

# AL-ZAHRAWI THE SURGEON MAGNIFICENT

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Al-Zahrawi, the magnificent surgeon of the Middle Ages had been known by various names like Albucasis, Bulcasis, Alsarbius, Alzahravius or Ezaharagui. His full name was Abul-Qasim Khalaf Ibn Abbas Al-Zahrawi. He was born in the royal city of Al-Zahra about five miles of Cordova. He attended the well known University of Cordova. Cordova, at that time was the magnificent capital of Al-Andalus, with a population of about one million where Muslim culture and science were at their peak.

Al-Zahrawi was an eminent physician and surgeon of the Court of Caliph Abd-al-Rahman III, who was the eighth Ummayyad Ruler of Spain at that time. He was born in 930 A.D.: spent a very productive life in practicing medicine, particularly surgery and medical writings. He died in 1013 A.D. at the age of eighty-three.

Al-Zahrawi's work was part of tremendous wealth of scientific knowledge. It was a basis of the culture and learning of the Golden Age of the Islamic State. This was a time when the Muslims had established a brilliant empire which was organized, powerful, and sophisticated. The capital of this empire in the East was Baghdad, and in the West it was Cordova. It was into this Golden Age of Islamic State that Al-Zahrawi was born in the western part of Islamic Empire. He lived in what has been considered the most glorious age of Al-Andalus, and was a contemporary. Besides being a contemporary surgeon, he was a great teacher and prolific writer. He believed and taught basic sciences like anatomy and physiology as the basis of good and sound surgery. He wrote "Before practicing, one should be familiar with the science of anatomy and the functions of the organs, so that he will understand them, recognize their shape, understand their connections, and know their borders.

Also, he should know the bones, nerves, and muscles, their numbers origins, and insertions, the arteries and the veins, their start and end. These anatomical and physiological bases are important. If one does not comprehend the anatomy and physiology, he may commit a mistake that can kill the patient. I have seen someone who pretended to be a surgeon, incised an aneurysm in the neck of a woman mistaking it for an abscess. The woman bled to death."

## Publications

Al-Zahrawi wrote thirty treatises comprising his encyclopedia called *Kitab-al-tasrif li-manajiza an al-taalif*. (Literal meaning — The book of enabling him to manage who cannot cope with the complications,

the implication being that it is a self contained manual of medical arts in all its branches; the user need refer to no other work). Some of the treatises are as follows:

- 1st Elements and the mixtures (various sorts of temperament) compounding of drugs and anatomy.
- 2nd Diseases and their symptoms and instruction for their treatment.
- 13th Surgery.
- 26th Diets for the sick and many of the healthy — arranged according to diseases.
- 29th Naming of drugs in various languages, how one can be used in place of another, stabilization of drugs compounded and otherwise.

The other 25 deal with materia medica preparation and uses of drugs, pills, ointment, plasters, and so on.

The 13th treatise is on surgery. This is the first rational, complete, and illustrated work of its kind. The purpose of this book, as described by the author was to revive the art of surgery as taught by the Ancients. In this treatise, in addition to his own methods, Al-Zahrawi refers from Hippocrates to Paulus Aegineta — spanning eleven hundred years. He described very accurately many surgical conditions with their management, operative procedures, and surgical instruments. Many of these were his own, and some of these were described crudely by his predecessors. Any number of these do not appear in previous writings. These procedures and instruments may therefore be regarded as his own, or at least part of distinctively Muslim-Arab practice. Some of these instruments described by him are shown in the following diagrams.



PROBES



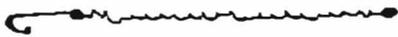
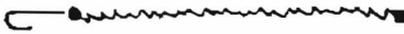
CAUTERY (VARIOUS SHAPES)



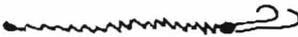
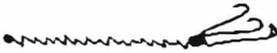
FISTULOTOMY SCALPELS



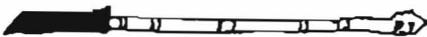
CONCEALED SCALPELS



HOOKS



MULTI-PRONGED HOOKS



SCALPPLS (VARIOUS SHAPES)



