

AZTEC MEDICINE *

With Comments on Mexican Neurosurgery

Robert H. Pudenz, M. D.

When Hernan Cortes and his band of 553 Conquistadors arrived in Veracruz in 1519 the Aztecs ruled a mighty civilization that extended from the Gulf Coast to the Pacific Ocean and from Honduras and Nicaragua in the South to the Southwestern United States in the North. It is believed that the Aztecs, like the other Indian tribes, migrated into North America across the Bering strait and arrived in this mile and a half valley in 1168 AD. According to the legend, the wandering tribe had chosen this site when they saw an eagle with a rattlesnake in its mouth perched on the nopal cactus growing on a rock. Their priests had foretold that this was the site on which they would build their capital, Tenochtitlan.

At first the Aztecs lived in a most primitive manner, barely subsisting on whatever food they could find. They hired themselves out as mercenaries to neighboring tribes and by the early 14th century had become a formidable military force which speedily conquered and annexed neighboring tribes and absorbed and improved their cultures.

Tenochtitlan reminded Cortes and his soldiers of Venice. It was a magnificent city located in the center of a lake, threaded with canals and reached by long, broad stone causeways. Hundreds of temples, palaces and other buildings, many of which were flamboyantly colored, were noted. There were beautifully landscaped country villas with pools and fountains. Their art works were outstanding, their markets stocked with a large variety of items and their scientific progress almost unbelievable.

The political structure of the Aztecs bore a strong resemblance to Imperial Rome. The emperor was all-powerful. He was counseled by tribal leaders and personal advisors. At his death his successor was chosen from his eligible male relatives on the basis of merit.

The judicial system protected the rights of all individuals. In contrast with the European system where women were usually mere chattels of their husbands, Aztec women had equal rights.

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Education, arts, sciences and the professions were dominated by the Aztec priesthood. The priests served as historians, scribes, mathematicians, astronomers and astrologers. In the sciences they functioned as teachers, practitioners and research workers. Outstanding among their many contributions was their calendar which in their 52 year cycle was within 11 minutes of absolute astronomical exactitude.

Much more could be said about Aztec science and culture but our concern is with Aztec Medicine. Our knowledge of this is based on manuscripts that survived the book-burnings ordered by the Spanish conquerors. Most important among these are the Badianus and Sahagun manuscripts.

The Badianus manuscript was written in 1552 by two Aztecs who were educated by the Franciscans at the College of Santa Cruz. It was first written in the Aztec language on loose sheets by Martinus de la Cruz and immediately translated into Latin by Juannes Badianus under the title "Libellus de Medicina- libus Indorum herbis." This beautiful little volume bound in crimson velvet was discovered in the Vatican Library in 1929 by Clark and Thorndike and subsequently translated into English by Dr. Emily Walcott Emmart. The English edition was published by the Johns Hopkins Press in 1940. (2)

The Sahagun manuscripts are the work of Fray Bernardino de Sahagun who is considered to be the true father of the history of medicine in Mexico. Fray Bernardino was a teacher at the College of Santa Cruz. Apparently he was away at the time de la Cruz and Badianus were writing the Aztec herbal and was unaware of this manuscript. His first books were religious and historical tracts which have preserved the history of the pre-conquest period. However in the great plague of 1546 he developed the disease (either smallpox or typhus) and following his recovery focused on Aztec Medicine. He gathered a group of native physicians about him and wrote extensively on native remedies and treatments. The manuscript was completed in 1585 with the text in both Nahuatl and Spanish. Subsequently it was translated into English. (6)

Additional knowledge of Aztec Medicine is contained in the letters of Cortes to Charles V and the historical accounts of Acosta, Oviedo and the classic history of Bernal Diaz del Castillo. Mexican medicine was introduced into Europe by the various publications of Nicolas Monardes during the latter part of the 16th century. Monardes, a physician of Seville, never came to the New World but gathered his information from ship's captains, travelers and missionaries and by correspondence with many individuals in New Spain.

