

American Academy
of
Orthopaedic Surgeons

Symposium on
Arthroscopy
and
arthrography
of the knee



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Orthopaedic Surgeons

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arthrography of the knee

with 499 illustrations, including 188 in full color

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Contributors

Alan L. Bass, F.R.C.P. (Ed.), F.R.C.P. (C)

Director, Service of Rehabilitation, Department of Medicine, Henderson General Hospital; Clinical Professor, Department of Medicine, McMaster University, Hamilton, Ontario

Robert C. Bechtol, M.D.

Consultant, Department of Orthopedic Surgery, Santa Rosa Memorial Hospital, Santa Rosa, California

Benjamin E. Bierbaum

Chairman, Department of Orthopedic Surgery, New England Baptist Hospital; Clinical Professor of Orthopedic Surgery, Boston, Massachusetts

S. Ward Casscells, M.D.

Attending Chief, Orthopedics, Wilmington Medical Center; Consultant at Alfred I. duPont Institute, Wilmington, Delaware

Murray K. Dalinka, M.D.

Professor of Radiology, University of Pennsylvania, Philadelphia, Pennsylvania

Kenneth E. DeHaven, M.D.

Associate Professor of Orthopaedics and Head, Section of Athletic Medicine, University of Rochester School of Medicine, Rochester, New York

Robert E. Eilert, M.D.

Chairman, Department of Orthopaedics, The Children's Hospital; Assistant Clinical Professor, Department of Orthopaedic Surgery,

University of Colorado Medical Center, Denver, Colorado

Houshang Farahver, M.D.

Attending Orthopaedist, St. Mary of Nazareth Hospital, Chicago, Illinois

Harry J. Griffiths, M.D.

Associate Professor, Radiology and Orthopedics, University of Rochester Medical Center, Rochester, New York

Michael Harty, M.A., M.Ch., F.R.C.S.

Professor of Anatomy and Orthopaedic Surgery, University of Pennsylvania, Philadelphia, Pennsylvania

Robert W. Jackson, M.D., M.S., F.R.C.S. (C)

Chief, Division of Orthopaedic Surgery, Toronto Western Hospital; Associate Professor, Department of Surgery, University of Toronto, Toronto, Ontario

Lanny L. Johnson, M.D.

Clinical Professor of Surgery, College of Human Medicine, Michigan State University, East Lansing, Michigan

John J. Joyce III, M.D.

Associate Clinical Professor of Orthopaedic Surgery, University of Pennsylvania School of Medicine, Philadelphia, Pennsylvania

Jeremy J. Kaye, M.D.

Associate Professor of Radiology; Associate Professor of Orthopedics and Rehabilitation, Vanderbilt University, Nashville, Tennessee

Ralph T. Lidge, M.D.

Clinical Associate Professor of Orthopaedic Surgery, Abraham Lincoln School of Medicine, University of Illinois at the Medical Center, Chicago, Illinois

John B. McGinty, M.D.

Clinical Professor of Orthopaedic Surgery, Tufts University School of Medicine, Boston, Massachusetts

Richard L. O'Connor, M.D.

Orthopaedic Surgeon, West Covina, California

Rochelle Prescott, B.S.Ch.

Principal Research Scientist, Dyonics, Inc., Woburn, Massachusetts

Preface

During the past 3 years the American Academy of Orthopaedic Surgeons has sponsored continuing medical education courses on arthroscopy and arthrography of the knee. The programs have been conducted eight times in cities across the United States. The response has been enthusiastic, and many physicians have participated in the course more than once.

The purpose of this text is to provide, in greater part, the lectures given by members of the faculty, some of whom represent the pioneers of arthroscopy in North America. It is through their efforts that this volume has been made possible.

Arthroscopy is presented as a technique that requires specialized psychomotor and interpretive skills. Diagnostic findings are illustrated.

Arthroscopy is developing as a modality of treatment, with marked growth of endoscopic surgery expected during the next decade. The procedure decreases morbidity, saves many hours of patients' time through an earlier return to work following surgery, and results in an economic reduction in hospitalization costs.

