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Dental Practice in Al-Andalus (Spain) in the 10th And 11 Centuries Ce: Abulcasis Al-Zarahwi

Dr. Antonio López-Valverde
Clínica Odontológica. C/Alfonso X el Sabio, S/N. Campus Miguel de Unamuno, Salamanca. 37007. Spain.
mailto:anlopezvalverde@gmail.com

López-Valverde, Antonio
Tenured Lecturer, Faculty of Medicine, School of Dentistry, Department of Surgery, University of Salamanca, Spain, anloval@telefonica.net

López-Valverde-Hernández, Nansi
Dental Student, Faculty of Medicine, School of Dentistry, Department of Surgery, University of Salamanca, Spain, nansitahernandez@hotmail.com

Bravo, Manuel
Professor, Faculty of Odontology, University of Granada, Spain, mbravo@ugr.es

Gómez de Diego, Rafael
Associate Professor, School of Dentistry, Alfonso X "El Sabio" University, Madrid, Spain
rgd6467@movistar.es

Rosel, Eva
Associate Professor, Faculty of Odontology, University of Granada, Spain, erosel@ugr.es

Gómez-Polo, Cristina
Associate Professor, Faculty of Medicine, School of Dentistry, Department of Surgery, University of Salamanca, Spain, crisgodent@hotmail.com

Camañas, Gustavo
Medical Manager, Vitaldent Clinics. Madrid, Spain, mailto:gcamanas@vitaldent.com

Montero, Javier
Tenured Lecturer, Faculty of Medicine, School of Dentistry, Department of Surgery, University of Salamanca, Spain, javimont@usal.es

Abstract
Abulcasis (Al-Zarahwi), a Hispano-Muslim physician born in the 10th century CE and deceased in the 11th, has been considered one of the fathers of modern surgery. His treatise Kitab al Tasrif was one of those that had the greatest impact the medical-surgical knowledge of the period. Volume XXX, dedicated to surgery, has seven chapters, from the twenty-eighth to the thirty-fifth, dedicated to the study of different aspects related to oral-dental pathology and oral surgery and they address areas as diverse as the treatment of gingivitis, the treatment of epulis and ranula, ferulization of the teeth and dental reimplantations.
For almost six centuries, his work continued to be one of the most important practical guides, both in Islamic Culture and in Mediaeval Europe.

Keywords: "Abulcasis", "Al-Zarahwi", "Kitab al Tasrif", "Oral-dental pathology", "Islamic Culture and in Mediaeval Europe".

1. INTRODUCTION

The contributions of Arab scholars to medicine in the Middle Ages were the result of the study of the Greco-Roman, Persian and Indian civilizations. The classic texts were translated to the Arabic in the 8th and 9th centuries and these translations played a key role in matters of medicine, since above all they brought back the Greek legacy, transmitting this to the West through Sicily and the Iberian Peninsula.

In those times, the great School of Medicine in Córdoba competed with the Salerno School (Schola Medica Salernitana), which was later to become the precursor of many Schools of Medicine

in Europe. Abulcasis taught his knowledge to others, as we learn from an engraving in the manuscript entitled "The hygiene of Abulcasis", where he appears in the guise of a professor [1].

The schools of translation, such as the one in Toledo (Spain) exported all the wisdom of the Arab world to the West. Thus, the medical treatise "Kitab al tasrif lib-man ajiza an al-ta alif", better known by the abbreviated title "Kitab al Tasrif", written by Abulcasis and translated into Latin by the Toledan scholar Garardo de Cremona, was one of those that had the greatest impact on the medical-surgical knowledge of the period and this lasted for almost six centuries as one of the most important practical guides, both in Arab culture and in Mediaeval Europe [2].

Abu I'-Qasim Khalaf ibn 'Abbas al-Zahrawi, also known by the numerous Latin forms of his name (Abulcasis, Abulcasim, Albucasis, Albucasim, Bulcas, Alsaharavius, Alzaragius, Altaragius, Ezzahravius or simply al-Zahrawi), was born arounf 930 at Madinat al-Zahara (currently Medina Azahara), at a distance of 5 Km from Córdoba (Andalusia, Spain), a city founded in 936 by Abd-er Rahmann III (Fig. 1).

