Rise in plasma alkaline phosphatase at the menopause

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Summary

1. Plasma alkaline phosphatase activity and urine hydroxyproline excretion were measured in age-matched premenopausal and postmenopausal women.

2. Both measurements were found to be significantly higher in postmenopausal women.

3. It is proposed that the rise in the plasma alkaline phosphatase, like that in the hydroxyproline excretion, may reflect the onset of bone loss that occurs after the menopause.

Key words: alkaline phosphatase, hydroxyproline, menopause, osteoporosis.

Introduction

It is well established that loss of bone starts at the time of the menopause, that it is associated with an elevation of the fasting plasma and urinary calcium and urinary hydroxyproline (Gallagher & Nordin, 1973) and that it can be attributed in part at least to an increase in bone resorption. Many variables have been used to monitor the onset and progression of postmenopausal bone loss, but little if any attention appears to have been paid to the plasma alkaline phosphatase in this connection. We have recently noticed that the plasma alkaline phosphatase tends to fall on oestrogen therapy and we have, therefore, examined our data to establish whether the alkaline phosphatase activity rises at the menopause. We now record that this is in fact the case.

We report plasma alkaline phosphatase activities in 27 pairs of pre- and post-menopausal women matched for age. All patients were referred to our Menopause Clinic, the postmenopausal patients because of typical menopausal complaints and the premenopausal patients because of symptoms thought to be related to the menstrual cycle. Most of the latter suffered from premenstrual tension and all were menstruating regularly. Patients with clear hormonal abnormalities were excluded, as were patients with known incidental disease. All samples were collected in the fasting state. The data presented are the means of two observations on untreated cases.

The method of Kind & King (1954) was used to determine the plasma alkaline phosphatase activities.

Urine samples were obtained from every patient at the same time as the blood sample and analysed for hydroxyproline and creatinine by standard Auto-Analyzer methods (Hodgkinson & Knowles, 1976). The results presented are the hydroxyproline/creatinine ratios (in molar units) and are also the means of two separate observations. The serum glutamic-oxaloacetic transaminase activity and bilirubin concentration were measured in the same plasma samples by Auto-Analyzer methods.

Results

The mean plasma alkaline phosphatase in the premenopausal women was 5.6 ± 2.1 (se) and 8.1 ± 2.3 King Armstrong units in the postmenopausal women. This difference was significant (P < 0.01) on the paired t-test. The mean urinary hydroxyproline/creatinine ratio in the premeno-
Premenopausal Postmenopausal

Fig. 1. Plasma alkaline phosphatase activity and urinary hydroxyproline/creatinine ratios in pre-
menopausal and postmenopausal women.

pausal women was 0.009 ± 0.0027 and in the post-
menopausal women 0.0146 ± 0.0047. This dif-
ference was highly significant ($P < 0.001$) (see Fig.
1). A small but non-significant rise in the serum
glutamic-oxaloacetic transaminase activity was
noted (15.4 i.u./l in the premenopausal and 17.6
i.u./l in the postmenopausal) but there was no
difference in bilirubin concentrations (11.7 and
10.6 μmol/l respectively). The normal ranges are
8–22 i.u./l for serum glutamic-oxaloacetic trans-
aminase and 3–15 μmol/l for bilirubin.

Discussion

Since the two groups of subjects were matched for
age, age as such cannot explain the rise in alkaline
phosphatase we have observed. It is therefore likely
to be a menopausal effect and is compatible with the
observation, which we will be reporting else-
where, that plasma alkaline phosphatase activity
falls on oestrogen therapy. The fact that it is
associated with a rise in urinary hydroxyproline
strongly suggests that it is the bone phosphatase
activity which rises at the menopause, and it is
possible that the actual level (like that of the
urinary hydroxyproline/creatinine ratio) reflects the
rate of bone loss. This possibility is presently under
examination.

It seems unlikely that the observation we report
here is attributable to altered liver function but this
possibility cannot be entirely excluded.

Acknowledgment

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serum glutamic-oxaloacetic transaminase activity
and bilirubin concentration.

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