A short history of laryngoscopy

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Visual examination of the larynx has a history rich in personalities and anecdotes. Beginning with early experiments, and continuing with the work of the eminent Spanish voice teacher Manuel Garcia, the history of indirect and direct laryngoscopy is presented, complete with contemporary illustrations. As with most medical advances, laryngoscopy is the result of advancing technology, leavened by human ingenuity. Despite the contemporary sophistication of videostroboscopy and laryngeal microsurgery. Garcia's original technique of mirror examination remains part of every laryngologist's armamentarium.

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INTRODUCTION

Laryngoscopy, the examination of the larynx, is an essential part of the otolaryngologist's art. It gives pause to consider, however, that our sophisticated techniques, which include microscopic examination, stroboscopy and video analysis, had their beginnings over 150 years ago.

The history of laryngoscopy, as that of all medicine, is rich in personalities and anecdotes. Advances that we take for granted in contemporary practice did not evolve in an orderly fashion. The convention that an idea is born, recognized and accepted in orderly progression is an illusion. Inventive minds circle around problems, at times encouraged by other technologic advances or by boldly discarding outdated dogma. Ideas are proposed, rejected, reinvented and eventually accepted in an ascending spiral that advances medical knowledge.

Laryngology as a speciality owes its birth to laryngoscopy. Before the 1800's, physicians could only surmise how the larynx functioned from examination of autopsy specimens. Before the last century, airway surgery was generally limited to tracheostomy, providing an airway by incising the "arteria aspera", or "rough artery", as the ancients ingenuously called the windpipe. Endstage laryngeal obstruction was grossly identified at autopsy or from gross examination of coughed-out tissue. The cause could not be easily differentiated in this era of syphilis and diphtheria before the germ theory, tuberculosis before Koch, and cancer before Virchow. Nor could physicians visualize these, or other, laryngeal disorders in their pre-fatal early stage in order to study their location and progression.

GARCIA AND THE BIRTH OF MIRROR LARYNGOSCOPY

Medical historians conventionally date the beginnings of laryngoscopy to 1854. At this time, the Spanish voice teacher Manuel Garcia first visualized his own larynx, using a dental mirror and a second hand-held mirror to reflect sunlight. Garcia lived over one hundred years, and he had a long and distinguished teaching career in Paris and London. His roster of distinguished students included "the Swedish Nightingale", soprano Jenny Lind. Garcia's presentation to the Royal Society of Medicine in 1855 caught the attention of the medical community, and indirect laryngoscopy began.

In fact, however, Garcia's idea was predated by almost fifty years, by the German physician Bozzini. In 1807, Bozzini published an account of his speculum, called "the light conductor, or a simple apparatus for the illumination of the internal cavities and spaces in the living animal body". Bozzini's imagination extended beyond the larynx, in that he saw the other endoscopic applications for his invention, including transurethral cystoscopy. Moving beyond available sunlight, Bozzini even invented a method for reflecting candlelight down his speculum, thus anticipating Czermak (2) by 50 years. Alas, Bozzini was a prophet before his time. His invention was roundly condemned by the faculty of physicians in Vienna, who remarked that "premature conclusions

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were likely to be arrived concerning the instrument", and further, "perhaps even there may be an outlay of money which might afterward be regretted". Bozzini, inventor and prophet, was sunk and forgotten.

Benjamin Babington was another predecessor of Garcia's. In 1829, he exhibited to the Hunterian Society of London an instrument which was an ingenious combination of epiglottic retractor and laryngeal mirror. He later modified his instrument, removing the retractor and using only a polished stainless steel mirror, much as we use today. Antedating even these two physicians, Morell Mackenzie (4, 5) described the French accoucheur Leveret, who in 1743 devised a bent mirror for examining the larynx, and even a snare for removing laryngeal polyps.

Despite the above inventions, Manuel Garcia has come to hold uncontested claim to being the first to see his own larynx. His detailed presentation, persuasive prose and longevity justly led to a consensus regarding his place as first among laryngoscopists.

