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EULOGY TO UN-REPORTED MUSLIM SCHOLARS OF HUMAN ANATOMY: A REFLECTIVE SNIPPET BY A MAXILLOFACIAL SURGEON

Nyer Firdoose C S^{*1}

^{1*}Maxillofacial and Cleft Surgeon, Clinical Director and Head, Dental Health Care and Research, Unit @ Gharonda, HOSMAT Hospital, Grace Town, Bangalore, India.

ABSTRACT

The author in the present manuscript reflectively attempts to review the voluminous anatomical contribution of Islamic literature essentially pre-Vesalius era. Modern medicine has reached amazing heights and there have been handful of discoveries in human anatomy off late which have overturned historical reads and unravelled new perspectives in the world of human anatomy. The power of new [microscopy and imaging] technologies to give deeper insight even in our own basic human anatomy and makes us realize that there are secrets we have not quite deciphered and are waiting for us to be explored. The author cumulates, diverse discoveries dating back as early the 7th century till date by adding his own recent discovery and stimulate readers thinking that these discoveries are the start, rather than the end, of a developing view of the human body along with raising awareness on under reported literature on pre Vesalius Muslim scholars of human anatomy.

KEYWORDS

Muslim scholars, Human anatomy, Reflective and Snippet.

Author for Correspondence:

Nyer Firdoose C S,
Maxillofacial and Cleft Surgeon,
Clinical Director and Head,
Dental Health Care and Research, Unit @ Gharonda,
HOSMAT Hospital, Grace Town, Bangalore, India.

Email: drnyeromfs@gmail.com

INTRODUCTION

Background Review

The intellectual leadership of the Muslim scholars during the early 8th / 9th until 13th century is consensually accepted with the evidence of remarkable progress in various scientific fields which included Medicine. Their contribution to advance human anatomy was somehow underplayed, according to the majority view the Muslim scholars exclusively had a passive role in the transmission of the knowledge base extending from the Greeks to the present West. Nevertheless, as quoted by Abdel-

Halim and Abdel-Maguid (2003)¹, we learn that the Muslim scholars seemingly considered the study of anatomy as a way to increase “*their belief in God and to appreciate his wisdom*”. Doubtlessly, Human anatomy is an intriguingly fascinating subject wherein every individual is similar and yet unique.

It is always considered that Galen was the father of Human anatomy for over 1000 years until the Renaissance as there were no major advances in anatomical knowledge and therefore the Islamic anatomy, from the 9th to the 12th century, was essentially Galenic.

The actual contributions of *Muslim Scholars for the Understanding of Human Anatomy* dates back to early 7th century even before Andreas Vesalius (1543) a Dutch Anatomist, known as the founding father of modern medicine and anatomy, the principal difference between Vesalius was Galen was, Galen did not dissect humans for religious reasons and social taboo. Therefore, Galen’s inferences of human anatomy were based on his dissections of animals which often led him into inaccuracies. For example, his anatomy of the uterus, is predominantly that of the dog’s.

Systematic dissections of the human body were performed neither in Islam nor in Christian lands owing to reasons commonly ascribed to religious prohibitions. However, this was not the only explanation and included various other possibilities such as: dissection would take place only when the knowledge of the structure of the human body is considered important for surgery, or increase in intellectual curiosity during revolution as was the case at the time of Herophilus and Galen, and of Renaissance Italy. Occasional animal dissections were performed, although no systematic dissections of the human body were taken up together with a new spirit of observation that was developing in Islamic medicine.

