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Review Article

Exploring Greek and Arab Scholarly Perspectives on Tasrīḥ Shaḥm wa Áḍalāt (Anatomy of Subcutaneous Fat and Muscle): A Literature Review

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Abstract

Anatomy has always been the cornerstone of medical science, providing the essential basis for diagnosis, surgery, and therapeutics. While modern anatomy relies on dissection and microscopic techniques, its origins lie in the traditions of Greek physicians and the scholarly contributions of Arab and Islamic medicine. Within this heritage, the study of *Tasrīḥ Shaḥm wa Áḍalāt* (anatomy of subcutaneous fat and muscle) highlights the integration of descriptive observation, philosophical reasoning, and clinical application. Greek physicians like Galen laid the groundwork with detailed, albeit animal-based, descriptions of muscles, tendons, and subcutaneous tissues, influencing subsequent generations despite notable inaccuracies in human applications. Arab scholars, building on these translations via institutions like the House of Wisdom, advanced anatomical understanding through systematic dissections and clinical observations, particularly in soft tissues such as subcutaneous fat (*shahm*) and muscles (aḍalāt). This synthesis not only preserved but enriched Greco-Roman texts, setting the stage for medieval medical progress. Through an analysis of primary Unani manuscripts, historical commentaries, and modern anatomical references, the works of Hippocrates, *Al-Rāzī, Al-Majūsī, Ibn Sīnā, Al-Jurjānī, Ibn Rushd, Ibn Hubal al-Baghdādī, Ibn al-Quff*, and *Al-Masīḥī* were examined. Their observations not only contributed to theoretical anatomy but also influenced practical medicine, such as methods of pulse detection, surgical approaches, and interpretations of disease. The comparison between classical and modern anatomy reveals that while ancient scholars provided largely descriptive and functional insights, contemporary anatomy has advanced these ideas with histology, imaging technologies, and biomechanics. Fat (*shaḥm*) was described as a nutritive reserve and protective cushion, whereas muscle (*áḍalāt*) was identified as the organ of movement, strength, and resilience. These early views, while framed in pre-modern contexts, share meaningful continuities with contemporary understandings of physiology. This review explores the perspectives of classical Greek and Arab scholars on fat and muscle, emphasizing their significance in both structure and function.

Keywords: Shaḥm, Áḍalāt, Subcutaneous fat, Muscle, Watr, Ligament, Tendon.

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1. INTRODUCTION

Anatomy has long been regarded as the cornerstone of medical science, forming the essential basis for diagnosis, surgery, and therapeutic practice.[1] Modern anatomy relies on systematic dissection and microscopic study, yet its origins can be traced to the descriptive traditions of ancient Greece and the scholarly elaborations of Arab and Islamic physicians.[2] These classical traditions did not merely preserve earlier insights but enriched them, offering critical commentaries and novel interpretations that shaped the evolution of anatomical knowledge.[3] Within this intellectual heritage, the study of subcutaneous fat (*Shaḥm*) and muscle (*Áḍalāt*) held particular significance.[4] Fat was perceived not only as a storehouse of nourishment but also as a protective layer that cushioned vital structures. Whereas muscle was recognized as the principal organ of movement, force, and bodily strength.[5] Together, these tissues symbolized both the structural integrity and dynamic capacity of the human body.

The exploration of subcutaneous fat (*Shahm*) and muscle (*Áḍalāt*) in classical texts underscores a pivotal shift from speculative Greek morphology to the empirical precision of Arab anatomists. Galen's seminal work on muscular action, derived largely from porcine dissections, posited fat as a protective cushion and lubricant for underlying structures, yet often conflated animal and human configurations. Arab scholars, translating and critiquing these ideas through the lens of clinical surgery, refined such concepts; *Al-Razi*, for instance, detailed fat's role in wound healing and insulation, drawing from human observations to correct Galenic overgeneralizations.[6] Greek and Arab scholar further illuminate this synthesis, classifying fat layers by humoral temperament and muscular insertions with unprecedented granularity. *Ibn al-Nafis* extended these discussions by linking adipose distribution to systemic circulation, challenging purely Galenic paradigms and anticipating modern fascial anatomy. Meanwhile, *Al-Zahrawī*'s surgical manual integrated these insights into operative techniques, advocating layered incisions to preserve subcutaneous integrity.[7]

The dialogue between Greek and Arab scholars established a rich anatomical tradition that extended beyond mere structural descriptions to encompass philosophical, physiological, and even therapeutic dimensions.[8] Thinkers such as Galen emphasized the functional relationship between form and movement.[9] Arab luminaries like Avicenna (*Ibn Sīnā*) and *Al-Zahrawī* critically engaged with and refined these ideas, often integrating them into broader medical compendia.[10] Within the Unani framework, the anatomy of *Shaḥm* and *Áḍalāt* was not viewed in isolation but rather as part of a holistic system in which balance, nourishment, and motion reflected the harmony of the humoral theory. By tracing these scholarly perspectives, the present review underscores how early explorations of fat and muscle anticipated later biomedical insights, and how historical concepts continue to resonate with modern discussions of metabolism, physical strength, and systemic health.

