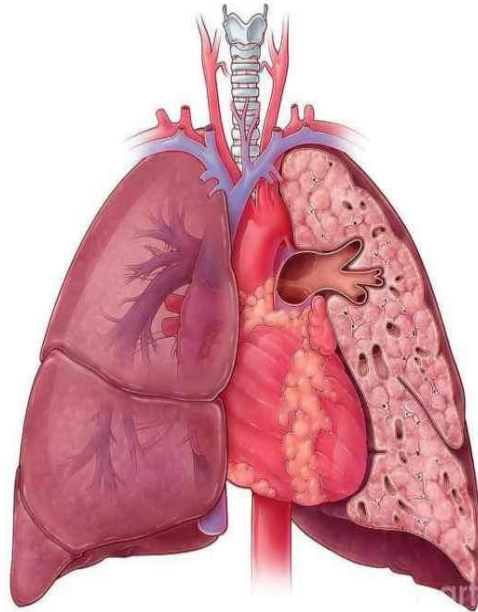


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لجان الدفعات



تفريغ أناتومي

Muscles

موضوع المحاضرة:

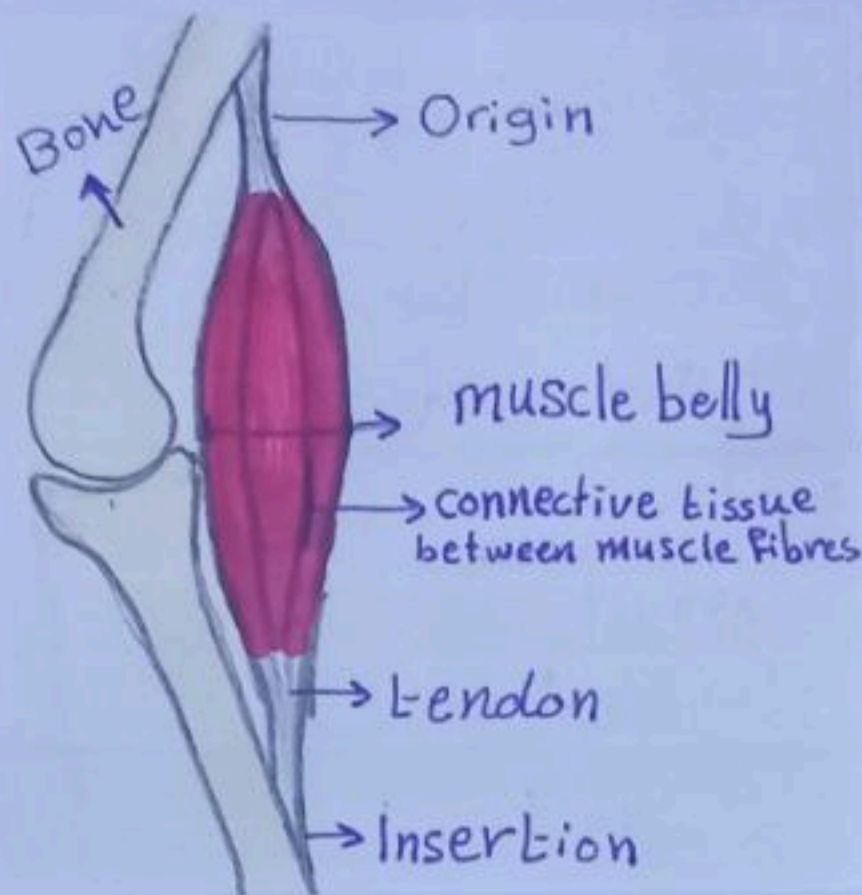
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رقم المحاضرة:

Bayan Alharahshah: إعداد الصيدلانية

The Muscular System

Dr. Mustafa Saad
(2021)



- Skeletal muscles are formed of several bundles of skeletal muscle cells. They are attached by tendons to bones.
- When a skeletal muscle contracts, the tendon will be pulled and this will pull the bone resulting in Movement.
- The **belly** of the muscle is the **fleshy (wide)** part between the tendons.
- Muscles have more than one bony attachment:
 - the attachment of a tendon to the relatively stationary bone is called the **origin**.
 - the attachment of the muscle's other tendon to the relatively movable bone is called the **insertion**.
 - the **action/s** of a muscle are the main movements that occur during contraction (e.g., **flexion** or **extension**).

Muscular Tissue

الأنسجة العضلية

Muscular tissue is the type of tissue whose cells are *differentiated* to optimally use the *contractile ability* of the cells.

