Original article:

Serum alkaline phosphatase activity & serum calcium levels: an assessment tool for disease activity in rheumatoid arthritis

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Abstract

Introduction-Rheumatoid arthritis is a chronic inflammatory disease due to an autoimmune disturbance in the body. Alkaline phosphatise is an enzyme with multisystem existence as its various isoenzymes are found in dif-ferent tissues of the body.

Aim-The aim of our study was to observe the activity of alkaline phosphatase in serum in patients with rheum-atoid arthritis & compare them with healthy controls to determine if any deviation exists from its normal active-ity.

Method-A total of 30 patients (15 male &15 female) who were established cases of rheumatoid arthritis atten-ding the immunology OPD at IMS & SUM Hospital were included in the study.30 age & sex matched healthy controls were also recruited. Serum of the patients and controls were assayed for alkaline phosphatase levels and calcium levels.

Result-Our study revealed a grossly elevated alkaline phosphatase & diminished serum calcium levels in rheu-matoid arthritis patients.

Conclusion-Thus serum alkaline phosphatase activity twinned with serum calcium levels might serve as an ine-xpensive biomarker for assessing the disease severity in rheumatoid arthritis.

Keywords-Alkaline Phosphatase,Rheumatoid arthritis,Serum Calcium,Biomarker.

Introduction

Rheumatoid arthritis is an autoimmune disease characterised by chronic inflammatory response with prolifera-tion of synovial tissue & destruction of articular cartilage.[1] Rheumatoid arthritis is known to affect about 1% of the entire world population & 0.75% of the adult Indian population.[2] Early diagnosis is the key to successful treatment in rheumatoid arthritis but an early diagnosis is often difficult owing to the non specific early manife-stations of the disease which include malaise,low grade fever,muscle soarness,weakness etc.[3]Diagnosis is chiefl-y based on clinical symptomatology , radiological findings & presence of rheumatoid factor in serum.[4] Rheuma-toid arthritis is characterised mainly by nonspecific inflammation of joints,articular destruction,morning stiffen-ss & joint deformities.[4] The classification of rheumatoid arthritis is based on ACR-EULAR 2010 criteria.[5] Oste-oblasts & cells of kidney ,liver & placenta have been found to contain alkaline phosphatase.Its function although is not clearly known but it is believed that it has some role in mineralisation of bone & osteoid formation. Insp-ite of the variability in location of alkaline phosphatase in the body,it is found that half of the total alkaline pho-sphatase in serum is derived from bone[6].A cross reactivity of about 20 % between bone & liver isoenzymes is a-lthough observed.[7] In this study of ours we therefore proposed to observe two cardinal markers of bone forma-tion namely alkaline phosphatase and

calcium levels in serum of patients with rheumatoid arthritis for any deviations from their normal levels.

Aim & objectives

We intend to monitor the alkaline phosphatase activity & serum calcium levels in patients with rheumatoid arthritis & report if any significant variations exist in comparison with the healthy controls.

Materials & methods

The study was conducted conjointly at IMS & SUM Hospital,Bhubaneswar & Hitech Medical College & Hos-pital,Bhubaneswar. A total of 30 patients(15 males & 15 females) were recruited for the study who were estab-lished cases of rheumatoid arthritis & were attending the immunology OPD at IMS & SUM Hospital for cons-ultation.Patients with rheumatoid arthritis who had concomitant history of liver disease & diabetes mellitus were excluded from the study .30 age & sex matched healthy controls were recruited from the subjects who presented at the general medicine OPD at IMS & SUM Hospital for routine health checkup.The entire process of the study was explained to the patients & the healthy controls in their local language & a written consent from each patie-nt & control was obtained.5ml of blood was withdrawn in fasting state from each patient & control subject with full aseptic precautions.The blood samples were collected in sterile vacutainers.The samples were subjected to test at the biochemistry central laboratory at Hitech Medical College & Hospital,Bhubaneswar.The sample coll-ected from each patient & control was centrifuged at 2000 rpm to obtain serum.The serum was assayed for alk-aline phosphatase activity & serum calcium levels using commercially available kits in autoanalysers.Data was tabulated using Microsoft Excel 2007 & was analysed using "Statistical Package For Social Sciences-v17.0".Pearson correlation coefficient was used to investigate the existence of correlation if any in the data. "p value"<0.05 was considered statistically significant.The study was presented before the institutional ethical committee at IMS & SUM Hospital which follows the Helsinki guidelines of human research & an ethical clearance was obtained.The study is completely self funded by the authors & the authors hereby declare no conflicts of interest.

Results

Our study has revealed a gross elevation in alkaline phosphatase activity in serum of patients with rheumatoid arthritis as compared to the healthy controls($p<0.001$).Females exhibited more elevation in alkaline phosphatase as compared to the male patients($p<0.001$).Serum calcium levels were also found to be diminished in the rheum-atoid arthritis patients as compared to the healthy controls(Table 1).

Discussion

Our study was conducted over 30 clinically proved cases of rheumatoid arthritis on the basis of they being tested positive for rheumatoid factor in serum & extent of wrist joint & other small joint involvement.We found that alkaline phosphatase levels were significantly elevated in the patients as compared to the healthy controls with women exhibiting a even larger elevation as compared to their male counterparts.These findings of us are in agreement with findings reported by Vaithialingam etal[8].The elevation of alkaline phosphatase in rheumatoid arthritis patients is probably due to degenerative changes in the wrist joint & other small joints leading to auto-immune erosive changes in bone.A compensatory mechanism in turn comes into action to restore the destroyed bone in the joints leading to proliferation of osteoblasts & hence the elevated alkaline phosphatase activity. Rheumatoid arthritis provides an ideal platform for osteoporosis to set in as the already eroded bone

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becomes brittle as a consequence of the autoimmune destruction making the patient more susceptible to fractures[9] .Circulating pro inflammatory molecules & hormones that alter calcium metabolism contribute to the dimin-ished calcium status[10].This is even worsened in case of a concomitant vitamin D deficiency.

Conclusion

Our study has revealed that alkaline phosphatase is markedly elevated & serum calcium level is decreased in rheumatoid arthritis .The elevation in alkaline phosphatase is explained by a compensatory bone regeneration mechanism in an effort to restore the eroded bones in joints[11].Hence more severe the erosion the greater is the osteoblastic proliferation & bone formation activity [11].This explains the rise of alkaline phosphatase with seve-rity of the disease process.This phenomenon might be exploited to assess the severity of the disease process. Thu-s estimation of alkaline phosphatase activity alongwith serum calcium levels might serve as an inexpensive pr-ognostic biomarker for rheumatoid arthritis.

Parameters	Patients(n=30)		Controls(n=30)		p-value
	Males	Females	Males	Females	
Serum Alkaline Phosphatase	179.57±16.85	186.35±15.83	150.84±7.10	153.92±7.25	p<0.001
Serum Calcium	8.13±0.75	8.10±0.78	8.23±0.89	8.01±0.91	p<0.001

Table 1: Serum Alkaline Phosphatase & Serum Calcium level in patients & controls expressed as MEAN±SD.

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