

# The Evolution of Gastrointestinal Endoscopy at The Mount Sinai Hospital

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## Abstract

Gastrointestinal endoscopy came to The Mount Sinai Hospital in the 1950s, along with the Wolf-Schindler gastroscope. In 1961, it was supplemented by the Eder-Hufford semi-flexible esophagoscope and later by the Olympus gastrocamera and then the Hirschowitz fiberoptic instruments from ACMI and Olympus. A formal training program was started by Jerome Waye in 1966 for flexible gastroscopy and esophagoscopy. In 1969, endoscopic retrograde cholangiopancreatography (ERCP) was introduced. Colonoscopy was at first performed under x-ray control, and subsequently replaced by the nonfluoroscopic method of colonoscopic topography, which was developed by Dr. Waye. A full-time nurse who was in charge of the endoscopy unit founded the Society for Gastrointestinal Nurses and Assistants while working at The Mount Sinai Hospital.

**Key Words:** Endoscopy, esophagoscopy, gastroscopy, ERCP, colonoscopy, Mount Sinai Hospital.

GASTROINTESTINAL ENDOSCOPY came to The Mount Sinai Hospital in the 1950s, when Dr. Albert Cornell personally purchased the first Wolf-Schindler gastroscope (1). The instrument permitted gastric visualization via a series of lenses in the distal half; "flexibility" was achieved with a gentle curvature of 20% from a straight axis. Dr. Harry Yarness introduced the procedure to Mount Sinai after visiting Dr. Schindler and learning it from him. During residency training, Dr. J. Lawrence Werther, who was already interested in gastric physiology, extended his interest to upper intestinal endoscopy and became a teacher of gastroscopy along with Dr. Yarness.

At that time, rigid sigmoidoscopy and proctoscopy were being performed at Mount Sinai by surgeons and gastroenterologists, in a separate operating room (OR) within the ear, nose and throat (ENT) operating room suite. But gastroenterologists were not allowed to perform esophagoscopy, because the ENT service (whose OR was used by Gastroenterology) considered the esophagus to be within their domain. However, the ENT physicians permitted gastroenterologists to use the Wolf-Schindler gastroscope because its optics were fixed at a right angle to the long axis of the instrument, thus

rendering it impossible to see the esophagus as the scope was passed through to the stomach.

In 1961 an Eder-Hufford (semi-flexible) esophagoscope was purchased by the Gastroenterology Division. The flexible portion consisted of a coil-spring obturator which passed through the long, rigid esophagoscope and protruded about 7 inches, thereby providing a short, flexible introducer to the otherwise inflexible instrument. The semi-flexible esophagoscope was introduced into the esophagus in a manner similar to that of the gastroscope, with the flexible portion advanced into the posterior pharynx by bending the coil spring with the fingers of the left hand, which had previously been inserted into the mouth. The right hand then swung the rigid portion around as the chin was extended to configure the mouth and esophagus in a straight line. During the procedure, the patient was supine on an examining table, with the head hanging over its edge, permitting the head-holder assistant to swing the head down to allow a straight intubation passage. The operator sat on a stool facing the patient. At the proximal end of the esophagoscope was a small telescope which could be rotated into view after the "flexible" obturator was withdrawn. This telescope focused on and magnified the tissue at the distal end of the esophagoscope. Esophagoscopy without the telescope, as performed by ENT physicians, displayed a tiny patch of mucosa 12 mm in diameter, viewed by the naked eye through a hollow tube 50 cm long. Because of

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the constraints imposed by the ENT Department, it was not possible to use this new, semi-flexible esophagoscope in the ENT operating room suite, and its use was confined to the GI clinic. Despite the magnified field visualized with the newer instrument, the ENT Department continued to do standard rigid esophagoscopy.

