETAVG	3.1274	0.5617	0.1796	
	Fat (g)	Lean+BMC (g)	Total Mass (g)	% Fat
GLOBAL	91.5	293.3	384.8	23.8
R1	3.3	12.2	15.5	21.4
NETAVG	3.3	12.2	15.5	21.4

Image not for diagnostic use
279 x 167

RBAR101

Young rat with arthritis (may investigation)

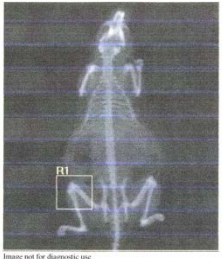
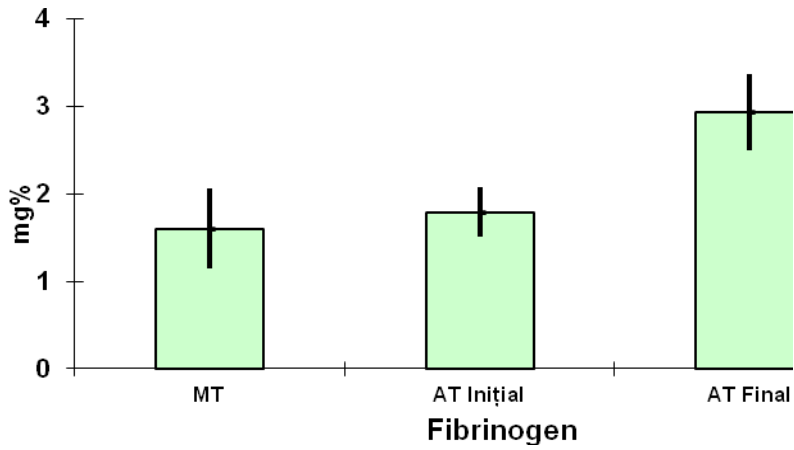
Name: PB2 Patient ID: DOB:	Sex: Female Ethnicity:	Height: Weight: 0.3 kg Age:		
Referring Physician:				
	Scan Information:			
	Scan Date: 10 July 2006 ID: A0710060I Scan Type: a Rat WB Analysis: 15 August 2006 14:53 Version 11.1 Rat Whole Body Operator: ZV Model: Delphi A (S/N 70748) Comment:			
DXA Results Summary:				
Region	Area (cm²)	BMC (g)	BMD (g/cm³)	
GLOBAL	56.1044	9.9883	0.1780	
R1	3.3373	0.6917	0.2073	
NETAVG	3.3373	0.6917	0.2073	
	Fat (g)	Lean+BMC (g)	Total Mass (g)	% Fat
GLOBAL	49.6	307.5	357.2	13.9
R1	4.2	17.1	21.3	19.7
NETAVG	4.2	17.1	21.3	19.7

Image not for diagnostic use
279 x 164

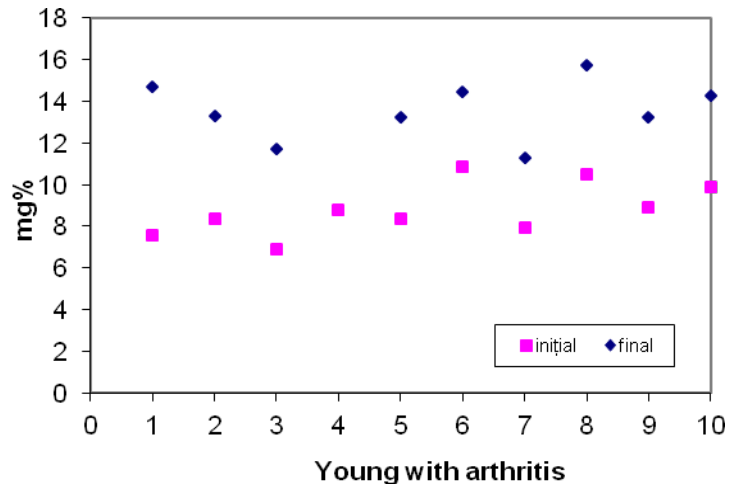
RBAR101

Young rat with arthritis (july investigation)

