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THE HISTORY AND FUTURE OF EQUINE DENTAL CARE

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ANCIENT TIMES

Equine veterinary dentistry is not a subject unique to the late 20th century. The horse, along with cattle, swine or sheep, have the focus of pre-academic health care long before the art of healing diseased animals became an academic profession. The Kahane papyrus, however, dating from 1850 BC, contains no references to horses, probably because the Egyptians did not use either donkeys or horses. Oral diseases, however, were already a matter of interest with descriptions of gingivitis in cattle being recorded. In the same period, the codex of Hammurabi from Mesopotamia proves that donkeys were already used in Asia Minor and the Orient. In China a manuscript from 250 BC documents the art of keeping and healing horses and records the presence of a specialized “horse surgeon.” From Asia the art of domesticating, breeding and healing horses quickly spread into all parts of Europe, especially the Greek and Roman empires and also into the Arabian world. Horse riding can be dated from 1000 BC.

Xenophon (430-354 BC), a student of Socrates wrote a text on the art of riding (Peri Hippikes) which was used in numerous copies and translations until the 16th century. Only the upper classes could afford well-trained and experienced horse keepers and healers. Such persons enjoyed well respected positions in court life as “heads of stables,” “equerries” and “masters of the horse.”

References can be found to a mouth gag (latin: “machina”) that facilitated the oral administration of medicinal drenches and solutions. It was also used in cases of esophageal obstruction to allow passage of a stick to clear the obstruction.

The horse played an important role in Arabian culture and their military expansion. Latin and Greek texts had been translated and used as references for equine health care. In addition, skills were developed and documented to add to the knowledge base. It is from the works of Ibn al Awam (12th century), Hassan Ibn al Ahnaf (1209) and Abu Bekr Ibn Bedr (1293-1340) that we find treatment options for inflamed gums, ointments to cure loose teeth (periodontal disease) and recommendations for the use of files and floats for trimming unequal teeth. Hassan Ibn al Ahnaf’s manuscript may be found in the Cairo, Egypt, university library and shows a drawing of a tooth extraction with a forceps. The three volume work of Abu Bekr Ibn Bedr not only presents a sketch of an early hand held mouth gag but also describes in detail the extraction of teeth and the cutting or breaking of elongated molars. A long, hook shaped level type of instrument is shown, to be used for the extraction of or, as quoted, “the off breaking of crowns or teeth.”

Later the Iberian Peninsula made impressive progression in veterinary science. This was in fact a direct consequence of Queen Isabella of Castilla finally defeating their Arabian conquerors in Granada in 1492. The Queen had given paramount attention to the development of equine science.

Juan Alvarez Salamiellas (13th century) had already authored a richly decorated manuscript in which he summarized and translated into Spanish some 96 chapters of ancient Arabian horse knowledge. The text is the most complete manuscript of medieval veterinary science and practice available today.

Martin Boehme (1559-1636) served in various armies in Germany, Holland and Hungary. He was trained as a horseshmith where he learned a lot about wound care and general surgery and was called to the court of the Brandenburg principality near Berlin as stabelmaster by the sovereign elect Johann Georg of Brandenburg. This established the first pre-university structured education of “scholars” in veterinary medicine. In 1618 he published his book “Ein New Buch von bewehrter Ross Artzeneyen.”

Boehme invented and improved many instruments, being a talented and excellent craftsman and blacksmith. His book showed, for the first time, exact prints (woodcuts) of his instrumentation, along with detailed descriptions of their use, rather than rough sketches as seen in the old Arabian manuscripts.

THE PERIOD OF THE STABLEMASTERS

The beginning of structured written documentation about “horsemedicine” is set by veterinary historians in the reign of Emperor Friedrich II of Hohenstaufen (1212-1250), who held court in Naples, Italy. He called Giordano Rosso from Calabria, southern Italy, to his court and charged all equine care to him and to Master Albrant, a farrier of German descent. Both men wrote down their experiences in handwritten manuscripts. Rosso, coming from a noble family, published it in Latin 1250, and Master Albrant, the less educated farrier, wrote his book in the German language around 1240. Rosso’s education allowed him to incorporate chapters and prescriptions from older Arabian textbooks, while Albrant published only his own experiences and medications in a very concise form (only 36 short notices about conditions and therapies). These short notes could also be read out to illiterate people to learn them by heart very quickly and transport knowledge to other European regions. Giving information from man to man and generation to generation in oral form is, however, much prone to error. If one compares various manuscripts with Albrant’s suggestions from different periods and regions, many mistakes can be detected compared to the original text.

Those early texts dealt mainly with recipes and prescriptions for herbal medicines to heal soft tissue diseases or wounds of the oral mucosa. Information about the estimating of the horses age (“Ageing”) through dental examination is an ancient art, described in Chinese manuscripts as early as 600 BC.