Preparation for an upper endoscopy was a formidable task. The ENT physicians taught gastroenterologists how to use cocaine to swab the posterior pharynx, providing effective local anesthesia. The pledgets of cocaine-laden cotton balls would be placed on an L-shaped clamp which painted the tongue and soft palate, gradually advancing deeper and deeper into the pharynx, where the swab, continually refreshed in a container of cocaine, would finally come to rest in the vallecular spaces. When the patient no longer retched on having the pledget placed deep into the pharynx, he or she was considered to be adequately anesthetized. Topical anesthesia was applied in a room across the hall from the main operating rooms, and following pharyngeal anesthesia, patients would walk across to the operating theaters, where rigid gastroscopy was performed without sedation. The Schindler rigid gastroscope had a two-inch rubber finger at the tip of the instrument, which aided its passage through the posterior pharynx. Hyperextension of the neck was accomplished as the gastroscope was introduced, because it was fairly rigid and an absolute straight path was necessary to be able to pass the scope from the incisor teeth to the stomach. Once past the cricopharynx, the instrument was rapidly advanced into the stomach. If the esophagus needed to be inspected, the ENT department was requested to perform esophagoscopy.

Light from a tiny bulb at the end of the gastroscope was transmitted through a series of lenses to the operator's eye. Neither fiberoptic teaching attachments nor video monitors were available, and the only view that could be obtained was through the lens at the proximal end of the scope. Since everyone in the room wanted to see any lesion found by the examiner, and photography had not been adapted to these instruments, the endoscopic examination necessarily took a long time when an abnormality was seen. During training sessions, each observer had to line up and take a quick look through the eyepiece as it was being held by the endoscopist. When more time was needed to see the mucosa, to view a lesion or to inspect the stomach, the endoscopist would take a stance in front of the patient, holding the protruding portion of the instrument with both

hands, while raising both elbows to ear level. This maneuver would keep others from grabbing the scope during the examination. Since patients were not medicated for the examination, it had to be done as quickly as possible to minimize the discomfort. While endophotographs were unknown, sketches were commonly made of any lesion seen. The duodenal bulb was never visualized, and a complete view of the stomach was rare. Atlases of endoscopy were not available, but attending physicians and students pored over the drawings from the Schindler book of endoscopy (2), which was considered the gold standard.

In 1975, the ENT Department left the operating theaters in the old administration building and moved to new quarters. The Gastroenterology Division was assigned to these vacated suites and was then able to perform both esophagoscopy and gastroscopy without supervision by the ENT Department. Soon, a new "system" was devised, with which esophagoscopy and gastroscopy could be performed sequentially. After completing the inspection of the esophagus with a standard Eder-Hufford esophagoscope, a slim-caliber lateral-viewing gastroscope could be passed through the esophagoscope to inspect the stomach. This modified system was the Eder-Palmer trans-esophagoscopic semi-flexible gastroscope.

The division later obtained a gastroscope with a channel for a small forceps, to allow for taking a biopsy. This was known as the Benedict operating gastroscope, manufactured by the American Cystoscope Makers, Inc. (ACMI), of New York City. When the forceps was extended beyond the gastroscope for only a few centimeters, it passed out of the field of view. In order to accomplish a biopsy, the forceps had to remain in the field of view while suction was applied to deflate the stomach. As the stomach collapsed and the lesion occluded the view, the biopsy forceps were closed and then withdrawn. Thus, adequate biopsies were obtained mainly by chance.

During both gastroscopy and esophagoscopy, air had to be continually insufflated by a hand-held bulb which was pumped throughout the examination. The operator would often hold the bulb in the palm of the hand, pumping it with three fingers while the thumb and forefinger held onto the shaft of the gastroscope to steady, advance, or rotate it.

It was during my fellowship, in 1963, that Hirschowitz's first flexible fiberoptic instrument became commercially available from ACMI. Dr. Gerald Friedman and I, co-fellows, carried this fiberscope from floor to floor, showing the house staff and attending physicians the

new instruments for performing upper intestinal endoscopic examinations. The first instruments were side-viewing scopes that did not permit a view of the esophagus, but a dedicated forward-viewing instrument soon followed. Focusing had to be done continually, and, as with rigid scopes, air was pumped in with a hand-held insufflator. The light source was actually a small incandescent bulb located at the tip of the instrument, causing the distal end of the gastroscope to become rather hot during prolonged examinations. The fiberoptic bundles, which transmitted the image, were fragile, and if the scope became kinked (or, worse yet, was bitten), the broken fiberoptic bundles were immediately seen as permanent black spots in the visual field.

