

## PARATHYROID HORMONE SECRETION AFTER OPERATIVE BONE TRAUMA

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Skeletal trauma in man (operations for scolioses and femoral shortening) results in a significant increase in parathyroid hormone secretion beginning the day after the operation and lasting for more than 1 week. A concurrent decrease in serum calcium, dependent on the postoperative lowering of serum albumin, was also observed.

*Key words:* parathyroid; parat hormone; bone trauma; serum calcium; scoliosis

Accepted 25.vii.78

Standardized bleedings in rats result in increased mitosis activity of the bone marrow cells, which might be due to a parathyroid dependent hypercalcemia (Perris & Whitfield 1967a,b). The bone marrow mitosis is proportional to the plasma calcium concentration (Perris & Morgan 1976). Femoral fractures and aspiration of bone marrow in rats also stimulate the mitotic activity of bone marrow cells of the opposite bone and of thymus cells (Hulth & Johnell 1976a,b). It is possible that this increase in mitotic activity is also dependent on the parathyroids. Bleeding and femoral fractures in rats also result in an increased amount of osteoclasts in rib metaphysis (Johnell & Hulth 1977).

The results of these experiments have evoked our interest in the study of parathyroid secretion after operative trauma in man. Investigations have shown serum calcium to be unchanged during the early

phase after bone trauma (Lal et al. 1976, Lyrits et al. 1976). In spite of the fact that serum calcium in man is very well regulated, it may be possible to find a change in the parathyroid hormone (PTH) secretion during the early phase after bone trauma.

### MATERIAL AND METHODS

Analyses were made on 11 patients; 9 patients aged 13-33 years undergoing operations for scoliosis according to Harrington's method and 2 patients (aged 19 and 24 years) on whom shortening of one or both femora, respectively, was being performed. The average blood loss during the operations was  $0.91 \pm 0.3$  (S.D.), which was replaced during or immediately after the operations. Blood samples were taken the day before, and 1, 3, 6 and 14 days after the operations. All the samples belonging to each patient were kept in the deep freezer and sent in for analysis concurrently to the Medicinsk Laboratorium, Copenhagen. Parathyroid hormone was analyzed with a radioimmunoassay method, standardized to Medical Research Council, England. No. 71/324=1. As standard, bovine PTH was used.

Financial support was obtained from the Swedish Medical Research Council (project no. B79-17X-05223-02).

The hemoglobin (Hb) and hematocrit (Hct) were measured regularly in all patients and in seven of the scoliosis cases the calcium and albumin in serum were also investigated.

RESULTS

The results are shown in Figures 1-3. PTH increased from the day after operation, the increase becoming highly significant ( $P < 0.001$ ) on the third day after operation and then undergoing a slow decline reaching the normal value on the 14th day (Figure 1). In only three cases did the peak values exceed the upper limit of the reference interval ( $0.50 \mu\text{g/l}$ ).

Ca decreased significantly on the 1st and 3rd days after operation. There was, however, at the same time a significant decrease in serum albumin (Figure 2). If the calcium values are recalculated in relation to the decreased albumin values, a significant serum calcium decrease no longer exists (Figure 3). A decrease in serum albumin occurs regularly after trauma, as shown by repeated in-

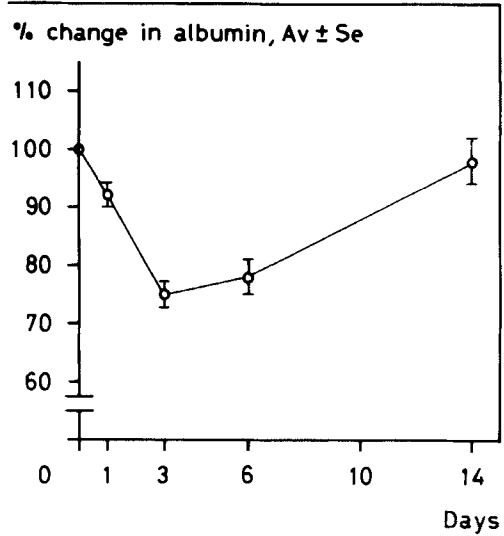


Figure 2. The postoperative decrease in albumin/s in per cent. The initial values = 100 per cent.

vestigations (Aronsen et al. 1972). In the course of the 3rd and 6th days after operation hemoglobin and hematocrit were significantly decreased, probably due to incomplete replacement.

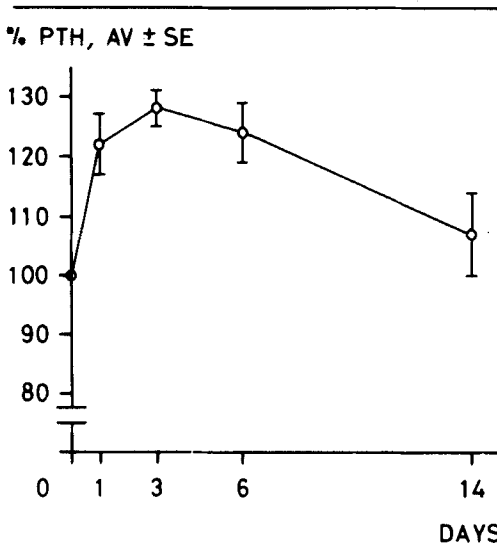


Figure 1. The postoperative increase in PTH secretion after the operations in per cent. The initial values = 100 per cent. The reference interval of the normal values is  $0.22-0.50 \mu\text{g/l}$ .

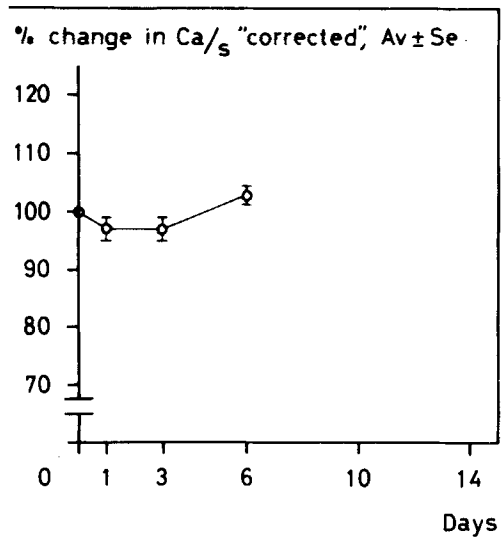


Figure 3. The postoperative change in calcium/s corrected for the concurrent decrease in albumin. The initial values = 100 per cent.

## DISCUSSION

The increase in PTH is of course difficult to evaluate, but nevertheless of interest to report. It is known that fractures in humans and immobilization result in immediate changes in mineral metabolism, demonstrated particularly by the increased urinary excretion of calcium (Howard et al. 1945, Klein 1966). Serum calcium in man is, however, always constant, as in our investigation, except in elderly people with femoral neck fractures where a decrease has been found (Nilsson & Westlin 1972). It is improbable that the rise in the PTH level is the only cause of the disturbance in the mineral metabolism. The rise is too low and in addition the increased PTH should have given the opposite effect on renal calcium excretion. At this moment, therefore, it is not possible to explain the increased PTH secretion after operative trauma, except as an unspecific stimulation.

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