تتميز خلاياها

Cell membrane = Sarcolemma

Cytoplasm = Sarcoplasm

Smooth endoplasmic reticulum = Sarcoplasmic reticulum

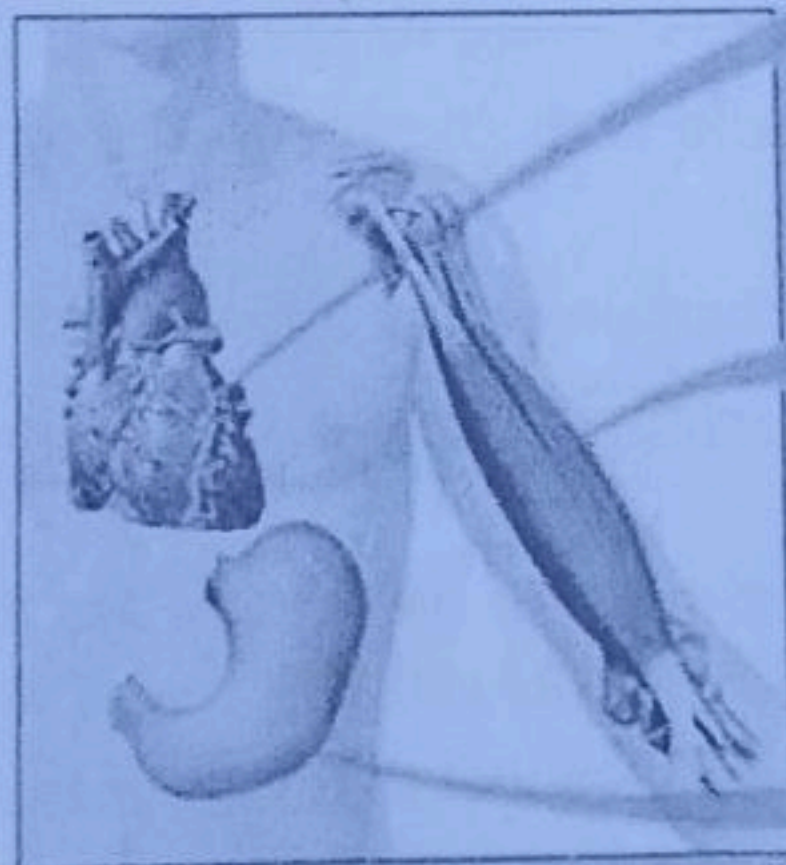
Muscle cells = Muscle fibers

because its Long than other cell.

Types of Muscle Cells

➤ Muscle cells are relatively long, therefore, they're called *muscle fibers*

➤ There are ³ three types of muscle cells:



1- Cardiac muscle cell

2- Skeletal muscle cell

3- Smooth muscle cell

Fig.1: Types of muscle cells.

مقارنة Comparison between the three types of muscle cells:

	<i>Skeletal</i>	<i>Cardiac</i>	<i>Smooth</i>
Location	Attached to bones	The heart	Internal organs and skin
Shape	Elongated and cylindrical 	Branched 	Spindle 
Nucleus	Several peripherally located nuclei	Single centrally located nucleus	Single centrally located nucleus
Striation	Striated	Striated	Non-striated
Function	- Movement of bone - Heat production	Beating of the heart	Movement of the viscera
Control	Voluntary	Involuntary	Involuntary

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Notes

تشبه الى بال skull

- Smooth muscle cells are held together by **desmosomes**. Also, gap junctions are present between the cells to allow the spread of Ca^{2+} (and thus contraction) rapidly between them.

تماسك معًا

- The branches of cardiac muscle cells meet each other at specialized structures called the **intercalated discs** which also contain desmosomes and gap junctions.

