THERAPEUTIC METHODS USED FOR OTOLARYNGOLOGICAL PROBLEMS DURING THE BYZANTINE PERIOD

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Evidence of herbal, animal, and chemical substances from the natural world used in medicines for otolaryngological problems, including opium, hyoscyamus, barley, honey, dried beans and peas, olives, fruits, *Agaricus*, castoreum, cassia, and afronitron, was traced in the Byzantine medical treatises, mainly from the 4th century AD to the 15th century AD. The texts of Antyllus, Orivasios of Pergamos, Aetios of Amida, Alexander of Tralles, Paul Aeginitis, Leon Iatrosophistis, Theophanis Nonnos, Nickolaos Myrepsos, Michael Psellos, and others strongly suggest the influence of ancient Greek and Roman medicine, but at the same time stress original medical thought. The main otolaryngological problems encountered in that period were loss of hearing, purulent otitis, rupture of the tympanic membrane, pharyngitis, laryngitis, rhinitis, acute tonsillitis, seasickness, vertigo, fracture of the nose, and cancers of the ear, larynx, nose, and oral cavity. The tradition stating that remedies were the final products of substance combinations, started in the classical period (5th and 4th centuries BC), is presented clearly and in detail in Byzantine prescriptions related to otolaryngology.

KEY WORDS — Byzantine otolaryngology, cancer, hearing loss, laryngitis, otitis, pharyngitis, remedy, rhinitis, tonsillitis.

INTRODUCTION

During the Byzantine period (4th to 15th centuries AD), not only did the medical tradition of Hellenic and Roman antiquity survive, but there were also contributions to original medical thought and introduction of new practices and new terms, especially in the early centuries (4th to 11th centuries AD). The new capital Byzantium founded by the Emperor Constantine and inaugurated in 330 AD as the "New Rome" — later Constantinople — soon played a crucial role in the eastern part of the Empire and became the true successor to Rome. The Greek language replaced Latin as the official language of the Empire. Even though the Empire expanded deep into Asia, continuous attacks and wars with neighboring nations finally limited it. Starting in the 8th century AD, the Arabs, spreading the new religion of Islam, conquered Egypt, other parts of northern Africa, and Syria; then, the Bulgars and Slavs occupied the Balkans. During the 11th century AD, the Turks further limited the Empire, which finally included only Greece and part of Asia Minor in post-Byzantine times. However, the Byzantine culture was a brilliant one in almost every field of science.

During the above-mentioned period, the practice of medicine was continuous and was performed by public and private doctors, and not by monks, as was widely believed until the beginning of the 20th century.[1] New therapeutic methods were introduced, and new medical terms were first used. The definitions and some symptoms of many diseases were mentioned for the first time in medical history. The Byzantine physicians transmitted medicine to the Arabic world. Nestorios, Patriarch of Constantinople in the 4th century AD, was also a physician. He was exiled by the 4th Universal Synod and with his companions went to Syria. His followers went to Djondishambur, where they established the basis of the Persian Medical School. They also cooperated with the neo-Platonians, a philosophical branch from Athens who had also been exiled by the Emperor Justinian I. During the 7th century AD, the Arabic Medical School was established, and later, through the Arabs of Spain, knowledge was transmitted to Montpellier and Salerno, where famous medical schools were established.[2]

This study focuses on the substances the Byzantine physicians chose from the natural world to treat otolaryngological problems, foretelling the progress of modern otolaryngology. To uncover the knowledge of the Byzantine period, we examined the medical texts of Antyllus (3rd century AD), Orivasios of Pergamos (4th century AD), Aetios of Amida (6th century AD), Alexander of Tralles (6th century AD), Paul Aeginitis (7th century AD), Stephanos of Athens (7th century AD), Palladios (6th century AD), Leon Iatrosophistis (9th century AD), Theophanis Nonnos (10th century AD), and Nickolaos Myrepsos (13th century AD). In the 11th century, Michel Psellos undertook a large-scale review of the natural sciences. Symeon Sith, his secretary, commented on Galen's philosophy. In this article, we quote the etymology of an-

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cient Greek and Byzantine words and the original manuscript whenever appropriate to emphasize the original context, meaning, and use of the relevant words. For the ancient and Byzantine writers, our main sources were manuscripts and medical treatises from the National Library of Athens, the Cambridge University Library, and the CD-ROM edition of the *Thesaurus Linguae Graecae*.