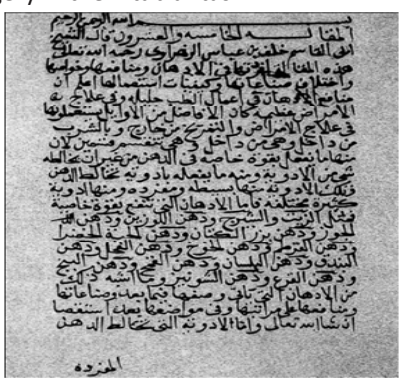
Fig1. Postage stamp dedicated to Abulcasis. Fourth Arab congress oral surgery. Syria 1964



Apart from his place of birth, little is known about his life. He learned the trade from his father, called Abbas, possibly in order to eventually take on his father's patients. However, there are some indications that in his youth he went to Bagdad to complete his knowledge of medicine. This was frequently the case among medical students of the time since that city had one of the most important hospitals in the Islamic world.

Upon his return, he worked in Córdoba and Medina Azahara, and eventually became the personal physician to Almansor (a Commander of the Caliphate of Córdoba) and to the Cordovan Caliph Abd.er Rahmann III. He died in the 44th year of the Hegira (around 1013), at the time when the wars involving the siege of the city by Christian troops was being waged [3].

Fig2. First part of the maqala devoted to surgery in the Kitab al-tasrif.



Source: La medicina en Al-Andalus. Fundación El Legado Andalusí. Junta de Andalucía. España

The only complete manuscript of the "Kitab al-tasrif" can be found in the Suleymaniye library in Istanbul. Based on "The Canon" of Avicenna, it comprises several volumes (maqalas) (Fig. 2), although the most famous one is volume XXX, dedicated to surgery, which in turn is composed of three books, the first dealing with the use of cauterization, the second one on incisions and venous sections and the third on fractures.

His work gathers the knowledge of the classical authors, above all the Byzantine physician Paulus de Aegina, and is enriched by personal contributions, reflecting a profound knowledge of anatomy, the design of surgical instruments, and surgical techniques [4].

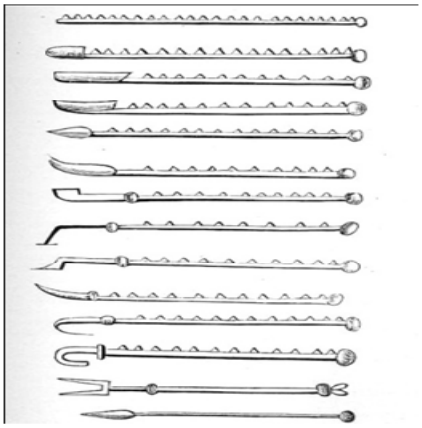
2. CONTRIBUTIONS TO DENTISTRY AND ORAL SURGERY

Although in the period addressed here all matters regarding to the mouth and teeth were considered secondary within the context of medicine, such fields being relegated to barbers and bleeders (alfagemes), Abulcasis covers everything related to these aspects in seven chapters, from the 28th to the 35th, devoting each one to different aspects related to oral-dental pathology and oral surgery. Chapter 21 is devoted to dental pharmacology and includes 84 recipes mainly for analgesic medications and whitening agents.

A. Chapter 29. on Dental Tartar

In this section Abulcasi offers a perfect argument that tartar is the main cause of gum inflammation and recommends that it should be removed by a scraping and smoothening of the roots. He describes 14 instruments (mijrads) designed by himself for such purposes [5] (Fig. 3).

Fig3. Scrapers recommended and designed by Abulcasis to remove tartar from teeth. Source: Taylor. History of dentistry. Lea & Febiger ed. Philadelphia and New York, 1922



The following (paraphrased) extract from the chapter "on the scraping of teeth" gives an idea of the importance he gave to this treatment:

"…sometimes, on the surface of the teeth, both inside and outside and below the gums, rough scales are deposited; these are ugly in appearance and are black, green or yellow. This corruption begins to affect the gums and the teeth enter a state of loss of protection. It is necessary to place the head of the patient on your lap, between your legs, and scrape the teeth and molars in which you see something akin to sand and continue doing this until these substances have been completely removed and the dirty colour of the teeth has disappeared, be it black, green, yellowish or of any other colour. If the first scraping is not sufficient, scraping should be continued on the following day, and –if necessary- a third or even fourth scraping should be performed…"

B. Chapter 30. on Cauterization

In this chapter, Abulcasis describes the use of different instruments for cautery and the removal of soft tissues, such as epulis. He also used cautery for performing gingivectomies, as the

modern electric scalpel is used today:

"…although the most noble material for making a cauterization is gold, this melts quickly and also cools rapidly. Iron preserves the heat longer and requires a higher temperature to melt. When iron is red hot it can be used to coagulate and when it reaches even higher temperatures and goes yellow it can be used to cut…"

He describes the treatment of epulis thus:

"…lift it with a hook or hold it with a forceps, cutting it out at its root and allowing the pus or blood to flow out. After closing the wound, astringent powders should be applied. If it grows back, it must be cauterized".