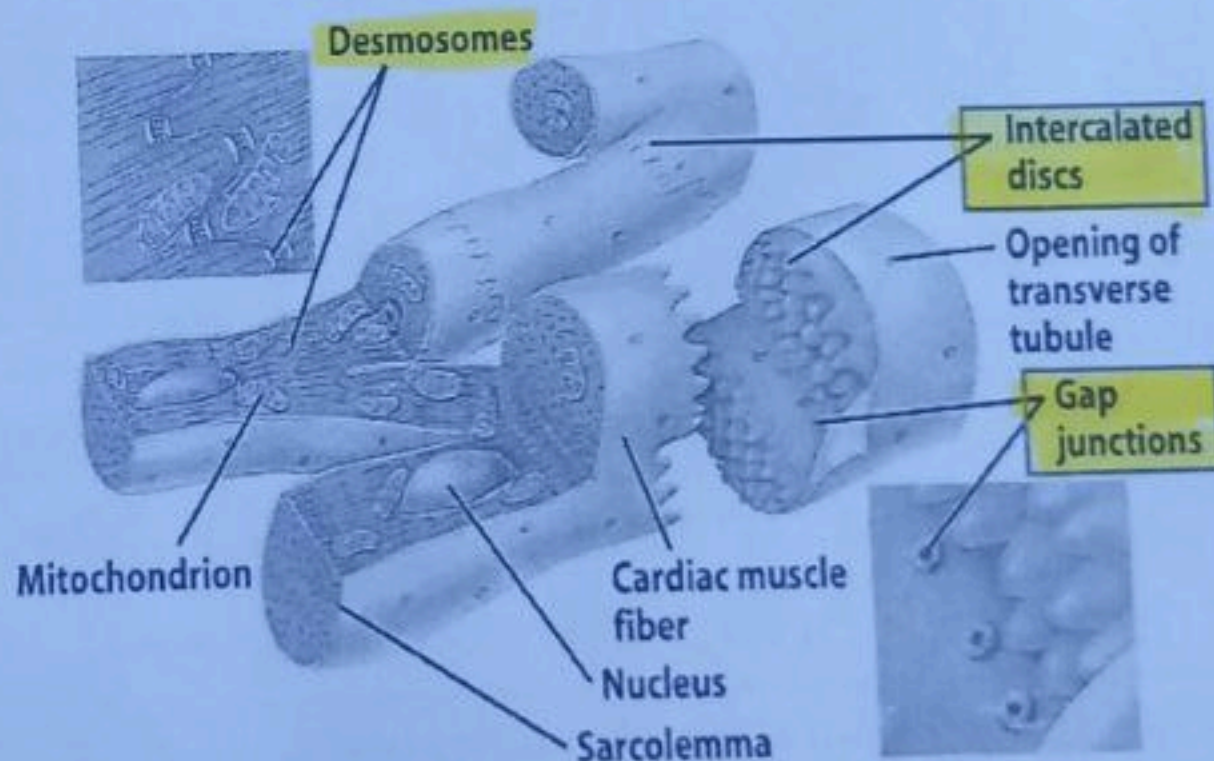
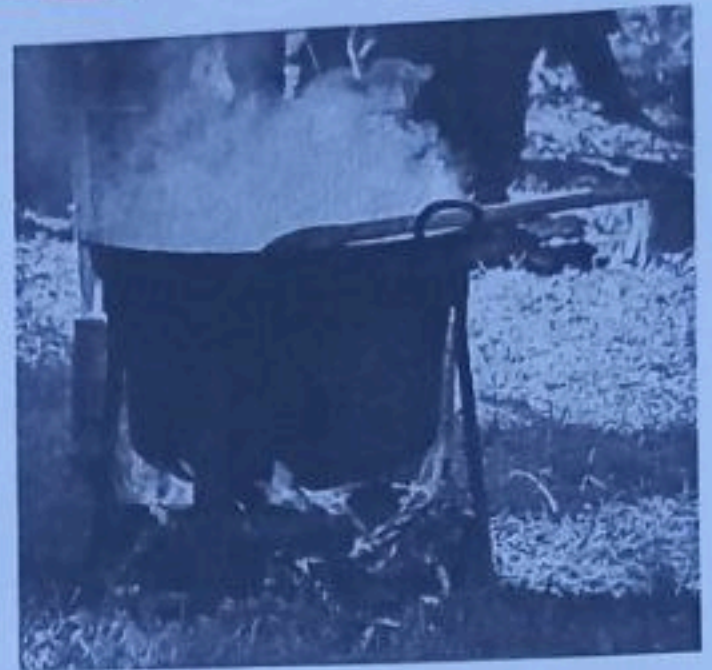


Fig.2: Cardiac muscle cells.

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تنظيم Organization of Skeletal muscles:

- Skeletal muscles are formed of several **bundles** of muscle fibers.
- Each fiber is surrounded by **Endomysium**: a loose areolar connective tissue layer. Each bundle is surrounded by connective tissue **Perimysium**. The whole muscle is surrounded by **Epimysium**: a dense connective tissue layer.
- The collagen fibers in these three connective tissue layers will extend beyond the fleshy part of the muscle to form the cord-like tendons or the broad aponeuroses that attach muscles to bones.



