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SERUM CALCIUM IN ORTHOPAEDIC PATIENTS

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Boström & Wengle (1969) demonstrated the value of serum calcium as a screening test in internal medicine. In 509 female patients they found 3 cases of hypocalcemia and 4 cases of hypercalcemia to whom the result of the screening test had been of importance for the final diagnosis and treatment. Keating et al. (1969) found that in healthy adults the serum calcium decreased with age in men but not in women. Conversely, Roberts (1967) found such an age relationship in women but not in men.

The object of the present study was to investigate the value of serum calcium as a screening test in orthopaedics and to study the age and sex relationships of serum calcium in orthopaedic patients.

MATERIAL AND METHODS

Half of the cases in the Department of Orthopaedic Surgery, General Hospital, Malmö are admitted for reconstructive surgery whereas the remainder are admitted because of trauma. Very few have long-standing severe disability such as chronic tuberculosis of the spine, polio, or paraplegia. During the time of the study rheumatoid arthritis only occupied a small part of the hospital beds.

Serum calcium and serum protein were among the laboratory investigations routinely performed at the time of admission during the years 1965-1969. These values were determined by the flame-photometry-method and the method for estimation of total protein according to Biuret, respectively. The precision of both methods was less than 3 per cent (coefficient of variation).

Four hundred and one patients, 213 men and 189 women, were randomly selected from the record room. The only patients excluded from the study were those with cancer metastases to the skeleton. Only a few of the individuals in the sample had been unable to walk prior to admission or prior to the accident causing admission. The records were studied for the final diagnosis of the patient and its possible relationship to the serum calcium value obtained at the time of admission. Age, serum protein, and serum calcium were correlated and compared between men and women.

Probability levels better than 99 per cent have been referred to as significant.

RESULTS

The serum calcium test taken at the time of admission could not be demonstrated to contribute to the diagnostic procedure in one single case out of the 401. The distributions of age, serum calcium, and serum protein in men and women are demonstrated in Table 1.

Table 1. Age, serum calcium and serum protein in 213 male and 189 female orthopaedic patients.

	Men Av $\pm$ SD	Women Av $\pm$ SD
Age	48.1 $\pm$ 20.25	52.9 $\pm$ 20.64
Serum calcium meqv/lit.	4.93 $\pm$ 0.30	4.89 $\pm$ 0.29
Serum protein g %	7.27 $\pm$ 0.64	7.21 $\pm$ 0.61

Table 2. Linear correlation coefficients of the relationships between age, serum calcium, and serum-protein.

	Men	Women
Serum protein vs serum calcium	0.531	0.401
Age vs serum calcium	-0.323	-0.198

There was a significant negative correlation between age and serum-calcium in men as well as in women; the correlation was stronger in the men (Table 2). There was also a significant positive correlation between serum-protein and serum-calcium. For any given serum-protein level the serum calcium level did not differ between men and women (analysis of covariance). There was no significant difference between fracture cases as compared to other cases admitted to the department with respect to the serum calcium level.

DISCUSSION

Patients admitted to an orthopaedic department may, in fact, not deviate very much with respect to their calcium metabolism from the general population to which they belong, except that there is an excess of elderly individuals who have sustained fractures and in whom bone fragility related to osteoporosis is one of the causing factors.

