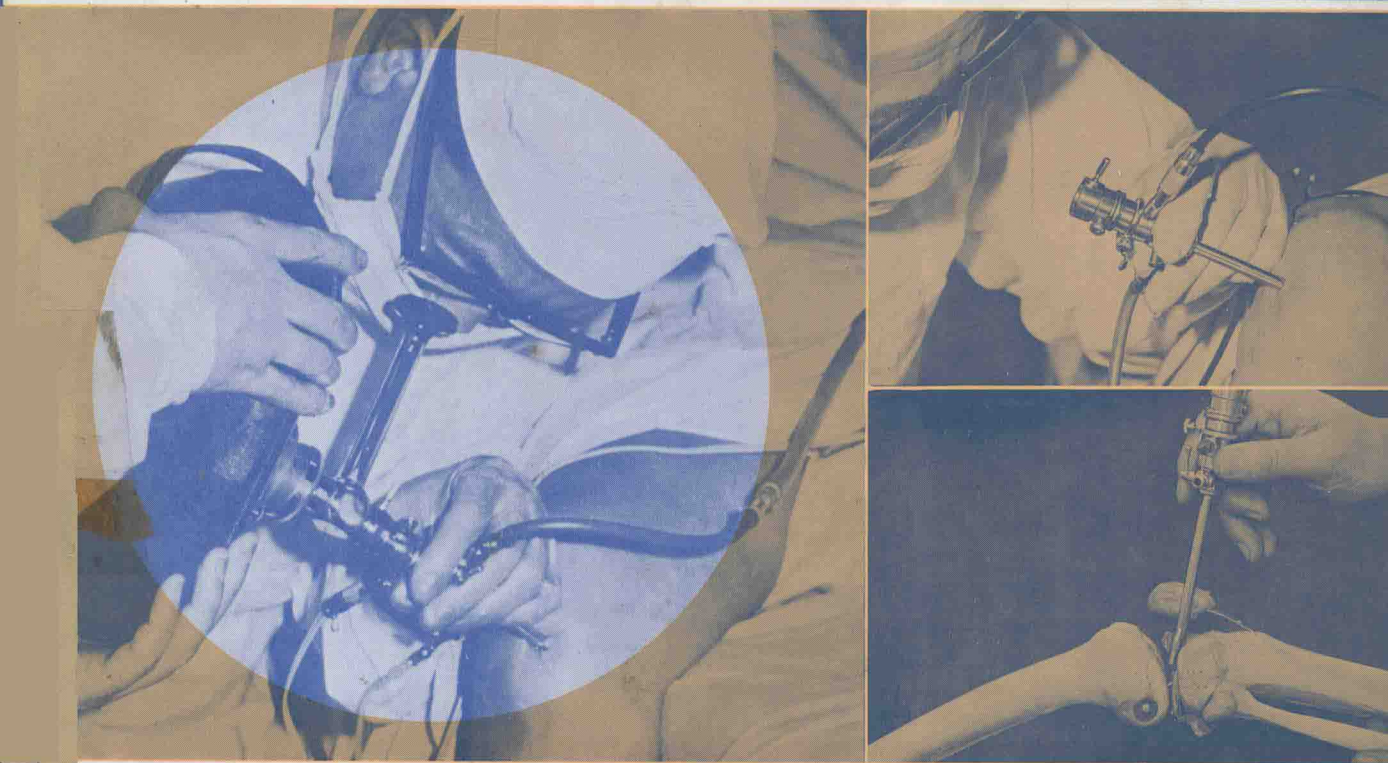


# ATLAS OF ARTHROSCOPY

THIRD EDITION

MASAKI WATANABE, M.D.  
SAKAE TAKEDA, M.D.  
HIROSHI IKEUCHI, M.D.



