

# The History of Thoracic Surgery at Mount Sinai

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## Abstract

The birth, development and maturation of thoracic surgery at The Mount Sinai Hospital, and its pioneering contributions are presented.

These achievements were accomplished not only by the individual surgeons who had an abiding interest in the surgery of the chest, but also with the fruitful collaboration of pathologists, radiologists, cardiologists, pulmonologists, endoscopists, neurologists, immunologists, and others. Continuing interactions of these specialists promise to yield new and important advances in the field of thoracic surgery at Mount Sinai.

**Key Words:** Thoracic surgery, The Mount Sinai Hospital, history of thoracic surgery.

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THE SEEDS OF THORACIC SURGERY at The Mount Sinai Hospital were planted in 1880, when 32-year-old Dr. Arpad C.G. Gerster, a Hungarian émigré, was appointed to the attending staff as visiting surgeon. Seven years later, in 1887, these seeds began to germinate when Dr. Howard Lilienthal, native-born American and Harvard graduate, was appointed house surgeon, having stood first in the competitive examination for internship.

Different as these two were in family and national origins, education, medical training and extracurricular talents, they combined to form a dynamic partnership to establish thoracic surgery as a specialty at Mount Sinai.

Gerster's autobiography, *Recollections of a New York Surgeon* (1), is a remarkable account of his personal and professional life, precise in detail and crystal clear in syntax and grammatical expression. He was born in 1848 in Kassa in the Austro-Hungarian Empire (today Kosice, Slovakia). He was a Hungarian Catholic, although apparently not strictly observant, tracing his family back to the 16th century in

Switzerland. After a classical early education in the *Gymnasium* tradition, he attended the University of Vienna, earning, *en passant*, a sabre-cut in a tendon of his little finger in a ceremonial duel. He earned his medical degree in Vienna under Billroth, Rokitansky and Skoda.

In 1874 he emigrated to the U.S., settling in Brooklyn, but on the way to the boat he visited Volkmann's clinic in Halle, Germany, where he observed the new Listerian method of antiseptic surgery using carbolic acid spray. This must have made an enormous impression on him, as he was to write, some 14 years later in 1888, a landmark American book, *The Rules of Aseptic and Antiseptic Surgery*, which ultimately went through three editions (2).

The primitive state of thoracic surgery in those early days is best illustrated by the case history of one Louis Stix, a Mount Sinai trustee whom Gerster was called to see in consultation in 1882. The patient presented with chills and fever, a draining, purulent sinus alongside the sternum, an irregular pulse, and cardiac displacement by a mediastinal mass. Successful curative surgery was carried out, consisting of debridement and resection of osteomyelitis of the sternum, along with drainage of a mediastinal abscess caused by *Mycobacterium tuberculosis*, which had been identified by Koch in that year. This was before X-rays (discovered in 1895), electrocardiogram (1903), and intratra-

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cheal anesthesia (1910), and without intensive care units, blood transfusion, etc. In gratitude, Mr. Stix exercised his influence in facilitating Gerster's election to the prestigious New York Surgical Society.

In 1887, a future giant in the new specialty of thoracic surgery stood first in the competitive examination for internship at Mount Sinai. His name was Howard Lilienthal. Born in Albany, NY in 1861, he was the oldest child of immigrant parents from Germany. He attended the Albany Boys Academy and graduated from Saratoga High School in 1877. After two years of private tutoring he matriculated at Harvard College, graduating cum laude in 1883. At Harvard, his extracurricular interests included choral singing (he sang at Henry Wadsworth Longfellow's funeral) and wrestling (he was small, but wiry). Upon graduation, he entered Harvard Medical School, earning his medical degree in 1887, at which time he took the Mount Sinai internship examination. He archly tells of himself that, having ranked first in the examination, he committed a "social error" by choosing the surgical rotation to house surgeon over the traditional first choice of the medical rotation. He states that he did not love medicine less, but that he loved surgery more. Years later, another Mount Sinai great, George Baehr, future attending physician, also chose the surgical over the medical internship, because he wanted to study under Gerster (Lilienthal's mentor). Baehr later became the first full-time chief of the medical service in 1945.