Although these documents are an invaluable source of information, they do not present the true picture of Aztec Medicine. Dibble and Anderson (6) point out that the Spanish impression

of the Aztecs' knowledge of anatomy and their medical practice was based on interpretation from the available 16th century medical vocabularies. It is also apparent that the Aztec physicians differed in their management of medical problems.

Medicine, as practiced by the Aztecs, was inseparably linked with religious ideas. Various gods presided over different diseases and medical specialties, even over sleep and dreams. Mendieta wrote in 1590 that "when called to cure a patient the (Aztec) physician used herbs and applied some remedies if the ailment was of minor importance, but if the disease was acute and dangerous he would tell the patient "you have committed a sin". Psychotherapy and religious rituals, therefore, supplemented the use of indigenous materia medica.

Despite this emphasis on the supernatural origin of disease the Aztecs recognized that diseases could be transmitted by other media, particularly through the air. They made extensive use of incense to ward off airborne diseases. When Montezuma and his courtiers greeted Cortes and his army on their arrival in Tenochtitlan, attendants carried censers and filled the air with incense. The Spaniards thought this a mark of esteem but the Aztecs were only protecting themselves.

It is difficult to evaluate the prestige of the physician in the Aztec social structure. More than likely it is a question of the standards by which they are judged. Cortes requested Charles V not to allow physicians to come to Mexico because the dexterity and knowledge of the native doctors made it unnecessary. Both the Emperor and the Pope dispatched emissaries to learn everything possible about Mexican materia medica. According to Carrington (1) the Aztec doctor was as respected as were the high priests. However, another modern authority, Francisco Guerra, states that male and female physicians had little prestige and in modern times would be classified as blue collar workers.

The Aztecs had two categories of physicians. The one group comprised the Tepati who were the legitimate physicians and the other the Ticitl who would be comparable to the witch doctor, sorcerer or medicine man in existing primitive societies.

Both men and women were trained as physicians in an apprentice system. Sons were commonly apprenticed to their physician fathers. Men started to practice at a younger age than women. The latter engaged in medical practice only after the menopause because menstruation and parturition were considered bodily impurities. A certain degree of specialism existed in medical practice. Among these specialties were internal medicine, surgery, midwifery, phlebotomy, pediatrics, pharmacy and dentistry.

Anatomy

In Book 10, Chapter 27 of the Sahagun codices there are descriptions of the parts of the body and their properties. A considerable number of anatomical terms and descriptions of attributes are noted for surface anatomy and for muscles, bones and joints. Much of this knowledge came from their practice of flaying sacrificial victims. Although they had some knowledge of visceral anatomy it was rather limited.

The Nahuatl name for the brain is quatextli and its attributes are listed as white or very white, fine textured or very fine textured, moist and cold. Nerves (tlatlatl) are noted to be strong and thin and "all the nerves we are bound together with."

Internal Medicine

The Aztec internist made extensive use of medicinal plants. The latter were gathered throughout the empire and planted in large botanical gardens. The Badianus manuscript mentioned 251 plants and illustrates 185 of these in color. Hernandez, who wrote in the latter part of the 16th century, compiled a list of almost 1200 plants.

The physicians were encouraged to use prisoners to determine the physiological effects of plant ingredients. Many of them had analgesic, sedative, antiemetic, antispasmodic, antihelminthic and other therapeutic properties. It is noteworthy that many of these plant extracts were being used by eclectic physicians who enjoyed great popularity in the United States at the turn of this century.

The hallucinogenic properties of certain mushrooms were well known. The Aztec expression for a vain, haughty and presumptuous person was "he mushrooms himself". A powder called yiauhitli or yoyotli, obtained from the plant thebetis yoyotli, had ataractic properties. It was blown into the faces of sacrificial victims for inhalation and calmed their fears.

As noted previously the treatment of the patient was not limited to the use of plant extracts. This can be illustrated by this quotation from the Badianus manuscript concerning the treatment of skull fracture:

"Herbs that spring up in the summer, wet with dew, ground up in the blood of a punctured vein and white of egg with emerald, pearl, crystal and bezoar stone of the huatzin, (a small native bird), and little earthworms, are to be smeared on the fractured head; when there is no blood found, burned frogs will serve."