TYPES OF MEDICINES USED IN BYZANTINE PERIOD

During the Roman period (2nd century BC to 4th century AD) and the Byzantine period (4th to 15th centuries AD), the use of herbal, animal, and chemical substances as the main basis for remedies was shown in medical texts. From the Roman period, centrally acting preparations capable of producing unconsciousness and relief of pain were widely used, including cannabis, opium, and extracts of plants of the Solanaceae family, to which *Mandragora*, *Hyoscyamus*, *Helleborus*, and nightshade (*Solanum*) belong. In most cases, opium (mekon's juice, or *mekonion* in Greek), castoreum (another analgesic consisting of a secretion from the buttocks or the genitals of beavers), mandrake, and hyoscyamus were used against ear and eye inflammations, pain, ulcers in the ear, cough, and fever. Special remedies against the cough of tuberculosis or of rheumatism in the thorax consisting of opium, *Aristolochia*, hyoscyamus, sulfur, and honey illustrate the medicine and pharmacopoeia of the time. Mekon or hyoscyamus leaves mixed with egg were given as plasters, while mekon juice (opium), mandrake juice, and even castoreum were mostly given as drops or as inhalations. Decoctions of various mixtures including opium were also given as drops.

During the above period, opium was used in several ways, but mostly, like castoreum, in the form of poultices for ear inflammations and in order to relieve pain and rheumatism. In cases of mild pain, opium was used in the form of inhalations, whereas in cases of severe pain, mekon leaves mixed with a cooked or uncooked egg in the form of plasters were also suggested.[3] In cases of severe pain, Galen[3] (2nd century AD) prescribed narcotic remedies consisting of opium. According to him, Archigenis, one of his peers, used against ear pain a decoction of mekones (white poppy flowers) mixed with warm oil or with woman's milk or poppy seed powder, while Andromachus (68 AD) used a mixture of myrrh, aloe, and mekon. For ear inflammations, Andromachus suggested halvani (galvanon), *Cinnamomum* (cinnamon), and mekon juice in the form of drops,[4] and for ulcerous ears, he mixed halvani and opium with honey in the form of drops. Another use of opium was in cases of ulcerous ears with blood and pus.[4]

During the Byzantine period, these remedies continued to be given in the form of powder, plasters (poultices), drops, pills, inhalations, and "katapotia." The ancient word *katapotion* is derived from the verb *katapeno* (swallow) and means "anything of a solid nature in the shape of a small bullet that is taken by mouth."[5] With the evolution of medicine together with pharmacopoeias, various preparations emerged, not only for surgical pain, but also for the pain of ulcers, ear inflammations, the cough of tuberculosis, fever, and other miscellaneous indications. The abundance of all relevant plants around the Mediterranean basin, from which they were exported, played a very important role in the development of medicine around the Mediterranean Sea, especially during the 1st and 2nd centuries AD and later.

Besides the surgical and conservative therapies such as bloodletting, cleaning, special diet, and physiotherapy, the use of medicines for specific therapeutic indications began. These medicinal preparations were of plant, mineral, metallic, and chemical origin, and most of them included opium. They were given either as *antidoton* (antidotes) or for therapeutic purposes.[6] Antidotes, consisting of chemical, animal, or herbal substances, were administered orally, rectally, or locally as embrocations (a liquid used to moisten or rub a bruised or diseased part of the body), poultices, or ointments. Medicines were prepared in the form of *drosaton* ("mixture of pharmaceutical liquid substances given orally"), *polymaton* (mixture similar to "drosaton"), *zulapium* or *serapium* ("extract by decocting [boiling] of medicinal herbs"), or as sublingual tablets, poultices, or eyewashes.

The soothing properties of many substances from plants, such as the leaves of the olive tree, *selinon*, *Helleliphascon*, and others, were also used to ease removal of foreign bodies from the external auditory canal, and a solution of saltpeter and vinegar was used for softening of hardened cerumen. All of these suggested substances continued the medical tradition of Hellenic antiquity. In otolaryngological cases, essential or volatile oils were not used, whereas oils from percolation (mainly olive oil) were highly respected by both folk and scientific medicine. If one dropped olive oil in the auditory canal, the foreign body could more easily slip out.

The main topics of concern of Byzantine medical thought in the field of otolaryngology were loss of hearing (*kofossis*, *varykoia*, or *dysecoia* in Greek), purulent otitis, rupture of the tympanic membrane, seasickness, vertigo, acute pharyngitis, laryngitis, rhinitis, tonsillitis (*amygdalitis* in Greek), tonsillectomy,

cancer of the ear, larynx, nose, or oral cavity, and fracture of the nose.[7] The terminology, stemming from Greek words, is still in use today.

