Leading Article

Contributions of Ibn Zuhr (Avenzoar) to the progress of surgery

A study and translations from his book Al-Taisir

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ABSTRACT

This study of the original Arabic edition of the book Al-Taisir Fil-Mudawat Wal-Tadbeer (Book of Simplification Concerning Therapeutics and Diet) written by the Muslim physician Abu-Marwan Abdel-Malik Ibn Zuhr (Avenzoar, 1093-1162 AD) aimed at evaluating his contributions to the progress of surgery and providing English translations of relevant excerpts. Ibn Zuhr's unique experiment performing a tracheotomy on a goat, proved the safety of this operation in humans and represented a further step in the development of the experimental school started by Al-Razi (Rhazes) of Baghdad in the ninth century who is known to have given monkeys doses of mercury to test it as a drug for human use. Ibn Zuhr also performed post mortems on sheep in the course of his clinical research on treatment of ulcerating diseases of the lungs. Same as all his predecessors in the Islamic Era, he stressed the importance of a practical and sound knowledge of anatomy for surgical trainees. Furthermore, Ibn Zuhr insisted on a well supervised and structured training program for the surgeon-to-be, before allowing him to operate independently. He also drew the red lines at which a physician should stop, during his general management of a surgical condition; a step forward in the evolution of general surgery as a specialty of its own. He believed in prophylaxis against urinary stone disease and reported the importance of dietary management for that purpose. Furthermore, Ibn Zuhr enriched surgical and medical knowledge by describing many diseases and treatment innovations not ever described before him.

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Many Western authorities on the history of medicine,[1-11] stated that; with the spread of Islam in the seventh century, a great revival of the sciences took place in Asia Minor. The school of Baghdad was characterized by a new scientific spirit. Proceeding from the known to the unknown; taking precise account of phenomena; accepting nothing as true, which was not confirmed by experience, or established by experiment; such were fundamental principles taught and acclaimed by the masters of the sciences. The Western Caliphate produced physicians and philosophers almost as brilliant as those of the East. Remarkable schools of medicine were founded at Seville, Toledo and Cordova. The most famous of the professors were Averroës, Albucasis and Avenzoar.[12] Avenzoar is the Latin name for Ibn Zuhr who is not, yet, as widely known in the current surgical literature as his predecessors Al-Razi (Rhazes, 854–925 AD), Ibn Sina (Avicenna, 980–1037 AD), and Al-Zahrawi (Albucasis, 930–1013 AD).

This study, therefore, aims at evaluating the contributions of Ibn Zuhr to the progress of surgery.

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Ibn Zuhr and his book Al-Taisir. Ibn Zuhr, known in the West as Avenzoar, Abumeron or Abynzoar, is the Muslim physician Abu-Marwan: Abdel-Malik ibn Abi Al-Alaa: Zuhr ibn Abi Marwan: Abdel-Malik Ibn Abi Bakr: Muhmad ibn Marwan ibn Zuhr, Al-Eyadi Al-Eshbeely who lived and practiced in Eshbeelia (modern-day Seville, Andalucia, Spain) between 1093-1162 AD.[13-16] The name Al-Eyadi refers to his original Arabian tribe Eyad, descendants from Nizar son of Maad son of Adnan.[17-21] Zuhr Al-Eyadi moved from Arabia to Andalucia in the 9th century (3d Hijra century)[14] and of him issued: Abu Bakr Mohammad ibn Marwan Ibn Zuhr, the famous Muslim Scholar in Fiqh (Islamic Jurisprudence) and Hadith (Prophetic Tradition) and the great grandfather of 6 successive generations of physicians in direct descent in the Ibn Zuhr family, in the period from the beginning of 11th to the end of the 13th Century as documented by each of; Ibn Abi Usaibia,[22] Ibn Khalkan,[23] Al-Dhahaby,[16] Al-Khoury[14] and Sarton.[15] Historians,[14,15,24] also agreed that when the patronymic Ibn Zuhr is used alone, it represents without ambiguity the most illustrious member of the greatest medical family of Muslim Spain: Abu Marwan: Abdel Malik ibn Zuhr the subject of this study. In addition to this succession of male physicians, Ibn Zuhr's daughter and her daughter were famous lady physicians; "'aalimatin fi sinaat al tibb wa al mudawah'; 2 lady scholars in medicine and therapeutics with good experience in the treatment of ladies" as stated by Ibn Abi Usaibia the famous 13th century medical historian.[25]

