SNS COLLEGE OF PHYSIOTHERAPY
COIMBATORE-35

COURSE : BPT

SUBJECT : BIOMECHANICS

TOPIC : JOINT STRUCTURE AND FUNCTION

UNIT : I

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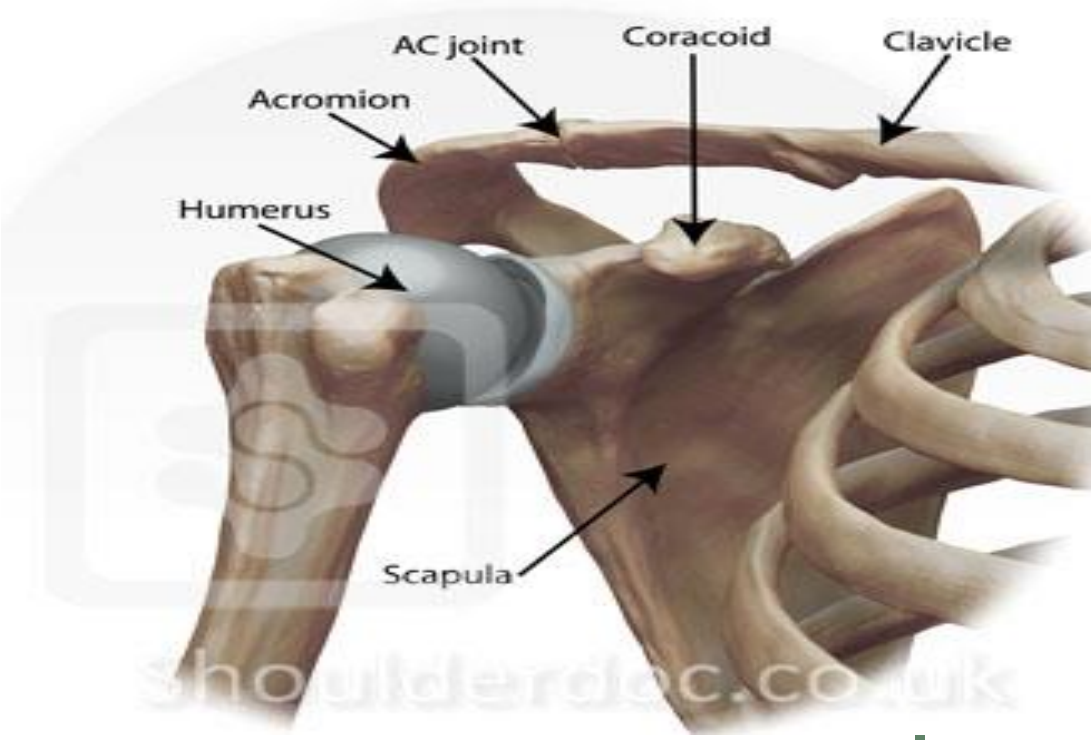
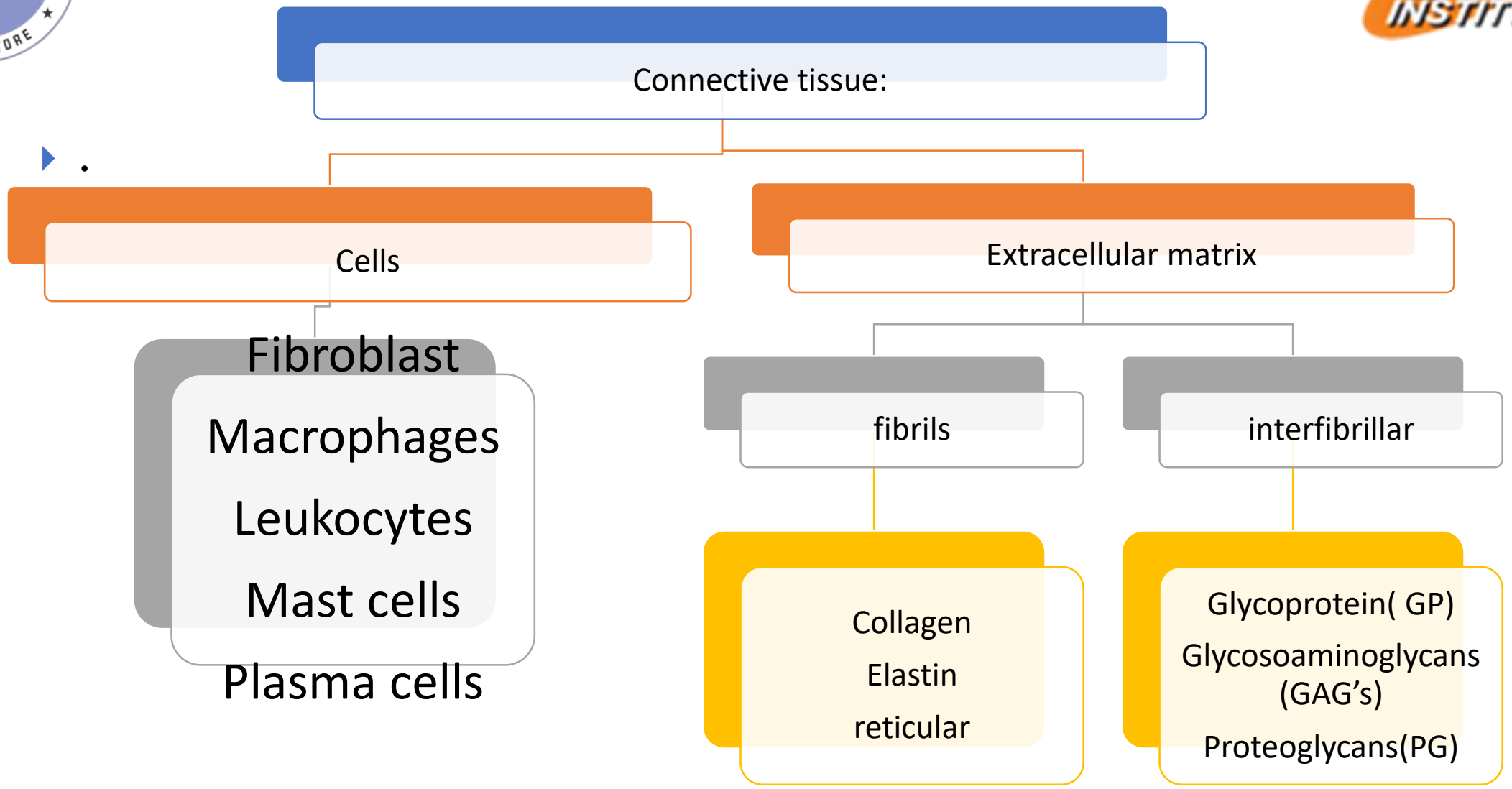
ASSISTANT PROFESSOR

