PRINCIPLES & PRACTICE OF UROLOGY

A comprehensive text

Volume-I

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Principles and Practice of Urology: A Comprehensive Text (Volume 1)

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This book is Dedicated

to

My Wife Dr. Khoorsheed Jahan Maula and my children Ishtiak Al Mamoon and Imtiaz Al Mamood who often missed me because of my pre-occupation with "Principles & Practice of Urology: A comprehensive text".

PREFACE

Why another textbook on Urology? There is always a universal demand of appropriate good book in any subject. Despite the existence of numerous monographs on urology there remains a desperate need for a book emphasizing the scientific background and principles of patient care for the student trainees and reinforcing such concepts for the practicing urologists in the developing world.

Urology now a days is a subject of growing importance and the need for a comprehensive text on the basic principle of general urology was deeply felt by the author, by the trainees and students. All medical writings are practically rewritings plus the recent advances, but they are presented in a different format suitable for the specific class of readers or users. Despite many good books available, an appropriate book is needed in between the users and the advanced texts.

Principles & Practice of Urology is not intended to replace the existing textbook nor it can provide the minute details contained in scientific journals. Instead the author expects that the book will serve as a rapid review of clinically important informations for the postgraduate students, residents, trainees and practicing surgeons and urologists. It is also expected to provide much of the updated informations in an identifiable and understandable format.

The purpose of composing this text is to guide and assist the students, residents, trainee doctors of urology and this book may be used as a text or reference book by the senior students in medical colleges. A space is kept on the left side of the page for the reader to record his personal note. This book is expected to be helpful for the consultant general surgeon who is working in a hospital where there are no urologists.

I do solicit additional modification, correction and criticism which may be addressed to me.

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I am especially thankful to my two secretaries Mr. Noor Mohammad and Mr. Rony. Mr. Noor Mohammad should be credited for typing the whole manuscript and taking dictations mostly at odd times beyond his working hours. Mr. Rony, an excellent young man, covered the responsibilities of graphic designs and more importantly created the medical illustrations. Without their help this book would not be possible to complete in this format.

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Evolution of Urological Techniques

MILE STONES OF UROLOGY

PRELUDE

Urological diseases are as old as mankind. This is understood from the discovery of a vesical calculus in the pelvis of a mummy from a prehistoric tomb in Egypt, which was approximately seven thousand years old. Urological expertise was also well known in the prehistoric time where the circumcision was clearly described.

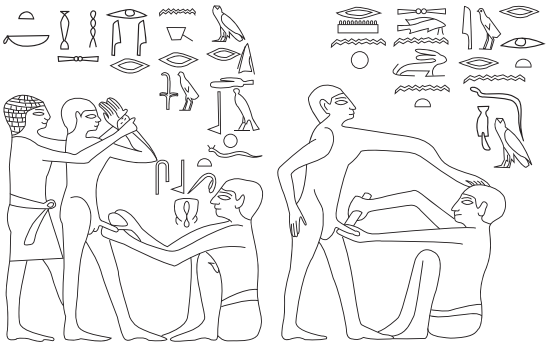

Fig. 01-01 : Illustration from temple of Ankha-ma-Hor in Saqqara showing the technique of circumcision.

(Courtesy : The urology of Pharaonic Egypt. Shokeir AA and Hussein MI et al. BJU International 1999; 84 : 766-761)

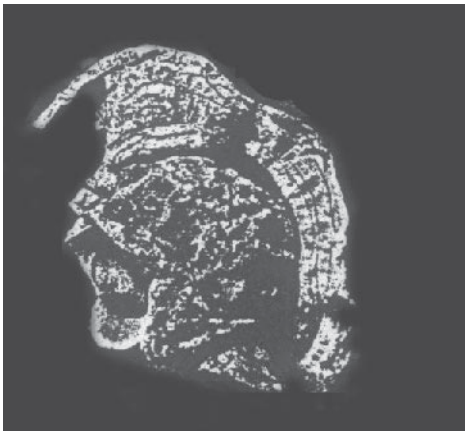

Fig. 01-02 : Prehistoric vesical Calculus recovered from mummy, found in Egypt

(Courtesy : Murphy Leonard JT. History of Urology Charles C Thomas Publisher Spingfield, Illinois, USA 1972)

The elective operations first performed by man – circumcision and cutting for bladder stone – the last was free from religious or ritual conventions and may therefore be pronounced the most ancient operation undertaken for the relief of a specific surgical condition.

