Review

What did Avicenna (Ibn Sina, 980–1037 A.D.) look like?

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ABSTRACT

We present a reconstruction of Avicenna's face from the only photograph of his skull available today. The photograph is more than 50 years old, and was obtained during the exhumation of Avicenna's tomb in Hamadan for relocation. The reconstruction procedure was performed by the Centre for Anatomy and Human Identification at the University of Dundee, UK. This is probably the first scholarly attempt to reconstruct Avicenna's face. Historians and clinicians who are interested in the history of medicine may find the current craniofacial analysis of Avicenna and the final output interesting and worth recording. The life, achievements and contributions of Avicenna to medical sciences and the influence of his "Canon" on Renaissance medicine are discussed.

1. Introduction

Forensic facial reconstruction is the interpretation of human remains in order to attempt to depict the face of the individual [1–8]. Facial reconstruction from the skeletal remains and a resulting publicity campaign may lead to recognition of an individual. The ultimate aim of facial reconstruction is to recreate an in vivo representation of an individual that sufficiently resembles the deceased person to allow for recognition. It must also be noted that facial reconstruction is not a method of identification, rather a tool for recognition; to produce a list of names from which the individual may be identified by DNA assessment, dental record analysis or other accepted methods of identification. Facial reconstruction is also frequently used to depict the faces of people from history for the purposes of archeological investigation and public communication/display. In the present manuscript, we aimed to describe the facial reconstruction procedure performed on a unique lateral view of a skull belonging to Avicenna and to present the final output of this procedure. A note on the life, achievements and contributions of Avicenna to medical sciences is also provided.

2. Facial reconstruction procedure

In 1949, Avicenna's grave was exhumed during a construction procedure to build a new tomb in Hamadan, a central city in the present-day Iran. His remains including his skull and a part of the skeleton together with those of Abu Said Abul-Khayr, a contemporary poet, who was buried next to him, were removed, photographed, placed in sealed boxes, and kept until being re-buried inside a new tomb [9]. All the photographs were registered and recorded by the national archeology center and later a branch in Hamadan. The skull of Avicenna was made available to the authors as a digitized black and white photograph of the right side of the skull. The photograph was thought to be over 50 years old. The quality of the photograph was good overall, although it was difficult to make out fine details. The skull appeared to be a robust male skull in good condition. The ends of the nasal bones were missing along with the right zygomatic arch and frontal incisor teeth. Avicenna is known to have died at the age of 58.

The two-dimensional approach to facial reconstruction uses a photograph of the skull upon which the face is built. Ideally, the skull is photographed with tissue thickness pegs in place. These pegs provide the average tissue thickness for the age, sex and ancestry group of an individual. However, in this instance, the only photograph available is thought to have been taken decades ago. As the original skull was not available, it was not possible to photograph it with the pegs in place. If a photographic scale had been used, it would be possible to add midline pegs after the photograph had

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been taken, however, this was not the case. Therefore, pegs had to be omitted in this instance.

The facial anatomy was drawn over the photograph on a sheet of (semi-transparent) drafting film. Facial muscles tend to originate and attach to the same anatomical landmarks in different individuals. The relationships between these landmarks differ for each individual, however, as every skull is unique in shape and size. By drawing the facial muscles over the skull in their proper anatomical positions, the basic face shape was given. The details of the facial features (nasal shape, lip form and eyelid fold) were drawn with respect to the assessment of the skull (Fig. 1). The size and shape of the nose are determined using regression equations from measurements of the nasal aperture [10]. As the ends of the nasal bones were missing, their location had to be estimated for the purposes of the equations and as such, may impact the accuracy of nasal prediction. The eyelids and eyebrow shapes are determined from the morphology of the supraorbital region. However, it was difficult to assess details at this area of the photograph. It is advantageous to have a frontal view for these features. The height and shape of the lips were determined by the occlusion of the mouth and height of the dental enamel. Non-adherent ears were drawn using the external auditory meatus to determine position. Finally, the skin layer and facial hair were drawn over the muscle structure to create the finished face on a separate piece of drafting film.

3. What did Avicenna look like?

The facial reconstruction presented in this study gives an interesting insight into the likely facial appearance of Avicenna. The reconstruction enabled visualization of a realistic face from the lateral photograph of Avicenna's skull. The final depiction of Avicenna is shown in Fig. 2.