JOINT STRUCTURE AND FUNCTION

- A joint contain various connective tissue.
- Connective tissue:
- Named because of their specific function of linking and support each other tissues/ organs of the body

- All components of human joints—bone, muscles, ligaments, cartilage, tendon—can adapt to functional demands




Connective tissue:
Cells
Fibroblast
Macrophages
Leukocytes
Mast cells
Plasma cells
Extracellular matrix
fibrils
Collagen
Elastin
reticular
interfibrillar
Glycoprotein(GP)
Glycosoaminoglycans (GAG's)
Proteoglycans(PG)

Ligaments

- Ligaments are subjected to forces from different directions,
- So the collagen fibrils in lig are arranged in more than one direction.

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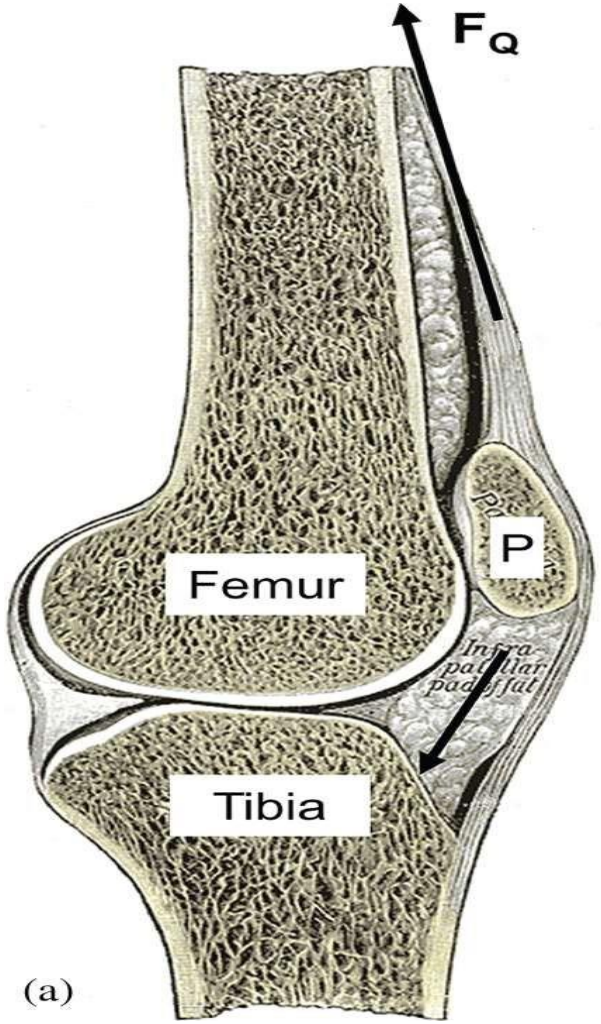
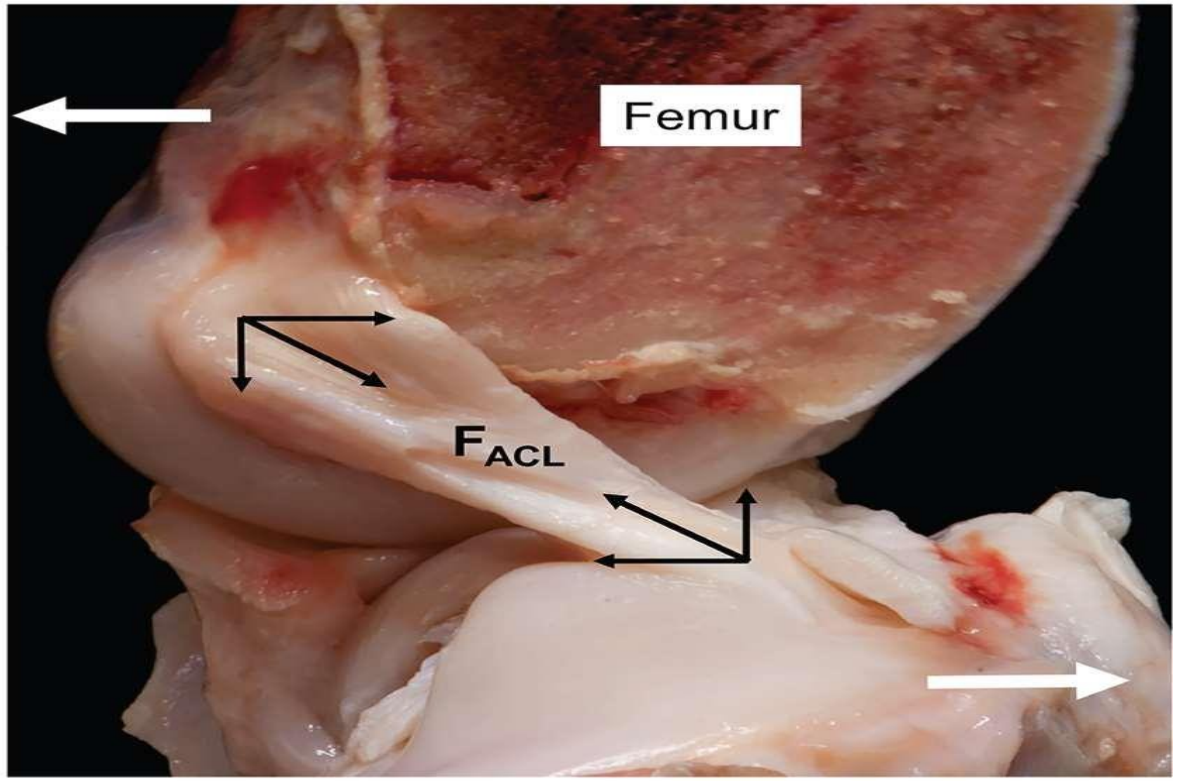
- Eg: postr fibers of MCL – stressed by extension., middle fibers are tensed- appliying varus stress.
- Lig are named acco- location, shape, bony attachments.
  - E.g: location: medial & lateral collateral lig- knee, elbow.

