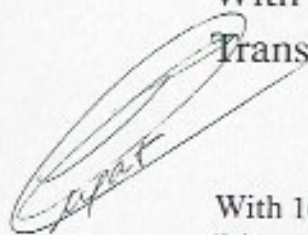


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Arthroscopy of the Knee Joint

With a Foreword by Erwin Morscher

Translated by P. A. Casey



With 163 Figures, most in Colour
Diagrams by F. Freuler

Springer-Verlag
Berlin Heidelberg New York 1980

1. Historical Perspective

The attempts of doctors to look into the human body cavities have a very long history. In the first half of the nineteenth century it became possible to visualize the larynx, the ear and the optic fundus. The names of Ludwig Thürk, Freiherr von Troeltsch and Hermann Helmholtz are indelibly associated with these pioneer developments.

The creation of the white-hot platinum wire led to the invention of the electric light and made it possible to illuminate the body cavities. The first attempts at endoscopy of the urinary bladder and the stomach were carried out in the second half of the nineteenth century. Max Nitze is regarded as the father of cystoscopy. In May 1879, with the aid of a device developed by himself and the instrument maker Joseph Leitner, he was able to examine the interior of the bladder. The first successful gastroscopy was probably that carried out by Mikulicz in Breslau. By 1881 he had succeeded in visualizing individual features in the stomach, such as the activity of the pylorus.

The invention of the carbon-filament light bulb by Thomas Edison enabled considerable advances to be made in endoscopy of all kinds. At the turn of the century cystoscopy had already become a routine procedure. A few years later gastroscopes — still rigid at that time — became available. Laparoscopy was a more or less parallel development. Jacobaeus, together with the Georg Wolff Company, designed an instrument for the inspection of the peritoneal cavity. This was the instrument which was first used for endoscopy of the knee joint.

In 1919/1920 the Swiss surgeon, Eugen Bircher, carried out the first experimental endoscopies of cadaver knee joints using the Jacobaeus laparoscope. In 1920/1921 the tech-

nique was used in living humans. In his famous paper—the first publication whatsoever on arthroscopy—in the *Zentralblatt für Chirurgie* in 1921 he reported the use of the laparoscope for arthroscopy of the knee joints of 18 patients. In 13 cases he was able to establish a correct diagnosis which was confirmed by the subsequent operation. In three cases the diagnosis was unsure. He reported only two incorrect diagnoses in tuberculous joints. Bircher carried out the investigation under general anaesthesia in almost all cases. The joints were filled with oxygen and nitrogen.

One year later, in 1922, Bircher published an article on the pathology and diagnosis of meniscus injuries in 20 knee joints which had been investigated endoscopically. Even at that stage he succeeded in endoscopically diagnosing eight out of nine meniscus injuries, the diagnoses being confirmed during subsequent surgery. At the end of the paper Eugen Bircher wrote: "Arthroscopy allows us to examine the interior of the joint and identify pathological changes, i.e. the diagnosis is made by direct visualization of the lesion. It is therefore superior to all other methods of investigation and, like endoscopy of the bladder, can be used to define certain indications for surgery. It will meet with resistance, as did cystoscopy, but, like the latter procedure, will gain in popularity and develop to the point at which it becomes indispensable."

In 1918 the Tokyo surgeon K. Takagi had, independently of Bircher, experimented with the use of a cystoscope for the visualization of the interior of the knee joint, or so his pupil, M. Watanabe, reports. In 1920 he developed a special device with a diameter of 7.3 mm for endoscopy of the knee joint. However, because of its thickness this instrument was not suitable for practical use. It was not

until 1931 that he succeeded in developing an arthroscope with a diameter of 3.5 mm. Takagi expanded the interior of the knee joint by filling it with saline. The first publication concerning his arthroscope appeared in 1933 in the Japanese Journal of Orthopedic Surgery.

The first paper on arthroscopy of the knee joint in English was that by P.H. Kreuzer in 1925 in which he described an arthroscope of his own development. He considered arthroscopy to be especially suitable for the early detection of meniscus injuries.

In New York at the beginning of the 1930s M.S. Burman, H. Finkelstein and L. Mayer at the Hospital for Joint Diseases were also working on an instrument for arthroscopy of the knee joint. Following a short publication in 1931, the current state of development was summarized in a paper in 1934. This article described for the first time a clearly defined technique of arthroscopy. The authors preferred local anaesthesia. The irrigation was carried out with Ringer solution. A description of the systematic inspection of the knee joint was followed by a clear account of the complications which could arise during the procedure. They reported 30 cases which they had investigated, and concluded that arthritis of the knee joint and meniscus lesions were the main indications for arthroscopy of the knee joint.

The development of this investigative technique was continued in Germany. In 1937 R. Sommer reported several cases in which he had carried out arthroscopy, although his publication in the *Zentralblatt für Chirurgie* did not deal with the technique and complications in detail. Like Sommer, the rheumatologist J. Vaupel was only familiar with Bircher's initial work as he tried to introduce arthroscopy for the diagnosis of lesions of the knee joint.

As a rheumatologist, Vaupel stressed the importance of the method in chronic arthritis. He arthroscoped individual knee joints as many as three times and hoped, by following the changes in the appearance of the synovial membrane, to gain insight into the course of the disease. Vaupel also tried to record his findings photographically. He used an arthroscope with a diameter of 3.1 mm for normal investigations and developed an instrument with a diameter of 4.7 mm for those cases which he wished to photograph. However, the underdeveloped state of photographic technology at that time prevented him from obtaining satisfactory pictures.

In 1939 K.H. Wilcke published a good review of the state of arthroscopic technology in the German- and English-speaking countries. Wilcke carried out his arthroscopies exclusively in cadavers. He described the technique of the investigation precisely. The coloured photographs provide evidence of the technical inadequacy of the photographic methods available at that time. In his summary Wilcke wrote: "Endoscopy is, in suitable cases, a worthwhile addition to the methods which are available for the investigation and diagnosis of lesions of the knee joint, but its value is not such that it could be recommended for routine use in living patients."

After the Second World War the main impetus in the development of arthroscopy of the knee joint came from Japan. At the annual meeting of the Japanese Orthopedic Association in 1953 M. Watanabe, K. Sato and W. Kawashima presented a report on the clinical use of the technique. Four years later, in 1957, the first edition of the *Atlas of Arthroscopy* by M. Watanabe, S. Taketa and H. Ikeuchi was published. This atlas was the basis of the subsequent world-wide increase in interest in arthroscopy of the knee joint.