After completing his internship, Lilienthal went into practice and became Gerster's assistant. In 1890 he was appointed assistant attending surgeon and in 1899 was elevated to the rank of full attending. The Surgical Department was then divided into two services, one led by Gerster and one by Lilienthal. Lilienthal began to develop his thoracic surgical expertise in cases of pleural and pulmonary suppuration, an expertise which led ultimately to pioneering accomplishments in pulmonary resection (lobectomy) (3) and other aspects of thoracic surgery.

One of the younger attending surgeons on Lilienthal's service was Charles Elsberg, who had, in the early 1900s, conducted animal research on "intratracheal insufflation" anesthesia at the Rockefeller Institute, under Samuel Meltzer and John Auer, both internists. The first-ever clinical application of this technique for thoracotomy in a human being was carried out at Mount Sinai in 1910 by Lilienthal, with Elsberg administering the anesthesia (4, 5). En-

dotracheal anesthesia, as it is now called, has become an essential part of thoracic surgery.

One collateral benefit of this experience with "intratracheal insufflation" (5) was its application in a female patient with severe myasthenia gravis in crisis, in acute respiratory failure. She was kept alive by this method for several hours. This technique of artificial ventilation for the treatment of the various types of respiratory failure, with subsequent modern embellishments, is routinely used today in critical care units all over the world.

In 1914, coincident with the retirement of Arpad Gerster, the entire Surgical Department was completely reorganized. Four services were created, each with a major specialty over and above the "routine" general surgery of the day. These were (a) Thoracic Surgery, under Howard Lilienthal, (b) Neurosurgery, led by Charles Elsberg, now specializing in this field, (c) Surgery of the Stomach and Duodenum, under A.A. Berg, also a former assistant of Gerster, who became famous for skill in surgery for peptic ulcer, and (d) Kidney, Ureter and Bladder, under Edwin Beer, pioneer in the endoscopic treatment of bladder tumors. This reorganization persisted up until the mid-1940s, after which the full-time system was inaugurated.

Each of these four surgical services became the nucleus of multidisciplinary specialty groups. The members of the thoracic disease group included Harry Wessler and Coleman B "Kelly" Rabin in pulmonology, radiology and pathology, Sidney Yankauer, Rudolf Kramer and Max Som in bronchoscopy, and others to be mentioned later. This group, in somewhat altered form, content and scope, continues to function today as the Department of Pulmonary and Critical Care Medicine.

Shortly after this reorganization took place, World War I began, and the hospital became involved in the war effort. U.S. Base Hospital No. 3 was constituted, with Major, later Lt. Col. Howard Lilienthal as its chief medical officer. Lilienthal was eager to be involved in the surgery of the severely wounded and for a time was on detached service with advanced surgical teams assigned to Evacuation Hospital No. 8 and U.S. Army Hospital No 101. Tragically, his son, an infantry officer, was killed in action just a few weeks before the Armistice.

On his return from overseas, Lilienthal resumed his hospital activities, adding to his large series of lobectomies for suppurative lung disease (3), developing the technique of esophagectomy for cancer of the esophagus (6),

promoting early diagnosis and treatment of lung cancer (7) and fostering the recognition of thoracic surgery as a specialty (8).

Lilienthal was also active in the thoracic surgical community. In 1917, he, with Willy Meyer of Lenox Hill Hospital and a few others, founded the New York Society for Thoracic Surgery, now the oldest thoracic surgical society in the world. With this society as a base, the American Association for Thoracic Surgery was founded later that year. Today it is recognized as the premier thoracic surgery organization in the world.

Down through the years, Mount Sinai thoracic surgeons have continued to be active in the New York Society for Thoracic Surgery. Among those serving as president included Paul A. Kirschner, Robert S. Litwak, Randall B. Griep, M. Arisan Ergin and Steven Lansman.

Other founding members of the New York and the national societies, from Mount Sinai, included Martin Ware, Sidney Yankauer (bronchoscopist), Abraham Wilensky, William Branower (anesthetist), Morris Manges (internist) and Charles Elsberg. Lilienthal became the president of the national society in 1922. His presidential address (7) was entitled "Malignant Tumor of the Lung: Necessity for Early Operation." In it, for the first time, he made a clear distinction between the two main topographical types of lung cancer: the central large bronchus type and the peripheral parenchymal type. This represented the beginning of the staging system so widely used today. In 1925, he clearly outlined the rationale for "thoracic surgery as a specialty" (8), antedating the specialty boards by more than 20 years.