2. OBJECTIVES

i. To critically examine Greek scholarly contributions, particularly from Galen and the Hippocratic Corpus, on the anatomy and functions of subcutaneous fat (*Shahm*) and muscles (*Áḍalāt*), identifying foundational concepts and limitations in human applications.
ii. To analyse Arab advancements during the Islamic Golden Age, highlighting empirical refinements and surgical integrations of these anatomical elements.
iii. To synthesise Greek and Arab perspectives, evaluating their reciprocal influences and enduring relevance to contemporary understandings of subcutaneous tissues and muscular layers in Unani and modern anatomy.

3. MATERIALS AND METHODS

This literature review employed a systematic approach to synthesize historical texts on *Tasrīḥ Shaḥm wa Áḍalāt*. Primary sources included Greek and Arab treatises, Kitab-al-umda-fi-Jarahat, *Al-Qānūn fī al-Ṭibb*, *Kitāb al-Manṣūrī*, *Kitāb al-Mā'āt, Kitāb al-Kulliyāt, Dhakhīra Khwārazm Shāhī, Mukhtārāt fī al-Ṭibb*, and *Kāmil al-Ṣinā'ah al-Ṭibbīyah*. Databases searched included PubMed, Google Scholar, ResearchGate JSTOR, and CCRUM repositories using keywords: "*Tasrīḥ Shaḥm wa Áḍalāt*", "subcutaneous fat", "muscle", "*Áḍalāt*", " *Shahm*".

4. LITERATURE REVIEW

4.1 Greek Scholarly Perspectives:

4.1.1 Buqrat (Hippocrates, 460–377 BC)

The study of anatomy, particularly of muscle (*Áḍalāt*) and subcutaneous fat (*Shaḥm*), has occupied the minds of physicians from antiquity to the Islamic Golden Age.[11] Early Greek medicine, led by Buqrat (Hippocrates), laid down some of the earliest systematic observations. In his writings, Hippocrates described the spinal column in remarkable detail, noting its vertebrae, apophyses, and surrounding soft tissues.[12] He highlighted the stabilizing role of Muscles, their ligaments, and associated vessels in maintaining posture and mobility.[13] Importantly, he observed the health risks of obesity, remarking that individuals who were "naturally fat" were more prone to sudden death compared to leaner counterparts an insight that foreshadowed modern links between obesity and cardiovascular disease.[14]

4.1.2 Jalinūs (Galen 131-200 AD)

Jalinūs (Galen) was among the earliest scholars to systematically describe the muscular system as a structured and functional component of the human body. He pioneered the conceptualization of the muscular system as an independent, organized entity, with his seminal On Anatomical Procedures establishing an authoritative benchmark for subsequent anatomists. Galen described muscles as fibrous assemblies (*ines*), rejecting simplistic notions of blood-borne pneuma as the sole contraction trigger in favour of neural mediation, a breakthrough confirmed through vivisections.[15] Galen accurately delineated antagonistic muscle pairs wherein one contracts as the other relaxes and clarified the muscular belly as the contractile locus, terminating in tendons (tenontes) for bony anchorage. He further described the muscle body as the active part responsible for motion, which narrows into tendons that attach muscles to bones and transmit the force necessary for movement.

Beyond mechanical roles, Galen viewed subcutaneous fat (pimele or stear) as a dynamic physiological entity rather than inert padding.[16] He posited its thermoregulatory function, acting as an insulating barrier to retain the body's innate heat against environmental extremes, aligning with humoral balance.

This perspective integrated fat into vital economy, portraying it as more than structural support. He differentiated oily sebum from denser suet, noting distributional variances across animals, which highlighted evolutionary refinements. These concepts, though animal-derived, profoundly shaped Arab refinements in human anatomy.[6]

In addition to his observations on muscles, Galen also discussed the physiological importance of body fat. He believed that subcutaneous fat played a significant role in maintaining the body's natural warmth by acting as an insulating layer that preserves innate heat. According to his explanation, fat was formed from processed blood and stored in the body as an energy reserve that could be utilized during periods of food scarcity. Galen also distinguished between different types of fat, noting variations such as oily fat and firmer fat and observing that their characteristics differed among animal species. These interpretations illustrate how early anatomical and physiological ideas attempted to explain body structure and function in relation to survival and balance within the body.