The fact that no difference in serum calcium levels could be

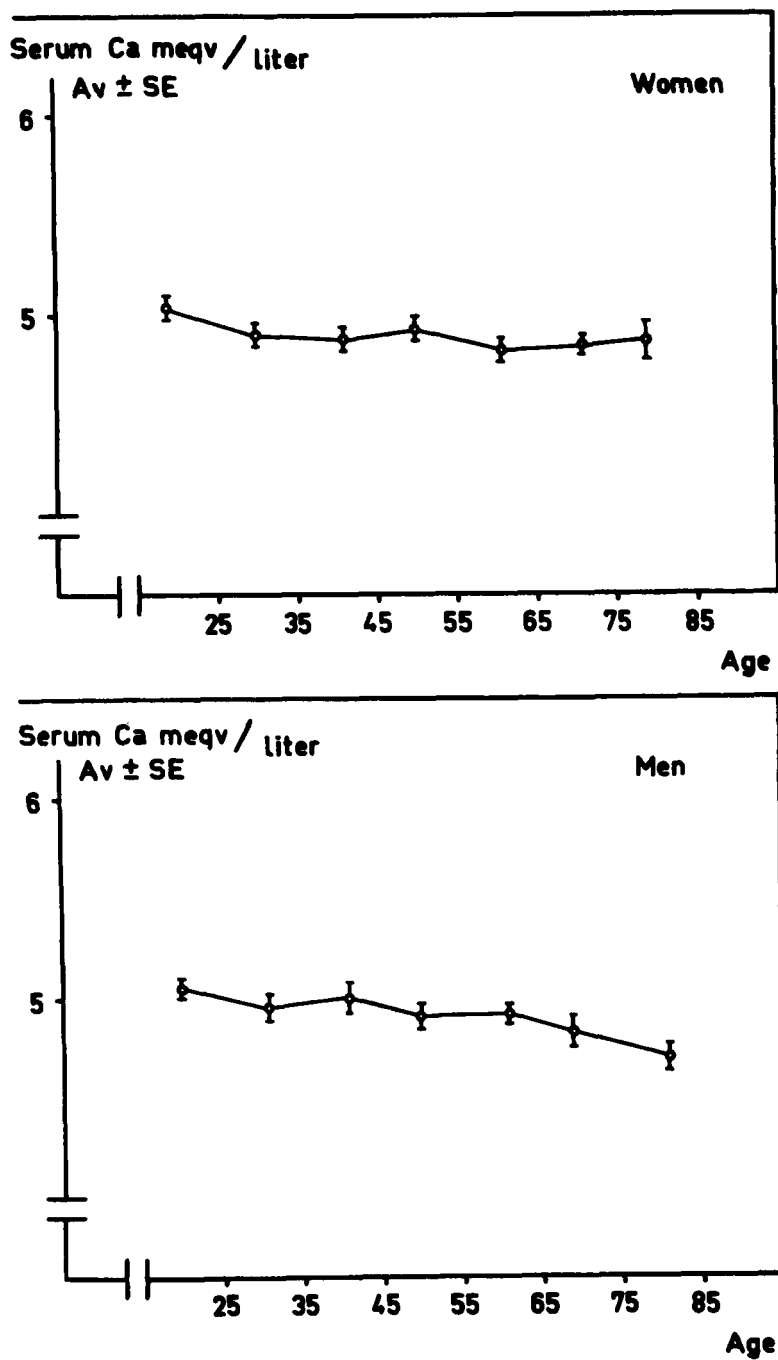


Figure 1. Serum calcium (average $\pm$ SE) at average age within 10-year groups.

demonstrated between fracture cases and other cases does not exclude differences between these groups, as the blood samples were drawn at the time of admission when the fracture healing process had not yet started.

The difference in the age-relationships of serum calcium in men as compared to women may be studied more closely by dividing the patients into age groups (Figure 1). Within the sexes there was no significant difference between any subsequent 10-year groups, as demonstrated by the standard errors in Figure 1. There was a tendency of decreasing serum calcium throughout the age groups in both sexes. However, there was an obvious deviation from this pattern in women, in that the decreasing tendency ceased or was even reversed after the age of 55. This finding indicates a slight increase in serum calcium after the age of 55 in women as compared to men, or at least the presence among the women who are orthopaedic patients of a subset with an increasing serum calcium level. The increase may be related to the process of bone resorption and osteoporosis after menopause.

SUMMARY AND CONCLUSION

In 401 orthopaedic patients, it could not be demonstrated that a serum calcium test at the time of admission to hospital contributed to the diagnostic procedure. In the same patients it was found that the serum calcium level decreased with age, more so in men than in women, and that the women deviated from the men after the age of 55 when the serum calcium level remained constant or possibly somewhat increased.

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REFERENCES

- Boström, H & Wengle, B. (1969) Serumkalk-screening vid intagning till medicinklinik. *Läkartidningen* **66**, 4763-4768.
- Keating, Jr, F. R., Jones, J. D., Elveback, L. R. & Randall, R. V. (1969) The relation of age and sex to distribution of values in healthy adults of serum calcium, inorganic phosphorus, magnesium, alkaline phosphatase, total proteins, albumin, and blood urea. *J. Lab. clin. Med.* **73**, 825-834.
- Roberts, L. B. (1967) The normal ranges with statistical analysis for seventeen blood constituents. *Clin. chim. Acta* **16**, 69-78.