ليف ليفي
Fiber → Endomysium
bundle → Perimysium
Muscle → Epimysium

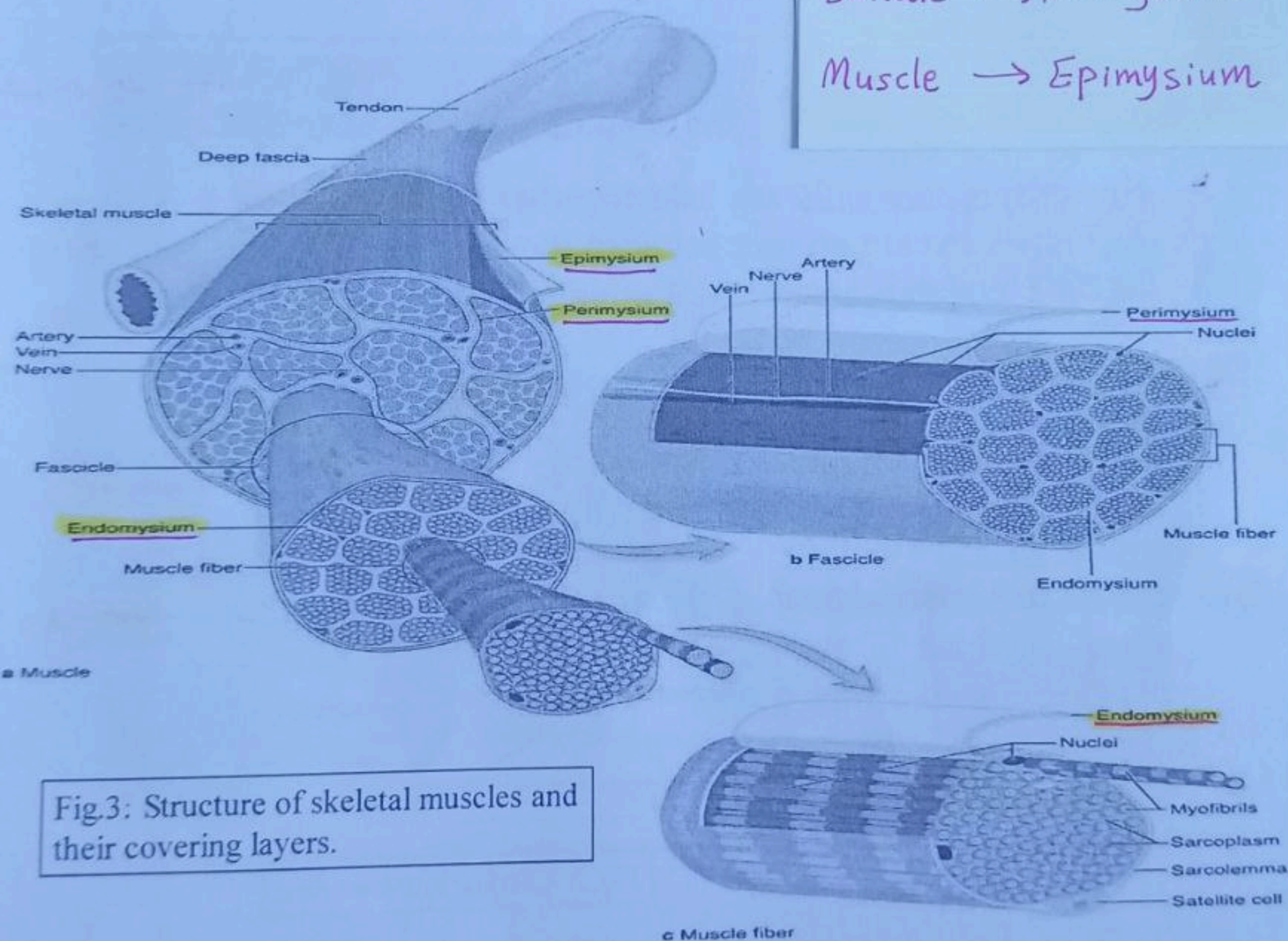


Fig.3: Structure of skeletal muscles and their covering layers.

Cross-Striation of skeletal and cardiac muscle cells:

- ✓ Skeletal and cardiac muscle fibers, under the LM, appear to have alternating dark and light areas. These are called the A and I bands respectively. The banding is due to the regular arrangement of the thin myofilament Actin and the thick myofilament Myosin.

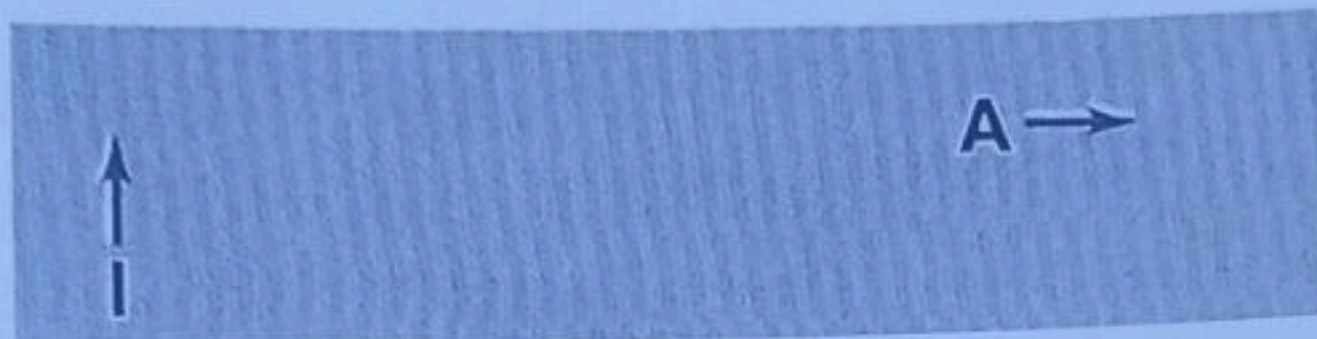


Fig.4: Striation under light microscope.