The claim of primacy among physicians, however, was more contentious. In 1857 Ludwig Türck (8), professor of laryngology in Vienna, decided to try Garcia's mirror in examining patients in the wards of the Allgemeine Krankenhaus. He was unsuccessful, and by the fall of that year he abandoned his efforts. Enter Johann Czermak (2), professor of physiology at the University of Pest. Czermak borrowed Türck's mirrors and continued experimentation over the winter of 1857. He was able to accomplish what Türck couldn't, and in the early Spring of 1858 he presented his findings to the Viennese medical community, claiming to be the first physician to visualize the living larynx (Illustr. 1). Türck contested Czermak's claims, and Czermak apologized, but the die was cast. To Türck's lasting chagrin, Czermak, a non-laryngologist, became known as the inventor of medical laryngoscopy.

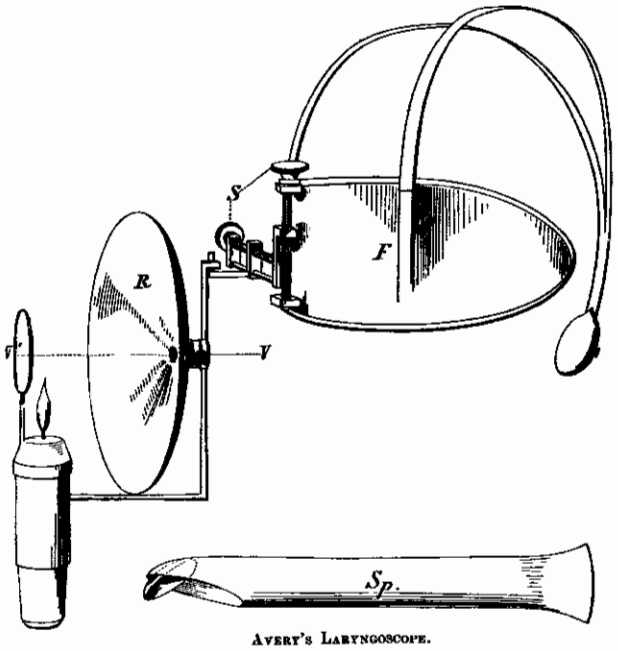
Figure 1. Johann Czermak examining a subject, using a light-concentrating mirror.

Johann Nepomuk Czermak was a fascinating, if somewhat dubious, figure. Several years ago in Amsterdam the first author had the opportunity to glance through several bound volumes of his collected writings. In addition to autolaryngoscopy, these also included less orthodox topics such as the therapeutic efficacy of mummy flesh.

Why did Czermak succeed where Türck failed? If the fall of 1857 had been less rainy, history might have been kinder to Türck. Unfortunately, Türck's attempts depended on the failing sunlight of the Viennese autumn; Czermak, on the other hand, developed a method of using magnified candlelight, and could continue his experiments through the winter. In the words of Morell Mackenzie, Czermak "freed laryngoscopy from the clock and the barometer". His inventions, the use of artificial light and of a light-concentrating concave head mirror, were clearly his, not Türck's, and they firmly set laryngoscopy on the road from curiosity to science.

ARTIFICIAL LIGHT AND "INDIRECT LARYNGOLOGY"

The overriding technical problem hindering early, and later, laryngoscopists was the need for light. The era was still some 30 years before the introduction of Edison's incandescent lamp in Europe, the days of candles, gas light and petroleum lamps. Goethe's dying words "Mehr licht!" might well have been uttered by these intrepid investigators, who applied every known optic principle to concentrate and amplify the flickering flame. In 1844, Avery modified the Palmer's lamp, used by miners, to concentrate and direct candle light down a modification of Bozzini's speculum (Illustr. 2). Did we say Czermak introduced the use of artificial light to laryngoscopy? Another bit of conventional wisdom lies shattered. Light, light, and more light was the cry, and contemporary drawings show that the laryngoscopist's lamp in its elaborate modifications became, a veritable Rube Goldberg machine. To further optimize vision, the examining room was shrouded with heavy black



AVERY'S LARYNGOSCOPE.