The most famous book of Ibn Zuhr is: Kitab Al-Taisir Fil-Mudawat Wal-Tadbir (Book of Simplification Concerning Therapeutics and Diet). In agreement with Sarton,[15] Guthrie[26] and Ullman,[27] the reputation which Avenzoar has enjoyed in Europe is founded on his Al-Taisir book which was promptly translated into Hebrew and Latin. The work was printed 8 times in Latin between 1490 and 1554. According to Sarton,[15] all of these editions contain, both the Taisir of Ibn Zuhr and the Kulliyyat of his contemporary Ibn Rushd (**Figures 1 & 2**). These Generalia of Ibn Rushd were generally regarded as the counterpart of the Particularia of Ibn Zuhr.[27]

Ibn Rushd and his book Al-Kulliyyat. Ibn Rushd known in the west as Averroes is Abu Al-Waleed: Muhammad ibn Ahmad ibn Muhammad ibn Rushd Al-Qortobi. He was a famous physician who lived and practiced in Cortoba (modern-day Cordova, Andalucia, Spain) between the years 1125 and 1198.[16,27-29] His reputation; however, as a distinguished doctor was overshadowed by his great achievements in Islamic Jurisprudence and philosophy. As a memorial, Ibn Rushd's statues have been placed along the ancient walls in the modern-day city of Cordova and in the vestibule of the University of Barcelona. He was taught medicine by Abu Harun Al-Tergali and Abu Marwan Ibn Hazbool,[16,28,30] not by Ibn Zuhr as stated by some modern historians. However, he was a colleague and a great friend of Ibn Zuhr and, also, a co-author.[28] The most famous medical book of Ibn Rushd is Kitab Al-Kulliyyat Fi Al-Tibb, the Book of Generalities in Medicine, the famous Colliget in the Latin translation, that provides the generalia of medicine in 7 parts:[27-29,31] 1) Anatomy of organs 2) Health (physiology) 3) Sickness (pathology) 4) Signs (symtomatology) 5) Drugs and foods (pharmacology) 6) Hygiene 7) Therapy (therapeutics).

The scientific collaboration between Ibn Zuhr and Ibn Rushd. As stated by Ibn Abi Usaibia, when Ibn Rushd wrote his book on the general topics of medicine, he requested from Ibn Zuhr to write a book on the special topics; so that the sum of their 2 works will be a complete work on Sinaat Al-Tibb, the Practice of Medicine.[28] This is further authenticated by the statements of the 2 authors: Ibn Rushd at the end of his book entitled Al-Kulliyayat[28] and Ibn Zuhr in the introduction of his book Al-Taisir.[32]

Kitab Al-Taisir by Ibn Zuhr provides the particularia of medicine including clinico-pathological correlations, diagnosis and treatment of diseases starting from the head and neck, chest, upper abdomen, lower abdomen then bones then general affections, fevers and epidemics followed by Al Jamie, a health education book for patients and their relatives.[14] Both books combined together constituted one complete comprehensive multi-author medical text book. **Figures 1 and 2** show 2 editions of this 2 volumes-in-one book printed in Venice in 1542 and 1553 consecutively. Accordingly, this is a clear documentation of the first-ever example of joint authorship of a medical textbook.

Methods of study. In order to evaluate the contribution of Ibn Zuhr to the progress of surgery, this original Arabic edition of his Book Al-Taisir (**Figure 3**) was carefully studied. The edition was published in 1983 by the Arab Educational Scientific and Cultural Organization. The editor of the book, the late member of Majmaa Allugha Al-Arabiaa in Damascus, Dr. Micheel Al-Khori, did an excellent job in editing 4 manuscripts of Al-Taisir, one of which was scribed in Barcelona 4 years after the death of Ibn Zuhr. Relevant excerpts from various sections of the book were translated into English. Furthermore, references including books, periodicals and online history of medicine resources have been reviewed.