Arthrography is an accepted diagnostic method and antedates arthroscopy in the United States and Canada. Technical aspects of arthrography are easier than arthroscopy; however, more interpretive data are provided by the latter.

We believe the contents of this text are representative of current fundamental knowledge that will be helpful to all of us in the continuous development of arthroscopy, arthrography, and intraarthroscopic surgery.

We express gratitude to the faculty members who have so generously taken time to produce these courses and to submit papers for this text; and to the secretaries who have devoted many hours in helping plan these programs and prepare subsequent manuscripts, our thanks. We express appreciation, last but not least, to the many physicians who have served as instructors in the laboratory of the arthroscope and other teaching aids.

*John B. McGinty
Ralph T. Lidge*

A.A.O.S.
Symposium on
Arthroscopy and arthrography
of the knee

Contents

1 Historical perspectives, 1

History of arthroscopy, 1

John J. Joyce III
Robert W. Jackson

History of knee arthrography, 8

Jeremy J. Kaye

2 Arthroscopists and arthrographers, 10

Arthroscopist, 10

Ralph T. Lidge

Arthrographer, 11

Jeremy J. Kaye

3 Optical design and care of the endoscope, 13

Rochelle Prescott

4 Instrumentation in arthroscopy, 26

Watanabe arthroscopes, 26

Robert W. Jackson

Fiber optic arthroscopes, 31

John J. Joyce III

Needlescope, 36

Lanny L. Johnson

5 Anatomy of the knee, 44

Arthroscopic anatomy, 44

Michael Harty

Arthrographic anatomy, 53

Murray K. Dalinka

6 Technique of arthroscopy, 61

John B. McGinty

7 Technique of arthrography, 80

Harry J. Griffiths

8 Lesions of the synovium, 95

Arthroscopy, 95

Alan L. Bass

Arthrography, 104

Harry J. Griffiths

9 Lesions of articular cartilage, 112

Arthroscopic classification, 112

Ralph T. Lidge

Arthroscopic and cadaver knee investigation, 122

S. Ward Casscells

Arthrography, 142

Harry J. Griffiths

10 Lesions of menisci, 153

Arthroscopy, 153

Robert W. Jackson

Arthrography, 166

Murray K. Dalinka

11 Lesions of the ligaments, 175

Arthroscopy, 175

Robert W. Jackson

Arthrography, 182

Harry J. Griffiths

12 The previously operated knee, 190

Arthroscopy, 190

John J. Joyce III

Houshang Farahver

Arthrography, 197

Murray K. Dalinka

13 Arthroscopy and arthrography in children and adolescents, 200

Arthroscopy, 200

Robert E. Eilert

Arthrography, 213

Murray K. Dalinka

14 Acute injury to the knee, 220

Arthroscopy, 220

Kenneth E. DeHaven

Arthrography, 228

Jeremy J. Kaye

15 Arthroscopic surgery of the knee, 230

Richard L. O'Connor

16 Joints other than the knee, 249

Arthroscopy, 249

Lanny L. Johnson

Arthrography, 261

Murray K. Dalinka

17 Role of the assistant in arthroscopy, 274

Ruth L. Becker

Lanny L. Johnson

18 Photography in arthroscopy, 282

John B. McGinty

- 19** Diagnostic aids in arthroscopy, 296
Robert C. Bechtol
- 20** Laboratory aids in the teaching of arthroscopy, 315
Robert E. Eilert
- 21** Correlation of arthroscopy and arthrography, 326
Benjamin E. Bierbaum

1. Historical perspectives

History of arthroscopy

John J. Joyce III
Robert W. Jackson

DEVELOPMENT OF ENDOSCOPY—EARLY PIONEERS

Although the Hebrews are said to have used vaginal specula, and proctoscopes are said to have been found in the ruins of Pompeii, it remained for Bozzini^{8,9} of Frankfurt-am-Main to produce his Lichtleiter in 1805 (Fig. 1-1). The apparatus consisted of a bifid tube which was attached to a light chamber that was divided by a thin, longitudinal partition. A candle, which acted as a light source, was on one side, while the examiner peered through a hole on the other. When this primitive but ingenious device was presented before the Viennese Medical Society in 1806 it was considered “a mere toy” (Fig. 1-2).

