



	Experiment title: Analysis of bone architecture in osteoporotic patients treated by biphosponate	Experiment number: LS 587
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Report:

The purpose of this work was to study the influence of osteoporosis treatment on bone architecture. Synchrotron Radiation Computed MicroTomography (SRCMT) was used to obtain three-dimensional images of bone samples. This system developed at ESRF provides high spatial resolution images with a high Signal to Noise Ratio. In this experiment the pixel size on the 2D 1024x1024 detector was set to 10.13 microns, leading to a field of view of lcmx1cm well adapted to size of samples.

Seven iliac crest biopsies from osteoporotic patients before and after one year of treatment were imaged. First, they were embedded in resin and 2D histomorphometric measurements were performed at Saint-Etienne Hospital. They were then tailored to 5mmx5mmx1cm and imaged using 3D SRCMT at an energy of 20 kev. (512)³ digital images were then reconstructed.

Figures 1a) and b) shows two 3D displays of a pair of iliac crest samples from an osteoporotic women before and after one year treatment. Visually, we may notice the rod like aspect of the first sample (figure 1a) which is typical for osteoporotic patient. The structure of the second sample looks stronger with a plate like aspect.

Quantitative analysis techniques were previously developed to quantify the structure. They provide morphological and topological parameters on each slice of the volumes.

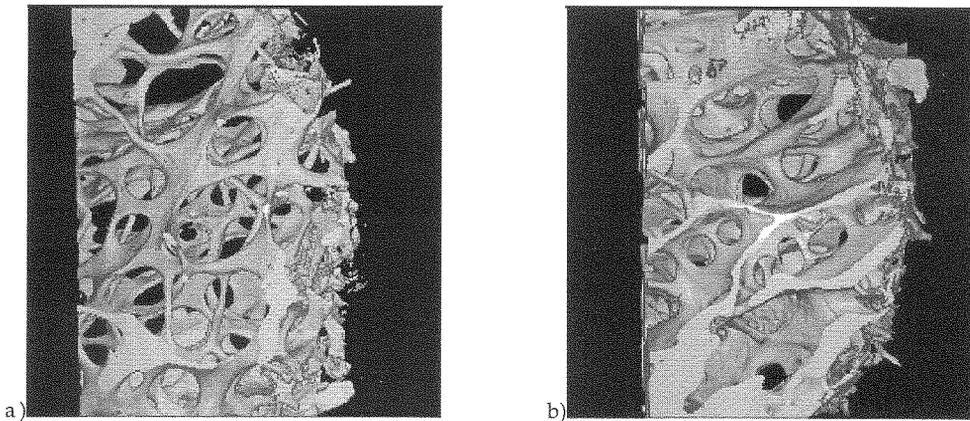


Fig. 1 : 3D displays of iliac crest biopsy samples on an osteoporotic patient (energy 20 keV, voxel size 10 mm x 10mm x 10 mm) : a) before treatment, b) after treatment.

Parameters computed on trabeculae sub-volumes extracted from the two images presented in Fig. 1 are reported on table 1. We present the mean values of the Partial Bone Volume (BV/TV), Trabecular Thickness (Tb.Th), Trabecular Number (Th. N in mm⁻³) and skeleton length (Le.Nw). The evolution of BV/TV and Tb.Th with the slice level are represented on Fig. 2. These results confirm the visual observation.

	BVITV	Tb.Th(mm)	Tb.N(mm ⁻¹)	Le.Nw
Before Treatment	6,78%	0,801	0,856	9,26
After Treatment	11,28%	0,915	1,23	15,69

T'able

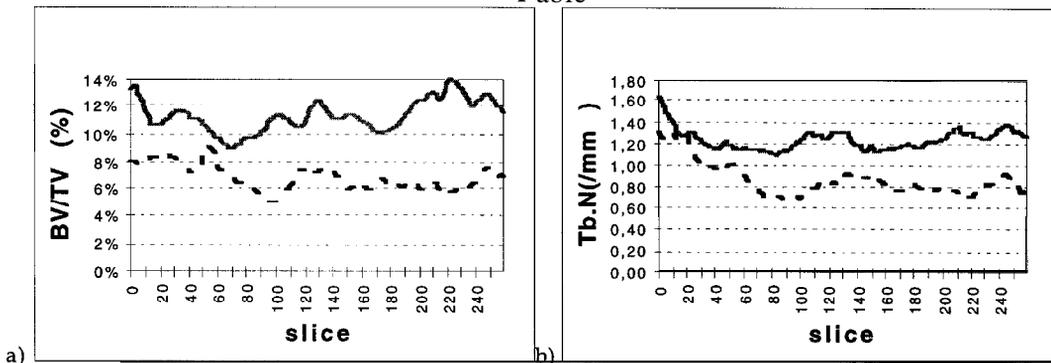


Fig. 2 : Evolution of BV/TV (a) and Tb.Th (b) with the slice level
(dot line : before treatment, continuous line : after treatment).

The analysis programs are under modification to take into account the particularities of the whole samples : non regular border and presence of cortical bone. Such an analysis seems to be promising and requires to be applied on a larger number of samples.