Thoracoscopic surgery: historical perspectives

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Recent technical advances have revolutionized the fields of surgical endoscopy, laparoscopy, thoracoscopy, and microsurgical spinal endoscopy. The authors discuss the rich history and recent evolution of these techniques. Thoracoscopy had been widely used for the treatment of pleural conditions associated with tuberculosis. It was largely abandoned in the 1950s when effective antituberculosis medications were introduced. In the 1980s the development of video-assisted endoscopic procedures in the fields of general surgery, orthopedics, and otolaryngology provided new impetus to revive thoracoscopy. As a result of these advances thoracoscopy replaced open thoracotomy in many cardiothoracic procedures. These improvements led to the application of these techniques to treat disorders of the spine. By the mid-1990s microsurgical endoscopy was being used effectively to treat thoracic disc disease, perform anterior surgical release procedures for scoliosis, resect tumors, and even to conduct complex spinal fusions and reconstructions. As technology continues to improve, there is no doubt that thoracoscopic surgery will find a permanent place in the armamentarium of techniques used to treat pathological entities of the spine.

KEY WORDS • thoracoscopy • thoracic disc • endoscopic

HISTORY OF THORACOSCOPY

Early Development of Endoscopy

The first endoscopic device used for medical practice was developed in Germany in 1806 by Philipp Bozzini to illuminate body cavities. The instrument consisted of a candle attached to a thin cannula that allowed illumination of body orifices or viscera. The device was called the Lichtleiter, which means light conductor. It had no magnification or optics and was inserted into the rectum, urethra, or vagina, while the physician looked through the device. Other physicians at the time did not readily accept the device because the visibility was poor and placing the device into orifices was painful for the patient. In fact the Viennese Surgical Academy censured Bozzini’s work.

During the 1800s there were several advances that improved the effectiveness of endoscopy. In 1853 Desormeaux was the first to introduce the use of a lens to focus a direct light source, by which a clearer image, compared with Bozzini’s device, was obtained. This made it feasible to use the endoscope to visualize structures or remove foreign bodies. Bevan performed the first esophagoscopy procedure in 1868. In 1870 Kussmaul undertook the first esophagogastroscopy in a patient who was a professional sword swallower. The next major advance in the field of endoscopy was the introduction of the cystoscope, which had both an illumination source and a working channel. The cystoscope was developed by Nitze, a urologist from Berlin, who worked with Beneche, an optician from Berlin, and Leiter, who produced instruments in Vienna. The device consisted of a working channel, a light source, and an optical lens through which light was reflected. In 1887 the cystoscope was improved by adding a small light bulb at the distal end, allowing better visualization.

The early 1900s, the endoscope was being used for diagnostic and therapeutic purposes in the pelvis, abdominal cavity, and later, the thorax. Kelling developed these techniques, and he performed the first laparoscopic surgery in dogs in 1902. He later refined these techniques and published his report on laparoscopic surgery in humans 14 years later. In 1929, he developed flexible endoscopes, which led to further improvement of these techniques.

THE DEVELOPMENT OF THORACOSCOPY

In 1910 Hans Christian Jacobeus, after learning the intracavitary techniques from Kelling introduced the technique of pleuroscopy or thoracoscopy. Jacobeus was a professor of internal medicine working in a tuberculosis sanitarium in Sweden. Using a local anesthetic and the instrumentation developed by Nitze, Jacobeus performed the thoracoscopic lysis of pleural adhesions and drainage as an adjunct to collapse therapy. In 1921 Jacobeus reported an extensive experience with thoracoscopy in the...
diagnosis of pulmonary and pleural tumors. Thoracoscopic procedures were widely performed in Europe during the 1920s, and in 1928, Cova published a color atlas of thoracoscopically diagnosed intrathoracic lesions. In the 1950s the administration of antibiotic therapy for tuberculosis largely replaced the use of thoracoscopy in the treatment of this disease. Over the next 20 years thoracoscopy evolved into a diagnostic procedure in the management of pleural effusions as well as primary and metastatic pleural tumors. Satller,21 Swierengen, et al.,23 and Brandt24 each reported series of over 1000 procedures.