Drs. Yarness and Werther, the previous teachers of rigid endoscopy, each held a training session one day a week. In 1963, when the flexible tools became available, they included them in the regular schedule of cases. When I finished my fellowship in 1963, I had performed flexible endoscopies twice weekly under supervision, and had twice the expertise with these instruments as the instructors, who only used the flexible scopes once per week. I was requested to stay on as a teacher of flexible endoscopy. Soon, Dr. Werther resumed his laboratory activities on gastric acid secretion and Dr. Yarness retired, leaving me as the only (very young) teacher in the endoscopy unit. Dr. Julius Wolf, who was chief of staff of The Medical Service at the Bronx Veteran's Affairs (VA) Hospital, was enlisted to come to Mount Sinai twice a week to be the official head of the endoscopy unit and lend an air of authority (and maturity) to endoscopy. Dr. Wolf came to Mount Sinai on a regular basis for three years and then on an irregular basis for another year, until 1972. At that time, I found myself the senior gastrointestinal flexible endoscopist. I was never officially appointed to the position of chief of GI endoscopy, since this program was always considered to be an integral part of the overall GI program.

Changes in techniques and instrumentation progressed at a dizzying pace. Just before the introduction of fiberoptics, miniaturized photographic capability was integrated onto the tip of a flexible endoscope. The first flexible gastroscopes were "blind," without visual capability, but had a camera on the tip. This gastrocamera took multiple pictures on a 5-mm film strip, which, upon development, showed the mucosal views taken during a prescribed sequence of instrument positions while moving the patient from supine to prone. Mount Sinai did not acquire the original 1962 gastrocamera, but did buy the next

model, GTF V, manufactured by Olympus Optical Company, Japan, which provided both a fiberoptic view and a film strip. The tiny images were projected onto a small screen, and our weekly endoscopy conference was born, as the growing number of faculty and GI fellows met regularly to watch the showing of the week's work. When endoscopic retrograde cholangiopancreatography (ERCP) was introduced, I traveled to Japan, in 1969, to learn the various techniques. Upon returning to Mount Sinai, I asked a senior endoscopist from the Minneapolis VA hospital, Dr. Jack Vennes, to visit Mount Sinai and take me through ERCP procedures under his tutelage. There was no funding for this. I lined up a series of private patients and sent Dr. Vennes the full amount of the fees collected from each patient to provide an honorarium and travel expenses. Once adept at this procedure, I traveled to several hospitals in New York City to teach the technique to anyone who asked.

When colonoscopy began at The Mount Sinai Hospital, it was performed under radiologic guidance, so that the location of the endoscope tip and the direction in which the endoscope was heading could be determined. The colonoscopes of that time had only two-way tip deflection and were rather stiff and clumsy. The first colonoscopic examination at The Mount Sinai Hospital was performed, without sedation, in the Radiology Department. Dr. Bernard Wolf, the then-chief of Radiology, and the other senior radiologists, were wondering how the advent of colonoscopy might affect the future need for the barium enema. At the onset, the patient was dismayed because of the gallery of attending radiologists, radiology fellows, attending gastroenterologists, GI fellows, and many x-ray technicians. She was also audibly uncomfortable during most of the procedure. After the first hour, all the attending radiologists had left, happy in the knowledge that this technique would not replace barium. After the second hour, all the GI attendings and fellows in Gastroenterology and Radiology disappeared. After the third hour, there was not a technician left to help with the imaging. Throughout the entire prolonged procedure, the patient, although obviously uncomfortable, continually encouraged and prayed for all the doctors. The procedure was successfully concluded, to the relief of both the patient and her endoscopist.