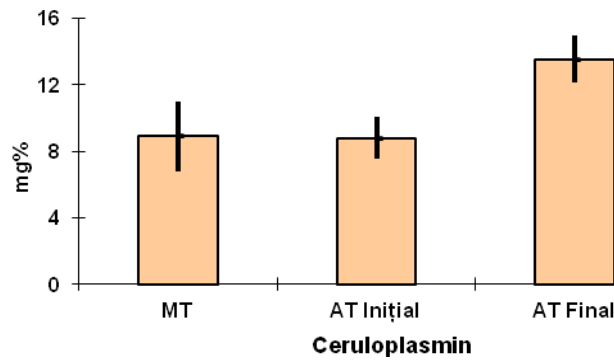
Inflammatory parameters in young animals



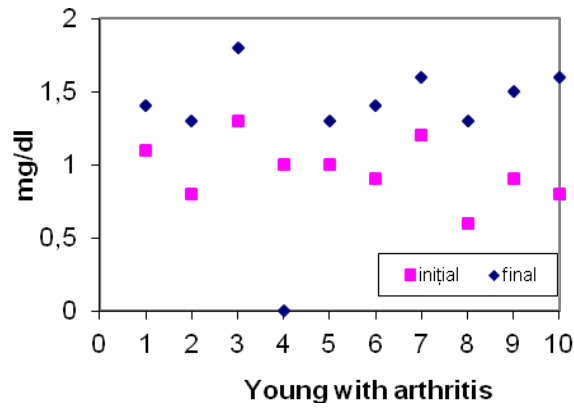
Average values of fibrinogen in young rats group with arthritis comparing to witness group



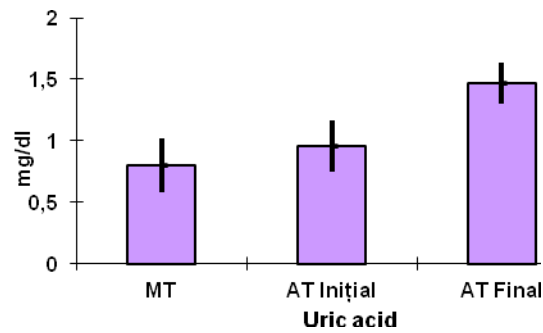
Ceruloplasmin levels variation in young rats group with arthritis



The average values of ceruloplasmin in young rats group with arthritis comparing to witness group