Figure 2. Avery's laryngoscope. Note the head mirror reflecting candlelight, a modification of the Palmer's lamp used by miners. The tubular speculum incorporating an angled mirror is similar to that proposed by Bozzini.

drapes. An illustration of Berlin laryngologist Adelbert Tobold's examination room from 1869 (7) looks more like a funeral parlor than an office (Illustr. 3).

Contemporary writings on laryngology are filled with the zeal of new converts, and do not lack the occasional vituperative aside. For example Tobold (7), a disciple of Türck's, spoke disparagingly of the usurper Czermak, referring to him as having come from "somewhere near Cracow". While light was the main concern, inconsequential side issues were just as hotly debated. The shape of the mirror, for example. Türck's was round, with a straight handle, Czermak's somewhat square with a curved handle. That can't work, said Türck; it doesn't matter, said Czermak. Later modifications continued, including an interesting convex magnifying mirror developed by Brünings (7).

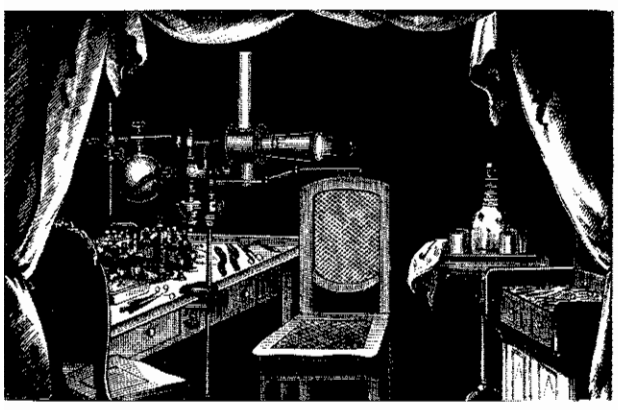


Figure 3. Adelbert Tobold's examination room, Berlin, ca 1869. Note the elaborate magnifying lamp and heavy drapes to shut out daylight.

Indirect laryngoscopy blossomed in the last decades of the 19th century. Surgical instruments were developed which allowed the laryngologist to cut, scarify, cauterize and remove laryngeal tissue with indirect visualization. In Vienna, the German surgeon Billroth marked a milestone in laryngeal surgery by performing the first total laryngectomy in 1874, and the Viennese school became the premier training institution in laryngology. Türck's students included the Schnitzler brothers, Johann and Arthur, the latter becoming much more renowned as an author and playwright.

Sir William Osler visited Vienna during the closing years of the 19th century. One of his curious recollections, preserved in a pamphlet in the Osler Library at McGill University in Montreal, is of a professional "patient" who trained fledgling laryngologists in laryngeal anatomy. This lady, originally a charwoman at the hospital, could accurately identify different parts of larynx as they were touched with a camel hair brush, and was thus able to instruct young doctors as they trained for the new laryngeal surgery, while supplementing her income.

And yet, the diagnostic and especially surgical limitations of working on a mirror image were constraining. With the introduction of the incandescent bulb and advances in anesthesia these glory days of indirect laryngeal surgery were also the days of its decline. Direct examination and instrumentation of the larynx was at hand.

DIRECT LARYNGOSCOPY

The first physician to directly visualize the larynx was the Berlin laryngologist Tobold (7). His patient, a female singer with papillomas of the larynx, was able to "press her exceedingly thin tongue against her lower incisors and hyperextend her neck, so the larynx could be glimpsed without any instrumentation". The year was 1864, and Killian (6), who later related the episode, correctly stated that Tobold was so focused on indirect laryngeal techniques that the significance of his observation escaped him.