The following day, Dr. Wolf called me into his office and told me that I would not be able to tie up an x-ray room for half a day trying to perform colonoscopy. Eager to continue developing my skills in this examination, I asked Dr. David

Dreiling, a surgeon with an abiding interest in pancreatic physiology, if I could use his fluoroscope (with which he positioned his "Dreiling tube" for pancreatic secretory studies). His laboratory was on the sixth floor of the old hospital building and was not air conditioned. It was accessible by a stairway from endoscopy on the fifth floor level; the patients and I walked up and down the stairs to use this facility, since it was easier and quicker to walk with the patient and instruments rather than wait for the old elevator. My colonoscopy career began in the heat of midsummer and with a fluoroscope which was old and inefficient. One needed to dark-adapt for twenty minutes with red glasses in order to visualize the faint image on the screen, and, even so, if a hand was waved under the fluoroscopic screen, one could not discern the skeletal structures. Also, the shape of the instrument could be seen, but the air column was not visible.

During these tedious sessions, where sedation was not used, I noticed that various areas in the colon had different appearances and shapes that could be correlated with the position of the instrument tip as noted on the fluoroscopic screen. After four sweat-soaked sessions in Dr. Dreiling's fluoroscopy room, I decided that there had to be a better way of doing colonoscopy than with x-ray imaging. This experience stimulated me to develop the nonfluoroscopic method of colonoscopic topography by noting various visual landmarks in the colon, which give a fairly accurate location of the tip of the endoscope. Over the next few sessions, I was able to further delineate these landmarks and they became universally adapted (3). Currently, with the use of these landmarks, abdominal pressure, and palpation, most colonoscopy is currently performed without x-ray imaging.

The original GI endoscopy service consisted of three (previous ENT) operating rooms and the operating room office. The fluoroscopic unit for ERCPs was borrowed from a nearby surgical intensive care unit (ICU), so that all ERCPs were performed in the surgical ICU area. The first full-time nurse for GI endoscopy was Marna Schirmer, who was instrumental in teaching everyone how to do endoscopy. She formed the Society for Gastrointestinal Nurses and Assistants (SGNA) while running The Mount Sinai Hospital endoscopy unit. This organization is now the largest and best-known organization of its type in the world.

In preparation for the new Guggenheim Pavilion, it was necessary to demolish the

building in which the endoscopy unit was located. Endoscopy was moved into the Annenberg Building, in a space that was known to be inadequate. Since it was the only space available, we were asked to "squeeze in" for a period of "one to two years," until the new building was constructed. That was fifteen years ago. The entire endoscopy space (as of this writing) is still contained in a 1,000 square foot area, which includes a waiting area, a reception area, a recovery space, two small endoscopy rooms, an even smaller storage room that was converted into a third endoscopy room, and a cleaning area. ERCPs are performed at a remote location using a C arm portable fluoroscope and monitor without the capability for overhead x-ray films. The unit currently performs about 7,000 endoscopic examinations annually. Because of space constraints, the forty members of the voluntary staff of the Gastroenterology Division now perform endoscopy in their private offices outside the hospital, while the full-time staff physicians have their own endoscopy set-up in their faculty practice area.

Many instructors are present for each and every scheduled endoscopy session. There is a special "fellows' endoscopy teaching session" weekly, in addition to the weekly "endoscopy conference." The latter has become one of the hospital's favorite meetings, attended by adult and pediatric gastroenterologists, general, laparoscopic and transplant surgeons, pathologists, residents, and medical students. This conference evolved from the original weekly gathering of interested GI physicians who reviewed the week's film strips of gastroscopic photographs.

The endoscopy training program at Mount Sinai is one of the best in the country, supervised by many dedicated GI attendings who give their time and effort without recompense. At the end of their training, the GI fellows are highly focused on both the cognitive and procedural aspects of endoscopy.

Plans have again been drawn up for a new endoscopy suite in the future ambulatory surgical pavilion, with an interim expansion and renovation of some of the current space.

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