IJAE
Vol. 123, n. 1 (Supplement): 181, 2018
ITALIAN JOURNAL OF ANATOMY AND EMBRYOLOGY

# Circumpherential growth of cartilage anlagen and comparison with grow plate cartilage

Marcella Reguzzoni[1], Andrea Salvi[2], Lavinia Casati[3], Daniela Quacci[1], Marina Protasoni[1] and Ugo E. Pazzaglia[2]

[1] Dipartimento di Medicina e Chirurgia, Università degli Studi dell'Insubria, Varese, Italia
[2] Dipartimento di Specialità Medico-Chirurgiche, Scienze Radiologiche e Sanità Pubblica, Università degli Studi di Brescia, Brescia, Italia
[3] Dipartimento di Biotecnologie Mediche e Medicina Traslazionale, Università degli Studi di Milano, Milano, Italia

Mineral deposition in cartilage matrix always occurs prior to that in osteoid in order to provide the substrate for osteoblasts apposition. Different architectural patterns characterize different bone anlage developmental phases or those of other cartilaginous structures such as the laryngeal cartilages, so that both structural and morphological differences can be expected in different anatomical sectors of the same bone even if resulting from a substantially similar calcification mechanism.

The primary ossification center of the human metacarpal diaphysis has never been considered for a comparative study of the mineral deposition process in cartilage matrix and osteoid. The two territories are well distinguished and can be studied during a limited period of fetal anlage development. Mineral deposition occurs in the avascular, hypertrophic cartilage mass, where there is no free fluid exchange between the hypertrophic chondrocytes and the circulating blood flow until the marrow vessels seeps into the ossification center. Therefore, this model can provide the basis for a quantitative analysis of mineral deposition in a much larger surface of the inter-territorial cartilage matrix than that of the metaphyseal growth plate intercolumnar septa.

Aim of our study was to compare the morphology, morphometry and progression of mineral deposition in cartilage and in bone matrix, processes contextualized in the primary ossification center model than in the metaphyseal growth plate cartilage. In order to describe this processes we apply an enlarged, methodological approach combining standard histology, SEM/EDAX and analysis of the tissue mineral phase with heat deproteination.

It has been possible to examine the progression of the calcification process, which leads to the complete calcification of the matrices involved in endochondral ossification (cartilage and osteoid) and to consider how specific anatomical and structural conditions can modify the process of evolution.

Our observations can be integrated to form part of the current knowledge of the cellular mechanisms controlling calcium and phosphate concentrations, ion transport pathways and the specificity of the collagen layout where the mineral deposits are settled. The different morphology and dynamics of the calcification process in cartilage and bone matrix can be explained by the anatomical and environmental conditions where the two phases of endochondral ossification develop.