Abulcasis emphasizes the importance of protecting adjacent structures when cauterizing with red-hot iron and recommends that after cauterization the patient *"should keep her mouth full of a good butter for one hour".*

C. Chapter 32. on Extracting Teeth

Abulcasis counsels prudence when making decisions about molar extraction, *"…because it is a noble organ and possession of it cannot be substituted perfectly in any case".*

Likewise, he warns that great caution should be exercised on deciding which tooth is the bad one since patients, fooled by their pain, often ask for a healthy tooth to be removed instead of the degraded one. *"This happens when a barber (alfageme) is the one performing the surgery".*

When carrying out an extraction, the technique to be used is described as follows:

"…it is necessary to detach the whole of the perimeter of the gum from the tooth with a sufficiently strong scalpel; then, either with the fingers or with pair of light forceps, the molar should be rocked gently until it becomes loose. Then, the surgeon, holding the patient's head firmly between his knees, should apply a stronger pair of forceps and withdraw the tooth vertically so as not to break it. When the tooth is rotten and empty, the cavity should be filled with small pieces of cloth, tamping them down firmly inside the tooth with the tip of a probe so that the tooth will not break under the pressure of the instrument".

"…It is crucial not to act like the crazy ignorant barbers (alfagemes), who in their temerity fail to observe any of the rules cited previously and often cause serious wounds in the patient, the least of these being tooth fracture, leaving the root in its place, or pulling a piece of bone from the maxilla together with the tooth, as I have often noted…".

He designed several types of forceps and elevators for tooth extraction, one of the forceps, straight and having a swans beak tip, being ideal for introduction under the gum and for the removal of root fragments:

"…if the operator cannot manage it, he should attempt it with an elevator".

D. Chapter 33. On Supporting Loose Teeth And Replacing Lost Teeth

Abulcasis also recommended the tying of loose teeth, and even suggested that fallen teeth be replaced, tying them with wire to contiguous teeth to stabilize them. He also counselled that when teeth were lost they should be replaced by artificial pieces made of ox bone, tying them to adjacent teeth:

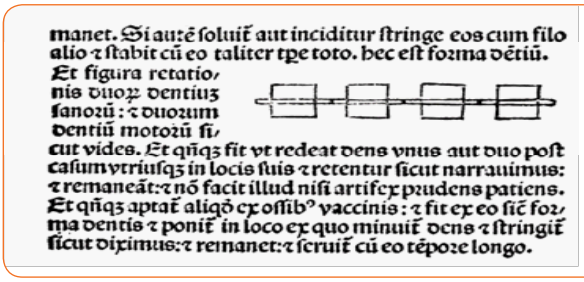

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Fig4. Illustration of the design of dental ferulization

Source: Abulcasis: On Surgery and Instruments

"…they should be tied to healthy teeth on both sides, using silver wire, although gold wire is better since it does not oxidize. It is also possible to replace one or two molars, after they have fallen out, in their respective places by constructing the scaffolding we have mentioned and these will remain fast; however, this can only be done by a talented and meticulous craftsman. Sometimes, a tooth from a cow is sculpted into the shape of the molar, after which it is placed in the cavity left by the fallen piece and the scaffolding is done as we have described. By doing so it will remain fast". (Fig.4).

E. Chapter 35. Treatment of Ranula

Among other issues, in this chapter Abulcasis described the surgical treatment of ranulas in terms very similar to those used today:

"…sometimes, a tumour resembling a small frog appears under the tongue and prevents it from carrying out its normal function. And it may sometime grow so big that it fills the mouth. The thing to do in these cases is as follows: open the patient's mouth, with his face towards the sun, observe the tumour and if you see that it is of a dark colour, is hard, and you note the patient has no sensation in it don't touch it because this is a cancer; but if it is white and moist, you should secure it with a hook, slice it with a fine scalpel and release it on both sides. If there is copious bleeding while you are doing this, put pulverized vitriol on it until it stops bleeding and then continue with your work until you have removed it completely. After this, the patient must wash his mouth with vinegar and salt until he is cured".

3. DISCUSSION

Oral-dental conditions were not accorded special attention by Arab authors during the Middle Ages and this is why there are no specific treatises addressing these pathologies. It is likely that they were considered very evident symptoms and that it was not necessary to spend time on them, as recommended by most Arab physicians of the day.

