FACTA ANATOMICA

ATAVISTIC STRUCTURES IN HUMANS

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Atavistic Structures in Humans

With the G20 presidency, India will focus on enhancing digital health and preventing emergencies.

" India's vision of a healthier globe emanates from the philosophy of Vasudhaiva Kutumbakam which translates into One Earth, One Family, One Future. So, as part of India's G20 presidency, policymakers from member countries and experts from the medical fraternity shall unfold the foundation and framework of a Global Health Architecture (GHA) at a series of Health Working Group meetings, starting this month. GHA envisages equipping countries to face the next health emergency with robust healthcare systems."

Mansukh Mandaviya

Honourable Health Minister of India at the G20 Summit

Atavistic muscle: Evolutionary origin and mechanism

"The revival of a biological structure that was lost in ancestors during evolution is known as Atavism"

Variations in Human anatomy can be categorized as Vestigial, accessory, or Atavistic.

Atavistic Muscles in Humans

- **Head & Neck:**

1. **Levator Claviculae (Cleidocervical**) muscle is located in the posterior triangle of the neck. It typically originates from the transverse processes of the C3-C5 vertebrae and inserts onto the lateral half of the clavicle. The muscle is believed as an accessory muscle of respiration.
2. **Platysma Occipitalis (Platysma cervicale):** The muscle appears in the early stage of development but disappears in a later stage. It origins from the lateral border of the upper part of the trapezius and inserts at the angle of the mouth where it merges with the platysma.

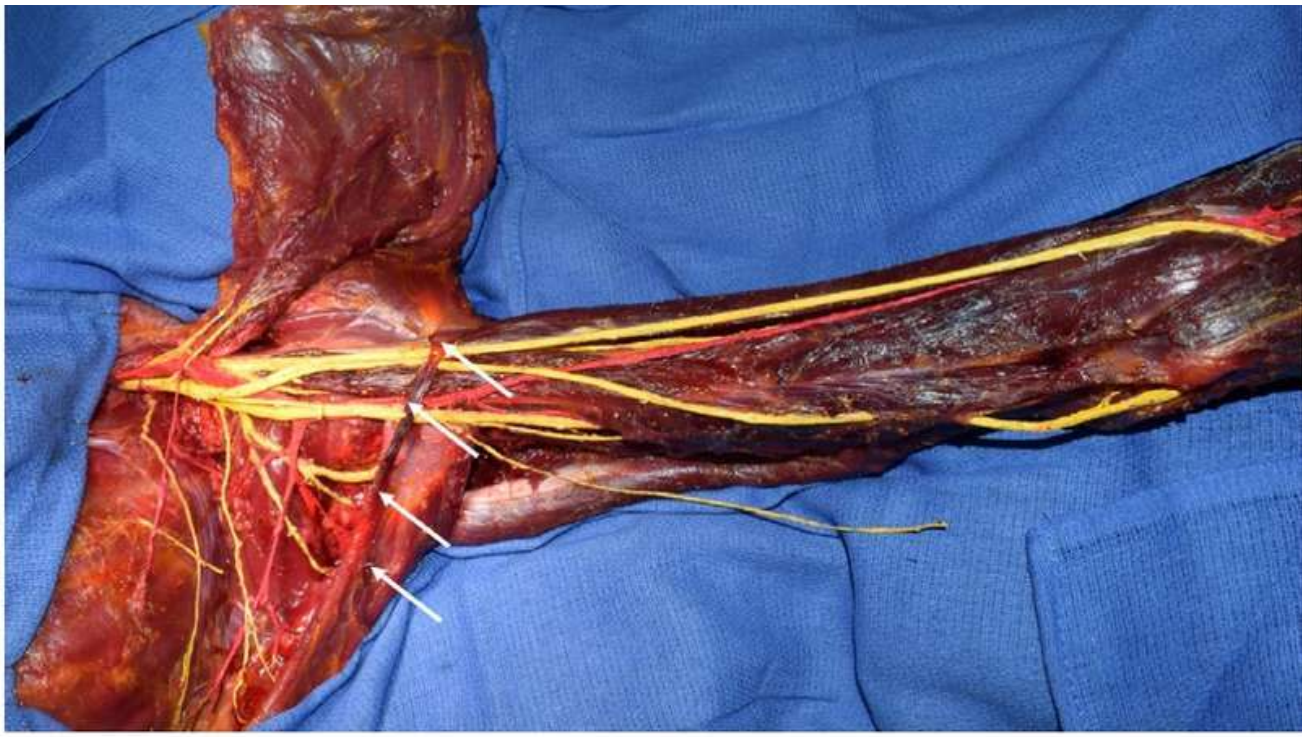


Figure 1: Cadaveric example of left latissimocondyloideus muscle (arrows) (Courtesy: Wahl, L et al. (2022). Atavistic muscles in human anatomy Evolutionary origins and clinical implications. Anatomia,Histologia, Embryologia, 00, 1–11)

- **Upper Limb**

1. **Extensor Digitorum Brevis Manus**: Commonly found in 1-3% of the population origins from the distal end of the radius and inserts on the extensor hood of the index finger.
2. **Contrahentes Digitorum (Transversus manus)**: May be seen as an extension of the oblique head of the adductor pollicis muscle. It may compress the carpal tunnel in the later age of life.
3. **Chondroepitrochlearis**: It origins from the lower border of the pectoralis major muscle near its insertion; and inserts near the medial epicondyle of the humerus. Its attachments reflect the evolution of primitive hominid locomotion from terrestrial quadrupedalism to arboreal and bipedal ambulation.
4. **Latissimocondyloideus (Dorsoepitrochlearis muscle):** This rare muscle origin from the lattisimus dorsi muscle and may insert in the fascia of the arm, biceps brachi, or in olecranon process of the ulna.

