HISTORICAL REVIEW

WHO APPEARED FIRST IN OTOLARYNGOLOGY: CLINICIANS, ANATOMISTS OR HISTOLOGISTS? A QUESTIONABLE ISSUE!

Anca Maria Cîmpean[1]*, Caius Doroş[2], Petru Matusz [3], Marius Raica[1]

[1] Department of Microscopic Morphology/Histology, Angiogenesis Research Center, [2] Department of Surgery I-ENT,
[3] Department of Anatomy and Embryology, "Victor Babeş" University of Medicine and Pharmacy, Timişoara, Romania
* Department of Microscopic Morphology/Histology, Angiogenesis Research Center, Piata Eftimie Murgu 2, 300041 Timisoara, Romania.
E-mail: ancacimpean1972@yahoo.com

ABSTRACT

Otolaryngology is mainly associated with clinical practice. Despite of this actual evidence, otolaryngology can be considered, from historical point of view as a complex speciality made up of a mixture of several preclinical specialities as anatomy, histology, pathology and physiology. Several scientists who studied these specialities first, became then otolaryngologists and others were known in the medical literature because of their studies in other specialities than otolaryngology. Most of the historical papers were focused on the ear, other regions being neglected. This review presents the forgotten part of otolaryngology, especially its preclinical facts with importance in etiology and pathogenesis of various disease of the ear, nose and throat structures and thus, present work can be considered as a particular overview of „forgotten" otolaryngology.
Key words: *otolaryngology, anatomy, histology, pathology*

AMAZING MEDICAL DISCOVERISES OF ANCIENT CIVILISATIONS

In 1926, Charles Cumston said that "we can never be in full possession of a science until we know the history of its development" [1]. This „universal phrase" also characterises the otolaryngology development from its begining to nowadays.

The most ancient of the medical specialities seems to be rhinology. Around 3500 B.C., many years before the Edwin Smith Papyrus started to be written, Sekhet'enanch treated King Sahura by healing his nostrils [2]. Evidence of this is a drawing of the doctor and his wife, found in the tomb of the king who ordered to perfom an inscription to a limstone as a testimony and also as a gratitude for cure of his nose [3]. Inscriptions in the tomb describe how he "healed the king's nostrils." What Sekhet' enanch did to King Sahura's nostrils, or what was wrong with them, historians don't know but Sekhet' enanch became the first known physician in the world. Edwin Smith Papyrus, the earliest surgical writing, dating back to about 1600 B.C. remained one of the most comprehensive treatise of medicine from ancient times. Ancient surgical methods, therapies and natural drugs were described in different section of the papyrus. The head and neck represented the favourite body part for „research" field of Ancient Egypt. This evidence is supported by a high number of cases (33 out of 48) described in Edwin Smith Papyrus, localized on head and neck region [4]. According to the popular belief that the brain represents an unimportant organ, the ancient egyptians discarded it during the embalming process. The mummifiers knew how to insert a special instrument to a nostril , penetrating the brain case and remove the brain [5]. But, more important, the case presentations concerning nose, ear, lips, cheeks and throat were wery well documented and their description contained data about clinical and therapeutic approach of their lesions. For nose, varying lesions from trauma to foreign bodies were mentioned in the papyrus, each of them having a particular description of examination, diagnosis, treatment and peculiarities. Lips and cheek disease were also accurately described [6]. Moreover, a rigorous and mandatory step of treating ENT lesions was represented by a carefully cleaning of the wound, especially by removal of blood clots and damaged tissues before applying „drugs". Despite of their fine clinical sense, Egyptians used almost the same treatment for all diseases of the ENT region: „ bind with fresh meat in the first day, followed by grease, honey and lint everyday until they recovers" [7].