4.2 Arab Scholarly Advancements

4.2.1 Abū Bakr Moḥammad Ibn Zakriyā Al-Rāzī (Rhazes, 865–925 AD)

Abū Bakr Moḥammad Ibn Zakriyā Al-Rāzī (Rhazes, 865–925 AD), in *Kitāb al-Manṣūrī*, described muscle as an organ formed by flesh, bones, and nerves, stressing the proportionality between muscle mass and the size of the organ it served.[17] This recognition of functional adaptation in musculature resonates with current biomechanical principles. *Al- Rāzī* emphasizes that the size and thickness of the Muscles are proportional to the size and strength of the organ they move. Consequently, the Muscles that move large organs are large and thick, tailored to meet the size and strength requirements of the organ they are responsible for moving. This explanation underscores the tailored design of Muscles, ensuring they are appropriately adapted to their specific functional roles within the body.[18]

4.2.2 'Alī Ibn Al-'Abbās Al-Majūsī (Haly Abbas, 930–994 AD)

'Alī Ibn Al-'Abbās Al-Majūsī (Haly Abbas, 930–994 AD) in *Kāmil al-Ṣinā'ah al-Ṭibbīyah* gave highly structured accounts of muscle anatomy.[19] He defined Muscles as red flesh reinforced by ligaments and membranes, tracing their origin to the brain or spinal cord and describing their integration with tendinous structures (*watr*) to generate movement. His categorization of flesh mixed, pure, and glandular also reflected an early attempt to classify tissue types, noting fat's protective and insulative role in areas such as the back. He identified several superficial arterial sites as the most suitable locations for assessing the pulse. These included the inguinal region, the dorsum of the foot, the ankle, the femoral artery, the dorsalis pedis, and the posterior tibial artery, as well as the carotid arteries in the neck and the radial and ulnar arteries at the wrist. In addition, he recommended the use of two to five fingers, rather than the thumb for palpation, a practice that remains standard in modern anatomical and clinical examination.[20]

4.2.3 Abū Sahl Masīḥī

Abū Sahl Masīḥī, in *Kitāb al-Mā'āt*, further expanded the understanding of intentional muscular movement. He emphasized how muscle size and structure corresponded with organ function large, strong Muscles for heavy organs and small, delicate ones for finer movements. His account of reciprocal muscular action anticipated the modern concept of agonist–antagonist pairs.[21] Abū Sahl Masīḥī also notes that intentional movements in the body include those of the forehead skin, eyes, cheeks, nose, lips, tongue, jaw, head, and shoulders. This detailed analysis highlights the complexity and coordination required for the various movements facilitated by the Muscles in different parts of the body.[22]

4.2.4 Ibn Sīnā (Avicenna, 980–1037 AD)

With the flourishing of Islamic scholarship, figures such as *Ibn Sī*nā (Avicenna, 980–1037 AD) advanced these foundations in *Al-Qānūn fī al-Ṭibb*.[23] He conceptualized Muscles as intricate organs composed of flesh, ligaments, tendons, and nerves, emphasizing their unity of form and function. Avicenna explained how nerves, despite their softness, transmitted impulses to hard bones, producing coordinated muscular contraction.[24] His anatomical accounts extended to the fine musculature of the face, including six distinct Muscles governing ocular motion and additional structures ensuring sharp vision anticipating modern ocular anatomy.

4.2.5 Ismail Jurjānī (d. 1136 AD)

Al-Jurjānī (d. 1136 AD), in *Dhakhīra Khwārazm Shāhī*, provided one of the most detailed analyses of facial musculature, identifying forty-five distinct Muscles responsible for expressions of the forehead, cheeks, lips, and jaws. His descriptions emphasized ligaments' supportive role and the precision required for coordinated facial movements.[25] The Muscles of the forehead are described as thin and broad, closely integrated with the skin, contributing to various facial expressions. The cheek Muscles and jaw Muscles are also highlighted, with particular attention given to their structure and function.

