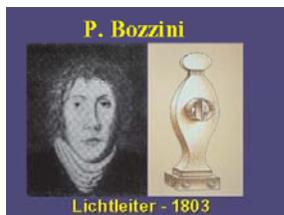


The Impact of The Arthroscopy Association of North America on the Development of Arthroscopic Surgery

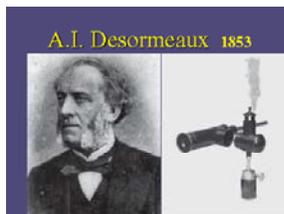
History of Arthroscopy before AANA

Early History of Endoscopy

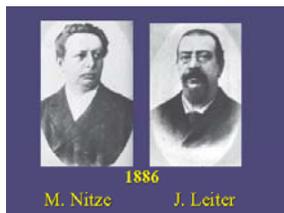
From the beginning of time, man has been obsessed with looking inside body cavities. The first structures to be examined were open cavities such as the mouth and the ears. The ancient Romans even had vaginal speculi. Since the bladder was a particular challenge, the first endoscopes, later called cystoscopes, were designed to look inside the bladder for the diagnosis and treatment of bladder stones.



Bozzini, in 1806, presented his “Lichtleiter” to the Rome Academy of Medicine. Unfortunately, it was scorned by that scientific body and very little progress was made until 1853 when A.I. Désormaux developed the “gazogene endocystoscope”. This instrument burned turpentine in a combustion chamber and transmitted the light into the bladder by mirrors.



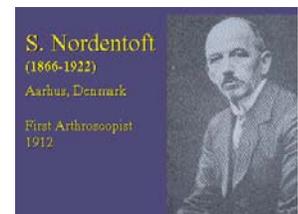
In 1860, J. Bruck, who was reportedly a dentist, transilluminated the bladder from the rectum, using a “diaphanoscope”, which essentially was a red-hot or glowing wire encased in a quill.¹ Dentists were involved because bladder stones were often thought to be similar to teeth, and only dentists were trained to handle these hard tissues.



A major breakthrough in endoscopy came in 1880, when Thomas Edison developed the carbon filament lamp. In 1886, two Germans, Nitze and Leiter, developed the first cystoscope to incorporate a small incandescent bulb. This enabled them, by 1890, to take the very first photographs of the interior of a bladder.

The Early Pioneers of Arthroscopy

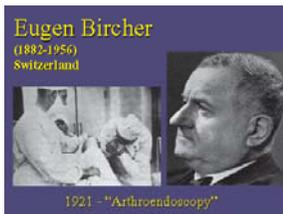
The first recorded application of an endoscope to the inside of a knee joint occurred in 1912, when Dr. Severin Nordentoft from Aarhus Denmark, used a Jacobaeus Laparoscope to examine the interior of knees and presented his work at the 41st Congress of the German Surgical Society, in Berlin. There is no question, from the written description in the published abstract that he was really the first to look inside a knee joint. However, there was no indication in his presentation that he used the instrument clinically.





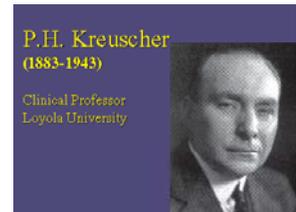
Professor Kenji Takagi, in Tokyo, is credited in 1918, with using a cystoscope on patients, to examine tuberculous knees, a prevalent problem in those days. His motivation was the belief that an early diagnosis of tuberculosis might lead to earlier treatment and prevent the long-term adverse complication of ankylosis, and a destroyed knee joint.

In 1931, Takagi developed his first arthroscope, (which was 3.5 mm in diameter) and over the next few years, developed and tested several modifications. By 1938 he was on his twelfth design, having gone from small to large trochar diameters, and both with and without lenses. Undoubtedly, he was the first true innovator in arthroscopy.



Meanwhile, on the other side of the world, in 1921, Dr. Eugen Bircher in Switzerland published his experience with the use of an arthroscope inside the knee joint of live patients. He called the technique “arthroendoscopy” and used a modified Jacobaeus Laparoscope made by the Wolff Company, to examine approximately 70 knees. Also of interest is the fact that he was the first to point out that private patients seemed to do better than patients who were on some form of “workers compensation.” These early arthroscopes had a limited field of vision, and relatively poor light and so he stopped doing arthroscopy after a few years and concentrated on developing the technique of arthrography, which he believed would provide a more accurate diagnosis.

The next known publication came in 1925, when Dr. Phillip Kreuscher, a clinical professor of surgery at Loyola University in Chicago, published “a plea” for the early diagnosis of meniscal injuries by the use of an arthroscope. Little is known about Dr. Kreuscher, but it is known that he did a fellowship in Berlin in 1912 and may well have been influenced by Nordentoft’s presentation. The arthroscope that he used has been lost to antiquity, but was probably a Jacobaeus laparoscope, as one of his general surgical colleagues published on the use of Jacobaeus scope, at that time. In a letter to Burman dated September 11, 1931 Kreuscher stated that he used the arthroscope in “not more than 25 or 30 casesIn the last year I have not used it at all because I have found no cases in which its use was definitely indicated The success in connection with the arthroscope depends on a clear field and good distension.” He described his various experiments distending the joint using nitrogen, oxygen and also formaldehyde solution. He also injected some joints with lipiodol and took x-rays after inspecting the joints by arthroscopy.