PREHISTORIC UROLOGY IN DIFFERENT PARTS OF WORLD

India

In ancient Indian texts stone disease is well described and lithotomy, although regarded as hazardous even in expert hands, was undoubtedly practiced. These accounts, should be credited to the indian surgeon, Susruta in the 6th century BC. He described the trans perineal removal of bladder stones. Susruta described the various urethral bugie for dilatation of the stricture urethra.

Susruta recognized the four kinds of calculi caused by phlegm, bile, air or semen and he also described the stone prophylaxis in stone disease by prescribing strict vegetarian diet. He described the treatment of extravasation of urine by incision in the perineal region. He practiced urethral installation of medicine for treating gonorrhea.

(Courtesy : Benoy BR 1998)

Fig. 01-03 : Ancient Indian surgeon operating on cataract patient for instant vision.

Middle East

The Sumerians recognized parts of the urologic anatomy, including the kidneys and penis, as early as 4000 BC. Persian medical references are found from around 1000 BC and stone diseases and catheterization are mentioned in later treatises. However, even by the Middle Ages, little further progress had been made, and lithotomy does not appear to have been employed until relatively recent times. In Hebrew medicine, 'circumcision', as in Egypt, was a religious procedure. Avicenna, Abul Quassim etc. described flexible catheter and uroscopy.

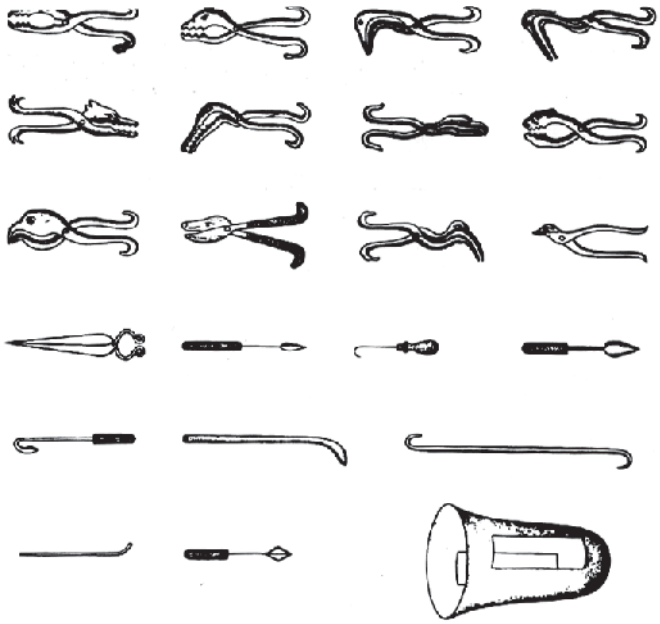

Fig. 01-04 : Equepment used by Sasruta *(Courtesy : Sakti Das American Journal of Urology 2001)*

Fig. 01-05 : Avicenna (930-1037). His cannon of Medicine combined principles of Hippocrates, Galen and Islamic medicine with contemporary practices. He discussed uroscopy and advocated soft and flexible materials for catheters, made from animal skins. *(Courtesy : American Urology Association)*

Fig. 01-06 : Arab physician Abûl Qâsim of 14th century using red iron to cautarize a scalp lesion.

(Courtesy : Christoph Mörgeli, Surgeon stage a history of the operating room, 1999. F Hoffmann-La Roche Ltd. Basel, Swizerland).

Greece

Medicine in Ancient Greece long predates Hippocrates. The worship of Aesculapius had led to the building of many temples, which later became medical schools. Hippocrates, born on the Greek island of Cos in 460 BC. He recognized and described stone disease, but also stated '*I will not cut persons laboring under the stone but will leave this to be done by practitioners of this work'*. Possibly this was the earliest recommendation for specialization.

