SECOND EDITION

UROLOGIC ENDOSCOPIC PROCEDURES

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Urologic endoscopic procedures

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SECOND EDITION
with **258** illustrations

The C. V. Mosby Company
ST. LOUIS • TORONTO • LONDON 1979

SECOND EDITION

Printed in the United States of America

The C. V. Mosby Company
11830 Westline Industrial Drive, St. Louis, Missouri 63141

Library of Congress Cataloging in Publication Data

Morel, Alice.
Urologic endoscopic procedures.

Bibliography: p.
Includes index.
1. Urinary organs—Diseases—Diagnosis. 2. Endoscope and endoscopy. 3. Urological nursing. I. Wise, Gilbert J., 1932- joint author. II. Title.
[DNLM: 1. Endoscopy. 2. Urologic diseases—Diagnosis. WJ141 M839u]
RC901.M67 1979 616.6'07'54 78-31423
ISBN 0-8016-3491-1

CB/CB/B 9 8 7 6 5 4 3 2 1 03/A/314

Urologic endoscopic procedures

Foreword

The specialty of urology depends to a great extent on diagnostic and therapeutic procedures requiring the use of special instruments and techniques whether in the office, clinic, or hospital. Procedures for urethral instrumentation, cystoscopy, or transurethral surgery of all types depend on properly trained nurses and technical personnel who are familiar with the procedure to be undertaken, sterile technique, and instruments and supplies required as well as proper care of instruments that are expensive and may be damaged by careless handling. The care of postinstrumental or postoperative patients on a hospital floor depends on nursing personnel who are familiar with the procedure carried out and with postoperative problems, and who have an awareness of possible complications as well as the ability to recognize problems that can best be learned by some experience with cystoscopic, diagnostic, and operative procedures. The care of urologic patients must be a team effort by urologist, office nurse, cystoscopic room nurse, and floor nurse. Unfortunately, there are no recognized postgraduate facilities other than on-the-job training to provide adequately informed individuals for urologic patient care.

The present volume is written with the idea of providing basic information concerning urologic procedures, instruments, sterilization techniques, and equipment. This is needed. It should prove of great value to students, technical personnel, and graduates who are about to be or are involved in learning urologic techniques. I am pleased to recommend this book, which is written by authors thoroughly familiar with urologic methods and vitally interested in improving urologic patient care.

Wyland F. Leadbetter, M.D.

Preface

Since the publication of the first edition in 1974 there have been a number of innovations in urology and new urologic equipment has been developed. Fiberoptics have replaced incandescent bulbs, the cystourethroscope has become the standard "cystoscope," and wide-angle telescopes are now in common use. Continuous flow transurethral resections have been introduced, and urethrotomies can be performed under direct vision.

This edition provides an amplified and completely rewritten text with many new illustrations and concepts. The book highlights the newer equipment but retains text and illustrations of older-model equipment, because many offices, clinics, and hospitals use well-maintained older equipment.

Evaluation of the patient with neurogenic or bladder dysfunction now requires an array of sophisticated equipment: the gas cystometer, the urethral pressure profile, the urethral sphincter or rectal sphincter electromyographs, and urine flowmeters. For this reason, a separate chapter has been written about urodynamic procedures.

Instrument cleaning requires special consideration, and this edition describes in detail the latest concepts of instrument care and decontamination.

Industry offers the urologic team a wide variety of instruments, catheters, drainage bags, and decontamination procedures. We have made no attempt to include every manufacturer or type of equipment; rather, we have indicated some of the more commonly used products available for urologic procedures.

As in the first edition, basic equipment and instrument requirements for specific urologic procedures are described in detail. Patient care before and after a urologic procedure is discussed. This book is designed to serve as an informative guide for the urologic team in the care of patients and the use of equipment designed to diagnose and treat urologic disorders.

Alice Morel
Gilbert J. Wise

Acknowledgments

I wish to express my sincere appreciation to the following people:

My staff, Barbara, Jean, and Eileen, who gave of their time to assist me with this project. A special note of appreciation to Janet Devaney, a member of the staff, who served as model for the illustrations.

Norman Miner, Ph.D., Manager, Biological Sciences of Arbrook, Inc., Arlington, Tex., for his input regarding disinfection and sterilization of lensed instruments.

Mike Barner, formerly of 3M Co., Infection Control Systems, for his advice in the writing of Chapter 9.

Edward J. Sullivan, Special Accounts Administrator of American Cystoscope Makers, Inc., Stamford, Conn., for his contribution in details regarding the microlens cystoscopic instruments.

Ralph L. Gentile, M.D., Attending Urologist, Montefiore Hospital and Medical Center, Bronx, N.Y., for his interest and support in furthering my career.