4.2.6 Ibn Rūshd (Averroes, 1126–1198 AD)

Ibn Rūshd (Averroes, 1126–1198 AD), in *Kitāb al-Kulliyāt*, synthesized Galenic thought with his own anatomical insights. He preserved Galen's enumeration of 529 distinct Muscles, highlighting their diversity in size and form from the large thigh Muscles to the delicate ocular ones. According to *Ibn Rūshd*, the human body is "the remarkable handiwork of God in His creation," and

for this reason, he believed that "the practice of dissection strengthens the faith.[26]

4.2.7 Ibn Hubal al-Baghdādī (1162–1231 AD)

Ibn Hubal al-Baghdādī (1162–1231 AD), in *Mukhtārāt fī al-Ṭibb*, offered meticulous descriptions of facial Muscles, including those governing eyebrow movement, eyelid elevation, jaw function, and cheek expressions. He restated Galen's account of 529 Muscles, including the 37 Muscles of the face, underscoring the sophistication of medieval anatomical understanding. The forehead Muscles attaches and extends from under the skin of the forehead, connecting to the skin without a *watr*. Its functions include lifting the eyebrows and creating space within the eye sockets. Each eye has seven Muscles: four surrounding it (top, bottom, and both corners), two that move the eye outward, and one Muscles behind the eye socket that supports the optic nerve and prevents the eyes from protruding when looking intently.

The jaws have six Muscles, with three for each jaw: two responsible for closing and one for opening. The cheeks have two Muscles, and each facet of the face has a Muscles known as Azala Prahaha (Chara Ma'zala). This detailed description highlights the complexity and specificity of Muscles function in different parts of the body, emphasizing their crucial role in facilitating various movements and expressions.[27]

4.2.8 Ibn al-Quff Masīḥī (1233-1286 AD)

In *"Umda fi al-Jarahah"* authored by *Ibn al-Quff*, muscles are described in terms of their varying shapes and functions. Some muscles are triangular, such as the pectoral muscles, while others are round or square, like the abdominal muscles. Additionally, muscles can be straight or crooked, exemplified by the calf muscles versus the muscles of the back. Certain muscles, like the abdominal muscles, lack a nerve net but contain fibers. muscles also differ in the shape of their ends; for instance, some form tendons, while others give off multiple tendons.

Ibn-al-Quff emphasizes the divine craftsmanship evident in the creation of muscles, which are connected to bones through ligaments, facilitating movement. The surrounding flesh, which is warmer and more rigid than fat and lymph glands, is essential for movement. Fat is deemed unsuitable for movement due to its coldness and tendency to melt under motion. He further explains that muscles and ligaments, being constantly active, require a substantial blood supply, which is provided by numerous arteries. The number of muscles corresponds to the organs that move the upper body, totalling twenty-five. Each organ has specific muscles dedicated to its movement, including the forehead, eye sockets, cheeks, lips, jaws, neck, shoulders, arms, fingers, chest, abdomen, thighs, legs, toes, and tail.[28] Fat is not directly mentioned in this context but can be inferred as unsuitable for movement due to its cold nature and tendency to melt, contrasting with the warmth and rigidity of muscles. This detailed account highlights the complexity and specialized nature of muscles structures and their vital role in bodily movement.

Together, these Greek and Arab scholars established a robust anatomical tradition of *Tasrīḥ Shaḥm wa Áḍalāt*, where fat was understood as a nutritive, insulative, and protective element, and muscle as the principal organ of movement, posture, and expression. Their observations reflect both empirical dissection and philosophical reasoning rooted in humoral theory. Beyond their historical value, these insights continue to resonate with modern anatomy and physiology, reminding us that many current concepts such as the health risks of obesity, the functional diversity of Muscles, and the reciprocal nature of muscular action have intellectual origins stretching back over two millennia.

5. SYNTHESIS AND COMPARATIVE ANALYSIS

The classical insights of Greek and Arab scholars into the structure and function of fat and muscle laid the foundation for modern anatomy. While early descriptions were often based on observation, dissection, and philosophical reasoning. Many of their concepts, such as the cushioning role of fat, the agonist–antagonist action of muscles, and the control of movement by the brain and spinal cord align remarkably with present-day anatomical knowledge. Modern techniques like histology, imaging, and biomechanics have refined these understandings, confirmed the accuracy of several early observations while corrected numerical details (e.g., muscle counts).[29] This continuity highlights how historical perspectives anticipated core principles of anatomy that remain relevant in medical science today.

6. MODERN RELEVANCE

Contemporary subcutaneous tissue research echoes these classical debates: Galen's thermoregulatory fat parallels metabolic roles in Dual-Energy X-ray Absorptiometry (DEXA) imaging, while Arab layered anatomy anticipates Superficial Musculoaponeurotic System (SMAS) fascia studies in plastic surgery. [30] *Tasrīḥ Shaḥm wa Áḍalāt*'s humoral frameworks resonate in Unani System of Medicine, informing obesity interventions where *Shahm* excess disrupts *akhlat* balance, offering cross-cultural insights absent in Western canons. These Greco-Arab synergies underscore fat's non-static nature insulator, reserve, and surgical barrier, relevant to current lipidomics.

