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Program: DPT 2nd

**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.