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Q1: Explain Biomechanics of Articular cartilage.

ANSWER: 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 bone.

FUNCTION OF ARTICULAR CARTILAGE:

1; To distribute joint load over a wide area thus decreasing the stress sustained by the contacting joint surface.

2; To allow relative movement of the opposing joint surface with minimal friction and wear.

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.

Q 2 : Explain “ Biomechanics of Tendon and Ligament”

[Introduction of Tendon and ligament :](https://image.slidesharecdn.com/biomechanicsofligamentstendons-170920015716/95/biomechanics-of-ligaments-amp-tendons-3-638.jpg?cb=1505872669)

**Introduction:**

**Tendons:**

* They connects muscles to bones.
* They originates at muscles and cross at least one joint and insert in bones.
* They consist of bundles of collagen fobers strength.

**Ligaments:**

**It**  connects bone to bone.

* They originates and inserts in bone.
* Offer less tensile strength.
* More elastic and fkexible than tendons.
* They mostly consist of bundles of elastic molecule formed into elastic fibers and some collagen .

**Composition:**

|  |  |  |
| --- | --- | --- |
| **Component** | **Ligament** | **Tendons** |
| Fibroblast | **20%** | **20%** |
| **Water** | **60-80%** | **60-80%** |
| Solids | **20-40%** | **20-40%** |
| Collagen | **70-80%** | Slightely higher |
| Type 1 | **90%** | **95-99%** |
| Elastin | Up to 2x of collagen | **Scarce** |
| Ground substance | **20-30%** | Slightely lesser |

**Function :** Tendons : Tendons carry tensil force from muscles to bones . They carry compressive force when wrapped around bone like a pulley . Proprioception Secondary function storage of energy .  
**Ligaments** : Its maintains correct bone and joint geometry . Ligaments + associated joints capsules combinly function passive joints stablizers . Secondary function : propioception.  
**Mechanical properties of ligaments in tendons**   
Both are viscoelastic tissue Both exhibit the non linear behavior . Strength ( sustain highly load ) . When load is applied enough it cause injury demage , dependent on rate and amount of load .  
**Factor that effect the biomechanical properties of ligaments And tendons**  
 Maturation and aging . Mobilization and immobilization Steroids . Non steroidal anti – inflammatory drugs . Hemodialysis . Grafts