Table 1: Contributions of Greek and Arab Scholars to *Tasrīḥ Shaḥm wa Áḍalāt* (Anatomy of Subcutaneous Fat and Muscle)

Scholar	Work	Key Contributions on Muscles (*Áḍalāt*) and Fat (*Shaḥm*)
Buqrat (Hippocrates 460–377 BC)	Early Greek texts	Detailed spinal anatomy. Emphasized stabilizing role of muscles, ligaments, and vessels. Observed obesity-related sudden death, foreshadowing cardiovascular risk.
Zakariyyā al-Rāzī (Rhazes, 865–925 AD)	*Kitāb al-Manṣūrī*	Defined muscle as organ formed of flesh, bones, nerves Emphasized proportionality of muscle size to organ moved Advanced principle of functional adaptation in musculature, resembling biomechanics.
Al-Abbās al-Majūsī (Haly Abbas, 930–994 AD)	*Kāmil al-Ṣinā'ah al-Ṭibbīyah*	Classified tissue types (mixed, pure, glandular); highlighted fat's protective/insulative role Traced muscle origins to brain/spinal cord Identified arterial pulse sites (inguinal, ankle, dorsum of foot, wrist, neck); recommended finger (not thumb) palpation, still in use today.
Abū Sahl Masīḥī	*Kitāb al-Mā'āt*	Explained relation of muscle size to organ function Anticipated agonist–antagonist muscle pairing Described intentional movements (forehead, lips, tongue, jaw, eyes, shoulders).
Ibn Sīnā (Avicenna, 980-1037 AD)	*Al-Qānūn fī al-Ṭibb*	Defined muscles as composite organs of flesh, ligaments, tendons, nerves. Explained nerve-bone-muscle coordination. Described ocular muscles (six for eye movements) anticipating modern ocular anatomy.
Al-Jurjānī (1040–1136 AD)	*Dhakhīra Khwārazm Shāhī*	Provided detailed account of 45 facial muscles Explained their role in expressions (forehead, cheeks, lips, jaws) Emphasized supportive role of ligaments and precision in coordinated movement
Ibn Rushd (Averroes, 1126–1198 AD)	*Kitāb al-Kulliyāt*	Synthesized Galenic and original anatomy Described muscles as red flesh with ligaments, tendons, membranes Preserved Galen's 529 muscle count.
Ibn Hubal al-Baghdādī (1162–1231 AD)	*Kitāb al-Mukhtārāt fī al-Ṭibb*	Detailed facial muscle anatomy (eyebrows, eyelids, jaws, cheeks); reiterated 529 muscles, 37 in face Described ocular muscles (7 per eye, including optic nerve support) Explained jaw (6 muscles) and cheek movement.
Ibn al-Quff (1233–1286 AD)	*Kitāb Umda fī al-Jarahah*	Classified muscles by shape (triangular, round, square, straight, crooked) Explained tendon formation; highlighted divine craftsmanship. Contrasted fat (cold, unsuitable for movement) with warm, active muscle. Emphasized arterial blood supply for active muscles.

