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Study of serum calcium/ phosphorus in rheumatoid arthritis patients

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Abstract

Background: Rheumatoid arthritis is chronic multisystem disease of unknown etiology. Although there is variety of systemic manifestations, the characteristic feature of RA is persistent inflammatory synovitis, usually involving the peripheral joints in a systemic distribution. The potential of synovial inflammation to cause the cartilage damage and bone erosions and subsequent changes in the joints integrity is the hallmark of the diseases.

Objectives: To estimate the serum Calcium / Phosphorus ratio in Rheumatoid Arthritis patients.

Methods: 50 RA patients who were fulfilling the ARA-1987 revised criteria as cases and 50 age and sex matched apparently healthy persons as controls included in this study.

Results: The estimated serum Calcium / Phosphorus ratio in cases is **1.51± 0.35** as compared to control **2.85± 0.5**.

Conclusion: The decrease in serum calcium / phosphorus ratio indicated that, calcium and phosphorus metabolism is altered in RA.

Keywords: Rheumatoid Arthritis, Calcium, Phosphorus.

Introduction

Rheumatoid arthritis (RA) is a chronic systemic inflammatory disorder that may affect many tissues and organs – skin, blood vessels, heart, lungs and muscles but principally attacks the joints, producing a non-suppurative proliferative and inflammatory synovitis that often progresses to arthritis and ankylosis of the joint.[(2)] It affects approximately 1-2% of general population.[(1)]

Pathogenesis of RA is unknown. At present some of the hypotheses of pathogenesis of RA include: a) The autoimmune reactions b) Mediators of tissue injury c) Genetic susceptibility d) Triggering antigens.[(2)]

Bone contains both organic and inorganic material. The organic matter is mainly protein; the inorganic or mineral component is mainly crystalline hydroxyapatite $\{Ca_{10}(PO_4)_6(OH)_2\}$. Approximately of body's 99% Calcium and 85% Phosphorus are present in bone.[(3,4)]

The exact reason behind bone erosion and joint deformities is not fully understood. There is continuing interest in the metabolic changes occurring in RA. With these basics this study was undertaken to estimate the serum Calcium /Phosphorus ratio in Ra patients.

Materials and Methods

Fifty subjects who were fulfilling the American Rheumatism Association, 1987 revised criteria (ARA 1987 criteria)[(14)] for classification of Rheumatoid Arthritis as cases and fifty age and sex matched controls included in this study. The study was done in Bapuji Hospital and Chigateri Hospital, Davangere (both Hospitals were attached to teaching institute, JJM Medical College, Davangere), also from general population. This study was approved by ethical and research committee of JJM Medical College. Informed consent was given by all subjects. Study was conducted from April 2010 to April 2011.

Exclusion Criteria: Osteoarthritis, tubercular arthritis, arthritis other than RA fitting into any syndromes, any other chronic systemic disorders like cardiovascular disorders, diabetes mellitus, liver diseases and kidney diseases. **Collection of blood samples:** About five ml of venous blood from all the subjects was collected aseptically from anti-cubital vein; serum was separated immediately by centrifuging at 3,000 rpm for 10 minutes and kept at 4^0C until analysis was carried out. The serum calcium was estimated by Ortho-Cresolphthalein Complexone (OCC) method[(15,16)] and serum inorganic phosphorus by Ammonium Molybdate method[(17,18)] respectively.

Results

Table 1: Age and sex-wise distribution of controls and RA patients

		Controls (n = 50) Mean ± SD	Cases (n = 50) Mean ± SD
Age (yrs)		41.9 ± 13.6	46.2 ± 13.3
Gender	Male	18	14
	Female	32	36

Table 2: Serum levels of Calcium, Phosphorus & Calcium /Phosphorus ratio in patients with RA and healthy controls

	N	Calcium (mg/dl)	Phosphorus (mg/dl)	Calcium/ Phosphorus
Controls	50	9.97 ± 0.91	3.57 ± 0.53	2.85 ± 0.50
Cases	50	7.67 ± 0.96	5.39 ± 1.05	1.51 ± 0.35
Mean difference		2.30	1.82	1.34
t-value*		12.35	10.93	15.45
p-level		< 0.001, HS	< 0.001, HS	< 0.001, HS

*Unpaired t-test

p<0.001=HS (Highly significant), p>0.05=NS (Not significant)

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Serum levels of calcium and calcium / phosphorus ratio were decreased and phosphorous levels were increased statistically which were highly significant (p<0.001) in patients with RA as compared to healthy controls.

Discussions

The statistical analysis by unpaired t test shows that the levels of serum calcium and calcium/phosphorus ratio were decreased and phosphorus levels were increased statistically, which were highly significant (p<0.0001). In RA patients as compared to healthy controls. These results are in accordance with several other studies.[5,6,7,8,9]

Low calcium may be due to prolonged inadequate calcium intake and accelerated osteoporosis. RA patients are vulnerable to steroid induced and disease associated osteoporosis. The high salt intake in our population may exacerbate calcium deficiency. At the proximal tubule, were sodium and calcium absorbs option are linked. Although not specifically studied, many disabled people rely heavily on pre-packed food and meals, much of which is high in sodium.[10]

RA is associated with collection of chronic inflammatory cells occurring adjacent to bone with subsequent bone destruction. It is possible that generated oxygen derived free radicals may be important in bone resorption.[11]

There may reduced calcium absorption in RA due to primary malabsorption process,[12] prolonged inadequate intake,[10] effects of drugs on calcium metabolism,[8] decreases mean total body calcium levels in RA patients who did not received corticosteroid drug strongly suggests that this is an integral feature of RA.[5,13]

Hypertrophy and hyperplasia creates hypoxic environment in synovial joints. This hypoxia may cause ATP degradation resulting in release of inorganic phosphorus from cells. It is corroborated by the reports of low glucose and high lactate levels in synovial joints of RA patients. This acidosis will promote shifts of phosphate from the intracellular to extra cellular pool.[5]

We conclude that in patients serum levels of calcium and calcium/phosphorus decreased and further studies on dietary management of calcium and phosphorus are needed.

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