The Centre of Anatomy and Human Identification at the University of Dundee, which performed the present analysis, has a current 65% success rate with identification in forensic investigations following facial reconstructions. Results of laboratory research employing blind studies suggest that it is possible to reconstruct a face from the skull with enough accuracy to allow recognition by a close friend or family member [11,12]. Certain limitations should be considered when accessing the accuracy of the present reconstruction, however. The reconstruction is based on only one lateral black and white photograph of the skull, which limits the information available for assessing the skull and determining the soft tissue facial features. No tissue pegs were used in the process. The nasal bones were damaged, affecting the accuracy of the nasal reconstruction.

4. Biography of Avicenna

Abu Ali al-Hussain ibn Abdallah ibn Sina (Avicenna in Latin) was born in the village of Afshaneh, close to Bukhara in the present-day

Fig. 2. The final depiction of Avicenna (Image courtesy of Caroline Erolin and Mohammadali M. Shoja).

Uzbekistan in August 23, 980 AD [13,14]. Avicenna's father was the administrator of treasury and connoisseur for the Samanid king of Bukhara, Nuh ibn Mansur [15]. As a child, Avicenna was able to memorize theological texts and had mastered rhetoric and mathematics. By learning fast and savviness, he was obviously superior to his peers. Such exceptional talents encouraged Avicenna's father to patronize his education. He then studied Indian arithmetic and Islamic law, and learned logic under a philosopher, Al-Matali, and became familiar with the works of Plato, Aristotle, Porphyry, and Euclid [15]. De Vries outlined three of Avicenna's characteristics, which were definitely pertinent to his immense achievements at such a young age; persistence in learning, thoroughness and amazing memory [15]. Into this list, we can safely add two other attributes: bravery in exploring new ideas and intense pleasure for investigating curiosities. Being versed in medicine at the age of 17 years, Avicenna surpassed other physicians in curing the king of Bukhara of an intractable illness [14]. To appreciate this, the court granted him access to the royal library [15]. This opportunity led him to compile a comprehensive scientific encyclopedia, The Utility of Utilities (Al-Hasel va Al-Mahsoul) in his early twenties [13].

Avicenna, known as Ibn Sina, Hakim Bu Ali, Abu Ali, Pur Sina, Sheikh or-Raeis and Sheikh Ali in Persia and Arab territories was regarded as the Prince of Physicians, the Galen of Islam and the Aristotle of Arabians [13,14]. Aside from mastering medicine, he was a philosopher, astronomer, politician, governor and administrator [16]. His life was complicated by the political turmoil in the region, and in order to secure himself, he had to adopt an itinerant lifestyle traveling between the cities under the ruling of autonomous powers
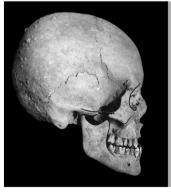

Fig. 1. The reconstruction process (Image courtesy of Caroline Erolin and Mohammadali M. Shoja).

scattered throughout Persia. His itinerancy provided him with an opportunity to meet with contemporary physicians and philosophers, and to access Khwarizmi, Buwayhid and Kakuyid libraries across the Persia such as those in Gorganji, Ray, Hamadan and Isfahan [13]. Avicenna began writing the Canon shortly after leaving Bukhara following the fall of the Samanid dynasty [17,18]. In Hamadan, he was appointed the minister to Sultan Shams al-Douleh, a Buwayhid ruler [19]. But after Sultan's death, he was charged with betraying the kingdom and was jailed. He escaped from prison to join the court of Sultan Aala al-Douleh, the Kakuyid ruler of Isfahan [19,20]. When Kakuyids captured Hamadan, Avicenna returned back into this city where he lived for the rest of his life [13]. The prolific life of Avicenna was cut short by severe dysentery [13,19].

5. Contribution of Avicenna to medicine and neuroscience

The Canon of Medicine is the main medical work of Avicenna through which he is now remembered. Written in five volumes, the Canon has been reckoned as the "medical bible" [21]. The Canon was so influential in medieval and Renaissance Europe that Sir William Hamilton maintained that "no other doctrines obtained currency in any of the schools of medicine than those contained in this work". Books one to five of the Canon respectively embraced the general principles of medicine, matrica medica, organ diseases, general medical affections and formulary/compositions of medicines [13]. The Canon mentions:

"Every investigator explains his theories according to the results achieved by his own experiments, and of course it is not unexpected and out of mind that a researcher reaches a conclusion that does not match with the conclusions/findings of another scientist. So, one has to trust the opinion of the majority and what we have told here [in the Canon] is based on that [22]."