THE BEGINNING OF ACADEMIC EDUCATION

In the 18th century, the need for structured education of qualified veterinarians became an urgent matter and resulted in the opening of the first government university veterinary schools in Lyon, France, 1762 and Alfort (near Paris) in 1766, both schools still exist today.

PROGRESS IN THE 19th CENTURY

The 19th century was the period of natural sciences, inventions and technical developments. The knowledge about veterinary medicine grew rapidly, especially in surgical matters, since internal diseases or infections were still poorly understood before the isolation of pathogenic bacteria.
EXTRCTIONS

Since many infected or traumatized teeth needed to be extracted, various options of extraction techniques and appropriate tools were developed and discussed by numerous authors. Professor Havemann from the Hannover Veterinary School (1805) reported in detail about his technique for extractions. He postulated that all fistulating teeth had to be extracted. He incised the skin crosswise under the position of the root, flapped the skin and chiseled the bone away, until he could see the root tip of the diseased tooth. There he placed the end of an iron punch and hammered the tooth out. This "repulsion" procedure is still in use today and had been brought to a certain perfection by Havemann after repeated uses. While deciduous teeth (caps) and short-rooted or loose teeth in old horses had always been removed with the help of handmade forceps (farrier), sometimes customized to the necessary angulation depending on the position of the tooth, new constructions of more or less effective extraction forceps were developed and have been published in various journals and books.

Root fractures, disastrous bone fractures of the alveolar bone and damage to the gums were very common complications. In horses the long roots fractured regularly, only short rooted teeth (and caps) could be extracted with a certain success. Other pioneers of equine dental surgery were J. H. Friedrich Guenther (1794-1858), together with his son Karl W. A. Guenther (1822-1888). From 1846 both worked intensively for the theoretical and technical progress of equine dental diseases. They had both received an excellent education in human and veterinary medicine and agriculture and became famous professors at the Hannover Veterinary School. They authored numerous articles and books. In 1859 they published "Die Beurtheilungslehre des Pferdes," in which we find a 164 page chapter on teeth. Not only a very precise and well illustrated part about the "ageing" of teeth can be found there, but especially an exact description of extraction techniques and instrumentation. After having studied the anatomical properties, positions and dimensions of all teeth and the surgical oral access to these, they constructed, evaluated and offered not less than 36 very innovative instruments for dental surgery.

They started with a new mouth gag, which opened the mouth with the help of a screw spindle. It allowed a wide open access to the equine oral cavity. Guenther's set of forceps consisted of not less than 19 different patterns, each model meticulously designed to ensure a perfect grip to the corresponding crown. The adequate size and angulation allowed physiological access and an ergonomic use for the operator.

English Veterinary surgeon Edward Mayhew published a textbook called "The horse's mouth showing the age by the teeth" in 1845. It was set up with 32 colored woodcuts showing the different tooth appearances according to age and numerous black and white sketches. In the third edition (undated, ca. 1865, Mayhew presents and enthusiastically recommends a dental forceps developed by "Mr. T. W. Gowing, the esteemed practitioner of Camden Town." Referring to the use of this innovative forceps, Mayhew writes on page 186: "the man (therefore) must exercise his mind rather than strain his muscles."

The most common and best sold type of forceps was the "Frick/Hauptner Universal Forceps" published in 1889 by Frick, who was a Professor of surgery in Hannover, later Berlin. It was presented and recommended in countless publications and textbooks. Two adjacent bars rotate in two joints when adjusted with a screw and thus close the jaws in a parallel fashion. This allowed the proper application to teeth of all diameters, while all the other models where the two parts of the jaws rotate around the riveted joint right behind the jaws (like in a pair of scissors) will subsequently cause a poor application to the teeth. According to Hauptner catalogues the Frick/Hauptner model was sold unmodified between 1889 and the 1970's and it is still in use today in many European veterinary clinics. Other models like the Trautvetter, Wendenburg, Schindler, Brogniez, Pillwax, Hoffmann and various other patterns were too complicated or not usable universally and disappeared from the market.

In 1889, T. D. Hinebauch, Professor of Veterinary Science at Purdue University, Lafayette, Indiana, USA, dedicated a 256 page text to "Veterinary Dental Surgery". In this book, which contains numerous illustrations, there is a comprehensive description of the anatomy, physiology, pathology and therapy of the equine dental system. Various instruments, mostly produced by famous instrument maker Sharp & Smith, established 1844 in Chicago, were presented. In chapter XXI, co-author Dr. Sayre describes in detail the technique for amalgam fillings in decayed (carious) incisors and premolars. Filling materials are gutta-percha and amalgam. He used a mechanical drill from human dental manufacturers.