Ibn Zuhr's contributions to the progress of surgery. 1) The most important contribution in this field is his application, for the first time, of experimental methodology in evaluating new, or

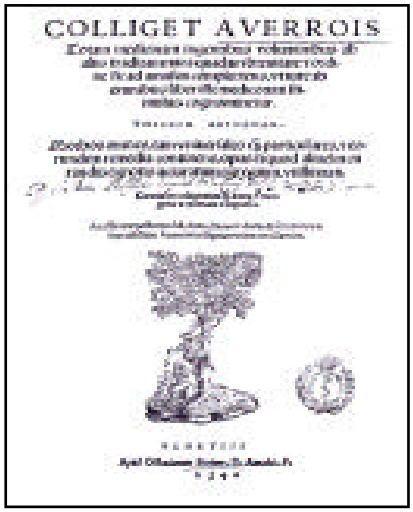


Figure 1

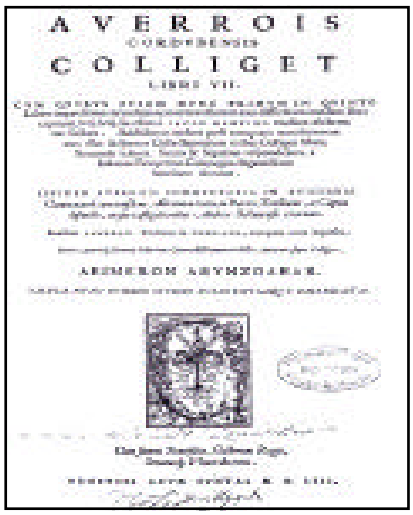


Figure 2

Figure 3

Figure 1 - Title page of the manuscript BH MED 323; the Colliget Averrois; the Colliget of Ibn Rushd and the Thezier AbynZoar; the Taisir of Ibn Zuhr. Courtesy of Biblioteca Histórica de la Universidad Complutense de Madrid: Available from: URL: http://www.ucm.es/cgi-bin/show-libros?d=x532982303&titulo

Figure 2 - Title page of the manuscript BH MED 23; the Colliget Averrois; the Colliget of Ibn Rushd and the Thezier AbynZoar; the Taisir of Ibn Zuhr. Courtesy of the Biblioteca Histórica de la Universidad Complutense de Madrid: Available from: URL: http://www.ucm.es/cgi-bin/show-libros?d=x532982303&titulo

Figure 3 - Title page of the Arabic edition of Al-Taisir book used in this study.

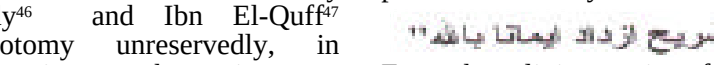
controversial surgical procedures. The role of tracheotomy in the resuscitation of life threatening suffocation due to upper airway obstruction remained controversial for several centuries. According to Adams,[33] Spink and Lewis,[34] Aretaeus in the second century and Caelius Aurelinus in the fourth century did not approve the technique of tracheotomy. Therefore, although Paulus[35] (seventh century) quoting Antyllus (second century), described the technique of tracheotomy, the operation remained in disfavor. This state of affairs lasted until the Islamic era[36] when Al-Razi[37] (ninth century) and later Ibn Sina[38] (tenth century) spoke favorably of the operation and refined the technique. Although Al-Razi spoke of tracheotomy as a drastic measure he reported seeing patients with wounds in the throat through which breath came out, yet the wounds eventually healed and patients survived. Al-Zahrawy,[39-41] in his book Al-Tasrif Liman Ajaz An Al-Taalif reported from his own experience the successful management of a suicidal cut wound of the trachea and concluded that tracheotomy is not a dangerous procedure. However, controversy continued in the time of Ibn Zuhr who noticed that tracheotomy, therefore, was not being carried out in patients who badly needed it. In order to sort out that controversy and prove that tracheotomy is a safe operation, Ibn Zuhr decided to do the following decisive experiment:[42] *"Earlier on in my training when I read those opinions (controversies), I cut on the lung pipe of a goat after incising the skin and the covering sheath underneath. Then I completely cut off the substance of the pipe, an area just less than the size of a tirmisah (lupine seed). Then, I kept washing the wound with water and honey until it healed and it (the animal) totally recovered and lived for a long time."* This unique experiment represents a further step in the development of the