Other instruments of improved design followed Bozzini’s effort. It remained, however, for Desormaux^{8,9} in 1853 to produce the gastrogen endoscope (Fig. 1-3).



Fig. 1-1. Philip Bozzini (1773-1809), designer of the Lichtleiter. (From Jackson, R. W., and Dandy, D. J.: *Arthroscopy of the knee: modern orthopedic monographs*, New York, 1976, Grune & Stratton.)

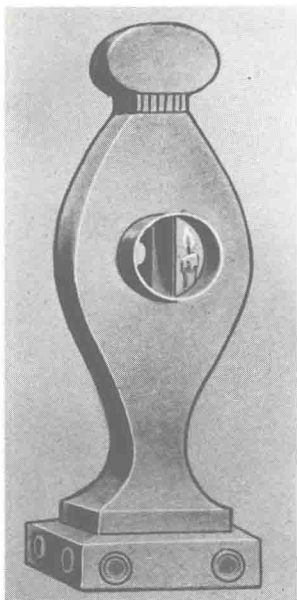


Fig. 1-2. Bozzini's Lichtleiter (1805). (From O'Connor, R. L., editor: *Arthroscopy: a scope®* publication, Kalamazoo, Mich., 1977, The Upjohn Co.)



Fig. 1-3. A. J. Desormaux (1815-1882), father of modern cystoscopy, designer of gastrogen endoscope. (From Jackson, R. W., and Dandy, D. J.: *Arthroscopy of the knee: modern orthopedic monographs*, New York, 1976, Grune & Stratton.)

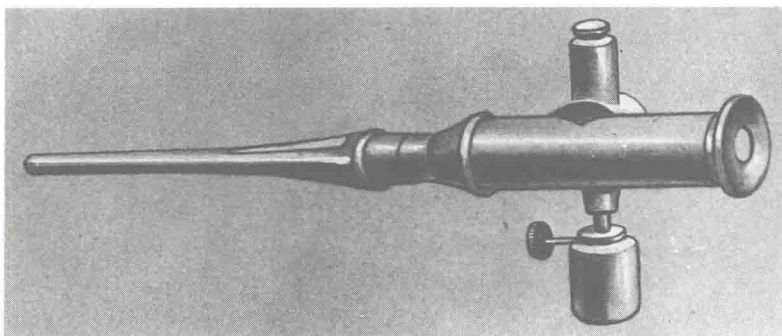


Fig. 1-4. Desormaux's gastrogen endoscope. (From O'Connor, R. L., editor: *Arthroscopy: a scope®* publication, Kalamazoo, Mich., 1977, The Upjohn Co.)

Many historians consider this device to be the true forerunner of our modern cystoscopes. The apparatus consisted of a gas lamp to which a series of tubes could be attached for insertion into the urethra (Fig. 1-4). A concave, perforated reflector directed the light down the tube and allowed the examiner to peer through the eyepiece into the bladder and urethra. The publication of the results of Desormaux's extensive studies established the value of endoscopy.



Fig. 1-5. Max Nitze (1848-1906), designer of modern cystoscope. First person to photograph bladder's interior through an endoscope. (From Jackson, R. W., and Dandy, D. J.: *Arthroscopy of the knee: modern orthopedic monographs*, New York, 1976, Grune & Stratton.)