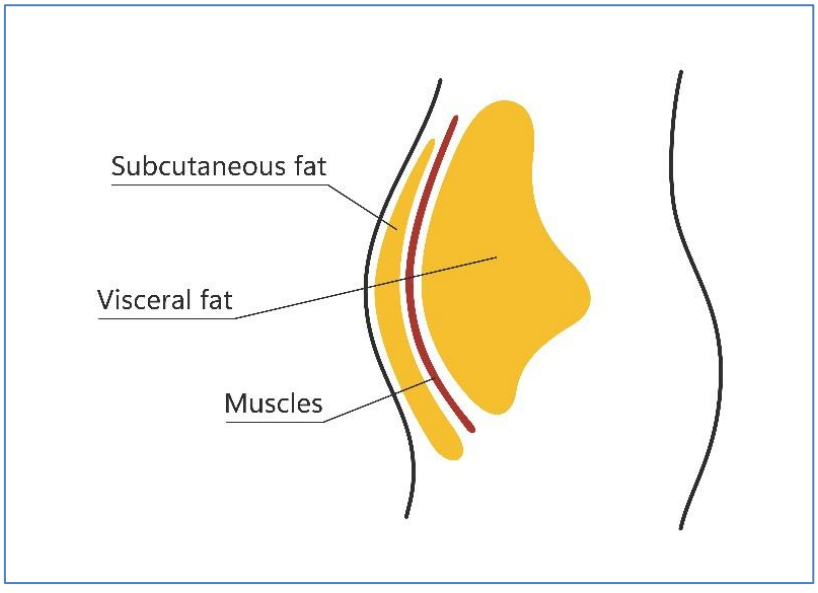

Figure 1. Subcutaneous fat

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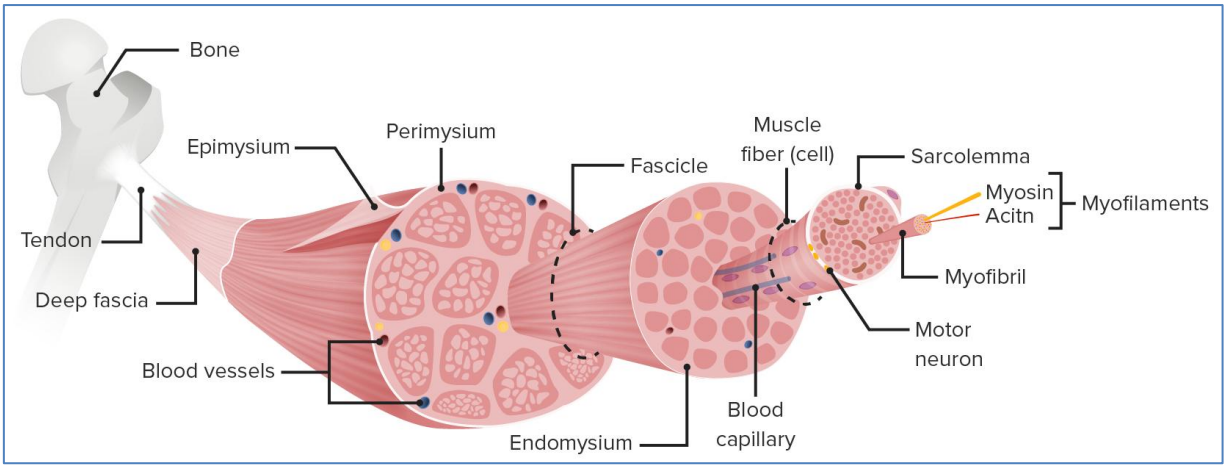

Figure 2. Structure of Muscle

Table 2: Classical vs. Modern Perspectives on Fat & Muscle Anatomy

Scholar	Classical Contribution	Modern View
Buqrat (Hippocrates)	Vertebrae & soft tissue Obesity linked to sudden death.	Same structure confirmed Obesity & cardiovascular risk
Zakariyyā al- Rāzī (Rhazes)	Muscle proportion adapted to function	Validated by modern hypertrophy/atrophy studies
Al-Abbās al- Majūsī (Haly Abbas)	Muscles from brain/spinal cord Fat protective Pulse sites described	CNS motor origin valid Fat protective Same pulse examination method used
Abū Sahl Masīḥī	Muscle size ↔ function Agonist–antagonist pairs	Biomechanics Confirms proportionality and muscle pairs
Ibn Sīnā (Avicenna)	Muscles = flesh + ligaments + tendons + nerves 6 ocular muscles.	Matches neuromuscular anatomy 6 extraocular muscles confirmed
Ismail Jurjānī	45 facial muscles Ligaments for stability	~43 facial muscles Ligaments essential for fine control
Ibn Rushd (Averroes)	Listed 529 muscles Dissection = faith in creation	Close to ~600 modern muscles Dissection still core teaching
Ibn Hubal al-Baghdādī	37 facial muscles 7 oculars per eye Jaw muscles	~43 facial muscles 6 oculars per eye Jaw muscles
Ibn al-Quff	Classified muscle shapes Fat cold/soft vs. muscle warm/rigid	Modern histology confirms varied muscle types Fat non-contractile

7. DISCUSSION

Greek anatomical foundations, particularly Galen's systematic muscular framework and subcutaneous fat conceptualizations, were meticulously preserved through Arab translation efforts during the Islamic Golden Age, yet Arab scholars transcended mere conservation by introducing empirical human-based refinements. Where Galen relied on porcine dissections leading to errors like exaggerated human muscle origins figures such as *Abū Al-Qāsim Khalaf Ibn 'Abbās Al-Zahrāwī*, commonly known as Albūcasis employed surgical observations in *Kitāb al-Tasrīf li-man 'ajiza 'an al-ta'lif fī al-tibb* to validate layered incisions through shahm, enhancing precision in wound management. *Ibn Sina's Al-Qanun fi tib* further synthesised humoral fat temperaments with Galenic insulation roles, correcting species discrepancies and integrating them into clinical pathology, thus elevating theoretical morphology into operative science.[6]