In 1865 and 1868, Voltolini took the first purposeful steps toward direct laryngoscopic examination; he used a tongue depressor spatula to expose the larynx for a direct glimpse. Obviously, these were unusual patients with favorable anatomy, and such early

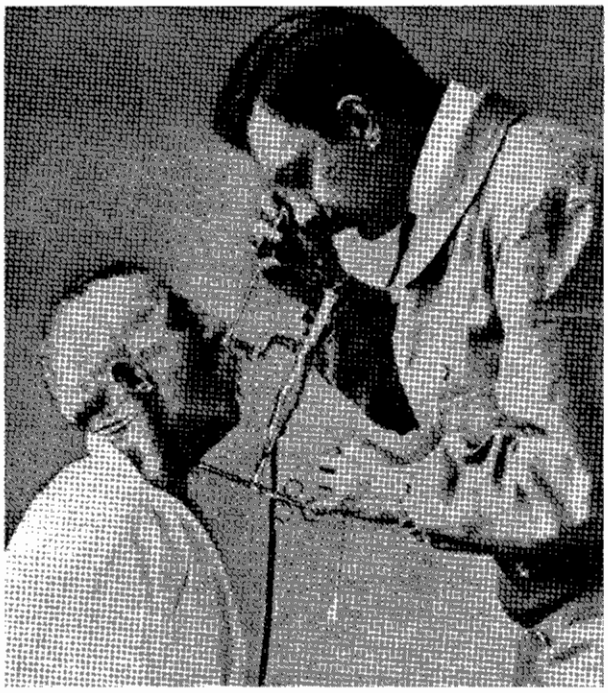


Figure 4. Autolarngoscopy described by Brünings (1910). The counter-pressure applied by the surgeon's left hand displaced the larynx posteriorly, and improved view of the anterior commissure. Note the dueling scar ("Schmiss") on the surgeon's cheek, a badge of honor from his student days.

anecdotes were as yet a far cry from universal applicability of the new technique.

The two problems plaguing direct laryngoscopists, now as then, were exposure and light. In our readings we came across an intriguing allusion to early experiments at getting light down an endoscope using a hot glowing platinum filament loop encased in a water-cooled jacket. We have not been able to track down the specific reference to this innovation, but it certainly predated the electric light. Since direct laryngoscopy coincided with the introduction of the incandescent bulb, lighting problems were solved by carrying the light down the tube: either by reflection of a headlight, introduced by Brünings, or by placing tiny lightbulbs directly into the laryngoscope. This latter method, popularized by Negus and Chevalier Jackson, is still in use in many operating theaters today.

Even as direct laryngoscopy came into popular use, there were problems. The examination was carried out in the office, and required a high degree of cooperation from the patient, and agility from the laryngologist. Some favored the patient sitting and the doctor standing, others the patient standing, or both sitting. A partial aid to adequate exposure was the counter-traction arm on some laryngoscopes. By tipping the laryngoscope into the larynx, the doctor pushed back on the thyroid cartilage bringing the anterior commissure into view (Illustr. 4). Nonetheless direct examination was limited, cursory, and uncomfortable. Brief procedures on cooperative patients were feasible, but the technique lacked finesse and universal applicability: skillful laryngologists and acrobatic patients were not the rule.

SUSPENSION LARYNGOSCOPY

The final chapter in our story relates the development of suspension laryngoscopy. It was Gustave Killian (6) who first happened upon the idea of suspending the larynx of the supine patient for examination and surgery. As with many innovations, this one had a serendipitous beginning. At the turn of the century, direct laryngoscopy using a tubular spatula-like device was in vogue. In the winter of 1909 Killian, who needed accurate drawings of the larynx for a paper, entered the dissection rooms of the University of Freiburg with his medical artist. Killian inserted the tubular spatula laryngoscope and exposed the larynx of the supine cadaver. The artist was slow, and Killian's arm was getting tired. An idea! Killian screwed some metal rods to the dissection table, and attached the spatula in a way that the head of the cadaver hung suspended by the tongue spatula. Suspension laryngoscopy was born.