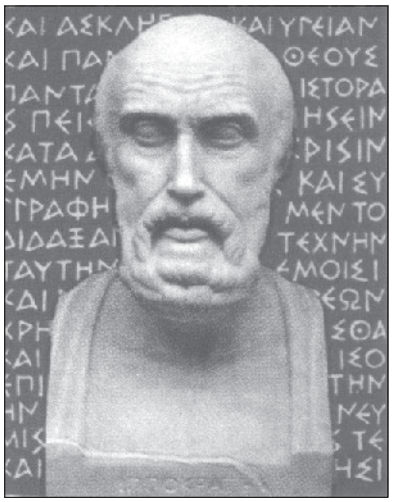

Fig. 01-07 : Hippocrates separated medicine from religion Defined numerous disease. His theory of causation of stones was valid until paracelsus (460-377 BC). *(Courtesy : American Urology Association)*

Renal and bladder injuries and disorders were described by Hippocrates, and reference made to the drainage of renal abscesses. He regarded wounds of the bladder as carrying a very grave prognosis, and it may have been this view that held surgeons back from the trans abdominal approach of the bladder.

Rome

The Greeks brought surgery to Rome and it was Celsus, living in Rome in the 1st century AD. He made the description of lithotomy that was to hold good with little change through to the end of the 18th century. In Celsus's time catheters were made of bronze, and some of these, demonstrating the traditional double curve, found in the excavations of Pompeii.

The Greek physician Galen, living and traveling through Asia Minor in the 2nd century AD, brought together in his writings many of the theories of medicine that were current in his day. He described lower urinary tract obstruction and supported Celsus's technique of lithotomy.

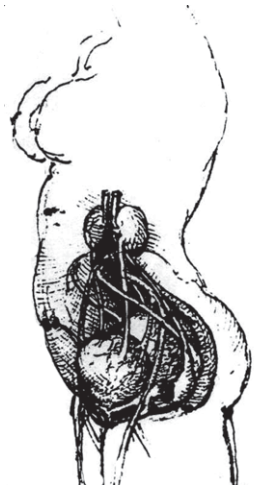

Fig. 01-08 : Sketch of urinary tract by Leonardo De Vinci

(Courtesy : Murphy Leonard JT. History of Urology Charles C Thomas Publisher Spingfield, Illinois, USA 1972)

MIDDLE AGES TO THE 18TH CENTURY

Perineal lithotomy

With its origins in the techniques of the Susruta and later that of Celsus, two types of perineal lithotomy developed. Hence surgeons were slow to take up this technique. The first successful suprapubic lithotomy was probably done by Pierre Franco in the early 16th century, removing a large calculus from a child's bladder by this approach. James Douglas, who is famous of pouch of Douglas, described the surgical anatomy of the bladder in 1717.

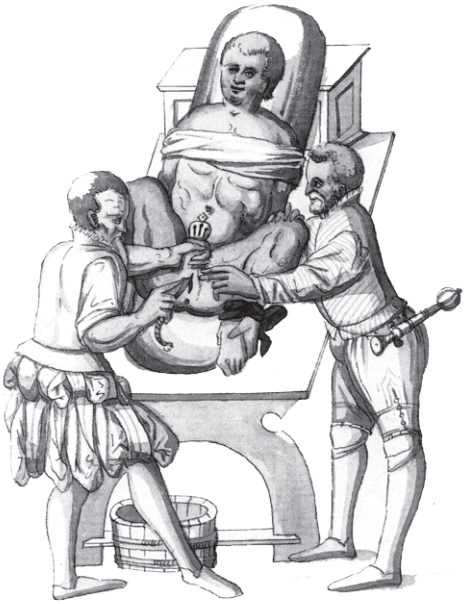

Fig. 01-09 : Lithotomy in progress through perinium, 1575.

(Courtesy : Christoph Mörgeli, Surgeon stage a history of the operating room, 1999. F Hoffmann-La Roche Ltd. Basel, Swizerland)

Endourethral lithotomy

The origins of this technique go back to ancient Egypt, with attempts to dilate the urethra and primitive procedures to fragment bladder calculi.