Despite of the generally accepted belief that Hippocrates mentioned for the first time the tympanic membrane [8], a short sentence in the Edwin Smith Papyrus contradicts this. According with Ebbell translation (1937) [9], of the Ancient Egyptian Ebers

Papyrus, „the ear that contain inside the tympanic membrane would be deaf from the eye vessels". In the same writing, it was discovered for the first time the empirical description of the future Eustacian Tube as it follows: „there are four vessels to his two ears together with the ear canal, namely two on his right side and two on his left side. The breath of life enters into the right ear, and the breath of death enters into the left year" [10]. Ozaena, nasal cattarh, secretory and suppurative otitis media were also known, described and treated by Egyptians [10].

In the past, in India, amputation of the nose was a frequent form of punishment for such crimes as adultery. Later, around 600 B.C., surgical reconstruction of the nose was first developed in ancient India by Sushruta together with earlobes reconstruction [11]. He has enlisted 29 ear disorders, 18 diseases related to nose and 75 diseases related to mouth cavity. The real name of this indian surgeon was not Sushruta. The name Sushruta derived from the Sanskrit, means „good listener" and anticipated his future work in the ancient otolaryngology field (*http://www.sanskrit.nic.in*).

But, the most amazing finding involving head and neck structures was reported by Wells in 1963 [12]. He accurately described the first multiple myeloma changes in the skull dating back from 3rd to 5th dynasty. Erosions of the left maxilla bone, destruction of the same side hard palate and posterior wall of maxillary sinus together with the vault of the skull with multiple translucent areas characterized the first plasmacytoma from medical history.

Two evidences about tracheostomy in Ancient Egypt was found in Abydos and Sakara. Drawings with two seated slabs with arms placed behind them to produce hyperextension of the neck and with a lancet directed to their trachea were the first proves of tracheostomy usage for breath problems [10].

Malignant pathology was also recognized by the studies done on egyptian mummies. Strouhal (1978) [13] described a case of nasopharyngeal carcinoma in a skull from the 5th Dynasty to the XIIth Dynasty in Upper Egypt. Derry's case, with destructive lesions involving the cribriform plate, ethomids and sphenoids was, probably, the first decription of a nasal carcinoma [14].

Ancient Arabian World, by their physicians as Rhases, Avicenna, Ali In Abbas, Abdol Latif al Baghdady or Ibn al Nafis developed early otolaryngology diagnosis and ENT surgical methods. Their observations were grouped in chapters from several important muslim medical treatises [15-18].

ANATOMY, HISTOLOGY, PATHOLOGY AND OTOLARYNGOLOGY

Together with its fine clinical sense, Avicenna had good skills in ENT anatomy. He accurately described the ear anatomy, by giving data about external auditory canal, eardrum and also the larynx and pharynx anatomical components (as cartilages, ligaments, joints and the small muscles of the larynx, and their role in performing the different laryngeal functions) [15]. Ali Ibn Abbas al-Baghdady [19] and Ibn al-Nafis proved that there are two separate cranial nerves for ear and face. Aristotle (384-322 B.C.) provided basic information about anatomy and embryology for several organs by dissecting various animals. He also dissected the ear and specified that „...of animals possessed of ears, man is the only one that cannot move this organ".

From Leonardo da Vinci, who made new descriptions of frontal and maxillary sinuses to modern anatomy, many anatomists were interested by the ear, nose and throat structures.

Nathaniel Highmore (1613-1685) was a british surgeon not so famous for his surgical performance but remembered for his anatomical studies including an accurate description of maxillary sinus which used to be more popularly referred to as the antrum of Highmore [20, 21] Niels Stensen (1638-1686), a danish student and the favourite pupil of Thomas Bartholin, accidentally discovered parotid duct by dissecting goat, lambs and rabbits heads. First, he considered this duct as to be a vessel but later, he described the saliva inside it „as a secretion derived from the blood but not similar with it". Now, this excretory duct is known as Stenon's duct [22]. Caspar Bartholin The Elder (the father of Thomas Bartholin) was a polymathic person, being 11 years professor of medicine at University of Copenhagen and then professor of divinity at the same university. In his book Anatomicae Institutiones Corporis Humani (1611), he observed and described for the first time the olfactory nerve [23].