IGAKU-SHOIN TOKYO NEW YORK  
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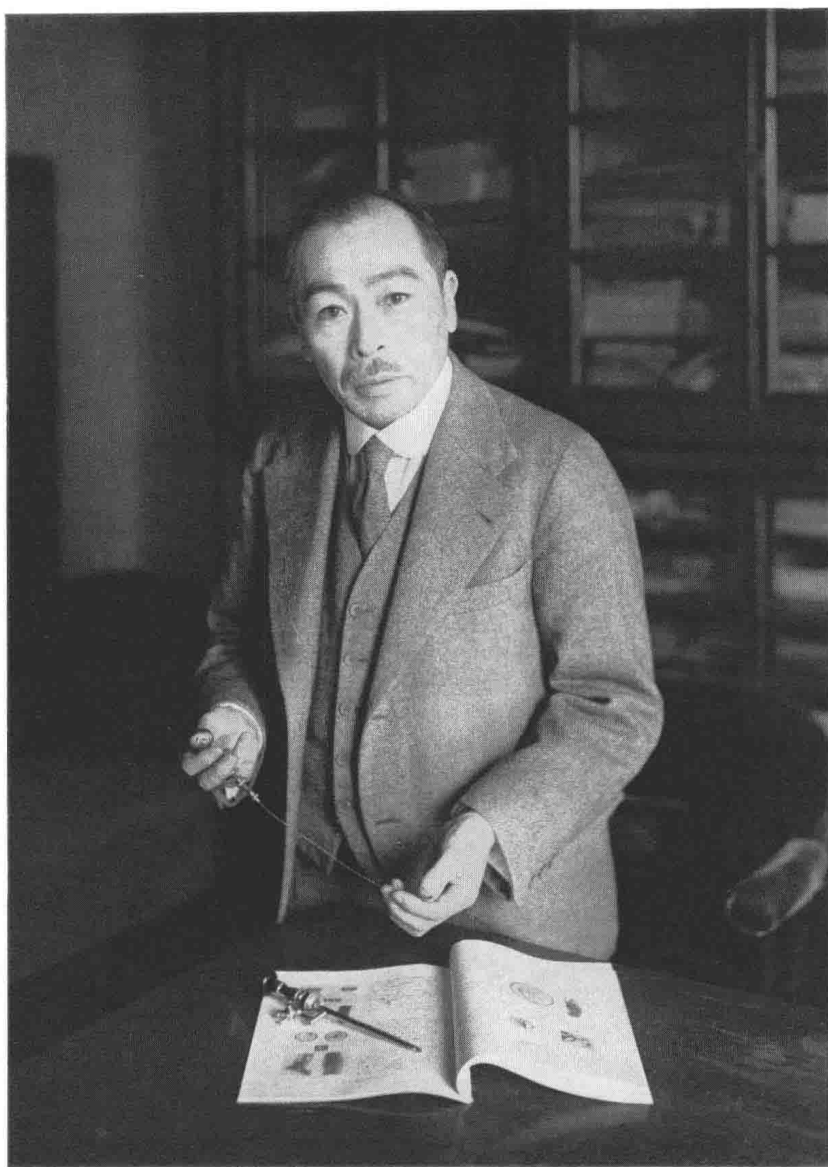
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**To the Memory of  
my Teacher  
Dr. KENJI TAKAGI**





**Dr. KENJI TAKAGI (1888-1963)**



## Preface to the Third Edition

Since publication of the second edition in 1969, considerable progress has been made in improving instruments used as well as in arthroscopic diagnostics. In 1970, our No. 24 arthroscope, also known as the Selfoc arthroscope, was developed for arthroscopy of the small joints. The No. 24 arthroscope, having a diameter of 1.7 mm, is the thinnest endoscope ever produced, and has been tested on about five hundred joints, including one hundred knee joints.

This third edition is published in order to provide additional description of recent advances in the field of arthroscopy and also to add, as mentioned in the summary of the second edition, a chapter on arthroscopy of smaller joints.

I will be most grateful if this edition should prove a contribution to progress in arthroscopy as a means of research and diagnosis in orthopaedic surgery and rheumatology.

Further I wish to express my gratitude to Dr. SHINNOSUKE FUJITA, President of Tokyo Teishin Hospital, for his great help in making this publication possible.

I would also note that a part of the research on arthroscopy of smaller joints was supported by scientific research funds from the Ministry of Welfare of the Japanese Government.

May, 1978

MASAKI WATANABE, M.D.



## Preface to the First Edition

The arthroscope has been developed to a stage of practical use, but an atlas is necessary for its popularization. We are planning publication of a complete atlas of arthroscopy under the supervision of KENJI TAKAGI, M.D. who is Emeritus Professor of Tokyo University Medical School and also the pioneer in arthroscopy in Japan. However, the realization of publishing such an atlas with a sufficient number of color prints has not been possible because of the lack of finances. Owing to an urgent need for an atlas with colored illustrations of the characteristic images of various joint diseases, I decided to make a small atlas.