Probably the most eminent lithotriptist of his day was the London surgeon Sir Henry Thompson, who successfully dealt with stone of King Leopold

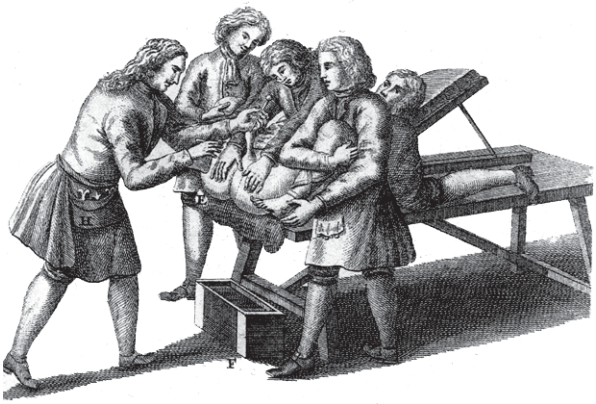

Fig. 01-10 : Lithotomy procedure using urethral probe, 1718

(Courtesy : Christoph Mörgeli, Surgeon stage a history of the operating room, 1999. F Hoffmann-La Roche Ltd. Basel, Swizerland)

I of Belgium in 1863. Civiale had carried out multiple lithotrities in 1862. Later Sir Henry operated on Napoleon III. Litholapaxy and the evacuating of the stone debris was then pioneered by Henry J Bigelow (1818-90) in the United States and Sir Peter Freyer in England.

19TH CENTURY

Vesalius (1514-64) corrected their studies in 1543, and can certainly be considered to be the father of urologic anatomy. Gabriel Fallopius (1523-

Fig. 01-11 : Sir Henry Thommpson performing lithotrity upon Napoleon III. The anesthetist is Joseph Clover and Sir William Gull is standing behind Sir Henry Thompson.

(Courtesy : Murphy Leonard JT. History of Urology Charles C Thomas Publisher Spingfield, Illinois, USA 1972)

62) demonstrated intrarenal anatomy, Bartholomeus Eustachius (1520-74) took these studies further, and Lorenzo Bellini (1628-1704) and Marcello Malpighi (1628-94) refined them. These and many other anatomic discoveries laid the foundation for the advances in physiology and surgery that contributed to the development of modern urology.

Urologic Infections

Venereal infection has been described since ancient times and both gonorrhea and syphilis were recognized and differentiated by physicians from all the ancient cultures. Giovanni Morgagni (1682-1771) first used the term gonorrhea in 1761, but by 1750 John Hunter (1728-93) in his London lectures had already described various forms of urethral inflammation.

Genitourinary Tuberculosis

The remains of ancient skeletons have confirmed the characteristic changes of tuberculosis, indicating that the disease affected humans in about 4000BC. It is also known that it was a common disease in Egypt in about 1000BC, and in 375BC Hippocrates described phthisis as a lingering illness that was worse in winter, resulted in emaciation, caused diarrhea, and was terminal.

CATHETERS AND UROLOGICAL INSTRUMENTATION

Catheters can be traced back into antiquity and were in common use in India and the ancient Greece of Hippocrates. Early catheters were usually made of metal, often bronze, and later silver, copper, and brass, but other materials, including treated paper, cloth impregnated with wax, horn, or green bamboo sticks, were also used. Both terminal and end-side orifices had their vogue. From an early time catheters were curved and by the Middle Ages the double curve had become established.

In the 19th century a gum elastic catheter with its angled neck, the Cude catheter of L.A. Mercier, became widely used, and the first attempts at a self-retaining catheter date from the same period of about 1840. With the advent of rubber, Auguste Nelaton (1807-73) developed the first catheter of this type. With the invention of latex rubber, Dr. F.E.B. Foley produced

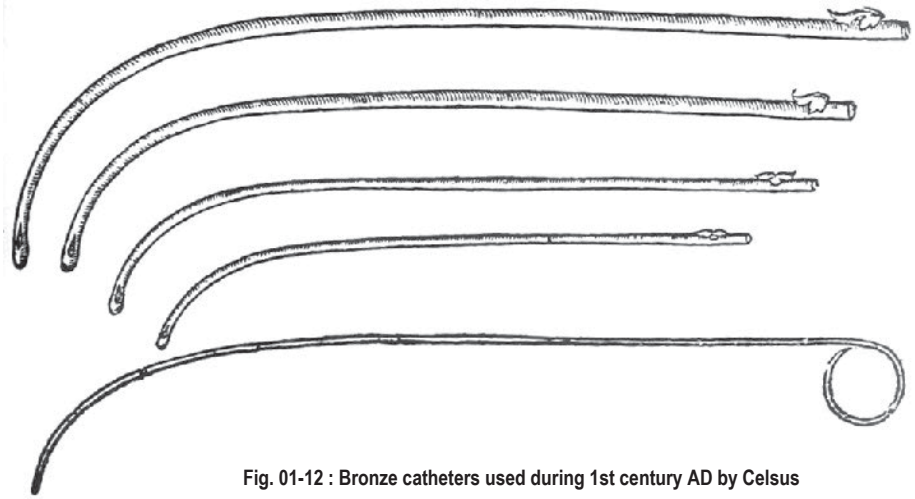

Fig. 01-12 : Bronze catheters used during 1st century AD by Celsus

(Courtesy : Murphy Leonard JT. History of Urology Charles C Thomas Publisher Spingfield, Illinois, USA 1972)

his balloon catheter and demonstrated it at the American Medical Association meeting in Atlantic City in 1935.