When Lilienthal retired from active ward service in 1923, the Medical Board honored him by assigning six "ward" beds for his personal patients for the following year, so that he could continue his pioneering work (9). He published a two-volume text book on thoracic surgery (10) in 1926, the first such publication of its kind in the United States, and between his "retirement" from ward service in 1923 and his death in 1946, he authored more than 60 additional publications, remaining a never-ending source of knowledge in thoracic surgery.

Between 1923 and 1934, the Thoracic Surgery Service was led by Alexis V. ("AV") Moschcowitz and then Richard Lewisohn. "AV" was the older brother of Eli Moschcowitz (a future chief of the medical service) and was noted mainly for his contributions to hernia surgery and for devising a successful operation

for prolapse of the rectum. Less well known are Dr. Moschcowitz's important contributions to thoracic surgery, including a classic text on the treatment of diseases of the costal cartilages (11) and his service on the Empyema Commission of the U.S. Army during the First World War. Other commission members included Major Evarts Graham (from Washington University Medical School, St. Louis), the chairman, and Lt. Frederick Zeman from Mount Sinai. The commission was seeking a reason for the very high postoperative mortality rate for empyema in the U.S. Army. At that time, the world-wide epidemic of influenza (sometimes called the "Spanish flu") was raging, and contagion was rife in the crowded barracks of the Army training camps. Empyema was a very common complication of the post-influenza pneumonia. Standard treatment of empyema then was wide-open thoracostomy drainage. This was attended by a frightful mortality rate, at times exceeding 50%. The commission determined that the cause of death in most instances was not the empyema per se, but "anoxemia" secondary to the collapsed lung which was also the seat of pneumonia. By changing from "open" to "closed" drainage of the empyema using a chest tube, thus maintaining lung expansion and pulmonary function, the surgeons were able to lower the mortality rate to low single-digit numbers (12). Evarts Graham, a noted pioneer in thoracic surgery, who later performed the first successful total pneumonectomy for lung cancer (in 1933), was awarded the prestigious Samuel Gross Prize in Surgery in 1925 for his report of the work done by the Empyema Commission. Later, as an attendant physician at Mount Sinai, Dr. Zeman became one of the founders of the specialty of geriatrics.

Richard Lewisohn, who followed Dr. A.V. Moschcowitz on the Thoracic Surgery Service, was primarily a gastric surgeon. He is best known for developing "citrate" blood transfusion, which led to blood banking (13). This process became a cornerstone in the development and growth of modern thoracic surgery (14).

During the period 1923–1930, the bulk of thoracic surgery was done by associate surgeon Dr. Harold Neuhof, who rose to the rank of attending surgeon in charge of Thoracic Surgery in 1930. He was born in New York City in 1884 and raised and educated there, earning his medical degree at the College of Physicians and Surgeons of Columbia University in 1905. He graduated from his Mount Sinai internship as

house surgeon in 1907 and spent the next year as resident in the private pavilion under Gerster and Lilienthal.

He always exhibited a wide range of medical-surgical interests, especially in confronting the challenges of severely life-threatening diseases. Thus, he displayed an early interest in transplantation, authoring in 1923 “The Transplantation of Tissues” (15). He did a xenograft of a lamb’s kidney to a young woman with acute renal failure due to bichloride of mercury poisoning. Needless to say, the graft failed in a few days. But this attempt to expand the frontier of medical sciences was characteristic of Dr. Neuhof.

He went on to confront other diseases, such as venous thrombosis and pulmonary embolism (16), mediastinitis (17) and lung cancer (18–20). In 1932, he and Harry Wessler (see below) published a paper in the *Journal of Thoracic Surgery* (21) entitled “Putrid Lung Abscess — Its Etiology, Pathology, Clinical Manifestations, Diagnosis and Treatment.” It served as an inspiration and template for the study of this disease; at least 26 papers on aspects of this subject appeared within the next 15 years. In 1987, more than 50 years later, Earle W. Wilkins, Jr., of Harvard acknowledged the validity and importance of this contribution in his article “Classics in Thoracic Surgery” (22).

