

PRESENCE OF NON-CARTILAGENOUS NON-MINERALIZED AREAS IN THE COSTAL CARTILAGE: A MATRIX RESPONSE IN “CARTILAGE CANAL” FORMATION

DEVIKA GUNASINGHE^{1*}, E.R. WICKRAMANAYAKE¹, M.S. CHANDRASEKARA¹ AND KUMARA KALUARACHCHI²

¹*Department of Anatomy and* ²*Department of Biochemistry Faculty of Medicine, Peradeniya.*

Cartilage is a highly specialized, avascular connective tissue. Researchers believe that avascularity is due to an anti angiogenic substance secreted by the chondrocytes of the cartilage. The chondrocytes obtain oxygen and nutrients and get rid of carbon dioxide and metabolic excretory products by simple diffusion. Therefore, almost all the cartilages are restricted in thickness in order to maintain vitality via the simple diffusion process. However, costal cartilage is relatively thicker than most of the other cartilage in the body. It has been reported that there are “canals” in the relatively “thick” cartilages including costal cartilage to facilitate the simple diffusion process.

Objectives of this study were to study the microanatomy of the “canals” in mouse costal cartilage, to find out the sequence of events take place in the “canal” formation and to determine the role of extracellular matrix calcification in the formation of “canals”.

Ten weeks old wild type Balb-C mice ($n=4$, 2 male and 2 female) were killed by an overdose of chloroform and the costal cartilages were harvested. Tissues were fixed in 4% Para formaldehyde, embedded in paraffin wax and 5mm thick sections were made. The sections were stained with Haematoxylin and Eosin, Van Gieson, Alcian blue and Saffranin ‘O’ and Von Kossa stains.

The upper costal cartilages were composed of hyaline cartilage. “Canal” like structures was observed in the centre of the lower cartilages. Initially, these canal like structures were appeared as empty spaces formed by the degradation of the matrix. Further down, hypertrophied chondrocytes were observed in the centre of the costal cartilage. Together with this gradual deposition of non-cartilaginous areas were seen. Surrounded by the non- cartilaginous areas, blood filled, “canal” was observed. There was no clear demarcation between the cartilaginous and non- cartilaginous areas and no apparent lining, limiting the canals. The non-cartilaginous tissue was not stained either with Alcian blue or with Saffranin ‘O’ indicating lack of abundant glycosamino glycans as it is in the cartilage. The non-cartilaginous areas were strongly stained with Van gieson where as cartilage areas were negatively stained, indicating presence of coarse collagen type I fibres in the former and lack of it in the latter. Strangely, Von Kossa staining was negative in the non- cartilaginous areas indicating the absence of mineralization. In the lower most regions, the cartilage tissue was totally replaced by the non-cartilagenous tissue.

Although it is pre mature to arrive at any conclusions, the observations indicate that “canal” formation is a functional requirement in the costal cartilage, as it grows thicker and this is accomplished by the degradation of matrix as in endochondral ossification.