E.S. Geist, in 1926, modified an otoscope to view the interior of the knee joint. In the *Journal-Lancet* published by the North Dakota Medical Association (not to be confused with the British *Lancet*) he described how he had explored the joints of cadavers and pathological specimens, but apparently did not do any clinical cases. He postulated “the performance of arthroscopy in the living ought not to be more stressing to the patient than a simple aspiration, provided local anesthesia is employed.” (The *Journal-Lancet* ceased publication in 1965.)



In 1931, Michael Burman, MD was a young resident at the Hospital for Joint Diseases in New York. He had begun to use an arthroscope in the anatomy laboratory of New York University, having had a special instrument designed for him by a Mr. R. Wappler. He went to Europe on a traveling scholarship in the spring of 1931 and continued his studies under Professor George Schmorl, the renowned pathologist and director of the Institute of Pathology in Dresden, Germany.

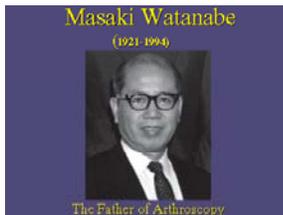
A study of the effect of dyes injected into the joint cavity on degenerative joint cartilage was initiated in Dresden and was a research venture that Burman continued later in clinical trials of arthroscopy on live patients. In the autumn of 1931, Burman returned to New York and published the results of his investigation in the historical paper "Arthroscopy or the Direct Visualization of Joints." He also printed 20 colored aquarelles of endoscopy findings in different joints. These were painted by the medical artist of the Dresden Institute, Mrs. Frieda Erfurt, and were actually the first pictures of arthroscopic findings ever published. Michael Burman went on to become an orthopaedic surgeon and worked at the Hospital for Joint Diseases in New York throughout his professional life. During the 1950s he collected material for an *Atlas of Arthroscopy* but this was never published, as he could not find an editor who appreciated his work. Watanabe visited him in 1957, Ikeuchi in 1961 and Jackson in 1969. Michael Burman died in 1975.



During that same time period several European surgeons were also involved in endoscopy of the knee joint and publications in German, R. Sommer (1937) and E. Vaubel (1938) were noted in the rheumatology literature.

Then came the Second World War (1939-1945) and all activity in the scientific exploration of arthroscopy was suspended. The next publications were by P. Verchione (1947) and A Santacroce (1950), both published in the Italian literature. These were followed by articles by E. Hunter(1955) and R. Imbert(1956).

The Beginning of the Modern Era of Arthroscopy



After the war, on the other side of the world, Masaki Watanabe, MD returned to the University of Tokyo, from duty in the Japanese Navy, and continued the development of arthroscopy from the point his professor, Dr. Takagi had reached. He enlisted the aid of newly emerging Japanese optics and electronics companies, and in 1955, the Watanabe #14 scope was produced. With that scope he was able to get the first color photographs of the inside of a knee joint.

In 1959, he developed the Watanabe #21, which became the first production scope, containing beautiful lenses with a field of vision of 101° and a depth of focus from 1cm to infinity, hand ground by a craftsman named Fukuya. The #21 was the last arthroscope to use an incandescent bulb.



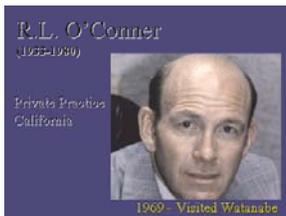
In 1967, Watanabe developed the first fiber-optic scope, which was called the #22, and in 1970 he introduced the first ultra thin fiber-optic endoscope which he called the #25. This scope was 2 mm in diameter and used a single “selfoc” fiber to transmit the image to the eye, or the camera. It later formed the basis of the “Needlescope”.

Watanabe also was the first to develop the concept of triangulation, bringing instruments into the knee from different directions to treat the pathology that was seen. In 1955, he performed the first recorded operative procedure under arthroscopic control, which was the removal of a solitary giant cell tumor from a knee joint. In 1961, he removed a loose body and in 1962 he performed the first partial meniscectomy under endoscopic control. In this work, he was ably assisted by Hiroshi Ikeuchi, MD and Sakae Takeda, MD.

Watanabe was a true scientist and a great teacher. He freely gave his knowledge to whoever was interested. He wrote the first Atlas of Arthroscopy, which was published in English in 1957, and which was beautifully illustrated by Fujihashi. His second Atlas of Arthroscopy was published in 1969 and was illustrated with color photographs of the interior of the joint. Dr. Ikeuchi has continued his great work to this day



Robert W. Jackson, MD from Canada, was the first foreign doctor to visit Watanabe in 1964. He recognized the potential value of arthroscopy in diagnosis and in treatment, and requested the professor of orthopaedics at the University of Toronto in Canada to purchase a scope for the original price of \$675.00. On his return to the University of Toronto in 1965, Dr. Jackson used the #21 Watanabe arthroscope on several cases, ably assisted by his research fellow, Dr. Isao Abe. He also gave the first instructional course on arthroscopy at the American Academy of Orthopaedic Surgeons in 1968 and wrote the first textbook (in English) on “Arthroscopy of the Knee” in 1976, with Mr. David Dandy. In those early years, Drs. John Joyce, Jack McGinty, Ward Casscells, and many others visited Jackson, to learn the techniques of arthroscopy.



The first two instructional courses in arthroscopy at the AAOS meeting were given by Robert W. Jackson, MD and then he was joined by Richard O'Connor, MD, who had visited Watanabe in 1969. At every meeting the early pioneers would enthusiastically compare notes regarding techniques and pathologies that were seen and which had not been appreciated before. For example, partial tears of the anterior cruciate ligament and pathological medial plicae were now becoming recognized as pathological lesions.