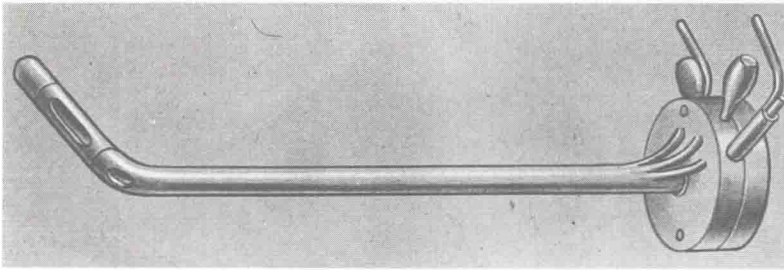


Fig. 1-6. Early model of Nitze cystoscope. (From O'Connor, R. L., editor: *Arthroscopy: a scope*[®] publication, Kalamazoo, Mich., 1977, The Upjohn Co.)

Until the advent of electricity, it was necessary to reflect light into the bladder from an outside source. In 1876 Max Nitze^{8,9} developed an instrument that closely resembled the modern cystoscope (Fig. 1-5). A platinum loop encased in a water-cooled goose quill, which glowed when electricity was passed through it, provided the first light source *within* the bladder. Edison's development of the incandescent lamp in 1880 was refined sufficiently by 1886 so that it could be substituted for the platinum wire. The addition of a lens system provided a wider and clearer visual field (Fig. 1-6). Rapid improvement of small electric lamps as well as optical systems ensued. By the beginning of the twentieth century the cystoscope had become an important urologic tool. The device was so far advanced that photographs of the bladder were possible.

ARTHROSCOPY

Prof. Kenji Takagi^{6,9} of Tokyo University must be considered a father of arthroscopy (Fig. 1-7). In 1918 he viewed a cadaver knee joint through a cystoscope. He was pleased with the extent and clarity of the visual field. Stimulated by his findings this ingenious observer designed a series of instruments better suited for use within joints. His first device, developed in 1920, had a diameter of 7.3 mm, making it impractical for routine use in the knee joint. The field of vision was also quite narrow. Takagi was, however, able to inspect the interior of a tuberculous knee. In 1931 continued efforts enabled this indefatigable pioneer to produce an instrument that was 4 mm in diameter (Fig. 1-8). By this time synovial biopsies had been taken under arthroscopic guidance, and by the mid 1930s Takagi had produced yet another arthroscope, through which the first color photographs were taken. A second light source introduced through a separate incision was required for this remarkable feat.

In 1921 Eugen Bircher^{1,2} of Switzerland used a Jacobeus laparoscope to examine a knee that was distended with oxygen or carbon monoxide and reported his findings (Fig. 1-9). Several other reports were made by the same author in subsequent years.

Philip Kreuscher⁷ in 1925 published a plea for the use of the arthroscope in the early recognition of meniscal lesions. Although the article provided a picture of the instrument, the author gave no details regarding the device or the technique of its use.

The first paper discussing the use of the arthroscope in joints other than the knee appeared in the 1931 issue of the *Journal of Bone and Joint Surgery*. Dr. Michael Burman^{3,4} not only reported his experiences in the examinations of the hip, knee, and ankle joints but also of the shoulder, elbow, and wrist (Fig. 1-10). This article



Fig. 1-7. Kenji Takagi, first person to view the knee's interior through an endoscope. (From Jackson, R. W., and Dandy, D. J.: *Arthroscopy of the knee: modern orthopedic monographs*, New York, 1976, Grune & Stratton.)