Though, oftentimes continued to be an untold story for the broader public, it is interestingly noteworthy that there were nine major pre *Vesalius*, *Muslim scholars of human anatomy*, who made a progressive contribution, relative to Galen’s knowledge of the human body. The prominent scholars with

significant contribution to the field of human anatomy were:

1. Al-Razi [Rhazes] (865-925 AD)
2. Al Akhawayni Bukhari [Joveini] (?-983)
3. Ibn Abbas / Hali Abbas [The complete art of Medicine] (930-994)
4. Ibn Sina / Avicenna [The Canon of Medicine] (980-1037)
5. Ibn Al-Haytham / Alhazen [Book of Optics] (965-1040)
6. Ibn Rushd / Averroes [Al-Kulliyat (Generalities)] (1126-1198)
7. Al-Baghdadi [Medicine from the Holy Book and the life of the prophet] (1162-1231)
8. Ibn Al-Nafis [Commentary on Anatomy in Avicenna’s Canon] (1210-1288)
9. Mansur ibn Ilyas [Mansur’s Anatomy] (1380-1422)

Al-Razi/Razes (865-925 AD)

Al Razi wrote over 200 scripts. The most famous of Al Razi’s work is the *Al-Hawi fi Al-Tibb* the medical encyclopaedia (The comprehensive book in Medicine), known in the west as “*Liber Continens*” which has 24 volumes including a collection of his own clinical observations with case studies involving techniques of treatment which he learned from Greek and Roman medicine. The other well-known book of Al-Razi’s is *Ketab Al- Mansuri*, popularly known as “*Liber Al-Mansuri*”, this book compared to the previous one was not as extensive and contained only the extracts from numerous previous scholars (Persaud, 1984)². The anatomy section in *Ketab Al-Mansuri* has 26 sections, which were divided into sections based on structures, such as arteries, veins, nerves, muscles, bones, and organs such as the heart, intestines, eyes, and nose. The individual structures have further sub sections where they were described in detail.

Al-Akhawayni Bukhari/Joveini (?-983 AD)

Al-Akhawayni’s only surviving script the medical encyclopedia is “*Hidayat Al-Mutallemin fi Al-Tibb*” known as a *Scholar’s Guide to Medicine*. This is considered as the first medical text written in new Persian (Farsi Dari) language and the most significant Persian text written around the 10th century (Yarmohammadi *et al*, 2013b)³. This book

consists of 3 parts in five major sections and around 184 - 200 chapters. His book focused mainly on anatomy entitled "Kitab al-Tashrih" known as Book of Anatomy. The Arabic word for dissection (tashrih) was used for anatomy as describing the human body. The eyes, respiratory system, nervous system, cardiovascular system, urinary tract, and kidneys along with gastrointestinal tract, and other structures were described in detail (Dalfardi and Yarmohammadi, 2014)⁴.

Ali Ibn Abbas/Haly Abbas (? 930-994 AD)

Ibn Abbas's medical encyclopaedia the "Ketab Kamel Al-Sena-a Al-Tebiah" also known as Al-Ketab Al-Malki, popularly known in the west as the Complete Art of Medicine and The Royal Book. This book had two parts the theoretical part and the latter practical part. The two parts have ten chapters each known as Maqala and every chapter has multiple sections known as Bab. the most controversial aspect of this book being criticizing the famous Greek, Christian, and Muslim physicians the likes of Hippocrates, Galen and Al- Razi, with an objective of creating the most complete encyclopaedic medical knowledge of his era (Dalfardi *et al*, 2014a)⁴. The anatomical section of this book was considered the prominent source of anatomical sciences in the Muslim world for over hundred years between 1070 and 1170 (Nabipour, 2003⁵, Golzari *et al*, 2013)⁶. Outside the Muslim world it was translated into Latin by Constantinus Africanus (1015-1087) which was known as Pantegni without any reference to Ibn Abbas which is possibly the most early instance of major scientific plagiarism (Zargaran *et al*, 2013⁷, Dalfardi *et al*, 2014a)⁴.