experimental school started by Al-Razi (Rhazes) of Baghdad in the ninth century who is known to have given monkeys doses of mercury to test it as a drug for human use.[43-45] Nevertheless, we think, Ibn Zuhr can be still given the title: "The Father of Experimental Surgery". Ibn Zuhr's application of an experimental animal model to a clinical problem was the forerunner of the method by which many current surgical procedures were developed. The authors who came after him in the thirteenth century such as Al-Baghdady[46] and Ibn El-Quff[47] recommended tracheotomy unreservedly, in life-threatening upper airway obstruction not relieved by other means, and described the technique with more refinements and in more detail. The investigative mind of Ibn Zuhr and his reliance on experimentation in seeking evidence is, also, shown in other sections of his book Al-Taisir. Faced, then, with the difficulty of having no good treatment for patients with severe lung ulceration, he heard from shepherds that sheep do also get a similar disease and there is a cure for it. The following translation from page 129 of Al-Taisir[48] shows how he further investigated this clinical problem:

"...Thus remedies for lung ulcerations are around in nature but are yet unknown to us. For (as) sheep when caught with a lung disease do leave the herd and wander about as if looking for something; shepherds say for a plant to eat and when they finish eating it their illness is relieved completely and are back to normal.. I did inspect lungs of sheep with the evident effect of breach of continuity and with obvious evidence of healing and union. Up till now I did not know that medicine; and I do think no one before me knew it either." Therefore, Ibn Zuhr resorted to performing post mortems on sheep in the course of his clinical research on ulcerating diseases of the lung. From this quotation and from several other places in his book, it seems he was, also, an observant pathologist.

2) The second important contribution of Ibn Zuhr to the progress of surgery is his emphasis on the great importance of a practical knowledge of anatomy for the surgical trainee. Here is a translation of his own words on page 141 in the management of inflammatory swellings of the neck if ripe and ready for bursting or drainage:[49]

"And in case you have mastered the science of dissection then drain by the scalpel in the way that you will not come across a vein, artery or a nerve or anything that its injury will lead to an extra harm to the patient. But if you were one of the group like me and did not practice dissection but knew it only by imitation, keep away from the knife as nothing you know by mere imagination will be the same in real life; especially in the case of small organs" This excerpt indicates that it is only the practitioner who practiced dissection himself and mastered the science who is entitled to do an operative intervention. Mastering anatomy, according to Ibn Zuhr, is an essential training for a surgeon. The importance of anatomy for surgical training is, again, another salient feature of Medical Education during the Islamic Era. Alrazi,[50] in Baghdad, Ibn Sina[51] in Hamadan and Al-Zahrawi,[52-54] in Cordova did stress its importance before. Ibn Rushd, the co-author of Ibn Zuhr, stated that: "Anyone who practices anatomy will increase his faith in Allah.[28]



From the religious point of view, this statement by Ibn Rushd is of particular significance because he was, at the same time, the Grand Qadi (Chief Magistrate) of Cordova and a well known authority on Islamic jurisprudence in the whole Muslim world; then and up till now.[16,28,55-58] Accordingly, his statement confirms that, contrary to Long,[59] the practice of dissection for medical teaching was not prohibited in the religion of Islam.[60]

3) Another important contribution of Ibn Zuhr to the progress of surgery is his insistence on an adequately supervised and structured training program for the surgeon-to-be, before allowing him to operate independently. This is again quite evident in many places of Al-Taisir book. Just as an example, here is the translation of page 27 in the section on head injuries after Ibn Zuhr stated the indications and technique of trephine operation:[61]

"…However I did mention it hoping to see among people, practitioners who are good at it; having enough skill, experience and training. Indeed no one should consider doing it unless he has practiced it as a student under the direct supervision of his teacher 'bain yadai mooallimehi' for a long time. Then practiced it on his own for sometime".