The shift from Galen's pneuma-driven, animal-centric models to Arab vivisection and autopsy practices marked a paradigm change, directly informing *Tasrīḥ Shaḥm wa Aḍalāt's* granular classifications of fat layers and muscular insertions. *Al-Razi's* wound healing insights and *'Alī Ibn Abī Al-Ḥazm Al-Qarashī (Ibn Al-Nafīs*) circulatory-adipose linkages challenged Galenic overreliance on innate heat, prioritising observable distributions over philosophical constructs.[31] This methodological rigour, rooted in *Bayt al-Hikma* collaborations, not only resolved antagonistic muscle mechanics but also anticipated fascial plane distinctions, bridging antiquity to Renaissance anatomy via Unani transmissions.

8. RESEARCH GAPS AND FUTURE DIRECTIONS

Despite syntheses, primary Unani manuscripts like *Tasrīḥ Shaḥm wa Áḍalāt* remain undigitised, with translation biases obscuring nuances in *Áḍalāt* attachments.[6] Gap persist in comparative MRI validations of classical fat distributions and AI-driven reconstructions of lost dissections. Unani literature provides a rich descriptive foundation that can inform modern anatomical research. Revisiting classical texts on *Shaḥm* (fat) and *Áḍalāt* (muscle) may help identify early insights into structural, functional, and clinical correlations that remain relevant today. By comparing these perspectives with advanced imaging, biomechanics, and molecular studies, future research can bridge traditional wisdom with modern science. This integration may not only enhance anatomical education but also support novel approaches in regenerative medicine, obesity management, and musculoskeletal health.

9. CONCLUSION

The exploration of *Tasrīḥ Shaḥm wa Áḍalāt* (the anatomy of subcutaneous fat and muscle) reveals the intellectual continuity and innovation in early medical sciences, marked by contributions from Greek, Arab, and Unani scholars. Hippocrates laid the foundation with his descriptions, while *Al-Rāzī, Ibn Sīnā*, and *Ibn al-Quff* systematized knowledge, merging observation with philosophical thought. Their works preserved and expanded Greek anatomical traditions through clinical experience and cultural context, ultimately establishing frameworks for understanding fat and muscle physiology and pathology, despite lacking modern microscopic precision.

Conflict of Interest: No

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Ethical Considerations

As this is a literature-based study, no human or animal subjects were involved, and thus no ethical clearance was required. However, due academic integrity was maintained through proper citation and referencing practices.

REFERENCES:

1. Turney BW. Anatomy in a modern medical curriculum. Ann R Coll Surg Engl 2007;89:104–7.
2. Brenna CTA, Sc B. Post-Mortem Pedagogy : A Brief History of the Practice of Anatomical Dissection. Rambam Maimonides Med J 2021;12(1):1–5.
3. Ghosh SK, Kumar A. The rich heritage of anatomical texts during Renaissance and thereafter : a lead up to Henry Gray ' s masterpiece. Anat Cell Biol 2019;(52):357–68.
4. Hoffmann J, Thiele J, Kwast S, Borger MA, Schröter T, Falz R, et al. Measurement of subcutaneous fat tissue: reliability and comparison of caliper and ultrasound via systematic body mapping. Sci Rep [Internet] 2022;12(1):1–11. Available from: https://doi.org/10.1038/s41598-022-19937-4
5. Ferris WF, Crowther NJ. Review Article Once fat was fat and that was that : our changing perspectives on adipose tissue. Cardiovasc J Afr 2011;22(3):147–54.
6. LNB C. The Muslim Brotherhood's forgotten treatise on the art of surgery. J R Asiat Soc 2009;19(3):301–20.
7. Spink, M. S., & Lewis GL. Albucasis on Surgery and Instruments : A Definitive Edition of the Arabic Text. [Internet]. California: University of California Press; 2023. Available from: https://public.ebookcentral.proquest.com/choice/PublicFullRecord.aspx?p=30874304
8. Review N. The evolution of ancient healing practices: From shamanism to Hippocratic medicine. Medicine (Baltimore) 2024;103(May):2–16.
9. Ezrokhi D, Lewis O. Galen's Typology of Organs. Apeiron [Internet] 2025;58(2):109–33. Available from: https://doi.org/10.1515/apeiron-2024-0077
10. Rahimi SY, McDonnell DE, Ahmadian A, Vender JR. Medieval neurosurgery: contributions from the Middle East, Spain, and Persia. Neurosurg Focus 2007;23(1):1–4.
11. Saad, Bashar O. Contribution of Arab and Muslim Scholars. In: Greeco-Arab and Islamic Herbal Medicine. 2011. page 22–30.
12. Singh K, Nafasat P, Ansari A, Akhtar J. Contribution of Hippocrates (Buqrat) In Anatomy of Spine And Its Applied Concept. 2022;10(1):563–75.
13. Vasiliadis ES, Grivas TB, Kaspiris A. Historical overview of spinal deformities in ancient Greece. Scoliosis 2009;4(Figure 6):1–13.
14. Sakers A, Siqueira MK De, Seale P, Villanueva CJ. ll Adipose-tissue plasticity in health and disease. Cell [Internet] 2022;185(3):419–46. Available from: https://doi.org/10.1016/j.cell.2021.12.016
15. Fleming TP. Galen On Anatomical Procedures. M.C. Lyons , B. Towers , L.H. Duckworth . Renaiss News [Internet] 1963;16(2):126–8. Available from: https://doi.org/10.2307/2857809
16. Siegel RE. Galen's system of physiology and medicine: an analysis of his doctrines and observations on blood flow, respiration, humors and internal diseases [Internet]. Karger Medical and Scientific Publishers; 1968. Available from: https://scholar.google.co.in/scholar?q=Siegel,+R.E.+(1968)+Galen%27s+system+of+physiology+and+medicine.+Basel:+Karger.&hl=en&as_sdt=0&as_vis=1&oi=scholart
17. Alghamdi MA, Ziermann JM, Diogo R. An untold story: The important contributions of Muslim scholars for the understanding of human anatomy. Anat Rec 2017;300(6):986–1008.
18. Al-Razi Z. Kitab Al-Mansoori,. In: Kitab Al-