Ibn Sina/Avicenna (980-1037 AD)

Ibn Sina wrote over 270 different publications, He is known as The Prince of Physicians. His famous medical encyclopedia the "Al-Qanun fi Al- Tibb" known as The Canon of Medicine. This book was divided into five parts: (1) chapters about general anatomy and principles of medicine; (2) dedicated to materia medica; (3) diseases of the special organs; (4) general medical conditions; and (5) formulary (Golzari *et al*, 2013)⁶. The sources of ibn Sina's descriptions are still considered controversial as

majority of his anatomical descriptions were similar to those of Galen and the previous Muslims scholars. Also, Ibn Sina quoted Galen in multiple sections of his book. Although, the descriptions in his book were remarkably detailed which included new data, some authors argued that he would have secretly performed human dissections, whereas others believed that Ibn Sina's anatomical considerations were mainly based on his clinical observations (Shoja and Tubbs, 2007)⁸.

Ibn Al-Haytham/Alhazen (965-1040 AD)

Ibn Al Haytham wrote a lengthy book entitled "Kitab Al- Manazir" known as the Book of Optics, this book until the 17th century was considered an influential book within the Islamic world and Europe. Ibn Al-Haytham's goal was to take the complete optical tradition, which would separate the truth from error and put together the truth into a single version of the phenomena of light and vision (Lindberg, 2003)⁹. His Book of Optics had the earliest preserved drawings /illustrations of the eyes and their connection to the brain. The book had seven chapters (Maqalat), each with multiple sections (Bab). He is known as Father of Modern Optics.

Ibn Rushd/Averroes (1126-1198 AD)

Ibn Rushd wrote 20 books in medicine alone, the most significant being the "Al-Kulliyat Fi Al-Tibb" known as the Generalities or General Medicine, it was known in Latin as Colliget (Muazzam and Muazzam, 1989)¹⁰. This book was divided into seven volumes. The first contained the anatomy of organs (Tashrih Al-a'ada'a) and had 25 chapters. Ibn Rushd wrote the "Practice of dissection strengthens the faith" as he was extremely interested in anatomy (Savage-Smith, 1995)¹¹. However, his descriptions in the anatomy book were brief and had limited details similar to that of Al-Razi. Moreover, Ibn Rushd predominantly followed Galen's anatomical work even when they were previously proven wrong by early Muslim scholars. Hence, the anatomical work of Ibn Rushd, the "Prince of Science," did not entirely compliment his huge contributions to the other fields of science.

Al-Baghdadi (1162-1231 AD)

Al-Baghdadi wrote as many as 147 books in different areas including medicine. While his work did not encompass detailed anatomical descriptions in his medical books, his emphasis was on the importance of knowing the parts of the human body and studying anatomy. He stated: “he who practices it (phlebotomy) must, therefore, have a perfect knowledge of the anatomy of the veins, the muscles, and the arteries”. In one of his famous books “Al-Ifada wal-Itibar”, he described the famine which occurred in Egypt during 1200. Al-Baghdadi was able to observe a huge number of skeletons during this famine, after which he concluded that Galen had been inaccurate regarding the bones of both the lower jaw and the sacrum (Bonadeo, 2013)¹². Despite his writings being very short section focussing on anatomy that was predominantly based on verses from the Quran and quotes from Sunnah, and also influenced by Galen’s works, he rectified important aspects of Galen’s descriptions of human anatomy and physiology.

Ibn Al-Nafis (1210-1288 AD)

Ibn Al-Nafis is known for “The Commentary on Anatomy in Avicenna’s Canon”, at the age of 29 years. This commentary was considered Ibn Al-Nafis’s most important one, as it included his ground-breaking perspective on the pulmonary circulation and heart (West, 2008)¹³. He clearly declared in the introduction of his Commentary that all his descriptions were based on the knowledge of previous scholars who practiced dissection such as Galen, however he would not include inaccurate hypotheses by those previous authors. His book had two parts. The first part concerning the internal organs and having five chapters regarding bones in over 30 sections, muscles in about 29 sections, nerves were explained in six sections, arteries, and veins in five sections each. The second part has 20 chapters which included the illustrations and drawings of cranial sutures and other vital organs. Ibn Nafis’s commentary had more detailed descriptions, and illustrations than the books of other Muslim scholars, since it collected the descriptions of many anatomists. Interestingly, despite a few errors, majority of ibn Al-Nafis’s descriptions are

similar to our current anatomical knowledge, his significant contribution is the accurate description of the pulmonary circulation. Regrettably, his description was abandoned by both the Muslim and Western scholars that replaced him, until it was re-discovered three centuries later (Savage-Smith, 1996¹¹, Al-Ghazal, 2007)¹⁴.