- ✓ Under the EM, this arrangement proves to be more complex.

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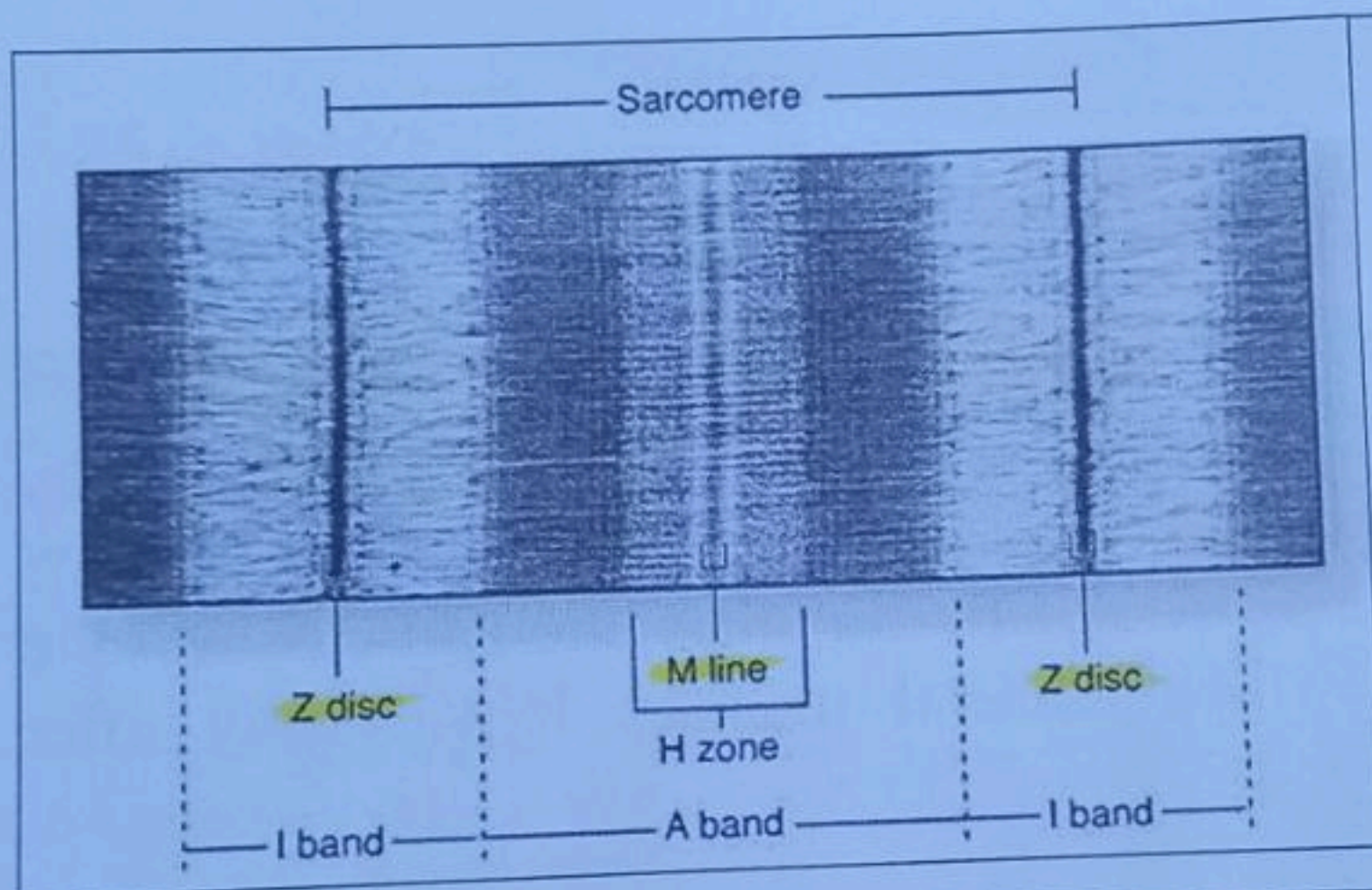
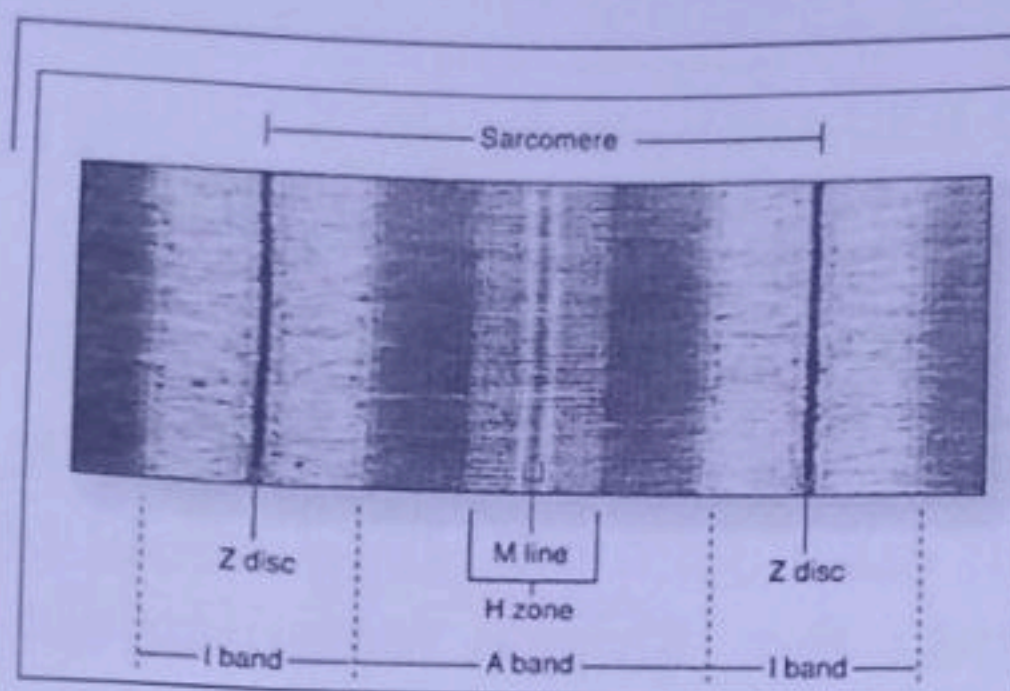
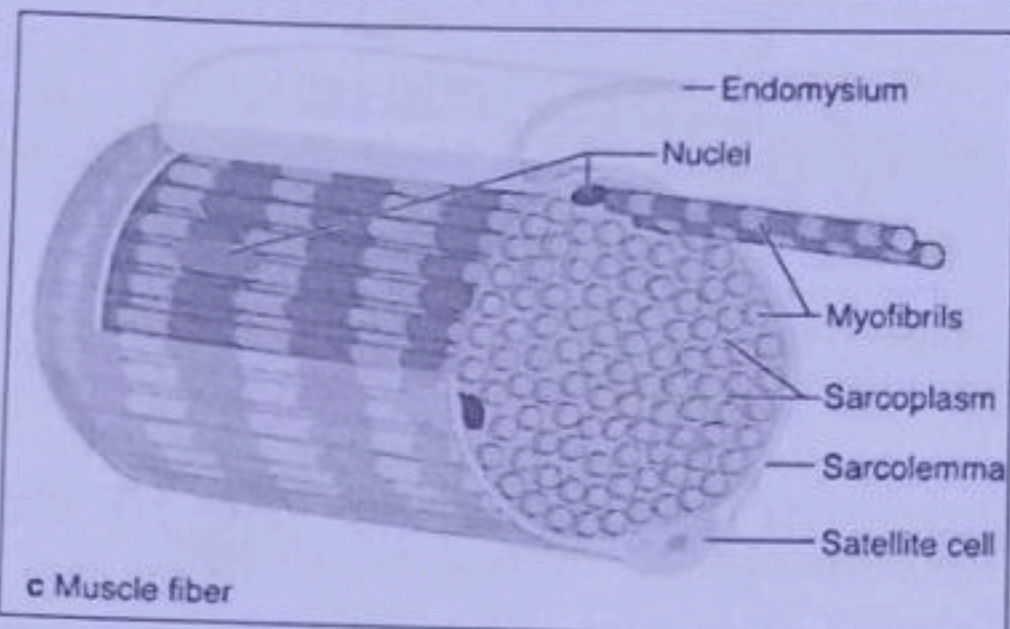