Mansoori, Urdu Translation Pub. By The Central Council For Research In Unani Medicine, Department Of AYUSH, Ministry of F&HW, GOI,. New Delhi: page 24–5.
19. Shoja MM, Tubbs RS. The history of anatomy in Persia. J Anat 2007;(January):359–78.
20. Golnoush, Nezhad1, Behnam D, Al M. sology) AD 994-930' (? Abbas H. Med Hist R 2015;4(4):181–90.
21. Taghavi-Shirazi M, Aghabeiglooei Z, Ghods R, Hashem-Dabaghian F. Abu-Sahl al-Masihi (960-1010 AD) and His Description of the Heart. Tradit Integr Med 2024;9(1):114–20.
22. Masihi A. Kitaab Al Maat. In: Kitaab Al Maat. New Delhi: CCRUM; 2005. page 68–9.
23. Islamic T, Islamic T, Ibn A, Sina I, Canon T, Canon T, et al. Thousand - year anniversary of the historical book : " Kitab al - Qanun fit - Tibb "- The Canon of Medicine , written by Abdullah ibn Sina. J Res Med Sci 2012;(November):993–1000.
24. Mazengenya P, Bhikha R. Anatomical concepts of the musculoskeletal and peripheral nervous systems in the canon of medicine. Acta Med Hist Adriat 2018;16(2):267–82.
25. Jurjani A hasan. zakheera khwarzam shahi. In: Zakheera Khwarzam Shahi. New Delhi: Kitab us shifa [In Urdu]. New Delhi: 2005. page 48–9.
26. Walid A, Ibn M, Ibn A. Arab and Muslim Physicians and Scholars. Ann Saudi Med 2008;28(April):145–7.
27. Baghdadi I l H. Mukhtarat fittib ibn ul baghdadi. In: Kitab Al-Muqhtarat fit Al-Tibb Translation BY CCRUM Vol. 1, Ministry Of H& FW,. New Delhi: 2008. page 48–9.
28. UL-Qaf I. umda fil jarahat. In: Kitab Al Umda Fil-Jarahah, Translated and Published in Urdu,1986, By CCRUM,. 1986. page 49–50.
29. Kumar R, Marla K, Sporn K, Paladugu P, Khanna A, Gowda C, et al. Emerging Diagnostic Approaches for Musculoskeletal Disorders: Advances in Imaging, Biomarkers, and Clinical Assessment. Diagnostics 2025;15(13):1–25.
30. Duckworth, W.L.H. Galen on anatomical procedures: The later books. Cambridge: 1962 Cambridge University Press.
31. Dols MW. The Black Death In The Middle East [Internet]. 1984. Available from: https://api.pageplace.de/preview/DT0400.9780691196688_A35805882/preview-9780691196688_A35805882.pdf