Mansur Ibn Ilyas (1380-1422 AD)

Mansur in his book called “Tashrih-I Mansuri” also called as “Tashrih-I Badan-I Insan” known as Mansur’s Anatomy and Human Anatomy respectively, had coloured diagrams (Shoja and Tubbs, 2007)⁸. His book was initially written in the Persian language and in a structured manner having an introduction with comments from Aristotle, Hippocrates, Galen, Al-Razi, ibn Sina, and the Prophetic tradition. Which was followed by five detailed sections on bones, nerves, muscles, veins, and arteries with a concluding section on complex organs and fetal development (Khalili *et al*, 2010)¹⁵. The author contemplates as he reflects that the above-mentioned scholars were probably amongst the first breezes that were harbingers of the winds of science that were to blow later. A most important aspect we note as we learn more about them in the following manuscript is their emphasis on the *superiority of observation over authority* and is quite noteworthy two illustrative examples - one of which shed light on a fundamental aspect of human physiology, that is, the circulation of the blood, and the other corrected a Galenic misconception. Ibn al-Nafis (c.1210-c.1288), asserted, contrary to Galen, *that there were no inter-ventricular openings in the heart* by showing remarkable courage and openly contradicting Galen; the other contribution was made by Al-Baghdadi (1162-1231), who showed that, again contrary to Galen’s belief, *the lower jaw was not composed of two bones*, as he had occasion to see many skeletal remains of those “who had died from starvation or had been eaten by their fellows” as at one place near Cairo more than two thousand skulls were piled up, during the era of terrible famine that befell the country in 1200-1201.



Abu Bakr Muhammad ibn Zakariyya al-Razi (Rhazes)



Al-Akhawayni Bukhari (?-983 AD). © Yarmohammadi, Dalfardi, and Ghanizadeh



Ali ibn Abbas al-Majusi, Hally Abbas (930-994 AD)



Ibn-Sina (Avicenna) 980-1037 A.D



Abu 'Ali Al-Hasan bin Al-Haytham (965-1040 C.E)



Abu'l-Walid Ibn Rushd, better known as Averroes (1126-1198)



Imaginary portrait of Abd al-Latif al-Baghdadi (1162-1231 AD) by Ms. Golnoush Sadat Mahmoudi Nezhad



Ala-al-din Abu Al-Hassan Ali ibn Abi-Hazm al-Qarshi al-Dimashqi known as Ibn al-Nafis



The illustration of human nerves from Tashrihi Mansuri

CONCLUSION

As rightly quoted by Sir Isaac Newton, 'There is not a discovery in science, however revolutionary, however sparkling with insight that does not arise out of what went before'.

Contrary to the regular norm that the Anatomists have so far mapped the entire universe of human body so much that there is nothing more to be explored or discovered, the author's current discovery of "Coronoid Foramen of Mandible", only goes to emphasize that there is still a far way to unravel the intricate mysterious nuances of human anatomy as created and presented to us by the Creator.

Adding to the above luminaries of Muslim Anatomic scholar's contributions, is the most recent one by the author himself of Indian origin's, discovery of an anatomic variant "Coronoid Foramen", a new opening in the lower jaw of live humans, and owing to the Phylogenetic Hypothesis. To the author, it all started as an incidental chance finding, turned out to be a pattern in multiple patients thereafter, which kept getting consistent. This variant type which once seen, is hard to be unseen at least not without a memory wipe away maybe, a sort of same truth repeating itself in as many as 50 patients and still counting in different parts of the globe. Clearly, without prior knowledge and the zeal to lookout for variants with eagle eyed alertness this is difficult and the author yet concludes by quoting Isaac Newton, "it is because I have stood on the shoulders of giants".

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CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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