Name : Muhammad NOMAN

Id : 16497

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Q 1: Explain " Biomechanics of Articular cartilage "

ANS…. **Biomechanical** Function. **Articular cartilage** is a thin layer of specialized connective tissue with unique viscoelastic properties. Its principal function is to provide a smooth, lubricated surface for low friction articulation and to facilitate the transmission of loads to the underlying subchondral

Function of articular cartilage:

Distributes joint load over a wide area , decreasing the stresses. sustained by the contacting joint surface

- Allow relative movement of the opposing joint surface with minimal friction and wear.
- Minimize peak stresses on subchondral bone
- . Surface roll or side during motion
- Provide a friction reducing weight bearing surface with friction coefficient of 0.0025

Function within a contact pressure range 2- 11 MPa

TYPE OF CARTILAGE..

Type	Appearance	Location
Hyaline	Glassy , smooth	Covers long bones , growth plates
Fibro	Dense	Inter vertebral disk , meniscus
Elastic	Yellow , opaque	Epiglottis, eustachian tube.

Biomechanics composition of articular cartilage:

- Extracellular matrix
- Proteoglycan (5-10%)
- Collagen (10-20%) type I
- Water , (68- 85%)

The Martial properties of articular cartilage depend on its extracellular matrix ,but the existence and maintenance of matrix depend on chondrocytes…

Q2…EXPLAIN BIOMECHANICS OF TENDON AND LIGAMENT..

. **Introduction of Tendon and ligament :**

Tendon :

- Tendon connect muscle to bone
- Tendon consists of bundle of collagenous fiber arrange in parallel
- Origin at muscle , crosses at least one joint and insert in bone
- Offer greater tensile strength .

Ligament :

- Ligament connect bone to bone
- Ligament consist mostly of bundle of elastin molecule formed into elastic fiber with some bundle of collagen .
- Origins and insert into bone
- More elastic and flexible than tendon
- Offer less tensile strength.

Composition :

Component	Ligament	Tendon
Fibroblast	20%	20%
Water	60-80%	60-80%

Solids	20-40%	20-40%
Collagen	70-80%	Slightly higher
Type l	90%	95-99%
Elastin	Up to 2x collagen	Scarce
Ground substance	20-30%	Slightly lesser

Anatomical position of tendon :

Tendon:

- Tendon contain collagen fibrils Type 1
- Tendon contain a proteoglycan matrix
- Tendon contain fibroblasts that are arranged in parallel rows

Type 1 collagen :

- 86% of tendon dry weight
- Glycine (33%)
- Proline (15 %)
- Hydroxyproline (15%)

Anatomical position of ligament :

- Similar to tendon in hierarchical structure
- Collagen fibrils are slightly less in volume fraction
- Higher percentage of proteoglycan matrix than tendon
- Fibroblasts

Function:

Tendon :

- Tendon carry tensile force from muscle to bone
- They carry compressive force when wrapped around bone like a pulley.
- They facilities skeletal muscle movement
- Propriception
- Secondary function : storage of energy

Ligament :

- It maintain correct bone and join geometry

- Ligament + associated joint capsule combinely functions as passive joint stabilizer
- Secondary function: proprioception.