This little atlas was made up of 68 pictures chosen from some hundred intra-articular view pictures which were painted by Mr. SHINICHIRO FUJIHASHI, a special painter for endoscopy, under direct observation. This publication was financed by special grants of the Ministry of Postal Services, our Tokyo Teishin Hospital being the head hospital of the said Ministry. In the future I should like to make it a part of the above mentioned Atlas of Arthroscopy to be edited by KENJI TAKAGI, M.D., my respected teacher.

The general remarks were arranged from the outline of researches made by Dr. TAKAGI and his associates over a long period of time. If through this little atlas the value of arthroscopy is appreciated, I shall be gratified.

I wish to express my grateful thanks for the great help of AKIRA TAKAHASHI, M.D., who is the director of Tokyo Teishin Hospital and the pioneer in cystoscopy in Japan, in the research and publication of this atlas. I also wish to express my thanks to Mr. SHINICHIRO FUJIHASHI for painting the arthroscopic images, to Mr. TSUNEKICHI FUKUYO of Takei Medical Optical Instruments Manufactures for perfecting the arthroscopes, to TAKESHIRO MATSUMOTO, M.D. and TSUNEHICO WATANABE, M.D. for the histological examinations.

August 30, 1957

MASAKI WATANABE, M.D.



**Abbreviations used for explanation of pictures.**

B .....	Bursa suprapatellaris
R .....	Recessus suprapatellaris
Pl. s. ....	Plica synovialis suprapatellaris
F .....	Femur
Condy. ....	Femoral condyle
T .....	Tibial plateau
P .....	Patella
M .....	Meniscus
Fat .....	Infrapatellar fat pads
ant. lig. ....	Anterior cruciate ligament
post. lig. ....	Posterior cruciate ligament
m. ....	Medial
lat. ....	Lateral



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# 1

## History of Arthroscopy

Since MAX NITZE invented his cystoscope in 1877, we have witnessed marked development in the application of endoscopy in many fields of medicine. Endoscopic examination of the articular cavity, however, stood neglected and no work was done on this subject until 1918, when KENJI TAKAGI, University of Tokyo, Faculty of Medicine (Fig. 1) made his first attempt at observing the internal appearance of a knee joint of a cadaver by means of a Charrier No. 22 (7.3 mm) cystoscope. TAKAGI's first arthroscope, which he constructed in 1920, was a primitive modification of a cystoscope having a diameter of 7.3 mm—said size rendering it unsuitable for practical use. With this apparatus, however, he managed to observe the interior of a tuberculous knee joint, using normal saline as a medium for dilating the joint cavity. He was extremely impressed, and became a life-long captive to the marvellous view thus obtained. All his efforts then centered on developing a practical arthroscope, centering his efforts on producing a thin arthroscope to be inserted into the knee joint without a skin incision.

TAKAGI attributed delay in the development of arthroscopy to factors such as narrowness of the articular cavity, complicated configuration of the joint and to its solid cartilaginous wall which inevitably prevented the endoscope from moving freely in the cavity.

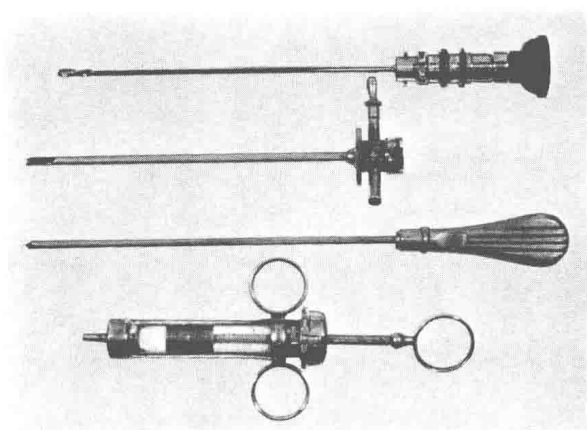
In 1931, after many attempts to overcome these various difficulties, TAKAGI finally succeeded in developing his No. 1 Arthroscope, an instrument 3.5 mm in diameter (Fig. 2, 3). He proved its practical utility when applied to the knee joint, and other body cavities, subsequently publishing a report on these applications under the title "Panendoscope or Arthroscope." Against this background, the instrument was placed on the market.