Another important source is William H. Clarke's book "Horses' Teeth." This book, first published in 1879, includes many detailed case descriptions as well as reviews of the science of "odontology". One page in the "Dentistry of the Teeth" - chapter is headed: "Skill versus Brutality."

FLOATING AND SHORTENING OF ELONGATED TEETH

The removal of hooks and sharp edges being the most common treatment in horses had resulted in the invention of countless instruments for that purpose. While floats and files can be found in numerous textbooks of all nations, the use of chisel and hammer is described controversially due to possible damage to the teeth, gums or alveolar bones. Especially the "old way," practiced from the 1600s until the 1800s by farriers, who chiselled away those hooks without use of a speculum lacking proper sight and control caused disastrous damage and even resulted in jaw fractures causing death of the patients (Ithen, 1835).

Although various designs of the instruments look very versatile and adequate still today, the main problem of the instrument makers was the poor hardness and durability of the steels at those times along with the rigor of the dental tissues. Although the use of a float, file or rasp was agreed to be the most successful way to grind down hooks and elongated teeth, the files didn't resist very long, if elongated teeth or greater hooks had to be treated.

The removal of a distal hook in the last molar caused many technical problems. This resulted in the introduction of the scissor type instruments, which developed remarkable forces due to the use of massive levers and screws in order to cut down protruding parts of the dental crown. The goal was to create an even occlusal surface. Numerous patterns can be found in catalogues and textbooks.

PROGRESS IN THE 20th CENTURY

Dramatic changes and achievements in all fields of science and technology in the beginning of the 20th century resulted in the development of countless new methods and
instruments. As far as equine dentistry is concerned probably the most successful invention was a new mouth speculum.

Herman Haussmann (Chicago) developed his veterinary mouth speculum and patented it in 1895. Its US patent number is #548194. It was the first adjustable mouth speculum with interchangeable incisor and gum plates. The jaw or side bars of the speculum were curved so as to leave the sides of the animal’s mouth clear to enable the surgeon to work from the sides without obstructing speculum parts in the work area. The speculum is secured on the animal’s head with a poll strap and upper and lower jaw straps.

J. Gordon McPherson of Toronto, Canada patented an improved mouth speculum, US patent #682832 in 1901. He used the same design as Haussmann’s speculum but improved the method of holding the interchangeable incisory plates and the method for securing the ratchets for adjusting the speculum. Most of the specula used today are truly of the McPherson design.

A certain disadvantage of the Haussmann/McPherson speculum is the fact, that the ratchet had to be adjusted to full opening with a remarkable amount of force. Aesculap offered an optional detachable screw mechanism, which imitated the general idea of the old Guenther pattern.

The Haussmann/McPherson speculum is the most popular speculum worldwide and very versatile for most dental procedures with the exception of incisor treatments. For those cases we need wedge shaped dental gags which block the premolars/molars like the Bayer pattern (Hauptner 1893)

Austrian veterinarian Schoupppe introduced his coil (spool) gag in the 1920’s and Landmeissner a similar model with a rectangular shape. Currently, the spool pattern is replaced by a gag with a solid plastic block instead of the metal coil, since the tongue may be jammed between the coils causing severe injuries. The McAllen speculum, the Eggert and the Weingart patterns allow opening of the mouth with a comfortable lever-mechanism. Asymmetrical specula had been recommended by several authors. Not only clinical progresses were published in the first decades of the 20th century, but also anatomical, embryological and pathological research was done. Joest, 1919 and 1926 (2nd edition), dedicated an important chapter of his handbook on Pathology to dental abnormalities. Ernst Joest was Professor of Pathology at the Veterinary School in Dresden. He also released his studies on the postembryonal development of equine molars in 1922.

The complicated structure and embryological development was still poorly understood. The Swiss Anatoomist Max Kuepf published a richly illustrated 200 page book called “Backzahnstruktur und Molarenentwicklung bei Pferd und Esel” in 1937. Virtually every moment of the embryological development and structure of equine molars is meticulously documented. The legendary 750 page “bible” by Sir Frank Colyer in England, published in 1936 and available in a reprint today, on “Variations and Diseases of the Teeth of Animals” shows dental abnormalities in more than 1000 photos, among them many equine examples.

Professor Dr. Erwin Becker, 1898-1978 was probably the most important contributor to modern equine dentistry. Being mechanically and technically skilled, he planned to study civil engineering sciences after having served during WWI in the French campaign. However, times in Germany were hard after the war and Becker couldn’t afford to study. His uncle Helmar Dun, a successful veterinarian with an important veterinary clinic in Sarstedt near Hannover, motivated him for the veterinary profession and agreed to pay for his education at the Hannover Veterinary School. Already at this early stage of education he improved instruments and created ideas for new tools and instrumentation.

