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PART FIVE :

MUSCLE

TISSUE

MUSCLE TISSUE

- Muscle cells are called muscle fibers.
- Muscle membrane is called Sarcolemma.
- The cytoplasm is called Sarcoplasm.
- The ER is called Sarcoplasmic reticulum.
- The mitochondria are called sarcosomes

1- Skeletal muscle.

2- Cardiac muscle.

3- Smooth muscle.

SKELETAL MUSCLE

L/M of skeletal muscle fibers (cells):

- Very long
- Cylindrical
- Multinucleated
- Nuclei are oval & peripheral
- Show cross (transverse) striations
- Sarcoplasm is acidophilic

C.T. Component:

1- Epimysium : dense C.T.

surround the entire muscle dense C.T

2- Epimysium:

Around each bundle (fascicle) of
Muscle fibers.

3- Endomysium: surrounds each muscle fiber.

Delicate C.T. composed mainly of reticular fibers &

External lamina.

Endomysium contains continuous blood capillaries and lymph vessels.

* Muscle fibers are arranged in regular bundles.

E/M of skeletal muscle fibers:

Sarcomere:

- Striations are formed of dark bands (A bands) and light bands (I bands).
- The center of each dark band is occupied by a pale area (H band) which is bisected by M line.
- Each light band is bisected by a dark line (Z line or disk).
- The region of the myofibril between two successive Z disks is the contractile unit of skeletal muscle.
- M line consists of myomesin & C protein.

Sarcolemma, Transverse (T) tubules &

Sarcoplasmic reticulum

T tubules: invaginations of the Sarcolemma forming anastomosing network of tubules that encircles the boundaries of the A-I bands of each Sarcomere in every myofibril.

Sarcoplasmic reticulum (S.R.):

1- Terminal cisternae: 2 lateral portions of S.R.

2- Sarcotubules: branching network of S.R around each myofibril.

Triad: components = T.T. + 2 T.C.

Mitochondria: numerous, elongated with many cristae.

Myoglobin: more in red fibers than in white fibers.

Glycogen granules.

TYPES OF SKELETAL MUSCLE FIBERS

1- Red Muscle Fibers.

2- White Muscle Fibers.

3- Intermediate Muscle Fibers

CARDIAC MUSCLE

L/M of cardiac muscle cells:

- Have cross (transverse) striations.
- Are usually mononucleotide (may be binucleated).
- Nuclei are oval & central.
- are elongated , branched cells.
- are parallel to each other.
- Have intercalated disks (at sites of end-to-end contact of cells in the same fiber).
- Mitochondria: about 40%.
- Lipofuscin pigments.

E/M of cardiac muscle cells:

Intercalated disks:

Types: 1- Straight.

2- Steplike (stepwise) pattern.

Junctions:

- 1- Fascia adherent.
- 2- Macula adherent (Desmosomes).
- 3- Gap junctions.

T Tubules:

- are more numerous and larger (wider) in ventricular muscle.
- are found at the level of Z lines.

Sarcoplasmic reticulum:

- is not as well developed.

Diads.

Mitochondria: occupy 40 % of the Sarcoplasmic volume.

Glycogen.

Lipofuscin pigment granules (aging pigment)

Secretory granules: more in RT atrium, atrial natriuretic factor.

WALL OF THE HEART

- (1) Endocardium.
- (2) Myocardium.
- (3) epicardium.

SMOOTH MUSCLE

SMOOTH MUSCLE FIBERS **(SMOOTH MUSCLE CELLS)**

L/M :

- Do not show cross striations.
- are fusiform.
- have a single nucleus located in the center.

E/M of smooth M.F.:

No T tubules, **No** Sarcomere.

Abundant intermediate filaments:

Coursing through the Sarcoplasm.

*Dense bodies (D.B.):

Types: 1- membrane-associated.

2- cytoplasmic.

Both contain α -actinin (are thus similar to Z lines).

Both actin & intermediate filaments insert to D.B.

* Abundant gap junctions.

FUNCTIONS OF S.M.F.:

1- Contractile activity.

2- Synthesis of extracellular products

e.g. collagen, elastin & proteoglycans.

REGENERATION OF MUSCLE:

(1) Skeletal muscle fibers (cells):

- cannot divide.
- Limited regeneration by satellite cells
(Inactive myoblasts).

(2) Cardiac muscle cells:

Have almost no regenerative capacity
beyond early childhood.

(3) Smooth muscle fibers (cells):

a- Can divide. b- Pericytes.

-----→active regenerative response.