Mount Sinai’s first thoracic disease group, as indicated above, consisted of non-surgeons representing the many specialties essential to the integrated treatment of thoracic surgical patients. The first of these pioneers was Dr. Harry Wessler, internist and radiologist, who clarified the difference between aspiration lung abscess and other forms of suppurative pulmonary disease (23). This led to the understanding of “putrid lung abscess” and to its successful surgical treatment.

Wessler was the mentor of Dr. Coleman B. (“Kelly”) Rabin, who was active from the 1930s to the 1970s and beyond. Like Wessler, Rabin was also an internist, radiologist and pathologist. His contributions included research on the pathology of mesothelioma and studies on so-called “bronchial adenoma” (now known as carcinoid tumor). He devised a method for the precise localization of lung abscess, which was necessary for successful surgery of that condition. He collaborated with Neuhof, Arthur H. Aufses, Sr., and Irving Sarot on a proposed topographic classification of lung cancer, a forerunner of the modern staging system. And he co-authored a textbook on radiology of the

chest with Dr. Murray Baron (24), much as Wessler had done with Leopold Jaches (25), then radiologist to the hospital, in earlier years.

Together with Neuhof, Rabin persuaded Dr. Ameil Glass, house staff graduate and fellow, and Dr. Rudolph Kramer, bronchoscopist, to study the anatomical basis for bronchoscopic drainage of lung abscess. From this investigation, based on lung dissections, the concept of the “bronchopulmonary segment” developed (26). Recognized today as a momentous advance in the surgical anatomy of the lung, this laid the groundwork for the localization and precise drainage of lung abscess, and the anatomical basis for precise pulmonary resection.

Other members of the thoracic disease group included Dr. Herman Hennell, internist and TB specialist, Sylvan Moolten, pathologist, Leo Stern, dentist, Daniel Stats, hematologist, Irving Selikoff, noted for his work on tuberculosis and asbestos, Herman Schwartz, pediatrician, and Louis Siltzbach, sarcoidosis specialist, among others. In 1974, Dr. Alvin Teirstein was appointed Chief of the Division of Pulmonary and Critical Care Medicine.

The thoracic surgeons on the service after Neuhof included Arthur S.W. Touroff, associate surgeon and main collaborator with Neuhof on lung abscess, Arthur H. Aufses, Sr., who did research on topographic classifications of lung cancer, Irving Sarot, who studied pulmonary resection, including pleuropneumonectomy in tuberculosis, and Gabriel P. Seley, who specialized in lung cancer and lung abscess.

After Neuhof’s retirement in 1946, Arthur Touroff became the new director of the Thoracic Surgical Services. Touroff pioneered the nascent field of cardiac surgery with work on such subjects as “blue babies” and infected patent ductus arteriosus.

The massive socioeconomic upheaval caused by World War II, coupled with spectacular advances in scientific medicine, would completely change the nature of medical practice, hospital organization and patient care. Thoracic surgery was in the forefront of these changes.

First, the widespread adoption of medical and hospital insurance led to hospital reorganization on many levels. The traditional separation of “ward” (charity) patients and “private” (paying) patients was rapidly obliterated and the separate house staffs were now merged. This was accompanied by the appointment of a full-time professional staff in charge of all patients — ward and private.

The first such full-time directors were in the Department of Medicine: Drs. George Baehr and Isidor Snapper. In 1952, Dr. Mark Ravitch followed Dr. Touroff as full-time director of the entire Surgical Service. Trained in The Johns Hopkins tradition (Halsted and Blalock) and imbued with the concept that a “general” surgeon should have expertise in all subdivisions of surgical specialties, Ravitch remodeled and amalgamated the Department of Surgery into a more amorphous entity. Thoracic Surgery as an identifiable separate service entity gave way to *ad hoc* assignments of “qualified” thoracic surgeons for the care of thoracic surgical patients. However, it should be noted that it was only just a few years before, in 1948, that the Board of Thoracic Surgery was created as a subsidiary of the American Board of Surgery, thus validating Lilienthal’s plea in 1925 for the recognition of thoracic surgery as a specialty (8). Ultimately, in 1971, a free-standing American Board of Thoracic Surgery was established.