It was refined further in the 19th century, along with the steady advance in urologic techniques. Up to recent times a malecot type of catheter was inserted through a metal cannula introduced with a trocar, but these have been superseded by the modern silastic balloon catheter fitted with intergal trocher.

DEVELOPMENT OF CYSTOSCOPES

Primitive Cystoscopes

Several attempts at endoscopy were made for a variety of conditions until

Fig. 01-13 : Dr. F.E.B. Foley, *(Courtesy : American Urology Association)*

Antoine Desormeaux (1815-82), the father of endoscopy, introduced his cystoscope in Paris in 1853. He was the first surgeon to succeed in designing an endoscopic instrument that had both diagnostic and therapeutic value for urology. As a light source he used a so-called gazogene lamp, which burnt a mixture of turpentine and alcohol. His endoscope was made of silver tubes, into which he projected light, using a combination of lenses and a mirror set at an angle of 45^0. Francis Cruise, an Irish surgeon in Dublin, collaborated with Desormeaux and demonstrated his first instrument in 1865. He found that the brightest illumination available was the flat flame of a petroleum lamp with camphor dissolved in the petroleum and the intensity of the flame increased by a tall draught chimney. He also designed new sheaths for examination of

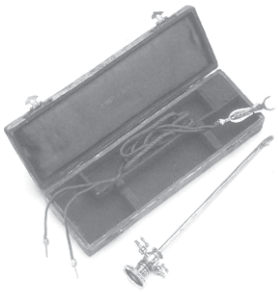

Fig. 01-14 : Early Nitze Cystoscope (1886). *(Courtesy : American Urology Association)*

Fig. 01-15 : (1877) Maximilian Nitze *(the father of the Cystoscope)* premiers his first cystoscope, utilizing a system of lenses for magnification and an incandescent platinum wire loop for illumination. *(Courtesy : American Urology Association)*

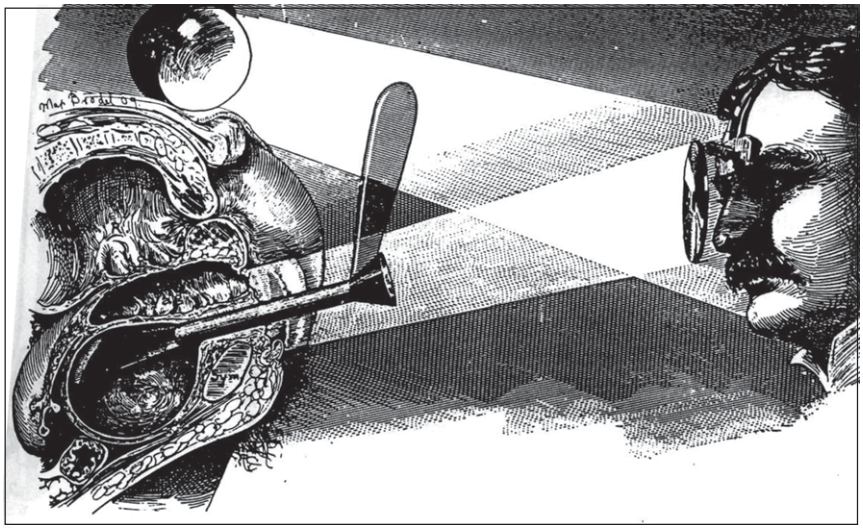

Fig. 01-16 : Premitive systoscope use to see the bladder with a reflected light.

(Courtesy : Murphy Leonard JT. History of Urology Charles C Thomas Publisher Spingfield, Illinois, USA 1972)

the urethra, bladder, and other body cavities, and urologists using a bladder catheter filled with boric solution were able to inspect the greater part of the bladder mucosa.