Despite its use in Europe, thoracoscopy was not widely used in the United States until the 1970s, when acceptance of the procedure followed several technical developments. The introduction of fiberoptics and flexible operating scopes piqued interest in the field, and Miller and Hatch23 and Newhouse15 are credited with reporting the initial experiences. The flexibility and maneuverability of these new devices led to a dramatic rise in their applications in the fields of gastrointestinal and pulmonary medicine, otolaryngology, urology, and orthopedic, general, and thoracic surgery. The development of endoscopic video cameras and improvement in surgical instrumentation further broadened applications of thoracoscopy. Use of the video camera frees the surgeon's hands, allows assistants to view the procedure, and facilitates maintenance of a sterile field. Newer developments also include laser surgery, and LoCicero, et al.,11 and Wakabayashi, et al.,24 have demonstrated its clinical effectiveness when applied in more complex thoracoscopic procedures.

The use of VATS has greatly increased over the past 10 years. Thoracoscopy can be used as a diagnostic and therapeutic tool in most areas of the chest. Video-assisted thoracoscopic surgery has been used in the anterior mediastinum to perform thymectomies; cardiac surgeons perform aortocoronary revascularization using VATS techniques; esophageal repairs and resections have been performed;3 and thoracic surgeons now can perform sympathectomies, pericardiectomies, and all types of lung resections previously restricted to open surgical techniques. Ruptured blebs and traumatic injuries can also be treated using VATS. The clinical benefits include less postsurgical pain, quicker recovery times, and a lower incidence of intercostal neuralgia.6

**Thoracoscopic Spinal Surgery**

The first use of thoracoscopy for the treatment of spinal disease was developed simultaneously by Mack and colleagues12,17 in Germany and Rosenthal and colleagues20 in the United States. Thoracoscopic spine surgery was initially applied to treat vertebral body disease or to obtain a tumor biopsy sample. Later, more complex procedures were performed. In 1993 Mack and colleagues12 reported on 10 patients in whom VATS was used for various therapeutic procedures; anterior release for scoliosis, discectomy, vertebral body biopsy sampling, drainage of a disc space abscess, and anterior interbody fusion. In 1994 Rosenthal and coworkers20 described a technique for endoscopic thoracic discectomy, which they first perfected in cadavers. After this they successfully performed a video-assisted thoracic discectomy in a patient with a herniated disc causing spinal cord compression, they called this procedure “microsurgical endoscopy.” As the tools for microendoscopic spinal procedures evolved, procedures of greater complexity were attempted. Numerous investigators4,5,13,17,19,20 reported using microsurgical endoscopy to perform anterior thoracic and thoracolumbar reconstruction in cases of metastatic tumors, fractures, and deformities, as well as anterior release and fusion for the treatment of idiopathic scoliosis. The advantages of microendoscopic spine surgery include excellent visualization of critical anatomical structures, the level of which is equal to that of open thoracotomy, and the provision of which inflicts far less trauma on normal tissues, resulting in less postoperative pain, shorter hospital stays, and lower complication rates.10,17 Data have been published to support this observation, although no study has been conducted in which a direct prospective comparison has been made. The disadvantages are mainly related to the steep learning curve involved in acquiring the skills necessary to perform thoracoscopy procedures. In the last few years thoracoscopic techniques for spinal surgery have improved dramatically, making it a valuable alternative to open thoracotomy for the effective treatment of a variety of spine-related conditions.

**CONCLUSIONS**

Endoscopic and thoracoscopic surgery has a long, fascinating history. In the last few decades several technological advances have greatly facilitated the use of endoscopy in the treatment of abdominal, thoracic, and most recently, spinal lesions. Currently the use of microendoscopic spinal surgery for treatment of thoracic disc disease and other spinal disease is safe and effective, with less violation of normal tissue compared with traditional methods. As technology continues to improve, there is no doubt that thoracoscopic surgery will evolve, and we believe it will find a permanent place in the armamentarium of techniques used to treat pathological entities of the spine.

**References**

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