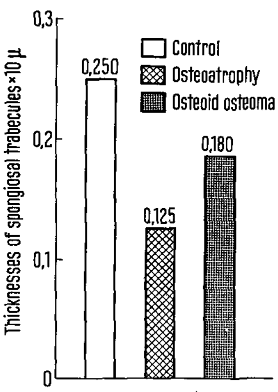
PRO EXPERIMENTIS

Changes of Trabecules of the Spongiosal Bones Measured by Radiomicrometry

The radiological estimation of the local and generalized osteoatrophy is based upon the 30–60% loss of the bone minerals, measured by different methods[1,2]. These alterations determined represent an increased radiotransparency of the bones. The remarkable decrease of the osseal minerals begins in the spongiosal bone, namely on the trabecules in the proximal end of femora, vertebrae and in the pelvic bone respectively.

The purpose of this following communication is to examine these trabeculare changes of the spongiosal bones quantitatively by radiomicrometrical measures[3].

Material and method. The spongiosal bone were gained from human femora of patients – regardless of sex – who suffered a traumatic accident and whose thigh bone was fractured pertrochanterically and nailed. Some spongiosal bone excochleated during the operation, about $5 \times 8 \times 12$ mm in size, and slab radiographs were taken immediately after its removal. For the radiographic examinations a finest granulated X-ray sheets were used with high sensitivity and a Hungarian X-ray set. The evaluation of the complete radiograms were made by microscope with an ocularmicrometer. The thicknesses of the spongiosal trabecules were measured in 11 cases by radiomicrometric method[3]. The average age of the operated patients was 71 years old, and their osteoporosis was verified roentgenologically and histologically during



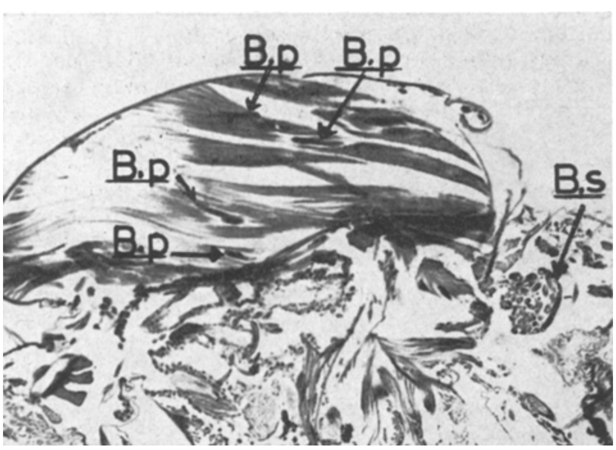
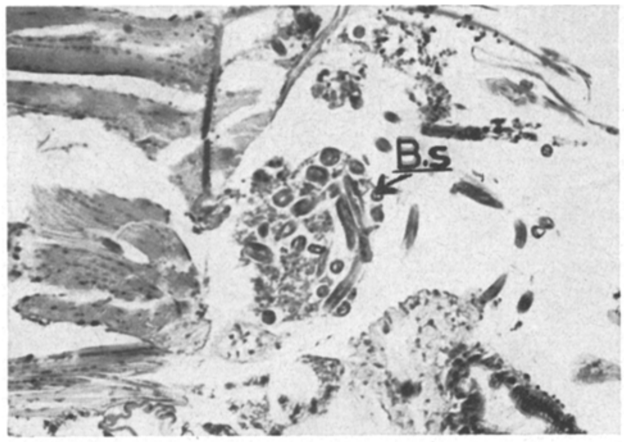
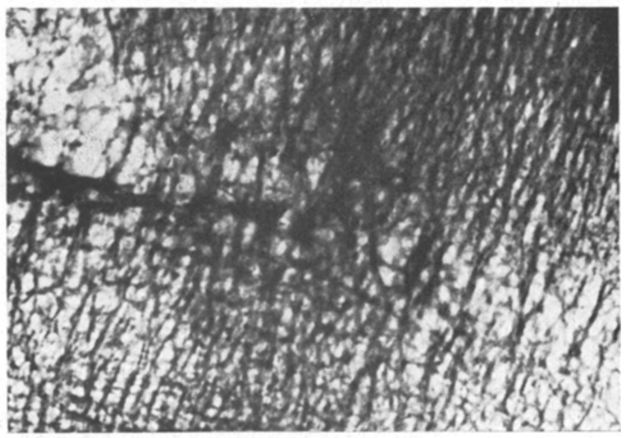


Fig. 1. Average trabeculare thicknesses of the spongiosal bone from normal intertrochanteric region of cadavers and of the operated patient suffering from a traumatic pertrochanteric fracture.