.LIGAMENTS

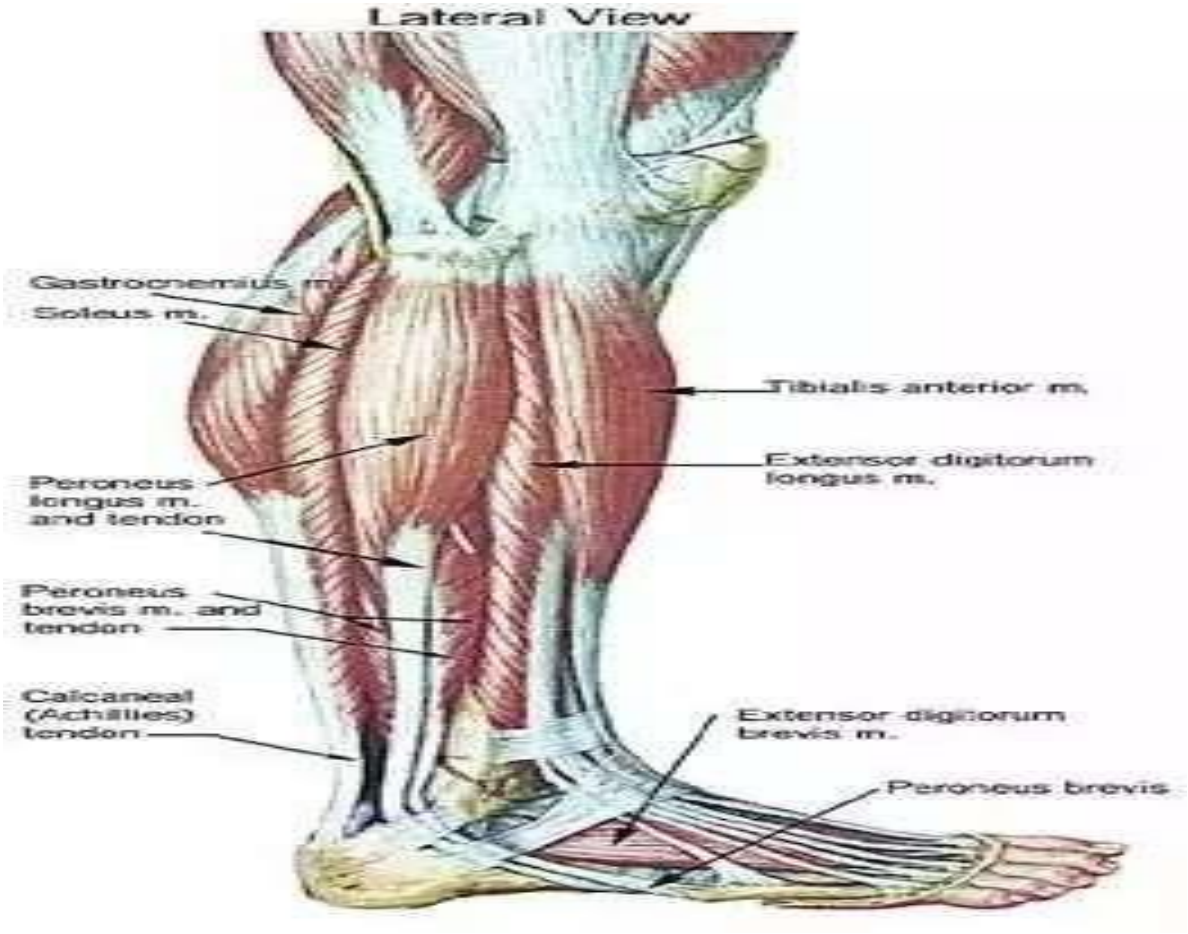


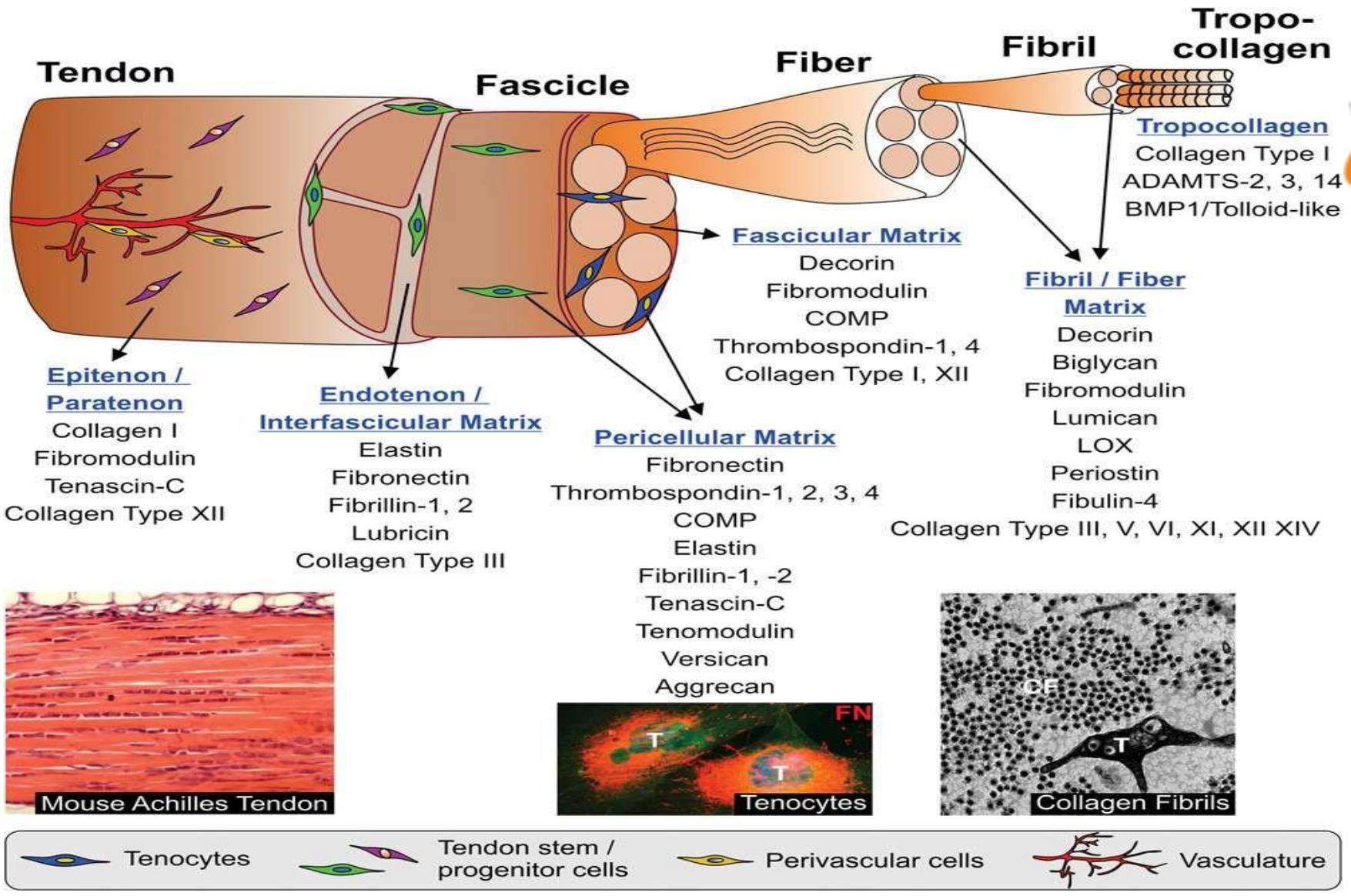


TENDONS