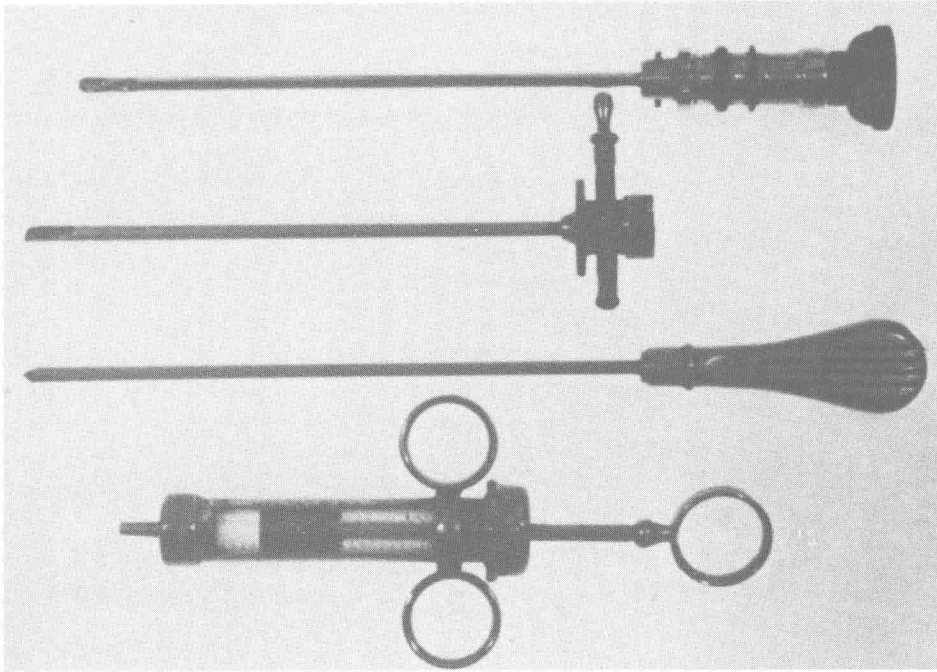


Fig. 1-8. Early Takagi arthroscope. (From O'Connor, R. L., editor: *Arthroscopy: a scope®* publication, Kalamazoo, Mich., 1977, The Upjohn Co.)



Fig. 1-9. Eugen Bircher (1882-1956), author of several articles on endoscopy of the knee. He used a Jacobeus laparoscope. (From Jackson, R. W., and Dandy, D. J.: *Arthroscopy of the knee: modern orthopedic monographs*, New York, 1976, Grune & Stratton.)



Fig. 1-10. Michael Burman (1901-1975), first person to describe arthroscopic appearance of other joints as well as the knee.

describes the fundamental principles of arthroscopy and remains a classic to this date. Although this ingenious man's arthroscope was a new addition to the field and had many original features, technical problems in the device caused Burman's colleagues to regard it with some skepticism. Unfortunately, his text for a planned monograph on arthroscopy remains unpublished.

In the mid 1900s Drs. Mayer, Finkelstein, and Burman,^{4,5} all of the Hospital for Joint Diseases in New York, also collaborated on the publication of a number of significant articles on the subject.

In the German literature, Sommer¹⁰ in 1937 and Vaubel¹¹ in 1938 reported on their experiences with the procedure.

Although World War II did not produce many articles on this developing technique, interest was revived in 1955 by Hurter who, in the French literature, described arthroscopy as a "new" method of examining joints. Further papers by Imbert also appeared in the French literature in 1956 and 1957.

Stimulated by Takagi's efforts, Dr. Masaki Watanabe (Fig. 1-11) continued to develop new instruments. His persistence and patience finally resulted in the Watanabe no. 21 arthroscope. This remarkable instrument has a diameter of 6.5 mm. The field of vision is 100°. It has a tungsten light source, and excellent photographs can be obtained.

In 1957 the first edition of Watanabe and associates' *Atlas of Arthroscopy* was published.¹² This beautifully documented and illustrated book was revised in 1969. In the meantime Watanabe has written many further reports on the subject.

Since the early 1970s well-documented reports by various authors have firmly established the value of arthroscopy as a diagnostic tool. At the time of this writing further interest has been stimulated by the recent development of operating arthroscopes by several manufacturers.

In 1973 the first seminar on the subject was held at the University of Pennsylvania



Fig. 1-11. Masaki Watanabe, designer of Watanabe no. 21 arthroscope and Selfoc arthroscope. (From Jackson, R. W., and Dandy, D. J.: *Arthroscopy of the knee: modern orthopedic monographs*, New York, 1976, Grune & Stratton.)