The first report on arthroscopy was made by EUGEN BIRCHER (1882–1956) (Fig. 4) in 1921. He examined meniscus of the knee joint with a Jacobaeus laparoscope. About the same time, pioneering efforts in arthroscopy were also being made in Germany, in the United States of America and in other countries. Arthroscopic examination was carried out for diagnosis of meniscus disorders by P. KREUSER (1925). In 1931 HARRY FINKELSTEIN and LEO MAYER devised an arthroscope for use in punch biopsy. The diameter of this instrument being 8 mm, its sheath was inserted into the joint through a skin incision. MICHAEL BURMAN reported further on the subject in 1931. He described arthroscopic investigation in smaller joints of cadavers, carried out arthroscopic investigations into the staining effect of the articular cartilage, while, at the same time, reporting on the subject of myeloscopy. In 1933 MICHAEL BURMAN and CHARLES SUTURO published a study on the fluorescence of the articular cartilage resulting from application of filtered ultraviolet rays. Clinical experience in arthroscopy of the knee joint, and an assessment of its value, were reported by MICHAEL BURMAN, HARRY FINKELSTEIN and LEO MAYER in 1934. Among





**Fig. 1** Dr. K. TAKAGI.



**Fig. 2** Takagi No. 1 arthroscope.



**Fig. 3** Takagi No. 1 arthroscope.

these, the work done by MICHAEL BURMAN (Fig. 5) of the Hospital for Joint Diseases in New York has been particularly extensive.

Still, in all of these instances, interest in the use of arthroscopy as a means of research and diagnosis was of short duration, and in each instance the use of the arthroscope for practical purposes had been abandoned.

Fortunately, however, the thread was again taken up by the publication of works by RENE SOMMER (1937), ERNST VAUBEL (1938), and WILCKE (1939). More recently, E.





**Fig. 4** Dr. E. BIRCHER.



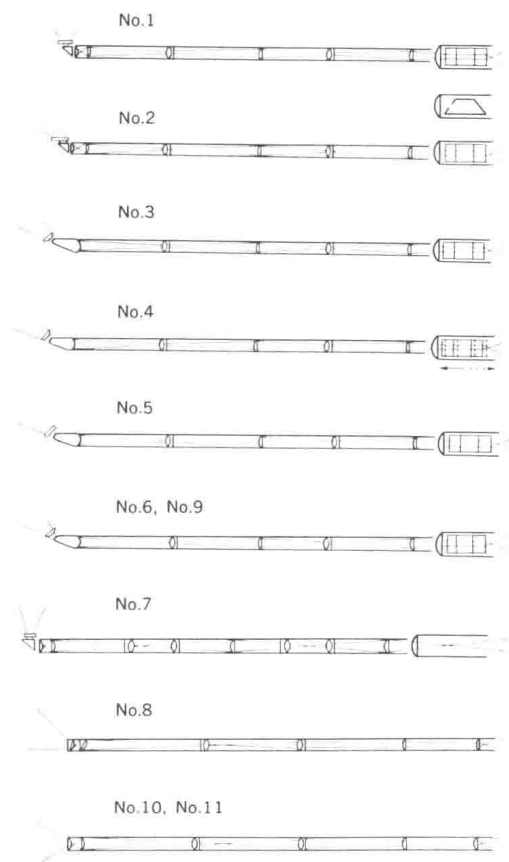
**Fig. 5** Dr. M. BURMAN.

HURTER reported in 1955 on the availability of arthroscopy for the diagnosis of meniscus disorders of the knee joint.