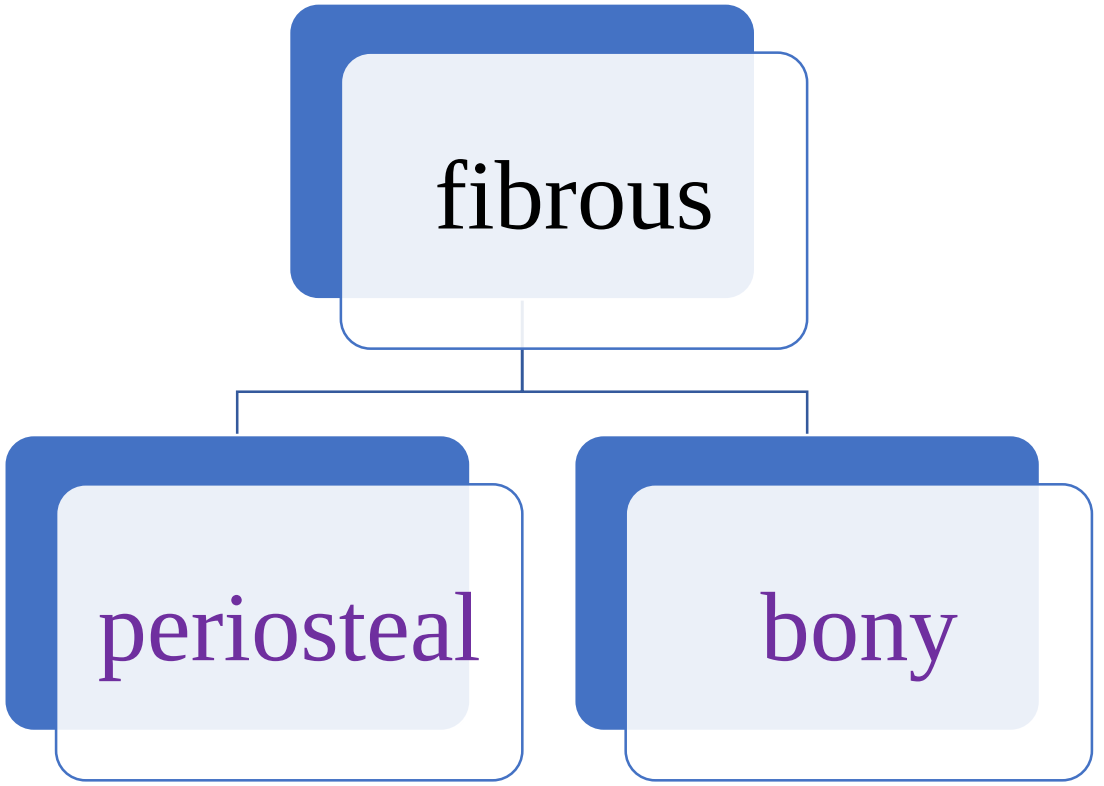
- Tendons have approximately the same composition and basic structure as ligaments.
- Tendons contain slightly more **type I collagen** and slightly less type III collagen than do ligaments.