MOUTH GAGS



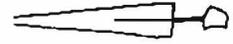
FORCEPS FOR DENTAL WORK



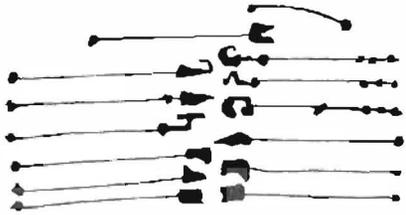
DENTAL FORCEPS



DENTAL FORCEPS



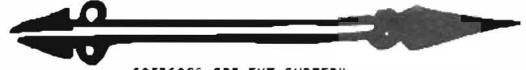
EAR SYRINGES



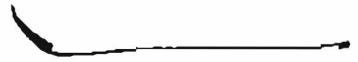
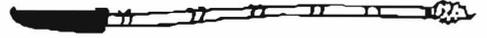
DENTAL SCRAPERS



SCISSORS FOR EYELID SURGERY



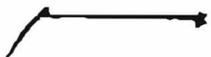
SCISSORS FOR EYE SURGERY



FINE SCALPEL FOR EYE SURGERY



FINE SCALPELS FOR EYE SURGERY



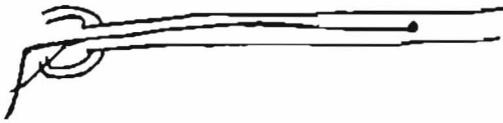
TONSILLECTOMY INSTRUMENTS



HOOK FOR EYELID RETRACTION



CATARACT NEEDLES



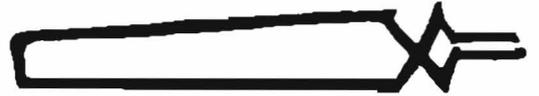
URINARY CATHETERS



SYRINGE FOR BLADDER IRRIGATION



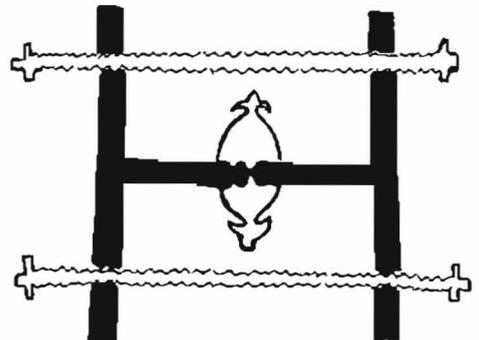
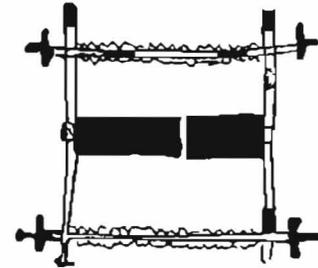
LITHOTOMY KNIFE



VAGINAL SPECULUM



CEPHALOTRIBE (FOR CRUSHING FOETAL HEAD)



VAGINAL SPECULUM

Al-Zahrawi appears to be the first surgeon to use cotton in surgical dressings, in the control of hemorrhage and as padding in the splinting of fractures. He explained the use of cautery for treating many conditions like control of bleeding, opening of liver abscesses, fistula in ano and perinal areas. He performed and described surgical procedures on almost every part of the body belonging to various specialties. These include dental, eye, ENT, orthopedic, obstetrics and gynecologic, and general surgical procedures. His descriptions of many conditions and operative procedures have been quite detailed and accurate. Following are a few examples:

#### Ranula

"Sometimes there occurs under the tongue a swelling resembling a small frog, which hinders the natural movements of the tongue; sometimes it grows so as even to fill the mouth. The operation for it is to open the patient's mouth in the full light of the sun and inspect the tumor. If you see that it is dark or black, and hard, and the patient has no sensation in it, do not interfere with it, for it is a cancer. But if it is inclined to be pale and has fluid in it, put a hook in it and incise it with a fine scalpel and free it all round; and if hemorrhage hinders you while operating, apply pounded vitriol to it till the bleeding stops. Then proceed with your work till all is extracted; then let him rinse his mouth out with vinegar and salt. Then give all the suitable treatment till healed."

#### Tonsils and tonsillectomy

"Sometimes there occur in the throat buboes called 'tonsils,' which resemble the buboes occurring externally. The operation for this is first to see, before operating, whether his inflamed tumor has already completely subsided or to some extent diminished. Then make the patient sit down in the full light of the sun with his head in your lap; open his mouth; and have an assistant before you to press back the tongue with an instrument like this. It should be made of bronze or silver, and slender like a knife. And when the tongue is depressed with its help, the tumor will be made manifest to you and your direct vision will fall upon it. Then take a hook and fix it in one tonsil and pull it forward as far as it will go; but be careful to not pull away with it any of the mucosa. Then cut it with an instrument of this form; it is like scissors, except that its extremities are curved, the beak of each meeting the other, and very sharp. It should be made of Indian iron or Damascene steel."