Fig.5: Striation under electron microscope.

- ✓ H Zone: a lighter colored area within the A band.
- ✓ M Line: darker colored line in the middle of the H zone.
- ✓ Z Disc (Line): a dark line in the middle of the light I band.



✓ **The Sarcomere:** is the repetitive functional subunit of the contraction apparatus. It extends from one Z-line to the next Z-line.



✓ Several sarcomeres arranged end-to-end form the cylindrical myofibrils. Each muscle fiber contains several myofibrils.

Fig.6: Sarcomeres and myofibrils.

Muscle Regeneration

تجدید العضلات

- ❖ Skeletal muscle cells cannot divide. Inactive **Satellite cells** are present close to the muscle fibers. When injury occurs, the satellite cells become active, divide and form new skeletal muscle fibers. This is also thought to be the mechanism by which skeletal muscles hypertrophy after exercise.
- ❖ **Cardiac muscles cannot divide** and they lack satellite cells. After injury, the damaged muscles are replaced by a connective tissue scar.
- ❖ **Smooth muscle cells can divide**, and, therefore, can easily replace damaged cells.

Muscles Of The Head

Muscles Of Facial Expression → عضلات تعبير الوجه

- Muscles of facial expression:
 - Lie within the subcutaneous layer. → تحت الجلد
 - Usually originate from skull bones & insert into the skin.
 - Are all supplied by the Facial nerve.
- Because of their insertions, the muscles of facial expression move the skin rather than a joint when they contract. Because of this, these muscle produce the wide variety of facial expressions that humans have. ^{تنتج}

الحدية فت تعابير الوجه التي تنتجها.

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* عادةً العضلات ترتبط من
الجهتين بـ Bone بطن الـ:
Muscles of facial
Expression
ترتبط من جهة بعظام الـ skull
والجهة الثانية بالـ skin للبشرة

Zygomaticus major -
The muscle of true
smile ← الضحكة الحقيقية

Risorius -
The muscle of false
smile (probably
present only in
humans and gorillas) ← الضحكة الكاذبة

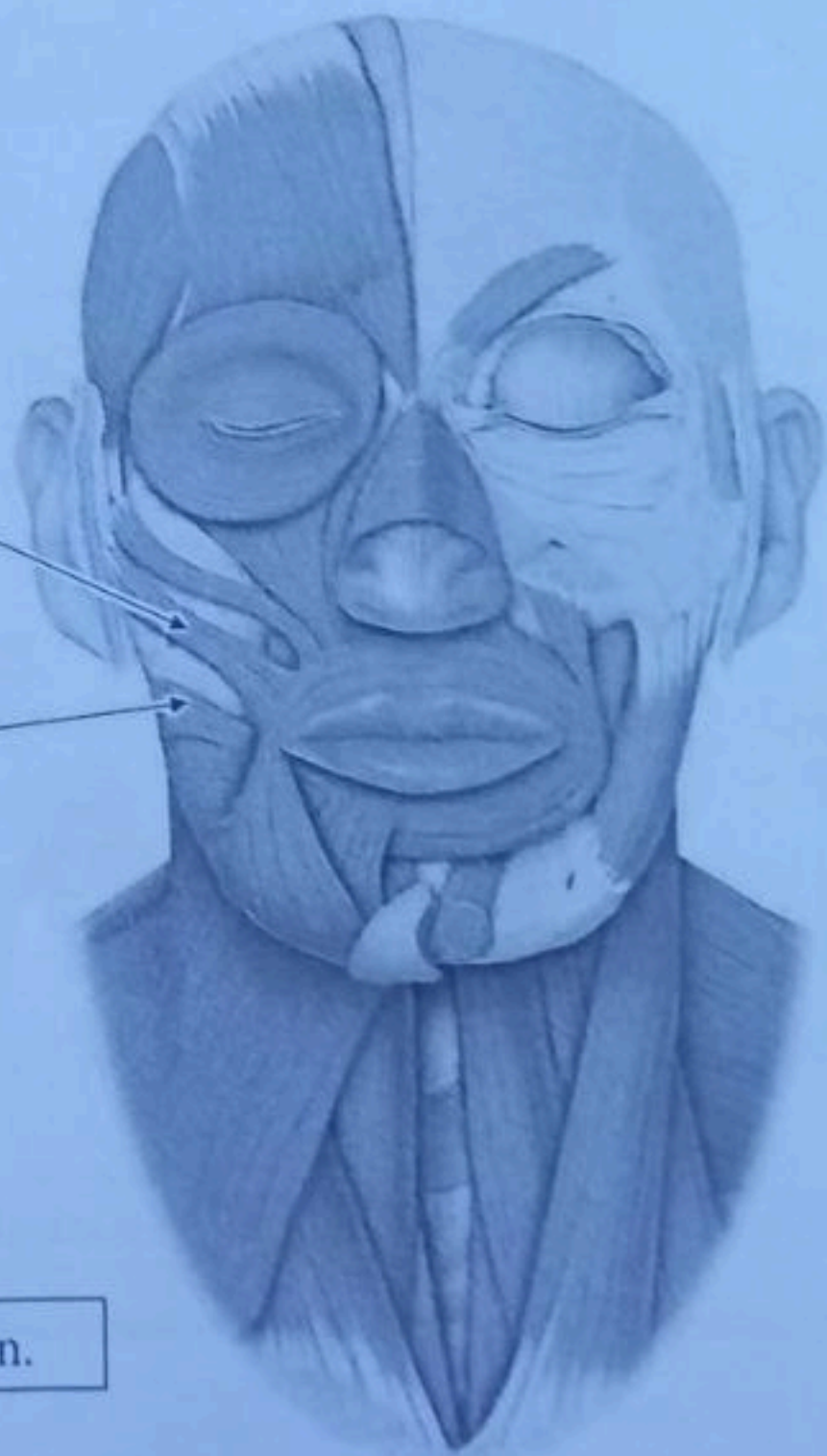


Fig.7: Muscles of facial expression.