TENDON

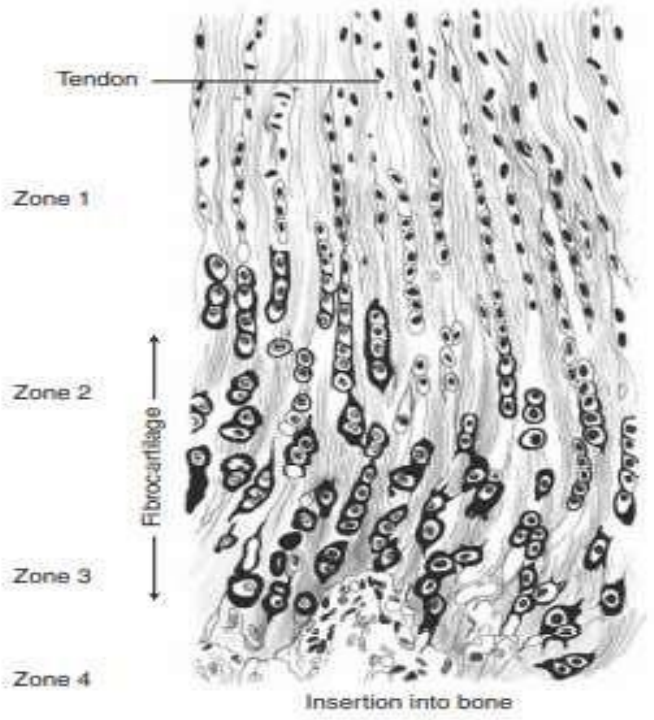

Lateral View
Gastrocnemius m.
Soleus m.
Tibialis anterior m.
Extensor digitorum longus m.
Peroneus longus m. and tendon
Peroneus brevis m. and tendon
Calcaneal (Achilles) tendon
Extensor digitorum brevis m.
Peroneus brevis


Tendon
Fascicle
Fiber
Fibril
Tropo-collagen
Tropocollagen
Collagen Type I
ADAMTS-2, 3, 14
BMP1/Tolloid-like
Fascicular Matrix
Decorin
Fibromodulin
COMP
Thrombospondin-1, 4
Collagen Type I, XII
Fibril / Fiber Matrix
Decorin
Biglycan
Fibromodulin
Lumican
LOX
Periostin
Fibulin-4
Collagen Type III, V, VI, XI, XII XIV
Epitenon / Paratenon
Collagen I
Fibromodulin
Tenascin-C
Collagen Type XII
Endotenon / Interfascicular Matrix
Elastin
Fibronectin
Fibrillin-1, 2
Lubricin
Collagen Type III
Pericellular Matrix
Fibronectin
Thrombospondin-1, 2, 3, 4
COMP
Elastin
Fibrillin-1, -2
Tenascin-C
Tenomodulin
Versican
Aggrecan
Mouse Achilles Tendon
FN
T
T
Tenocytes
CF
T
Collagen Fibrils
Tenocytes
Tendon stem / progenitor cells
Perivascular cells
Vasculature

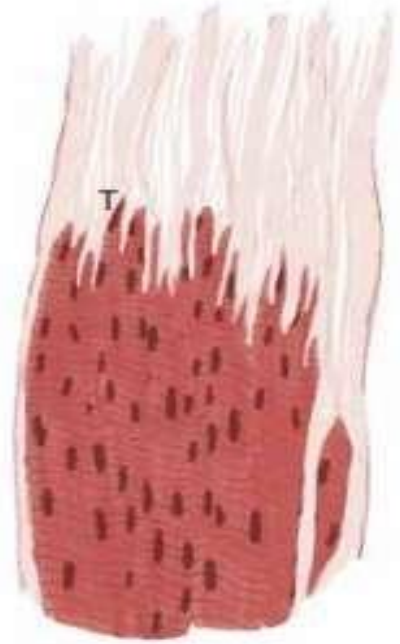
- There are two types of tendon attachments to bone: fibrocartilaginous and fibrous.
- The fibrous attachment is tendon fibers directly attaching to bone.
- The fibrous entheses is subdivided into two categories: periosteal and bony.
- The attachment of tendon to muscle at the myotendinous junction (MTJ) comprises interdigitation between collagen fibers and muscle cells


fibrous
periosteal
bony

- Tendons also have two types of bony attachment : fibrocartilaginous and fibrous.
- The fibrocartilaginous
- attachments has 4 zones.
- The first zone contains tendon proper
- The second contains fibrocartilage and marks the beginning of transition from tendon to bone.
- The third zone contains mineralized fibrocartilage
- The fourth zone contains bone



▲ **Figure 2-7** ■ The bone-tendon (or ligament) junction. There are four zones, from pure tendon (zone 1) to bone (zone 4). In between, the material gradually transitions from fibrocartilage (zone 2) to mineralized fibrocartilage (zone 3).



Muscle-tendon junction

▲ **Figure 2-8** ■ The muscle-tendon junction. The muscle cells interdigitate with the tendon (T). There are direct connections between the muscle cell membrane and fibroblasts, PGs, and collagen. The endotenon blends into the endomysium, and the epitenon blends into the epimysium, which forms a meshwork of connective tissue around the muscle fibers.

THANKYOU