THERAPEUTIC TREATMENTS FOR OTOLARYNGOLOGICAL PROBLEMS IN BYZANTINE PERIOD

For hearing loss physiotherapy, cathartic plasters and drops formed from chemical, animal, and herbal substances were suggested. Sith's[7,8] suggestion, a mixture with crane's bile useful for the loss of hearing, completed the advice of Aetios,[7,9] which was to keep "the holy place clean and the head dry and to drop in the ear medicines from nut oil." According to Alexander of Tralles,[10] drops of myrrh, incense, bitter nuts, afronitron, which is a white foam of niter, crocus, opium, and the plant "galvanon" mixed with an acid had positive results. Nickolaos Myrepsos[11] suggested mixing hare's bile and woman's milk and, after warming the mixture, dropping it in the ear; the patient would be astonished by the result. Moreover, he applied a special plaster from an asphodel with oil and suggested rice juice or seeds of wild fig trees.

For acute purulent otitis, for which Sith[7,8] blamed cold that consequently caused pain and inflammation in the ear, Sith suggested wild mallow and especially a paste of small lentils mixed with balsam and a paste of pumpkin flowers as a plaster. In the case of tympanic membrane rupture, Alexander of Tralles[10] suggested dropping substances from nature into the ear. In this case, medical treatment and cleaning the ear with special instruments was used. Even though Aetios[9] gave similar advice for otitis, he seemed to prefer surgical treatment.

In cases of acute tonsillitis and pharyngitis, Theophanis Nonnos and Paul Aeginitis[7,12] used washing with antiseptic substances, as well as gargles and coatings. Alexander of Tralles[10] suggested anti-inflammatory treatment with manure from dogs. He also used a mixture of chemical and vegetable substances: blueberries and honey with myrrh, nitre (saltpeter), and sulfur. Moreover, *elxini* (a burr) was used for tonsillar inflammation. According to Sith,[8] "zoulapis," a decoction of pharmaceutical substances, named *serapium* or *zulapium* by Actuarius, could be used during bloodletting, chiefly from the vein under the tongue.

Two lists of Greek surgical instruments found from the Byzantine period include an *antiotomon* (tonsil knife), strongly indicating that the Byzantine doctors knew the technique of removing the tonsils, as was also mentioned in their scientific texts.[13]

According to Aetios' method, if a tonsillar abscess was presented, it was opened so the pus could exit. Then the physician applied a gargle of "melikraton," a mixture of honey and milk or roses. Afterward, he suggested gargling with milk several times. If the abscess recurred, and medicines seemed not to work, he performed tonsillectomy. Aetios, in his description of the surgical approach, mentioned that the part of each tonsil that protruded abnormally from the anterior faucial pillar to the middle line was cut off. After the operation, he recommended the prescription of cold "oxicraton," that is, a drink of milk and vinegar.[7] Paul Aeginitis also described the removal of the tonsils by hook and scalpel, and Leon Iatrosophistis (a title for head or teaching physicians) also applied tonsillar cutting.[14] They all stressed the danger of bleeding.

For acute laryngitis, Myrepsos[7,11] applied sublingual disks, antidote, and gargles. The suggested antidote consisted of nuts, sweet rice paste, pine nuts, and poppy seed, while the disks consisted of incense, pepper, crocus, sweet rice paste, and soft pine nuts. Sith[8] underlined the positive effects of mallow, which made the voice smoother, while Ioannis Actuarius[7,15] suggested gargles with "moros" for laryngeal infections, and Andriomenos[16] added the use of plasters to improve the voice.

For vertigo and seasickness, treatment consisted of diet, physiotherapy, cleaning, and remedial substances. The last came from chemical, animal, and other substances, given by mouth in drops, antidote paste, and decoction forms. Dioscorides (1st century AD) used nut oil, and Aetios used drops, pharmaceutical resin, and walnut oil. Ioannis Actuarius[15] underlined the use of chemical substances that alleviated bad mood and applied a special medicine, as well as "the theriac antidote." The latter was a special mixture of pepper, a poppy decoction, dried roses, iris, cinnamon, sweet rice paste, incense, and Athenian honey. "Iera Rufus," a special pharmaceutical composition of chemical, animal, and vegetable substances, was suggested by Rufus[7,17] and Aetios, whereas Orivasios[18] stressed the positive results of *Agaricus* (a fungus genus) and Koriandros' seed or lettuce seed, as well as apple paste, barley, and grapes. Symeon Sith[8] suggested tree fruits for seasickness and application of water with a sponge, mentioning also how warm food and medicines could help. Against tinnitus, Alexander of Tralles[10] suggested irrigating the ear with acid, honey, and nitre.