#### Blepharoplasty

"When superfluous lashes grow on the eyelid outside their natural place, below the natural lashes, and continue, they injure the eye and give rise to many kinds of disease, such as chronic lachrymation, dropping of the eyelids, and whiteness and opacity, eventually resulting in the destruction of the eye. The plastic operation on the eye is carried out in four ways: by the actual cautery; by caustic in the way mentioned above

in the book on cauterization; by incision and suture; or with canes, as I shall describe.

You should place the patient's head in your lap, then with your left hand, turn out the eyelid. Now if it thus becomes everted, good; otherwise introduce a threaded needle beneath the eyelid and pass the needle up; let that be near the hair itself. Then draw the thread up with the lid and invert the lid with a probe; then make an incision on the side of the lid below the superfluous lashes with the lancet, from the greater to the lesser angle. Then draw out the thread and put beneath the lid a small pad of cotton or linen; then mark with ink on the eyelid the shape of a myrtle leaf. The shape should be according to the amount you wish to raise the lid, and varies in different people. In some cases you should cut away a fair amount in proportion to the ptosis, but in others a smaller incision is enough; all this in due proportion to the extent of the ptosis. Then with a scalpel incise over the two lines you have marked, beginning at the greater angle and going toward the lesser angle; and let one incision be close to the natural lashes, at a distance of about the breadth of a probe. Then introduce a hook into one angle of the skin and peel it all off; then join the edges with a needle and a fine woolen thread, and wipe away the blood; and stick the ends of the threads to the eyebrow with adhesive, if you like; but if you do not, it does not matter. Then let the suture and the threads remain for about three or four days, then dress."

#### Liver abscesses

"When there is an abscess in the liver and you are anxious to know if the tumor is in the body of the liver or in its capsule: if it is in the substance of the liver, the patient will be suffering from a feeling of heaviness and no very acute pain. But if it is in the capsule of the liver, there will be the sharpest intensity of pain and you will see that it has baffled the doctors. Then the patient should lie back on his neck; then mark the place of the swelling with ink. Then heat the cautery in the fire, this being the cautery resembling a probe, of this form, and with that make one cauterization till the whole thickness of the skin is burnt through, finishing up at the capsule so that all the purulent matter comes out. Then apply the treatment for wounds. This kind of cauterization should not be employed except by one who has a long experience of the medical art, and who has frequent practice at dealing with this kind of disease."

#### Aneurysms

"When an artery is injured and the overlying skin scars, a tumor very often rises from this, the same thing happens to a vein. A swelling and a tumor. And these are the signs by which you may diagnose whether the swelling and tumor arise from an artery or a vein. If it be from an artery, the tumor will be a deep and elongated mass, and when you press upon it with your finger, there will be a feeling of pulsation. But if it arises from a vein, the swelling will be circular and

superficial. It is dangerous to make an incision on tumors of this kind, especially in the axilla, the groin, the neck, and in many other parts of the body; it is indeed highly dangerous, so in these you must avoid treatment by the knife; also in those in the limbs and in the head it must be avoided, but any such that arises from the inflation of the mouth of an artery, you may cut down in the skin over that with a longitudinal incision; then open up your incision with hooks and dissect away the artery freeing it from the tissue until it is left bare and run a needle beneath the artery to reach the other side, and tie the artery in two places with a double thread as I showed you for the extraction of temporal artery."

#### **Umbilical hernia and omphalocele**

"The navel becomes prominent for many causes; either from a rupture of the peritoneum over the abdomen, so that omentum or intestine comes through it as in other ruptures; or from blood extravasation from an artery or vein, as we have mentioned; or else from wind trapped in it. If it be due to ruptured peritoneum and protruding omentum, the color of the tumor will be the same as the rest of the body; it will be soft and painless and will seem to change its position, compared with what we have described, will be greater, and it will disappear on digital pressure, and then will recur; and often there will be crepitus with it, and it will increase in size on entering the bath or on violent exertion."