Surgery

The Aztec surgeon's knowledge of external and superficial anatomy enabled him to become skillful in the treatment of wounds, the setting and immobilization of fractures and in draining abscesses. There is no evidence that he performed any thoracic or abdominal operations. Their surgical instruments were fabricated from obsidian, wood and thorns.

Aztec surgeons were superior to their European counterparts in the treatment of wounds, particularly those resulting from warfare. Wounds were cleansed with water and astringents and closed with interrupted sutures, ofttimes human hair, and dressed immediately with a latex type of material. Open wounds with infected granulation tissue were irrigated with the juice of papaya and other plants. They were considered reasonably skilled in the setting and immobilization of fractures. Immobilization was accomplished either by applying four wooden splints surrounded by bandages or by applying a cast made from feathers, gums and resins. In the Sahagun codices there is a most interesting description of an "intramedullary nailing technique as follows:

"And if one is very sick and his body is much fevered and the bone is exposed, a very resinous stick is cut, inserted within the bone, bound within the incision, covered with the medicine mentioned."

It is questionable whether the Aztecs trephined skulls. Schendel (7) states "the outstanding surgical procedure performed by the Aztecs was trepanation". The procedure was allegedly used to elevate depressed skull fractures and to release "evil spirits" in the epileptic or insane person. Their technique is said to have differed from that used by the Incas. It consisted of punching a series of small holes in the skull surrounding the area to be removed, cutting between the holes and lifting out the section of bone or the depressed fragments. Guzman West (5) states, however, that trephination of the skull was no longer practiced at the time of the Spanish conquest and that all of the trephined skulls found in Mexico belong to the periods between 600 BC and 1000 AD.

Other surgical procedures consisted of dissection and removal of pterygia from the eye with instruments fabricated from thorns. Some authors have stated that they removed cataracts but Guerra (4) notes that in the treatment of cataracts and corneal opacities they used scatalogical procedures which could only have led to violent inflammation and blindness.

Dentistry

Dentistry as practiced by the Aztecs involved several procedures. Teeth were filed and inlayed with precious and semi-precious stones for cosmetic purposes. There is no evidence that cavities were drilled or filled.

In the Badianus manuscript it is said that teeth were extracted after applying a substance consisting of the ashes of a burned iguana, rattlesnake venom and vinegar. In his recent book Schendel (7) mentions that in modern times itinerant Mexican Indian dentists apply a secret substance to the teeth of their patients and extract them painlessly.

Obstetrics

Obstetrics was practiced by midwives. They would remain with the parturient woman during the latter part of her pregnancy. Bathing of the patient and certain rituals were employed. They were considered to be quite skilled and practiced such procedures as external version and embryotomy.

Public Health

The Aztecs were fastidiously clean in their habits of daily living. They are said to have bathed and changed their clothing frequently. Sauna and mineral baths were very popular. They brushed their teeth with a mixture of wood ashes and honey, used deodorants and perfume.

Their water supply was derived from springs in the Chapultepec Hills and flowed into the city in an aqueduct several miles in length. It was piped into the larger homes and into public fountains where inhabitants could fill their clay jars.

Human excreta was collected and transported by barges to the farms where it was used as fertilizer. Public latrines were placed in strategic places. The streets were swept and watered daily by a large corps of street cleaners.

The government established hospitals for veterans throughout the empire and staffed them with physicians and surgeons. These hospitals also served as regional centers for providing assistance to the poor. Quarantine was employed in the presence of transmissible disease. However, individuals with incurable or contagious disease were frequently turned over to the priests for sacrifice. Deformed children and adults were housed and displayed in a compound adjacent to the Imperial Zoo, a custom reminiscent of the old circus side-show. While some might consider this cruel, it should be remembered that at this time the deformed and crippled in Europe were considered outcasts unless they were fortunate enough to become members of a royal court.