It was Helmar Dun, who focused his interest in the dental field. Dun was working on a new mouth gag, which Becker improved and finally produced and marketed as a mouth gag after “Becker-Dun.” It was patented and first offered by Hauptner (52) in 1937. The speculum was quite heavy, but very solid, secured with straps to the head, but easily removable with a “panic bolt,” which, when pulled, allowed the instant removal of the speculum. Interchangeable bite plates and upholstered round bars allowed the positioning over the incisors and on the edentulous part of the jaws. The opening mechanism worked with two threaded spindles, which made the opening quite easy. In the days before the development of sedatives, the operator had to work against the muscular forces of the patient during the regulation of the mechanism. This was a major disadvantage of the Haussmann/McPherson speculum, where the ratchet had to be adjusted with remarkable muscular force.

Dun was probably the first veterinarian, who had experienced the need for a routine dental check with literally every equine patient after having worked with draft horses during WWI as a cavalry veterinarian. Consequently, practically every horse was given a thorough dental exam in the Sarstedt veterinary clinic, where Becker became acquainted with this procedure from the very first days of his studies.

His main interest was the production of a mechanical, motor-driven float system, which Dun had begun to develop with the assistance of a human dentist. First prototypes were ready in 1930 and the production at the Hauptner plant started in 1937 after having patented the system.

Hauptner had already introduced a simple system in 1930, constructed with the help of P. Leue (catalog 1932, p.137). The hand-piece, equipped with a rotating steel disc, was attached with a flexible shaft either to a hand-driven shearing machine out of the Hauptner sheep equipment program or to an electric motor.

The unit was used successfully and gave impressive results. The quality of equine dental work, particularly arcade corrections, was improved and treatment times were greatly reduced. A detailed and well illustrated book “Neuzeitliche Zahnbehandlung beim Pferd” about his research and equipment was published in 1938.

Becker was conscripted into military service shortly before WWII and served as a surgeon in a veterinary company.

At the end of WWII the veterinary military headquarters moved from Berlin to Salzburg, Austria, as Soviet troops approached. Becker was subsequently taken POW by American troops and his horse hospital taken over by the American Calvary. His POW status lasted form May 7 until June 16, 1945, but he stayed on in Salzburg as a civil employee of the hospital until 1947, where he was not only charged with medical services but also trained veterinary students who were serving in the US army.

Becker never returned to Sarstedt; after the war he was divorced (1948) and he continued his career in Berlin. Meanwhile Berlin had been divided into 4 allied sectors and the former Nazi/SS and SA Ridingschools in Berlin-Düppel had been transformed into an American Cavalry and riding center. The US-Commander of Berlin, General Frank L. Howley, installed the 287th Military Police Company Horse Platoon there. 120 german horses were trained and kept here, later the American Riding Association of Berlin (ARAB) was added.
The horses were used for leisure and sports as well as for the Military Police who was controlling the Berlin woods, parks and forests or paraded at the occasion of public events. It was the only remaining American cavalry unit in Germany, staying there until 1959.

General Howley himself, a keen horseman, called Becker to Berlin. He had met Becker in Salzburg earlier in spring 1945 and knew about Becker's excellent qualification, since Becker had treated Howley’s horses there.. He needed an experienced clinician in Berlin, since the numerous American veterinary officers there were trained to care for food inspection, not for medical services. The American Army, modernizing its equipment into motorized units, had employed only 50,000 horses in WW II, while the German army still had 2,5 million horses in service.

A summary of all his knowledge about animal dentistry was compiled in his 229 page chapter in Joest's Handbook on Pathological Anatomy, published 1970.

In the mid-seventies the need for proper dental care, especially in small companion animals, became again a matter of interest in the veterinary world. A dental clinic had already existed at the Vienna, Austria, Veterinary University in the 1930's under Prof. Bodingbauer. His successors Prof. Eisenmenger and nowadays Prof. Zetner continuously developed this field too long neglected, also in equine dentistry.

Prof. Hugo Triadan, a human dentist, opened a dental suite at the Bern, Switzerland, veterinary faculty in 1970. His nomenclature for charting the dentition in animals, the TRIADAN system, is now the standard worldwide.


The first intensive course with practical exercises was held at the Auburn, Al., Veterinary Faculty in February 1996, where numerous experienced lecturers and professors shared their experiences with the delegates. New and innovative instruments have been placed in the market and a growing scientific basis of experiences, results and statistics allow newcomers to become familiar with the art of equine veterinary dentistry. Horse owners demand and ask for correct diagnoses and treatments to ensure full performance of their often very valuable horses.

The technical progress has offered a large selection of power-driven equipment to the veterinarians. The machinery for the routine treatments seems quite complete today, but advanced techniques like endodontic treatment and apicoectomies need further research, especially in anatomy. The physiology and anatomy of the equine teeth, esp. their changes with age, is still poorly understood and needs clarification.