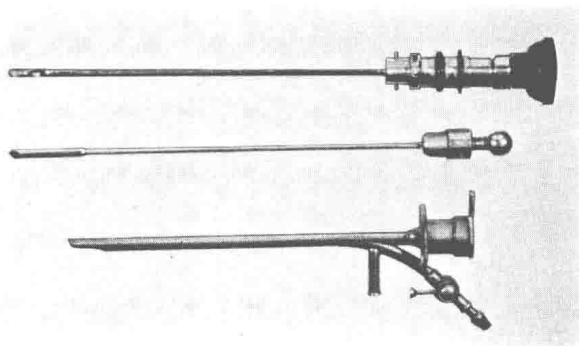
In Japan, as has already been stated above, TAKAGI made his No. 1 practical arthroscope in 1931 and had applied it clinically. Subsequently he designed several new types of apparatus (Fig. 6-13), including 11 telescopes and several types of trocar sheath, as well as various other accessories for specialized purposes. His No. 7, 10 and 11 telescopes were the thinnest—having a diameter of 2.7 mm. His No. 11 arthroscope, for example, was small enough for use in the canine knee joint. With his No. 4 arthroscope it was possible to obtain a close-up view of up to 3 mm by using its adjustable focus. This type of instrument was exhibited in the Japanese Government Display at the International Exhibition held in Paris in 1937. His No. 12 arthroscope consisted of two telescopes, a flexible



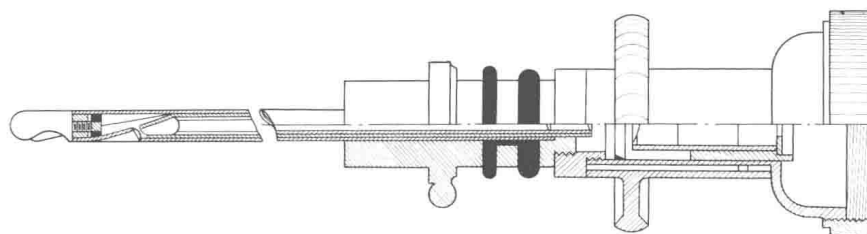
## HISTORY OF ARTHROSCOPY



**Fig. 6** Lens system of Takagi arthroscope.



**Fig. 7** No. 4 sheath. Cross section is oval so that both a telescope and a flexible biopsy punch or cauterizer can be introduced into the joint.



**Fig. 8** Takagi No. 4 arthroscope.



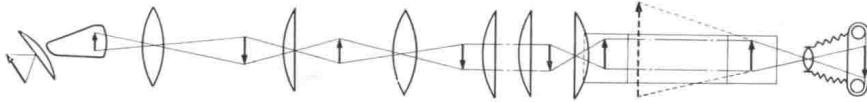


Fig. 9 Lens system of No. 4.

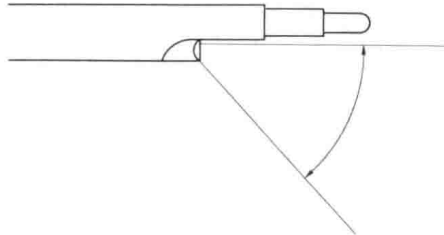


Fig. 10 Takagi No. 8 arthroscope.

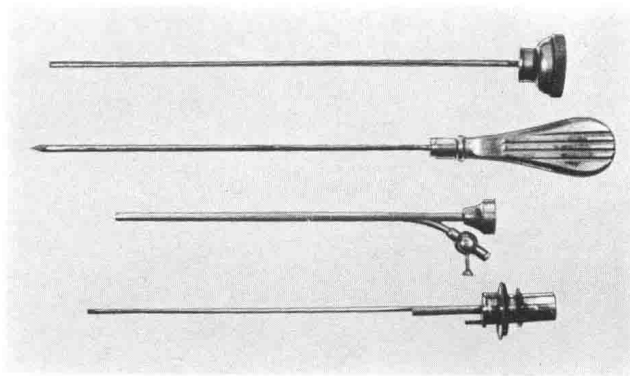


Fig. 11 Takagi No. 10 arthroscope.

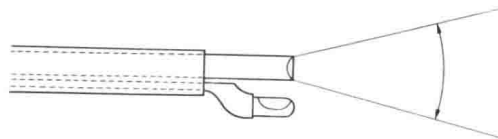


Fig. 12 Takagi No. 10 arthroscope.

