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DEVELOPMENTAL STUDY OF CARTILAGE CANAL IN TIBIA OF ALBINO RAT

Thesis

Submitted in Partial Fulfillment of the Requirements the Master Degree in Basic Medical Science (Anatomy)

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2001

إنّا كُلّ شيء خلقناهُ بقدر

سورة القمر آية (٤٩)

TO MY PARENTS

TO MY HUSBAND

AND TO MY LOVELY DAUGHTERS

RANA, LENA AND NOOR

ACKNOWLEDGEMENT

*Praise to **ALLAH,** the merciful, compassionate for all the countless gifts I have been offered.*

*I am absolutely lucky to be supervised and directed by **Prof. Dr. Refaat Shehata Mohamed,** Professor of Anatomy, Faculty of Medicine, Assiut University, for selection of the subject of this thesis, his kind guidance, encouragement and keen supervision all through the course of this study.*

*With considerable appreciation, I express my great indebtedness to **Prof. Dr. Shefaa Mostafa Mostafa Gawish,** Professor of Anatomy, Faculty of Medicine, Assiut University for here guidance.*

*I wish to express my sincere acknowledge to **Dr. Mohamed El-Badry Mohamed,** Assistant Professor of anatomy, Faculty of Medicine, Assiut University, for his generous attitude, persistent support and kind attitude through out this work. Thanking his constructive criticism and generous help throughout the course of this study through revising every part of this thesis.*

Many thanks to all the Staff Members of the Department of Anatomy, Faculty of Medicine, Assiut University and all my colleagues for their spiritual encouragement.

Haidi R.M.

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The cartilage canals are channels of loose, vascularized, mesenchyme that traverse the hyaline cartilage of the epiphysis before ossification. The canals contain blood vessels which will eventually become incorporated into the developing ossific center and connective tissue cells contain more than one cell type and is generally described as polymorphic mesenchymal cells. Little information was known about the cartilage canals. Also there were some conflict in their structure, formation and growth.

This work aims to study the cartilage canals developmentally as regard to their structure, function and fate.

REVIEW OF LITERATURES

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The Cartilage

Definition of the cartilage:

The cartilage is a phylogenetically ancient tissue widespread in vertebrates as either a permanent or a temporary skeletal component (Williams et al., 1995).

The cartilage is a specialised type of connective tissue consisting of cells, called chondrocytes, and extracellular fibers embedded in a gel-like matrix (Fawcett, and Jensh, 1997). The intercellular components predominate over the cells, which are isolated in small cavities within the matrix.

During early foetal life the human skeleton is mostly cartilagenous. In adults cartilage persists at the surface of the synovial joints, in the wall of larynx, trachea, bronchi, nose and external ears, in the epiglottis and as isolated small masses in the cranial base (Lessons et al., 1985).

The cartilage is covered by a fibrous perichondrium except at osseous junctions; at syovial surfaces, the latter are lubricated by secreted, nutrient fluid (William's et al., 1995).

Function of the cartilage:

The cartilage is essentially a type of stiff, load bearing connective tissue. Its distinctive properties, are a low metabolic rate and a vascular supply confined to its surface or to large, penetrating tunnels. It has a capacity for continued and often rapid interstitial and appositional growth, also, a high resistance to tension compression and shearing, with some resilience and elasticity (Telford & Bridgman, 1995).

The capacity of the cartilage for rapid growth while maintaining a considerable degree of stiffness makes it a particularly favorable skeletal material for the embryo. Most of the axial and appendicular skeleton is first formed in cartilage models, which are later replaced by bone (Anderson, 1969 and Bonucci, 1967).

The cartilage is of more restricted occurrence in postnatal life. But, it continues to play an indispensable role as the long bone grows in length in the immature individual. It also persists in the adult on the articular surfaces of the long bones (Bonucci, 1967).

The hyaline cartilage:

In the adult, the hyaline cartilage is found on the ventral ends of the ribs, in the tracheal rings and the larynx, and on joint surfaces of the bones. It is a somewhat elastic, semitransparent tissue with an opalescent bluish gray tint. It's histological appearance is most easily understood from a consideration of its mode of development (Gluckman and Heymann, 1996).

Development of the hyaline cartilage:

At sites of future cartilage formation in the embryo, the mesenchymal cells first withdraw their processes and become crowded together in dense aggregation called *protochondral tissue* or *centers of chondrification*. The nuclei of the cells are very close together and the cell boundaries are indistinct. As the cells enlarge and differentiate, they secrete around themselves a metachromatic extracellular matrix. Tropocollagen is secreted at the same time, but the fibrils that form extracellularly tend to be masked by the hyaline matrix in which they are embedded. As the amount of interstitial material increases, the cells become isolated in separate compartments or *lacunae* and gradually take