Ravitch’s tenure as full-time director antagonized some of the voluntary attending surgeons, leading to his early resignation in 1955. This had all the earmarks of a “town vs. gown” situation.

The type of thoracic surgery practiced at this time now began to undergo a qualitative change. Pulmonary infections (abscess and bronchiectasis) and tuberculosis were coming under control by means of antibiotics, decreasing the need for operative intervention. Cardiovascular surgery, initially of the “closed” heart type, began to emerge as a new specialty. Because of its steeply rising incidence, lung cancer was rapidly becoming a major surgical problem.

Between 1955 and 1957, Dr. John Garlock, attending surgeon to the hospital, served as interim director. While he was best known as a master abdominal and alimentary tract surgeon, he had distinguished himself as a world pioneer in surgery of the esophagus (27), dating back to his earliest contributions in the 1940s. Garlock was a founding member of the boards of Thoracic Surgery, General Surgery, and Plastic Surgery.

In 1957, the second full-time Director of Surgery, Dr. Ivan D. Baronofsky, was appointed. The turmoil that had occurred with Dr. Ravitch’s tenure recurred and culminated in Baronofsky’s resignation in 1959. Cardiac surgery, essentially “closed heart” surgery for congenital and acquired heart disease, was now becoming technically feasible. By 1960, the development of pump-oxygenators and cardiopul-

monary bypass would open the door to the explosive growth of “open heart” surgery as we know it today. During his tenure at Mount Sinai, Baronofsky instituted and developed a successful open-heart surgery program, which has persisted to this day.

During the tenures of Ravitch and Baronofsky (through 1960), the general thoracic surgery service functioned much as a “government in exile,” as if it had no official identification. However, over the next forty plus years, it developed into a specifically designated service.

After an interim stewardship from 1959–1960 under Dr. Samuel H. Klein, Dr. Allan E. Kark was appointed full-time director of the Department of Surgery in 1962. Dr. Kark was a native of South Africa who trained at a number of hospitals in England and served as a Fellow in Surgery at the University of Chicago. He later chaired the Department of Surgery at the University of Witwatersrand in Durban, South Africa. One of Dr. Kark’s first official acts in 1962 was to recruit Dr. Robert S. Litwak of Miami University to head a newly formed Division of Cardiothoracic Surgery. Dr. Litwak was actually a second-generation cardiothoracic surgeon, having trained under the famed pioneer in cardiac surgery, Dr. Charles P. Bailey.

Dr. Litwak was accompanied by his able associate and collaborator, Dr. Howard Gadboys, to direct the experimental laboratory. The rest of the attending staff, all still voluntary, comprised those surgeons, mainly Drs. Paul A. Kirschner, Bernard P. Robinson, Fouad Lajam, Daniel J. Krellenstein, and Steven Herman, who dealt with problems of the lung, pleura, mediastinum and esophagus — coming to be known as “general thoracic surgery.” This latter group, combined with the full-time cardiac surgeons, constituted a well-balanced staff for patient care, teaching and research.

Drs. Kark and Litwak also established a two-year residency training program which met the requirements of the Board of Thoracic Surgery. The board itself, which had been established in 1948, became in 1971 the free-standing American Board of Thoracic Surgery, further validating Howard Lilienthal’s dream of “thoracic surgery as a specialty.” In 1983 the two-year residency training program was expanded to three years to handle the ever-increasing complexity and volume of surgery of the chest and heart. This was one of the first three-year programs in the country.

Upon his arrival at Mount Sinai, Dr. Litwak established a series of “Lilienthal lectures” in

honor of the field's great pioneer. This lecture series ran for more than 10 years, attracting famous speakers from around the world.

For the next twenty or more years the "general thoracic surgeons" dealt with a growing number of problem cases of lung cancer, pleural tumors and infections and, especially, mediastinal disease. Following the description of mediastinoscopy in 1959 by Eric Carlens of Sweden and its introduction to North America by F. Griffith Pearson in 1965, this procedure was adopted for cases of lung cancer and mediastinal tumors. Fifty such patients were operated on at Mount Sinai and reported in 1967 (28). Mediastinoscopy soon became a routine staging procedure for lung cancer and remains to this day one of the foundations of the staging system.