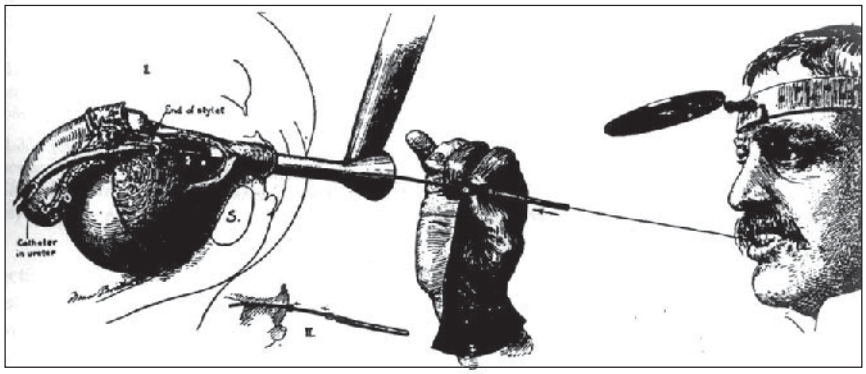

Fig. 01-17 : Howard Kelly performing ureteric catheterization with aerocystoscopy. Note Style of catheter held in teeth

(Courtesy : Murphy Leonard JT. History of Urology Charles C Thomas Publisher Spingfield, Illinois, USA 1972)

None of the techniques available attracted much attention until a young urologist in Berlin decided to reopen the whole question of endoscopy. Max Nitze (1848-1906) had two new ideas. First, in 1876 he used lenses in the form of a miniature telescope to magnify the image down the endoscope, and secondly he illuminated the interior of the bladder by a water-cooled electric platinum filament.

With cystoscopy it was necessary to catheterize repeatedly during inspection, a painful procedure for the patient. Nitze succeeded in

Fig. 01-18 : Nitze's operating cystoscope with wire snare for avulsion of tumor or application of cautery-one of several models. *(Courtesy : Murphy Leonard JT. History of Urology Charles C Thomas Publisher Spingfield, Illinois, USA 1972)*

producing the irrigating cystoscope, where the bladder could be inspected and drained at the same time.

Towards the end of the 19th century two further developments had

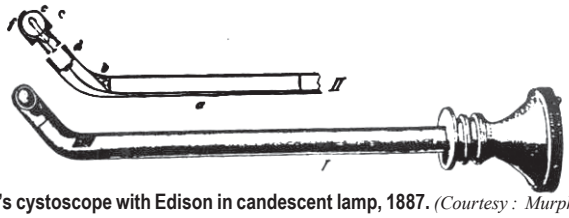

Fig. 01-19 : Nitze's cystoscope with Edison in candescent lamp, 1887. *(Courtesy : Murphy Leonard JT. History of Urology Charles C Thomas Publisher Spingfield, Illinois, USA 1972)*

occurred. In 1887 the German Alexander Brenner designed a catheterizing cystoscope with a curved catheter that could be inserted into the ureter. In 1896 a French urologist, Joachim Albarran (1860-1912), developed a system by which the catheter could be elevated or lowered by a small lever that could be sunk into a slot near the tip of the instrument.

Fig. 01-20 : Brenner's catheterizing cystoscope 1887. *(Courtesy : Murphy Leonard JT. History of Urology Charles C Thomas Publisher Spingfield, Illinois, USA 1972)*

Rodlens systems for urological endoscope

The most important advance since Nitze in 1876 has been the development of the Hopkins rod-lens system. In 1957 J G Gow of Liverpool requested Professor Harold Hopkins of Reading University to make improvements to the optical design of telescopes. This resulted in the publication of

Fig. 01-21 : Porter carrying apparatus needed for cystoscopy

(Courtesy : Murphy Leonard JT. History of Urology Charles C Thomas Publisher Spingfield, Illinois, USA 1972)

Hopkins's patent in 1977. He described how the total light transmission through the telescope was 80 times greater than the traditional system.

It was achieved by replacing the air spaces in between the objective lense and eye piece lense of long telescope. Use of coated rod glass lenses of high refrective index interspaced with air make the telescope excellent for viewing the interior of the body. Still the resolution and clearity of image provided by rod lens system is the best.

Fig. 01-22 : Diagram of telescope made of rod lens *(Courtesy : Olympus)*