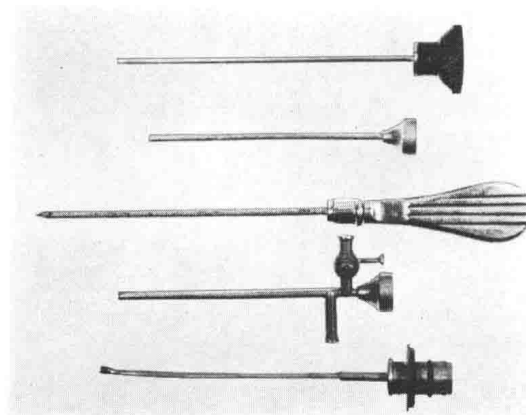
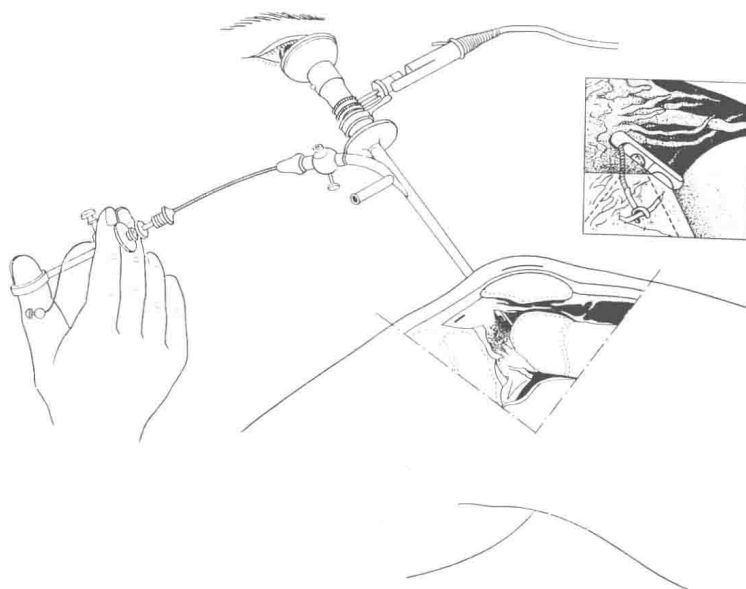


Fig. 13 Takagi No. 11 arthroscope.

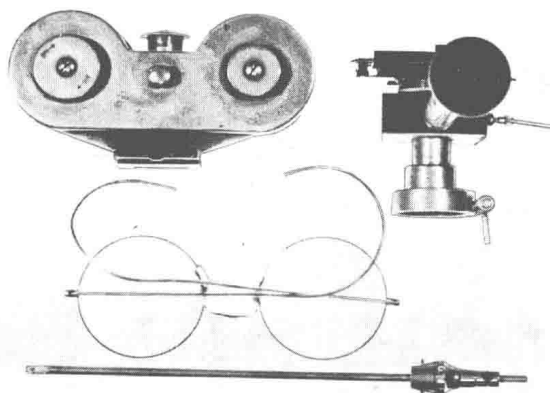


biopsy punch and a cauterizer plus accessories. These instruments were introduced through the same sheath having an outside diameter of 4.0 mm and manipulated under arthroscopic visualization (Fig. 14). The No. 12 arthroscope was an advanced endoscope for that era. However, its fragility was a problem. Furthermore, repairs required many days, or even months, at that time.

Still, TAKAGI and his associates did persist in carrying on basic, as well as clinical investigations. In 1932 TAKAGI succeeded in taking black and white photographs through the arthroscope (Fig. 15). Then, in 1936, he and IINO managed to take color pictures, as well as cinematographs on 16 mm black and white film, through the arthroscope. At the Annual Meeting of the Japanese Orthopaedic Association in 1938, the main presentation connected with the arthroscope was presented by TAKAGI, who in addition to discussing arthroscopy in general, provided details regarding clinical experiences with 16 cases of tuberculous arthritis, 14 cases of chronic arthritis, 4 cases of osteoarthritis, 4 cases of sarcoma