4) Furthermore, Ibn Zuhr drew, in an emphatic way, the red lines at which a physician should stop, during his general management of a surgical condition. This is a step forward in the evolution of general surgery as a specialty of its own. In all sections, we find plenty of examples on that. Here is a translation of one example, page 27 in the same section on management of wounds of the head:[61]

"If the wound caused by a sharp iron has taken into the bones and not extended to the interior, then the treatment I just mentioned is enough for you, so stick to it. However, if it did penetrate the bone then in such a case, the surgeon 'saneul al yad' should come and see."

5) The reliance of Ibn Zuhr on his own clinical observations together with his skill in differential diagnosis and his interest in clinico-patholgical correlations shines through in all sections of the book. Based on his own experience, he staged and classified diseases in a practical way relevant to their management and prognosis. Furthermore, in agreement with all of his biographers Western or

Eastern, he did enrich surgical and medical knowledge by describing many diseases not ever described before him such as pericarditis, mediastinitis, mediastinal tumors, empyema, meningitis, intracranial thrombophlebitis, inflammation of the middle ear, pharyngeal and esophageal paralysis, verrucous malignancy of the colon, fecal fistula, Peyronie's disease, purpuric skin rash and scabies.[15,21,26,62-68] Accordingly, Ibn Zuhr is not a mere compiler; he was an original contributor and innovator.

6) It is evident from many places in Al-Taisir that Ibn Zuhr was, by nature, primarily a physican. He abhorred cutting on the bladder stone an operation which was made safer by points of technique introduced by his predecessors Al-Razi in Baghdad and later on Al-Zahrawi in Cordova.[69-71] He preferred medical treatment and described, in details, remedies to dissolve, disintegrate or help the spontaneous passage of the stone. He even described, how to detect in normal persons a tendency to stone formation: *"Whenever you see, in a healthy individual, that his urine turns thin, looking like water you must fear the possibility of him forming stones".* Henceforth, Ibn Zuhr advised to start that individual on a prophylactic regimen of diet and herbal preparations:[72] *"Indeed if you managed him with this regimen I think that Allah will save him from stone formation".* Therefore, Ibn Zuhr believed in prophylaxis against urinary stone disease and reported the importance of dietary management for that purpose. In the management of a patient with acute urinary retention due to a stone impacted in the urethra, Ibn Zuhr, like Al-Razi and Al-Zahrawi, prescribed several conservative measures. If those measure failed he did not hesitate to intervene following the same endourological principle introduced by Alzahrawy in order to avoid open urethrotomy.[69-71] However, instead of using Al-Michhaab of Alzahrawy he devised a new lithotrite-idea for that purpose.[73] *"And if a fine probe is introduced, in the urethra, till it reaches the stone and the probe is of the finest caliber, with a tiny piece of diamond-stone fitted to its end; that diamond upon touching into the stone will lead to its crushing".* Ibn Zuhr ingenuity with instruments and planning of management lines is also evident in many other places of his book Al-Taisir. He modified an ophthalmic surgical instrument to serve better its purpose.[74] He also designed tubes for orogastric feeding and tubes for rectal feeding in patients with esophageal paralysis, rejecting the opinion of those who claimed that such a patient can be fed by immersing him in a container full of milk or soup.[75] Accordingly, in conclusion and in agreement with Ibn Khaldoon,[24] Ibn Said[56] and Sarton,[15] among the many distinguished physicians of the Muslim West, Ibn Zuhr was by far the greatest. He was perhaps the greatest clinician in Islam after Al-Razi.[15,16,76] Furthermore, he was the most famous physician of his time, not only among Muslims, but in Christendom and his influence upon European Medicine was maintained until the end of the seventeenth century.[15]

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