The practice of dentistry n the Middle Ages was considered secondary; a job for barbers and bleeders (alfagemes). Nevertheless, in Moslem Andalusia (Al Andalus) there was a series of medical treatises that paid much attention to oral-dental pathologies (Table 1):

Table1. Treatises on medicine in Al-Andalus.

Treaty	Author
Kitab al-tasrif lib-man ajiza an al-ta alif	Abulcasis Al-Zarahwi
Kitab al-Wisad	lbn Wafid
Kitab al-Taysir l-mudawat wa-l-tadbir	Abü Marwan Ibn Zuhr (Avenzoar).
Kitab al-Kulliyat fi tib	lbn Rusd (Averroes)
Kitab al-lstiqsa wa-l-ibram fi ilay al-yira hat wa-l-awram	Mubammad al-Safra
Kitáb Amal man tahba	Ibn al-Jatib

- Kitab al-tasrif by Abulcasis Al-Zarahwi.
- Kitab al-Wisad by the Toledan physician and pharmacologist lbn Wafid.
- Kitab al-Taysir l-mudawat wa-l-tadbir by the Sevillian physician Abü Marwan Ibn Zuhr (Avenzoar).
- Kitab al-Kulliyat fi l-tib by the Cordovan physician, jurist and philosopher lbn Rusd (Averroes).
- Kitab al-lstiqsa wa-l-ibram fi ilay al-yira hat wa-l-awram by the Valencian surgeon, settled in Granada, Mubammad al-Safra.
- Kitáb Amal man tahba by the Granadine polygraph Ibn al-Jatib [6].

Different authors have addressed the work of Abulcasis, most of them addressing regards surgical aspects [7, 8, 9, 10, 11, 12]. In the literature consulted, the authors have only found one article that analyzes his work from the perspective of dentistry [13].

The diagnosis and treatment of oral-dental disease were not practiced in a specific way in Moslem Spain (Al-Andalus) of the 9th and 10th centuries, although nearly all the physicians tackled these pathologies in their treatises, above all offering suggestions concerning the preservation of dental health, following the theories of the great Greek physicians [14]. By contrast, surgery underwent great advances in Al- Andalus, above all with Abulcasis Al-Zahrawi.

Abulcasis was much in favour of conserving dental structures and believed in delaying tooth extraction as long as possible.

On just a few occasions he performed tooth reimplantations since he considered that this was an intervention that involved great difficulty and that it could only be carried out by a talented, meticulous operator [6, 15].

4. CONCLUSION

The different therapeutic options for oral-dental disease recommended by Abulcasis in the treatise Kitab al-tasrif also allow the construction of a document on the commonest oral-dental pathologies in those times: caries, tartar, gingivitis and periodontitis, toothache, halitosis, ulcers and cysts, aphtas, tonsillitis and parotidiitis. All these particularities make the Kitab al-tasrif an extremely interesting historical treatise worthy of being consulted by any professional working in the field of dentistry and oral pathologies.

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AUTHORS' BIOGRAPHY



Antonio López-Valverde.
Oral and Maxillofacial Surgeons. Doctor in Medicine and Surgery. Tenured Lecturer. Faculty of Medicine. School of Dentistry. Department of Surgery. University of Salamanca, Spain.



Nansi López-Valverde-Hernández.
Dental Student. Faculty of Medicine. School of Dentistry. Department of Surgery. University of Salamanca, Spain.



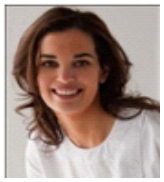
Manuel Bravo.
Doctor in Medicine and Surgery. Doctor in Dentistry. Professor of Preventive Dentistry. Faculty of Odontology. University of Granada, Spain.



Rafael Gómez de Diego.
Doctor in Dentistry. Associate professor of dental materials. School of Dentistry. Alfonso X "El Sabio" University. Madrid, Spain.



Eva Rosel.
Doctor in Dentistry. Associate professor of Preventive Dentistry. Faculty of Odontology. University of Granada, Spain.



Cristina Gómez Polo.
Doctor in Dentistry. Associate professor of Prosthesis.School of Dentistry. Department of Surgery. University of Salamanca, Spain.



Gustavo Camañas.
Doctor in Dentistry. Medical Manager. Vitaldent Clinics. Madrid, Spain.



Javier Montero.
Doctor in Dentistry. Tenured Lecturer. Faculty of Medicine. School of Dentistry. Department of Surgery. University of Salamanca, Spain.

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