Claude Perrault (1613-1688), the well known architect of the east wing of the Louvre Palace in Paris, was also a physician and now, unfortunately, one of the „forgotten" anatomist. His work entitled „Du Bruit" (On Noise) mentioned for the first time the „spiral membrane" and gave us an accurate description of it as „a soft and flexible membrane attached to the modiolus but not to the opposite wall". He also had several hypothesis about nerve fibers of the ear but he was not able to prove them [24].

Recognized as a scientist with deep involvement in the study of ear anatomy, Antonio Scarpa (1752-1832) also gave details about the nose-palatine nerve [25]. His work was continued with an extensive and accurate description of nasopalatine nerve plexus done by Domenico Cotugno (1736-1822), who also found the labyrinthic fluid and formulated a theory of resonance and hearing [26]. Despite of his descriptive studies in otolaryngology, Cotugno remains famous because of seminal work in the neurology field, being credited with the discovery of "liquor cotunnii" (known today as cerebrospinal fluid) [27].

Marie François Xavier Bichat (1771 –1802), french anatomist and physiologist is considered also the father of histophysiology and descriptive anatomy [28, 29]. Based on „tissue theory" derived from British Medical school (previous theories launched by John Hunter) but working without microscope, Bichat was the first to make correlation between tissue types and their different reaction to external stimuli primarly observed on nasal and pharyngeal mucosa. He started to prove his theory about connection of a structure with a specific function by performing numerous dissections and macroscopic observation of texture and colour for different parts of the body. He divided mucous membranes (mucosa from modern histology) into two types: first type included those which lies in the interior of nose, mouth, pharynx, larynx and reacted by inflammation to cold exposure and, the second type, those mucosa lining urethra, ureter, kidneys and prostate or vagina which do not react by inflammation to cold exposure [30]. Bichat considered tissues as anatomical entities "carrying" specific properties.

German histologist, pathologist and anatomist, Friedrich Gustav Jakob Henle is well known in the medical literature because he is credited with the discovery of the loop of Henle in the kidney. But, few people know that, in 1861, Henle described the supra-meatal spine that serves as a landmark in the mastoid area, named today Henle's spine [31].

Joseph Toynbee (1815-1866) was an English otologist but, his carreer was dedicated mostly to pathological and anatomical studies of the ear.It is believed that he was the first scientist who found a link between stapes fixation and hearing loss [32]. His passion for otology experimental field was fatal for him. He was found dead in the consulting room at the age of 50, after accidentally inhalation of a mixture of prussic acid and chloroform during an experimetal test of a new remedy for tinnitus [33].

Pupil of Bartolomeo Panizza and Joseph Hyrtl, and close friend with Kolliker and Virchow, Alfonso Giacomo Gaspare Corti (1822-1876) can be considered as a proeminent figure of „preclinical" otolaryngology. He dedicated his scientific life to the study of the cohlea and learned to use methods to preserve several preparations of the cochlea in the laboratory of Professors Jacobus Schroeder van der Kolk and Pieter Harting in Utrecht [34, 35]. He was the first who described the microscopic structure of the organ of Corti, including the sensory epithelium spiral ganglia and stria vascularis, also. He also identified the Hensen cells but he did not give them a special attention.These cells were recognized and completely characterized later by the founder of biological oceanography, the german zoologist, embryologist and anatomist, Victor Hensen [36].