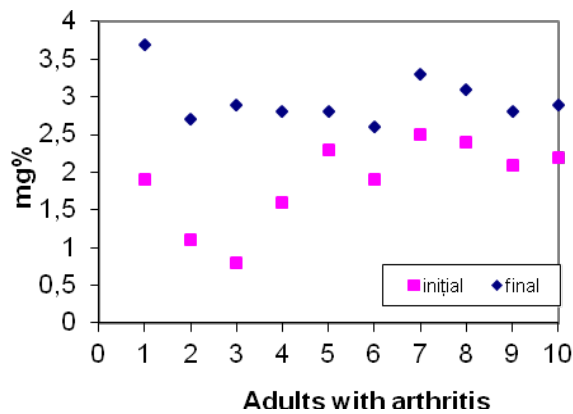


The variation of uric acid levels in young rats group with arthritis

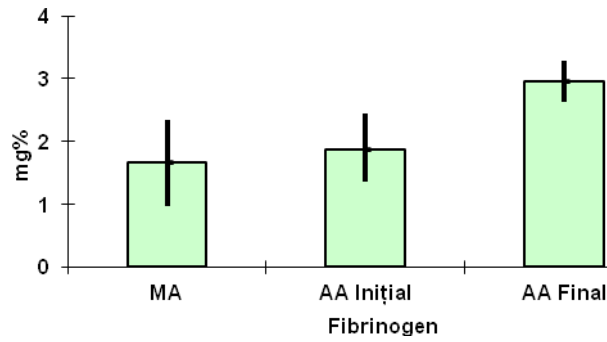


Average values of uric acid in young rats group comparing to witness group

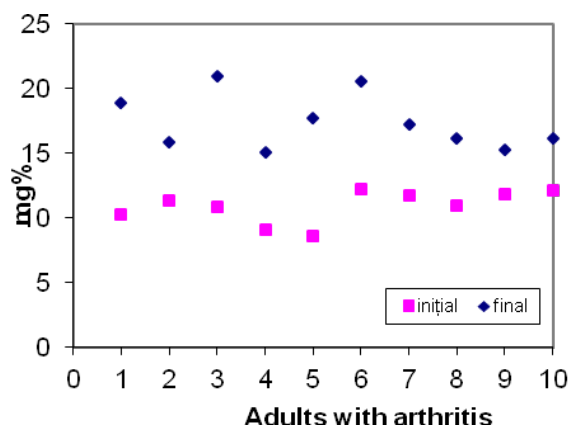
Inflammatory parameters in adult animals



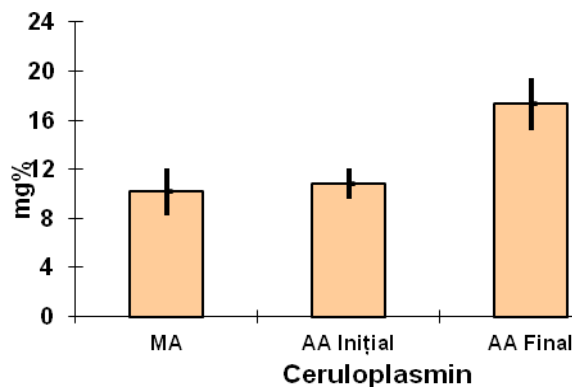
The variation of fibrinogen levels in adults rats group with arthritis



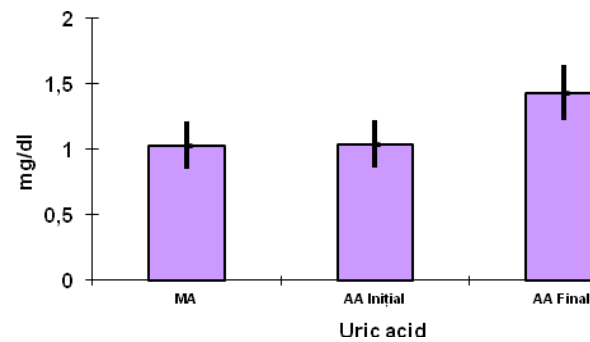
Average values of fibrinogen in adults tars group comparing to witness group



The variation of ceruloplasmin levels in adults rats group with arthritis



The average ceruoplasmin values in adults rats group with arthritis comparing to witness group



Average uric acid values in adults rats group comparing to witness group

Conclusions. Intensity of bones and cartilage destruction phenomena was higher in the young animals compared to adult ones, thus confirming the data presented in the literature.

Bibliography

Kellgren JH, Lawrence JS: Radiological assessment of rheumatoid arthritis. *Ann. Rheum Dis* 1997, 16:485-493;

Larsen A, Dale K, Eek M: Radiographic evaluation of rheumatoid arthritis and related conditions by standard reference films. *Acta Radiol Diag* 1977, 18:481-491;

Lassere M, Houssein D, Scott D, Edmonds J: Reference curves of radiographic damage in patients with rheumatoid arthritis: application of quantile regression and fractional polynomials. *J rheumatol* 1977, 24:1288-94;

Lewis EJ, Sedgwick AD, Hanahoe THP: Automatic quantification of rat plasma acute phase protein levels reactants in experimental inflammation. *J. Pharmacol Methods* 1989; 21:183-94.