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Muscles of Mastication (Chewing)

- Four pairs of muscles move ^{تحويل الفك السفلي} the mandible, and are known as ^{عضلات المضغ} 'muscles of mastication'.
- They are all supplied by the **mandibular branch of the trigeminal nerve**.
- The **masseter**, **temporalis**, and **medial pterygoid** close the mouth and account for the strength of the bite.
- The medial and **lateral pterygoid** muscles help to chew by moving the mandible from side to side.
- The lateral pterygoid is also the main depresser of the mandible as in opening the mouth. **Note** that **Gravity** assists in depressing the mandible (plus other muscles). ^{الجاذبية}

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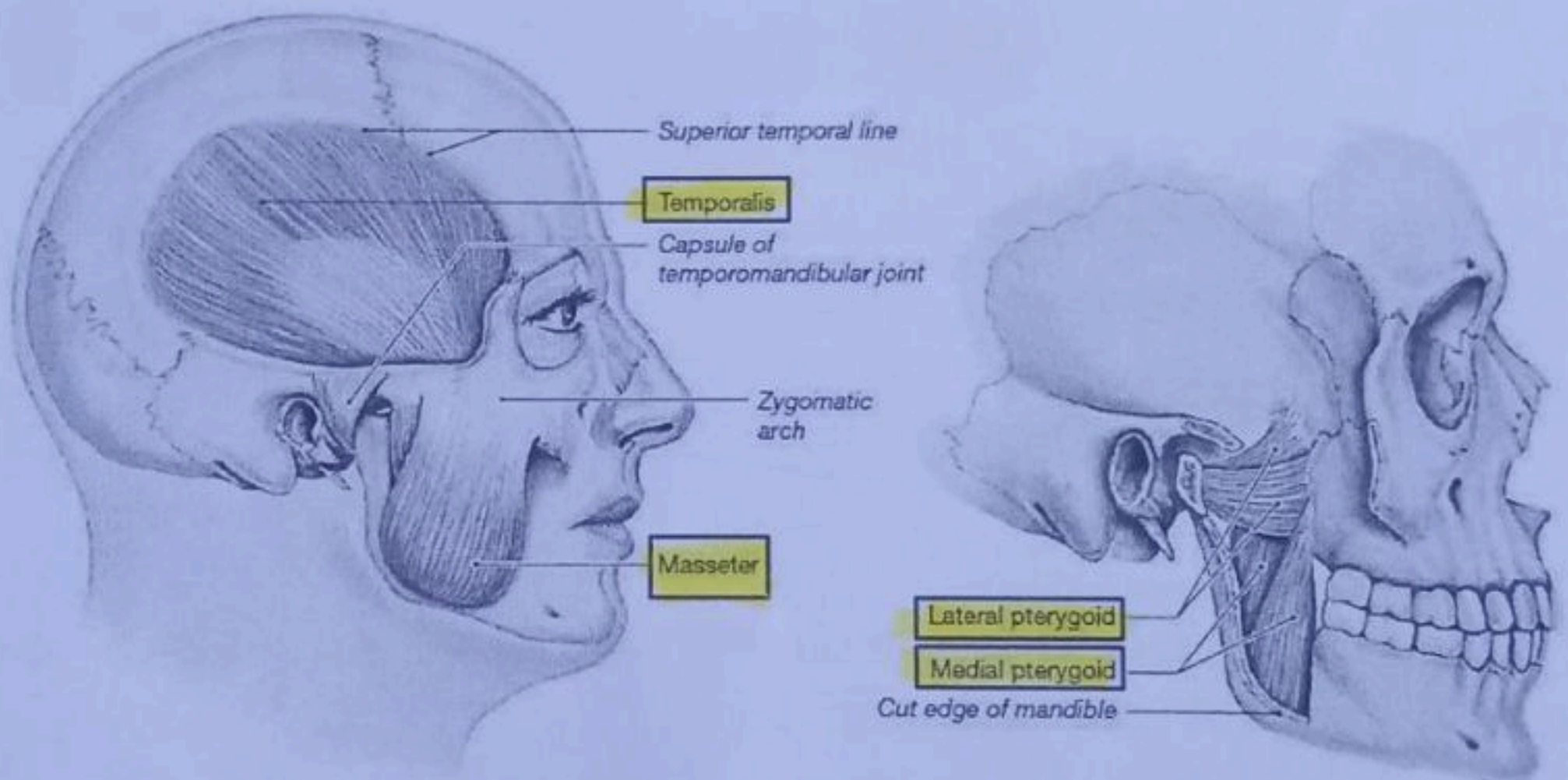


Fig.8: Muscles of mastication.

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