Such exposition, in the 11th century AD, of the idea for what is now generally referred to as "evidence-based medicine" is unique and in fact reflects Avicenna's adherence to the Stoic logic probably inherited from the works of Galen; this aspect of Avicennian logic and thought has been described in detail [22].

The Canon was first translated from Arabic into Latin by Gerard of Cremona (1114–1187). More than 30 Latin versions of the Canon – either partially or entirely translated – were available in the Europe prior to 1500 AD [23]. The translation of Gerard was edited and improved by Andrea Alpago of Belluno (died 1520 AD), an Italian physician and professor in Padua who lived thirty years in the East and had a good knowledge of Arabic [23]. The edition of Alpago was available in Venice in 1527 [23]. In Italian schools of the 16th century such as in Bolonga, students were taught in the theoretical medicine by Galen's Ars Medica, the Aphorisms of Hippocrates and the Canon, while the sources for teaching practical medicine were only the Avicenna's Canon and the Kitab al-Mansouri of Rhazes [24]. The first Hebrew edition of the Canon by Rabbi Nathan Amathi was also printed in Naples in 1491 [23,25].

The Canon was deemed as so complete and copious that medieval European physicians considered it as infallible and a work that could not be augmented or enhanced [26]. The authority of Avicenna, however, partially declined during the Renaissance, but was never entirely rejected. Copies of the Canon were publicly burned in Basel in 1526 [27]. Paracelsus was a strict proponent of Avicenna [27]. Lorenz Fries, the physician of Colmar, Germany, rose to defend Avicenna. He acknowledged him as a father of medicine, and believed that respecting him was as important as respecting his own parents. The preface of his Latin treatise "Defensio Medicorum Principis Avicennae" (A Defense of Avicenna, the Prince of Physicians) printed in Strasburg in 1530 reads as:

"…when I noticed all the abusive and execrable insults that are poured out on our parent Avicenna, I was unable to bear it any longer, seeing that he was as helpful to me in my study of medicine as Hippocrates and Galen. I pondered seriously the question of what weapons to use to take revenge for the injuries inflicted on this father; finally, after a great deal of anxiety, I had the idea of writing a defense against those snooty little physicians who are driven by their great arrogance and scorn to dare to bark against reputable writers with their pathetic voices." (Translated from [28].)

However, like other great books in the history of science, the Canon was not without shortcomings despite its merits, which were ahead of its time in the eleventh century. The Canon provided a clear and systematic account of the teachings of preceding Greek and non-Greek authorities as well as Avicenna's experiences with patients [13] and in this way, the Canon, as Messini and Messini [23] indicated, "represents a great challenge to systematically organize [incorporate] the medical doctrines of Hippocrates and Galen and the biological concepts of Aristotle." Avicenna was so busy with administrative activities and with his patients' care that he most likely did not pursue or did not have a chance to dissect human corpses, although some Persian and Arabic texts claim such a possibility [13]. So, Avicenna made only small modifications to the anatomy of Galen and Aristotle. In some passages (e.g., brain) he follows the former and in others (e.g., heart) the latter. Thus, it is not clear whether his modifications of this anatomy are derived from mistranslations of Galen and Aristotle, the influences of another source or his direct observations on the anatomy of animal or perhaps human. Despite the shortcomings in the anatomy of the Canon, Avicenna was an absolute master in clinical examination and observation of signs and symptoms [13]. Therefore, he is regarded as the founder of semiology [29]. His rational approach to discuss medical issues in the Canon has been praised by Giovanni Battista Morgagni [23]. The Canon's influence on Western medicine continued up until the 20th century [22]. Nowadays, the Canon is a rich historical source for the medical historians to investigate and understand the roots of current clinical practice from its ancient and medieval origins.

6. Conclusion

In the present article, we provide a reconstruction of Avicenna's face from the only photograph of his skull available today. This is most likely the first scholarly attempt to do so. Historians and clinicians who are interested in the history of medicine may find the current craniofacial analysis of Avicenna and the final output interesting.

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