Although Hippocrates (4th century BC) was the first to describe the cause of cancer as an excess of "black bile," this view was elaborated by Galen (2nd century AD) and dominated Western medical thought for more than a thousand years.[19] Byzantine physi-

cians believed in a humoral predisposition. Nickolaos Myrepsos stressed that tumors appeared to be caused by the bad condition of the organism or to bad juice in the entrails. Aetios and Theophanis Nonnos spoke of "carcinoid dispositions." According to Aetios, cancer was one of the "melancholic passions." Paul Aeginitis, Theophanis Nonnos, and Neophytos agreed with him. The last said that cancer was caused by a "boiling melange of bile." Theophanis Nonnos and Stephanos from Athens[7,20] added that when black bile was excessive in the organism, *karkinoi* (cancers) and *ongoi* (tumors) were caused.[19] There was also a belief that external toxic substances could cause cancer, as shown by the therapeutic treatment by antidotes. Different types of cancer were known, apart from childhood cancer, which was not fully recognized.[21]

For cancer of the oral cavity, which was distinguished as cancer of the tongue and the lips, Myrepsos applied a medicine called *xirion*, which was a mixture of the roots of nut trees, seashells, burned dates, and pepper plant. For cancer of the ear, Myrepsos[7,11] applied the "plaster of Apollonius Megaritus," which, according to him, was beneficial for sarcoma and consisted of a burned metallic mixture, *terra sigillata*, and walnut oil. For cancer of the nose, Myrepsos applied a mixture of eggshells, burned nut flakes, and burned palm tree bark. Aetios[7,9] suggested another well-known medicine of his time, "drakontion," without giving details about it. However, from other sources, it becomes clear that it was an herb for snakebite. Others, like Apuleius, used the term "clematitis" for nasal carcinoma and polyps, usually to describe a benign tumor appearing in the nasal cavities with a pedicle and originating from the mucous membrane. Also, malignant and "carcinoid" ulcers were mentioned as appearing in the larynx. Therapeutically, chemical, animal, and herbal substances were applied, such as ammonium, scammony, castoreum, myrrh, *Agaricus*, *Helleborus niger*, bdellium (or *kommi* in Greek), cassia, and others.

Byzantine physicians suggested plugging the nose with gauze or spraying pharmaceutical substances into the nose for nosebleeds. Alexander[10] suggested use of a specially made burned sponge soaked with oil; Aetios' suggestion was similar.[9] Alexander applied plane tree root to stop the bleeding. A paste of "hypouris," a plant living near the water, was suggested by Aetios for its similar action. Sith[8] recommended cinnamon for bleeding.

Aetios[7,9] used the plant "drakontion" against nasal polyps, and Myrepsos[11] suggested a medicine consisting of *styptiria*, myrrh, a chemical substance of sulfur, and burned copper. Among the two lists of Greek surgical instruments mentioned above, there were special models for excision of nasal polyps.[13] Texts of the period do not give any further details, apart from the way Byzantine physicians managed the odor caused by nasal polyps: they usually dropped inside the nose a pharmaceutical powder consisting of *kissos* (ivy), myrrh, dried roses, and other natural substances.[7] For dyspnea, "xirion of Theodore," consisting of grapes, myrrh, and dried roses, was applied.

CONCLUSION

During the Byzantine period, the main otolaryngological problems were not much different from today's problems. The main topics of concern were loss of hearing, purulent otitis, rupture of the tympanic membrane, seasickness, vertigo, acute rhinitis, pharyngitis, tonsillitis, laryngitis, fracture of the nose, and cancers of the ear, nose, oral cavity, and larynx.

In many cases, chemical, herbal, and animal substances were used in the form of drops for therapeutic treatment. Particularly against inflammations, similar substances were used in the form of plasters, disks, and antidotes or gargles. Decoctions from plants were highly respected, and burned metallic mixtures were often used against cancer. Surgical treatment was not unknown, and tonsillectomy was used.

It is important to mention that from Galen's time until the Byzantine period, most substances were used together with others in the form of remedies against diseases or in other medicinal situations, and not alone, as they had been mainly used in early antiquity. Then, physicians started to distinguish the individual effects of the different substances in the remedies, isolate the therapeutic substances, and acknowledge their specific actions on the human body. The more scientific that medicine and therapeutic treatment became, the more physicians found it desirable to rely upon the expertise of a specialist in the preparation of remedies. The observations that followed from experience acquired the form of a real *materia medica*, consisting of a system of remedies and their ingredients. Dioscorides later contributed much to this objective.

Byzantine physicians conserved the original findings of ancient Greek medicine and improved on them. Also, the ancient Greek terminology they followed and further completed was adopted by modern medicine. It is obvious that most of the remedies they used are nowadays out of use. However, some of the substances, mainly herbal ones such as opium, are in use even now in the field of otolaryngology and constitute contemporary therapy against pain and many diseases.

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