Wilhelm Kiesselbach (1838-1902), came from a family of doctors and businessmen. He was research assistant for ear clinical examinations at the surgical clinic in Erlangen and, then, Associate Professor of Otolaryngology (*http://www.luise-kiesselbach.de/wilhelm-kiesselbach*). He was interesed in the studies of nosebleeds and characterized a special portion of the nasal mucosa-Kiesselbach plexus- riched in branched and anastomosed capillaries, which is responsible for more than 90% of nasal bleedings. His interest in this nasal vascular plexus, and his fame as otolaryngologist specialised in the treatment of nose bleedings and ear diseases, favoured him to know his future wife, Louise, who was 24 years younger than him. Right at the first consultation Louise (who came initially for an ear ailment) had also a nose bleeding and Kiesselbach exclaimed: "Oh, you're bleeding nose, no, what is the kind of you, I'm working on it and I appreciate any case quite formidable". Kiesselbach made also extensive studies on the the mucus content of nasal polyps (Kiesselbach, 1888), laryngo-tracheal stenosis [37], papillary epithelioma of the middle nasal mussels [38] and treatment of diseases of the nose and pharynx [39].

Wilhelm His (1831-1904, a swiss anatomist, inventor of the microtome and well known researcher of cell and tissues under the microscope) together with Adam Politzer (hungarian and austrian physician, one of the otology founders), examined the skull of Johann Sebastian Bach in order to explain the relationship between Bach talent and structural peculiarities of his ear and temporal bones structures. They found a particularly pronounced development of the temporal bones and in addition to this „the abnormally large size of the fenestra rotunda (diameter of 2.5 mm. as opposed to a normal of 1.5 mm); the extraordinary thickness and firmness of the mastoid process, particularly in its cortical part; the remarkable width of the incisura mastoidea; the prominence of the petrous ridge; the unusual hiatus subarcuatus" as it is stated in the work of Baer (1956) [40]. The same author reported the large size of the first coil of the cochlea as a sign for an unusual development of the cochlear ganglion and, accordingly, of the higher sensory centers.

Despite of its first description in humans long time ago, by Friedrich Ruysch (1703) in a 2-year-old child's nasal septum [41], the vomeronasal organ (VNO, aslo known as Jacobson organ) remains one of the most mysterious structure in humans. The controversies start even from the person who described it in humans. Who was the first? Ruysch, Jacobson or Kollinger? A huge paradox „governs" this organ with emphasis to the first scientist who observed it in humans. It is widely accepted today that Ludwig Levin Jacobson never described human vomeronasal organ; he described it only in animals, especially in birds! But the most known name of this nasal structure even rudimentary in humans is ...Jacobson organ! Ruysch anatomical and accurate macroscopic description was later completed by von Kollinger excellent histologic assessement of the VNO. Rudolf Albert Kölliker, swiss anatomist, histologist and physiologist, is likely known for his histologic studies and

discoveries of muscle and nervous system but his accurate descriptions of prenatal and postnatal VNO histology is less known [42, 43]. Today, molecular methods are applied to study vomeronasal organ. The genes which code for VNO receptor proteins are nonfunctional in humans. In addition, no accessory olfactory bulbs, which receive information from the vomeronasal receptor cells, are found. Thus, some controversies still persist concerning the structural and functional changes of human VNO [44].

In close relationship with VNO, Grüneberg ganglion is an olfactory subsystem responsible for the detection of alarm pheromons and cold temperature. He was reported for the first time in 1973 , by a british genetician, Hans Grüneberg who described it in rodents [45]. According to him, this structure is also present in human beings nose, but this theory failed to be proved till now. Grüneberg was also interested in the study of Chievitz organ, another medical controversial issue [46]. Juxtaoral organ of Chievitz, was first described by Johan Heinrik Chievitz in a 10 weeks old human embryo (Pantanowitz and Tschen, 2004) [47]. Since its first description, juxtaoral organ of Chievitz was considered exclusively an embryonic neuroepithelial structure for a long time (almost 100 years), till Zenker, in 1953 observed and reported it in adult humans [48]. Unfortunately, Chievitz had also an unpleasant relationship with otolaryngologic pathology. In the last years of his life, he developed a laryngeal tuberculosis which restricted his academic and scientific duties.

FINAL REMARKS

Far from being a complete story of preclinical studies in otolaryngology, this review attempted to recall the contribution of basic sciences as anatomy, histology and pathology to the otolaryngology development and, it can be considered also an invitation to achive a closer cooperation between clinical and laboratory specialities.

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