#### **Hydrocele**

"A watery hernia is a collection of fluid in the white membrane lying beneath the skin surrounding the testicle, which is called the scrotum. Sometimes it has a capsule of its own which later has formed along side the testis so that one would think it is another testicle. When we begin operative treatment, the patient should be told to be venesected if possible, if you see that he is of plethoric bodily habit. Then let him lie on his back on something a little raised and have a heap of materials placed beneath him. Then sit down on his left side and with an assistance sit on his right side, and draw out his penis towards one side or the other of the scrotum and towards the hypogastrium. And take a broad scalpel and make a longitudinal incision in the scrotum from the middle of most of the pubis. Incision should be straight on a parallel with the median raphe of the scrotum down to the tunica albuginea and dissect away from it carefully less you cut it. You should dissect chiefly on the side where the testicle is most adherent, and take your dissection as far as possible. Then open up the membrane containing the fluid with a wide perforation and draw all the fluid. Then with hooks separate the two edges of the incision and draw the membrane upwards, but do not touch the skin overlying the testes; then cut away the membrane in whatever way is possible, either as a whole or piecemeal, particularly the side piece. If you find the testicle corrupted by some other disease, you will have

to tie off the vessels which are in the suspensor for fear of hemorrhage. Then cut the testicle from the suspensor and remove it. and dress it as we said above."

#### **Varicose veins**

"Have the leg shaved if it is much hairy. The patient gets a bath and his leg kept in hot water until he becomes red and the veins dilate; or he exercises vigorously. Incise the skin opposite the varicose vein longitudinally either at the ankle or at the knee. Keep the skin open by hook, exposed, dissect, and separate the vein. Introduce a spatula underneath it. When the vein is elevated above the skin level, hang it with a blunt rounded hook. Repeat the procedure about three fingers from the previous site and hang the vein as previously done. Repeat the procedure at as many sites along the varicose vein as necessary. At the ankle, ligate and strip it by pulling it from the incision just above. When it reaches there, repeat at the higher incision until all of it is stripped. Ligate the vein, and then excise it. If difficulty is encountered in pulling it, ligate its terminal part with a string and pass it under the spatula, and dissect it further. Pull gently and avoid its tearing because if it does it becomes difficult to strip all of it, and can cause harm to the patient. When you have stripped all, put alcohol sponges at the sites of the skin incision, and take care of the incisions until they heal. If the varicose vein is tortuous, you have to incise the skin more frequently, at each change of direction, dissect it and hang it with the hooks, and strip it as previously described. Do not tear the vein or injure it. If this happens, it becomes difficult to strip it. The hooks used should be blunt, eyeless and rounded, otherwise it can injure the vein."

#### **Influences on the West**

During the time of Al-Zahrawi — in the early Middle Ages when the Muslim culture and science including the healing arts were at their zenith, the position of medicine in Europe and West was dismal. This was limited to monasteries where monks administered simple herbal remedies. The few hospitals functioned as hospices, places for destitutes and needy, rather than for sick. Medical teaching was virtually nonexistent. Whatever education was there, it was confined to the ranks of clergy. Scientific study and research was dead. During the time of Al-Zahrawi, while surgery in the Islamic world became a respected specialty practiced by reputable physicians in Europe, it was belittled and practiced by barbers and butchers. In the year 1163 A.D., the Councils of Tours declared the following resolution: "Surgery is to be abandoned by the schools of medicine, and by all decent physicians."

Towards the end of the 12th century and subsequently, European medical world started awakening. Western scholars journeyed to Spain, studied the work of Muslim Arabic scholars. Subsequently these works were translated into Latin and other European languages. Al-Zahrawi's *Al-Tasrif* was translated into Latin five times by Gerard Cremona starting as early

as mid to late 12th century. Surgery started to develop in the West with a book written by Roger Salerno entitled "Practica Chirurgica" which was published after the translation of Zahrawi's Al-Tasrif. Salerno, in his surgical writing, appeared to be very much influenced by Zahrawi's work. In early 13th century, Ronald di Parma, who demonstrated great skill and experience in the treatment of head wounds and skull fractures, appeared to learn many techniques from Zahrawi's writings. Guy di-Chauliac (1300-1367) was the first French surgeon who was influenced by Zahrawi and mentioned him in his book, "La Pratique en Chirurgie," more than 200 times. He used ointments, oils and lints in the manner of Zahrawi. Another Latin surgeon was Guillermo de Saliceto who lived in 13th century appeared to be very much influenced by Zahrawi in the treatment of hydrocephalus. This Italian surgeon described the treatment of hydrocephalus — the method used exactly by Zahrawi earlier. Even today many surgical procedures still appear to be influenced greatly by Zahrawi.

#### References

1. Campbell, *ibid* 85-90
2. Gillispie, *ibid*, Vol. XV 584-585
3. Habibi, *ibid* 3
4. Sharif, *ibid* 1342
5. Spink, M.S. & Lewis, G.L., *Albucasis On Surgery and Instruments*, University of California Press, 1973



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