Non-Ossifying Fibroma of Bone
A Histochemical and Ultrastructural Characterization

A. Llombart Bosch *, A. Peydro Olaya, and A. Lopez Fernandez

Department of Pathology, Faculty of Medicine and Sanatorio de la Malvarrosa,
Valencia, Spain

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Summary. The microscopic morphology, histochemistry and electron microscopy of a non-
ossifying fibroma of the upper metaphysis of the femur in a sixteen-year-old girl, is presented.

The authors describe a fibroblastic cell type as the basis of the neoplasia which transforms
itself into a foam cell loaded with lipids. Histochemically it is characterized by high activity
in alkaline phosphatases, ATP-ases, fructose 1-6 diphosphatase and NADH-NADPH tetra-
zolio reductases. Electron microscopy identifies extremely active fibroblastic cells with a syn-
thesis of proteic and lipid material which transforms them into foam cells. The lipids appear
irregularly enveloped in laminar systems. There is also a deposit of hemosiderine in certain
fibroblasts.

Non-ossifying fibroma differs from the metaphyseal fibrous bone defect as the fibroblasts
show a higher activity for alkaline phosphatase and lipids are stored in the cytoplasm.

The present report deals with an histochemical and electron-microscopical
study of a case of non-ossifying bone fibroma (Jaffe and Lichtenstein, 1942). It
demonstrates the morphological characteristics of a tumor displaying a peculiar
variety of alkaline phosphatase positive fibroblasts in whose cytoplasm, lipids
are also produced and progressively stored.

Case Report

A sixteen-year-old girl (Clinical Record No. 29265) with no prior history of trauma com-
plained of a pain which had been present in her hip for a period of three and half months.
Roentgenograms revealed a radiolucent multiloculated area involving the entire upper meta-
physis of the femur with a secondary extension to subtrocanteral and cervical areas of the
bone. The cortex delimiting the lesion was thinned but there was no discontinuity or rupture
of the periosium (Fig. 1). A complete skeletal survey and extensive laboratory studies revealed
no other abnormality.

A surgical section of the tumor presents an osseous cavity filled with firm reddish-brown
tissue. After curettage the cavity was packed with autogenous cancellous bone chips. The post-
a operative course (20 months to date) has been excellent with no recurrence of symptoms.

The material from the present case is studied in comparison with a histochemical
and electron microscopical analysis of two cortical bone defects as well as with a
regeneration tissue scraped from the osseous cavity of the femur in a female patient
who had been operated on two months before (simple curettage) for an osteo-
clastoma (giant cell tumor).

For optical microscopy fragments of tumor tissue were paraffin embedded and stained with
hematoxilin-eosin, P.A.S., trichromic of Masson and reticuline of Gomori. Small analogous

* Present address: Professor of Pathology, Medical School of Murcia, Spain.
fragments of tissue were frozen in carbon dioxide snow and sections were performed in an IEC cryostate without prior fixation. As previously described (Llombart et al., 1970), the following histochemical techniques were employed: Alkaline and Acid Phosphatase; Glucose-6-phosphatase; Fructose-1,6-diphosphatase; ATPase (pH 9.4); Succinic dehydrogenase activated with menadione; Isocritic dehydrogenase; NADH and NADPH tetrazolium reductase. In addition, histological checks were made for Sudan III, for cholestene by the Schultz-Liebmann techniques, hemosiderine (Pearl's reaction) and P.A.S. Nitro-blue tetrazolium was used as hydrogen acceptor. Enzymatic activity was evaluated as follows: none (–), low activity (+), moderate activity (++), and intense activity (+++).

**Electron Microscopy.** Several fragments of different areas of the tumor were cut into approximately 1 mm blocks and fixed in glutaraldehyde and osmium tetroxide (OsO4); the tissue blocks were then rapidly dehydrated in a graded solution of ethanol-acetona, immersed in propylene oxide and embedded in Dureupan ACM (Fluka A.G.). Thin sections of tissue cut in an LKB ultramierotome were placed on copper grills and stained with uranil acetate or lead citrate before being examined under a Jeol JEM-100 B electron microscope.

**Results**

**A. Macroscopical Pathology and Histology**

The tumor is made up of consistent fibrous connective tissue, with shells of sclerotic bone between tumoral areas. The microscopical picture of the tumor consists of bundles of firm connective tissue. Most cells are spindle-shaped, packed in close unions and associated with abundant collagen material. Occasionally they adopt a perivascular disposition with cells radiating from the perivascular area.