**Fig. 14** Punch biopsy through No. 12 arthroscope.

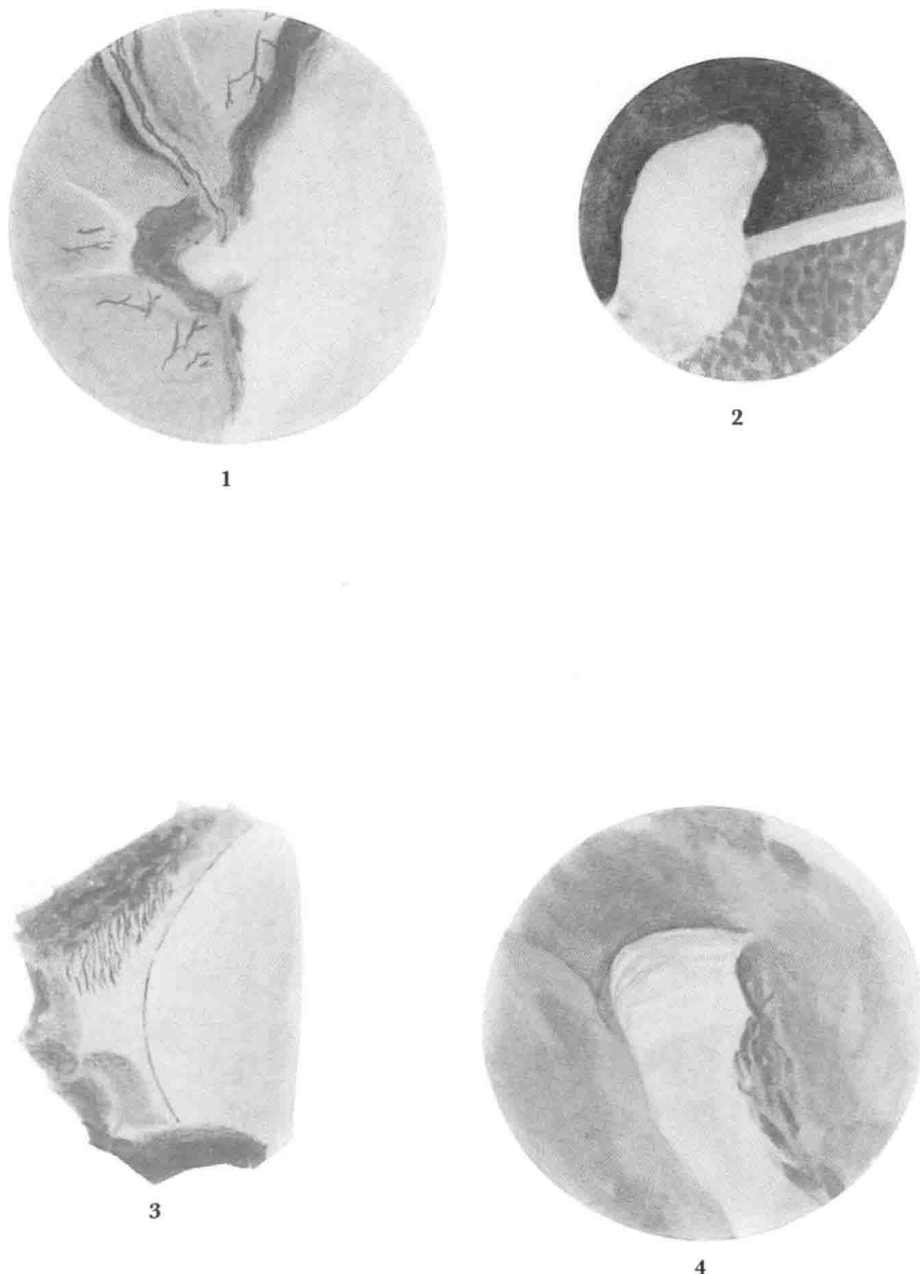


**Fig. 15** Camera, attachment, eyeglass and supplementary bulb.



involving the knee joint, 4 cases of rheumatoid arthritis, 3 cases of contusion of the knee, 3 cases of fracture of the patella, 3 cases of the knee joint of a paralyzed limb (poliomyelitis), 2 cases of meniscus disorders, 2 cases of Charcot's joint, 1 case of tuberculous hip joint, 1 case of suppurative arthritis and 1 case of dislocation of the patella (Fig. 16-19).

Basic investigations essential for arthroscopic interpretation were carried out by SABURO IINO, MASASHI MIKI, FUMIHIDE KOIKE and others, as will be described in the next chapter.



**Fig. 16**

1. Contusion of the right knee joint. Dilatation of the blood vessels.
2. A flap of torn lateral meniscus (left knee).
3. Pannus over the outer rim of lateral meniscus (right knee).
4. Torn lateral meniscus (left knee).