The earliest suspension laryngoscope designed by Killian was little more than an angled tongue blade with a hook. The device grew more complex later, as an adjustable suspension apparatus (or "gallows") was

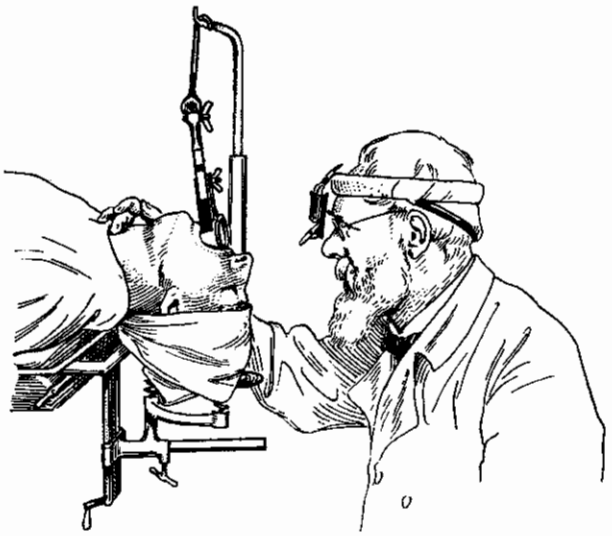


Figure 5. Gustav Killian performing suspension laryngoscopy, 1919. The patient's head is suspended by attaching the laryngoscope to the "gallows".

developed (Illustr. 5). Minor modifications were again made, including the familiar Lynch apparatus, but the principle has persisted to the present.

An interesting, now obsolete modification of the above is the chest plate suspension apparatus. As personally related by Dr. Juergen Tonndorf, this was invented by his teacher, Professor Seiffert, again by accident. According to Tonndorf, Seiffert was performing a suspension laryngoscopic procedure one day using the Killian apparatus, when the gallows collapsed onto the patient's chest. Seiffert immediately noted that the instrument remained in place, supported by the now collapsed apparatus lying on the patient's chest. Chance favours the mind prepared, and a new method of suspension was born.

In this brief paper, we have tried to highlight some of the personalities which illuminate a rich segment of our speciality's history. Advances continue, utilizing better illumination and magnification. Perhaps it is not overly romantic to say, however, that these incremental improvements seem to pale when compared to Garcia's dental mirror glistening in the morning sun.

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SAMMANFATTNING

Laryngoskopins historia

Laryngoskopins historia är rik på intressanta personligheter och anekdoter. Denna presentation börjar med den framstående spanske sångpedagogen Manuel Garcia och åtföljs av samtida illustrationer. Som de flesta medicinska framstegen är laryngoskopin ett resultat av både teknisk utveckling och mänsklig uppfinningsrikedom. Trots samtida högspecialiserad videostroboskopi och mikrokirurgi i larynx fyller Garcias ursprungliga undersökningsteknik med larynxspegel en viktig plats vid undersökningen av struphuvudet.

YHTEENVETO

Kurkunpääntähystyksen lyhyt historia

Kurkunpään näönvaraisen tutkimuksen kehityshistoria sisältää runsaasti luonteikkaita henkilöitä ja tarinoita. Kirjoituksessa esitellään suoran ja epäsuoran kurkunpääntähystyksen kehityksen vaiheet varhaisista kokeiluista lähtien, espanjalaisen laulunopettajan Manuer Garcian kautta päätyen alan viimeaikaiseen kehitykseen. Kuten yleensä lääketieteen kehitys, on tässäkin kyse teknologian kehittymisen tuomista uusista mahdollisuuksista nokkelien ihmisten käytössä. Huolimatta videostroboskopian ja mikrokirurgian kehittymisestä, on Garcian kehittämä peilitutkimus edelleen säilyttänyt jalansijansa.