Mexican Firsts in Medicine

It was mentioned previously that there were no Spanish physicians attached to Cortes' army. They began to arrive after the Conquest. Tenochtitlan had been razed and the construction of the new city in Spanish style was begun and continued at a feverish pace using native laborers. Hospitals were constructed and were operated by the priests who enlisted the aid of the native physicians. Medical practice soon became a fusion of Aztec and Spanish medicine which had its advantages and disadvantages.

The stage was now set for the development of the many medical "firsts" in Mexico. By 1524 the first hospital on the American continent, the Hospital de Jesus, was in operation and continues to this day. In his will, Cortes arranged for the perpetual endowment of this institution and stipulated that the patron and head of the hospital was to be a direct descendant of himself.

There has been some controversy concerning the establishment of the first university in the Americas. Was it in Mexico or Peru? In his book entitled "La Real y Pontificia Universidad de Mexico 1536-1865" Careno proves that Phillip II issued a proclamation on April 30, 1547 establishing the University of Mexico. The University of San Marcos in Lima, Peru was founded by the same king on May 12, 1551 (3).

In medical teaching there is also a Mexican priority. The University began medical examinations in 1553 and the Chair of Medicine was formally established in 1559. The Chair of Medicine was not established at the University of San Marcos until November of 1634.

Other Mexican "firsts" include the first leprosarium, mental hospital and government council regulating medical practice. The first medical text written and published in the Americas was "Opera Medicinalia" by Francisco Bravo. Members of this Academy will be pleased to learn that in 1591 Juan de Cardenas published a book entitled "Primera parte de los problemas y secretos maravillosos de las Indias".

The first caesarian section in the New World was performed by two Franciscan friars. Jose Ignacio Bartolache, a famous doctor and mathematician, born in 1739, established the first medical magazine.

Mexican Neurosurgery

In closing I would like to pay tribute to our Mexican colleagues by commenting briefly on the development of neurologic surgery in Mexico. I am indebted to Juan Cardenas for this information. In reviewing the last 80 years of neurological surgery in Mexico Dr. Cardenas states that from 1890 to 1930 there

were no neurosurgeons in Mexico. Neurologists, such as Dr. Rafael Lucio, made diagnoses of brain tumor. General surgeons treated depressed skull fractures, cerebral fungus and other traumatic conditions.

In 1922 a young general surgeon, Dr. Gustavo Baz, who was one of the first Mexican members of the American College of Surgeons, went to the United States and Europe for post-graduate training in both general surgery and neurosurgery. He returned to Mexico in 1925 to practice general surgery. In 1930 he visited many neurosurgical services in the United States and Europe and following his return to Mexico carried out a large number of neurosurgical operations.

On the basis of this experience, Dr. Baz, who later became Minister of Health, sent as many as 500 people, including physicians, nurses, architects and engineers abroad to study not only medicine but the construction of new hospitals.

In 1945 many of the neurosurgeons present at this meeting returned from the United States, Canada and Europe after completing their neurosurgical training. Among these are Doctors Robles, Guzman West, Sanchez Garibay, Velasco Suarez, Ramon del Cueto, Juan Cardenas and others. These men founded neurosurgical services in hospitals as well as a neurological institute. They trained many other neurosurgeons and founded the Consejo Mexicano de Cirugia Neurologica which is the equivalent of our American Board of Neurological Surgery. It is apparent that neurosurgery has come of age in Mexico as it has in other countries of Latin America.

MEXICAN "FIRSTS" IN WESTERN MEDICINE

General Hospital	1524	Hospital of Jesus
Leprosarium	1526	Hospital De Tlaxpana
Public Health Service	1527	Mexico City
University	1547	University of Mexico
Medical Examinations	1553	University of Mexico
Mental Hospital	1566	Hospital De San Hipolito
Medical Textbook	1570	"Opera Medicinalia"-Bravo
Autopsy	1571	Dr. Lopez Hinojosa y H
Chair of Medicine	1579	University of Mexico
Medical Journal	1739	Jose Bartolache
Caesarian Section	1779	Franciscan Friars