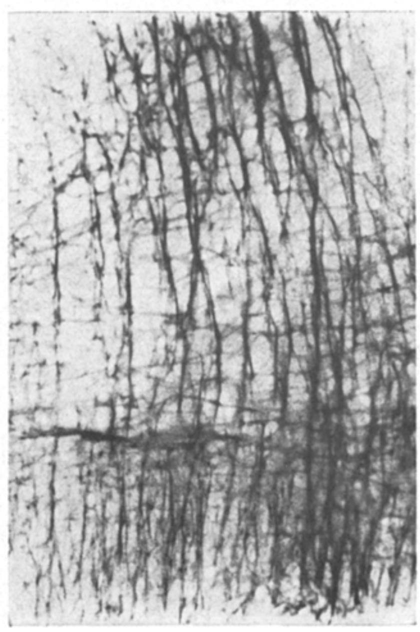


Fig. 2. Slab radiogram of the normal (a) and atrophic spongiosal trabecules (b). × 5.

the mobilization period. The control spongiosal bones were collected from identical places of normal human femora of cadavers in 11 cases – regadless of sex, the average age being 35 years. The necropsy revealed no kind of skeletal disorder in the control cases.

Results and discussion. The results of the radiomicrometric values measured are presented in the Figures. The scheduled data indicate a remarkable decrease of the thicknesses of the spongiosal trabecules of the osteoatrophic bones originating from operated patients (Figure 1). The intertrabeculare spaces were widened by this process. The differences in the spongiosal trabeculare thicknesses between the operated osteoatrophic and normal cadaver bones represent a rarification of the trabecules and explain the increased radiotransparency that may be observed on the radiograms (Figure 2, a and b). The radiomicrometrically measured data resembling the histomorphometric results of FROST and SCHENK[4,5] are in a good agreement.

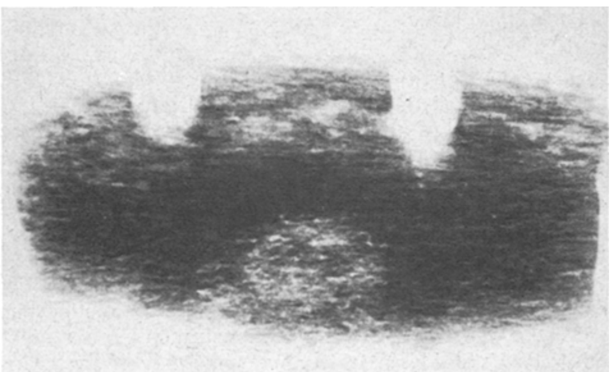


Fig. 3. Slab radiogram of a removed osteoid osteoma. × 5.

In one case of the localized cortical bone atrophy surrounded with sclerosis, after its operative removal the rarification of the cortical trabecules may be seen on slab radiogram as the nidus (Figure 3). The trabeculare thicknesses measured in the nidus were found to be 180 μ thick (Figures 1 and 3). On histological examination this alteration was characteristic of an osteoid osteoma. This cortical atrophy was in a close relationship with the increased vascularity[6].

This manner of evaluation and the results indicate that the trabeculare radiomicrometry on slab radiogram is a suitable and much more exact method for the estimation of the rarification of the spongiosal trabecules by the decreases of their thicknesses, than the visual means. By these radiomicrometric measurements, the trabeculare changes could be demonstrated convincingly in a quantitative way.

Zusammenfassung. Bericht über eine radiomikrometrische Messung der Trabekel des spongiösen Knochens welche genauere Werte ergibt als die gebräuchlichen Methoden.

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Preparation of Large Volumes of Linear Gradient Solutions for Zonal Ultracentrifugation

Zonal ultracentrifugation techniques in sector-shaped rotors require preparation of large volumes of gradient solutions of sucrose, cesium chloride or other solutes[1]. The gradient solutions used are either linear or exponential with respect to rotor volume. These solutions are prepared in a suitable gradient former and immediately delivered to the rotating zonal head. The volume of the solution used ranges between 45 and 1,675 ml, depending on the type of the rotor employed. It is desirable to perform the whole loading operation within a period of not more than 10–20 min. Therefore, a gradient-forming device capable of delivering a constant liquid output of up to 150 ml/min may be required.

The preparation of large volumes of linear gradient solutions used in zonal ultracentrifugation presents particular difficulties which will be discussed briefly. A linear gradient solution can be prepared by filling 2 identical reservoirs with the heavy and the light end of the gradient, respectively. The 2 reservoirs must be connected so as to keep their contents at the same level at all times. The content of the chamber corresponding to the light end of the gradient is continuously stirred as it receives solution from the reservoir containing the heavy solution. As the gradient is formed, the solution is withdrawn and fed into either centrifuge tubes or the zonal rotor.

In the gradient device described originally by PARR[2], the linear gradient was obtained by the simultaneous emptying of the 2 chambers under the influence of gravity. Modifications of this open chamber-device have been described by others[3,4]. These simple gradient-forming devices are not suitable for zonal ultracentrifugation work. In the first place, in the gradient formers described above, solution mixing is achieved by means of magnetic bars or

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