A landmark advance stemming from the experience with mediastinoscopy was its application to thymectomy for myasthenia gravis (see below). Mount Sinai had been a leader in the study and treatment of myasthenia gravis under the direction of Dr. Kermit Osserman from 1951 until his death in 1972. In 1952, Osserman described the use of the "Tensilon" test (29), and his clinical classification of myasthenia gravis is still in use today (30).

Mount Sinai now had the one of the two largest myasthenia gravis clinics in the world (along with The Massachusetts General Hospital). The procedure of thymectomy, stimulated by the work of Blalock, Keynes and Clagett, was carried out via a major chest or sternal-splitting incision to handle both thymomatous and non-thymomatous myasthenia gravis.

Our previous experience at Mount Sinai with mediastinoscopy helped us "rediscover" and embellish the long-forgotten technique of "transcervical" thymectomy, which had been done at the beginning of the 20th century in infants and children for respiratory distress attributed (incorrectly) to so-called "status thymicolymphaticus."

In 1967, the first of a series of 21 cases of transcervical thymectomy was done at Mount Sinai; the series was reported in JAMA in 1969 (31), by Kirschner, Kark and Osserman. This technique was soon adopted worldwide, but not without reservation or even vehement objections by some surgeons. The issue is still being debated today. Mount Sinai became a referral center for thymectomy. In this current era of minimally invasive surgery, transcervical thymectomy is probably the first of such minimally invasive techniques. By 1989, Dr. Angelos Papatostas had performed almost 1,000 such

operations. Unfortunately, his untimely death that year cut short a brilliant career.

Over the past 50 years, thymomas and other mediastinal tumors such as teratomas, germ cell tumors and neurogenic tumors have also become commonplace on the General Thoracic Surgery Service.

Dr. Kark resigned in 1974 and was immediately replaced by a Mount Sinai surgeon "born and bred" — Dr. Arthur H. Aufses, Jr. Dr. Aufses came from a Mount Sinai thoracic surgical family. His father, Arthur H. Aufses, Sr., had served as attending surgeon. His mother, Beatrice, served as a volunteer to the Surgical Service under Dr. Harold Neuhof. Arthur Jr., who had been Dr. Ravitch's chief resident, left Mount Sinai to serve as chairman of surgery at Long Island Jewish Hospital. He returned to Mount Sinai as professor and chairman of Surgery following Dr. Kark's departure. He was always supportive of the Cardiothoracic Surgery Service.

In 1979, Dr. Paul A. Kirschner was designated chief of the General Thoracic Surgery Section of Cardiothoracic Service. Kirschner made the transition from voluntary attending to full-time attending in 1991 and served until 1998.

In 1985, Dr. Randall B. Griep succeeded Dr. Robert S. Litwak as chief of the Division of Cardiothoracic Surgery, inheriting a superb legacy from Dr. Litwak.

In 1990, the Division of Cardiothoracic Surgery became a free-standing department, with Dr. Griep as chairman. Dr. Griep's area of expertise included the field of cardiac and pulmonary transplantation, of which he was a pioneer. Under Dr. Griep, his then-associate Dr. Ali Sadeghi performed lung transplants with a high degree of success. This program was temporarily discontinued when Dr. Sadeghi departed.

In 1998, Dr. Kirschner stepped down and was replaced by Dr. Stephen Keller, who served a brief 18 months.

In 1999, Dr. Paul Waters was appointed chief of General Thoracic Surgery. Waters was especially concerned with lung transplantation, having had a large experience in Toronto and southern California.

Again there was a regime change when Dr. Griep stepped down in 2001 and was succeeded by Dr. David Adams of Boston as chairman of the Cardiothoracic Surgery Department. Dr. Scott Swanson, also of Boston, became chief of the General Thoracic Surgical Division. Dr. Swanson is now leading a vigorous

and growing program in general thoracic surgery, including esophageal surgery and minimally invasive techniques in pulmonary resection.

The writer of this report has been honored to be a part of the great traditions of healing, research, and innovation in the specialty of general thoracic surgery at Mount Sinai.

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