- **Thorax**:

1. R**ectus Thoracis Bifurcalis**: This unique muscle originates from the pectoralis major, rectus abdominis, or sternocleidomastoid muscle. It has two insertions: inferiorly to the external oblique aponeurosis and superiorly to the manubrium at the jugular notch. This muscle aids in cutaneous twitching reflexes on the thorax of most mammals for warding off insects, and a reflex lost in human evolution as the upper limb gained a wider range of mobility.

- **Abdomen:**

1. Pyramidalis: The most common atavistic muscle generally found in 30% of the population. The muscle aid expression of the milk in prosimians by contracting the glands. It is often used in non-invasive microsurgical muscle transfers to repair small defects in the tarsal and pedal regions.

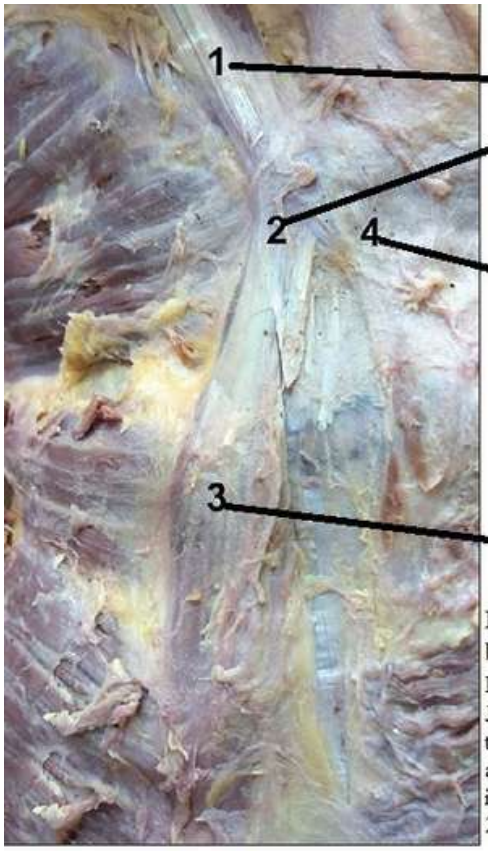


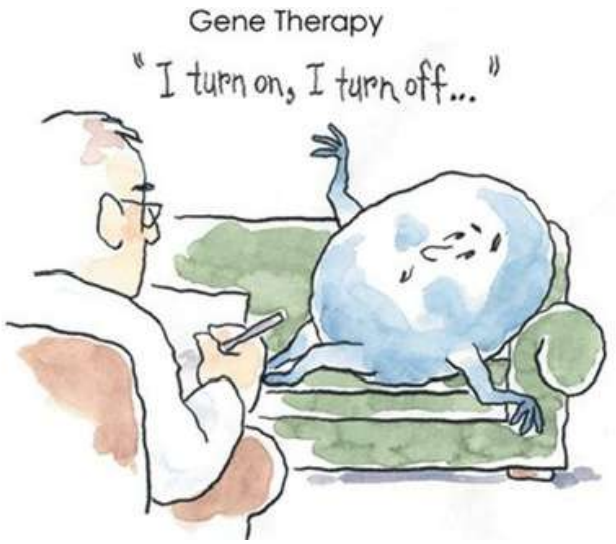
Figure 2: Rectus thoracis bifurcalis Muscle
Image resource: aida MA, Damen NS, Jianu AM, Grigorita L. Sternalis and transversus thoracis muscles: An anatomical variation and its clinical implicationss. J Anat Soc India 2021;70:113-5

Atavistic structures are not uncommon; most anatomists would have found them during their careers. Muscular atavistic structures are generally nonsymptomatic. While some functional atavisms have clinical and applied aspects.
Other Atavistic Structures and traits in human:

- Elongated coccyx, color blindness, enlarged teeth, excess hair, and supernumerary nipple are some of the atavistic traits in humans.

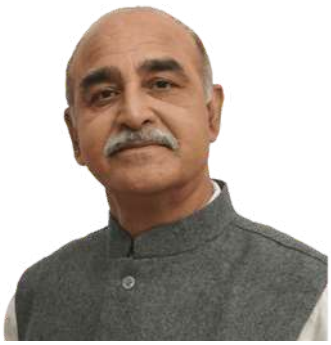
Humans do not have tails, but do we have "what it takes" for a tail? Hens don't have teeth, but they have the genes for it.
With atavism, it is as if our genomes serve as archives of our evolutionary past.

- Errors in gene regulation can lead to the reappearance of lost traits.
- Loss of function or structure during evolution does not mean the loss of the gene responsible for it. Down expression of the gene may also lead to the disappearance of the structure.
- In the process of evolution, many transposons have gained the functional role of regulatory elements. For example, they can act as enhancers
- Excision of transposon can restore the function of the gene lost because of insertion.
  - Genomic stress can excise the transposon
  - Active transposon can excise the transposon
- Remobilization can return cells, tissue, and organ to a state close to the state of the ancestral organism



MESSAGE FROM EXECUTIVE DIRECTOR

PROF.DR. (COL.) CDS KATOCH, AIIMS RAJKOT



I heartily congratulate the Department of Anatomy for bringing this informative newsletter on the unified anatomical explanation of Atavistic structures in Humans. My best wishes to the entire team.

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