A. M.

I wish to acknowledge the help of my wife and research assistant, Mrs. Sharon Christenfeld Wise, and my administrative assistant, Mrs. Rose Winkler. I am indebted to the inspiration provided by the many urology residents and hospital personnel who have been a great help to me.

We are indebted to the numerous companies who have graciously provided the photographs and material cited in this edition.

Finally, the inspiration given me by my parents, Mr. and Mrs. Maurice Gold, has served as a basis for my desire to train and educate personnel in the practice of medicine and urology.

G. J. W.

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CHAPTER ONE

Development of urologic endoscopic procedures

Urologic procedures have evolved from the ancient and medieval lithotomists, who removed bladder stones by means of perineal incisions and manipulation (Fig. 1-1). This "art" persisted in its basic form until the sixteenth century, when urethral instruments such as the sound, dilator, and forceps were developed. Although physicians had sought to visualize the bladder interior, it was not until the early nineteenth century that the first attempt at cystoscopy was made.

In the early 1800s, a German physician from Frankfurt named Philipp Bozzini attempted the first cystoscopy by means of placing a candle within

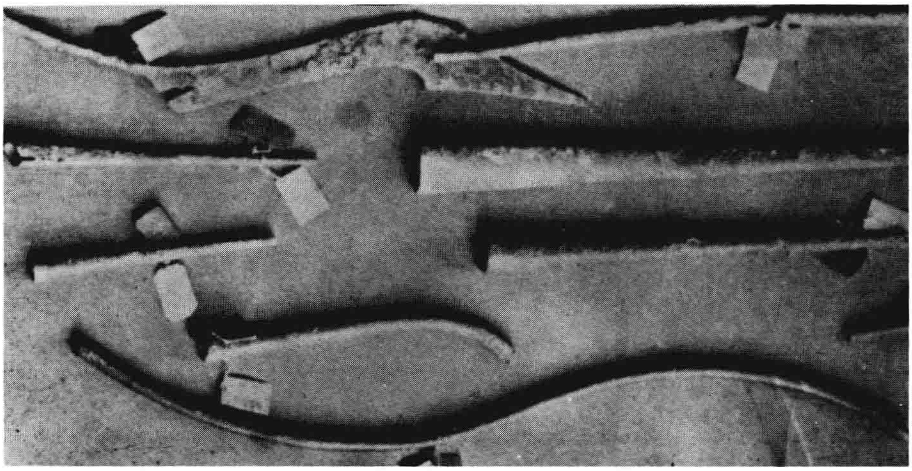

Fig. 1-1. Early urologic instruments.

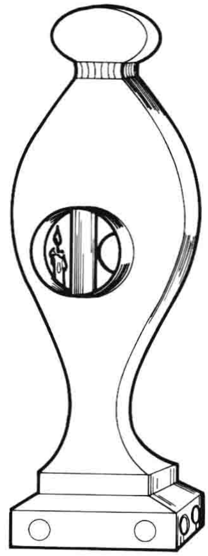

Fig. 1-2. The Bozzini lichtleiter.

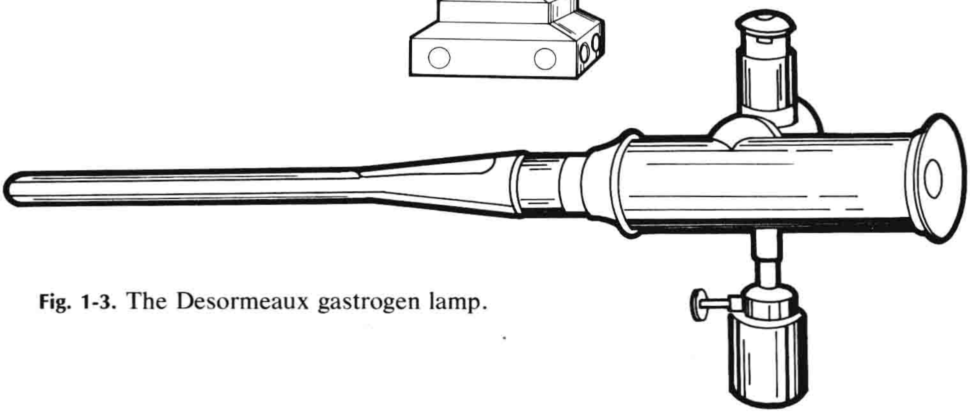

Fig. 1-3. The Desormeaux gastrogen lamp.

a box and reflecting its light through various tubes or speculums with which he attempted to visualize the female bladder and male urethra (Fig. 1-2). Bozzini's *lichtleiter* was criticized by many of his colleagues, and further utilization was aborted by professional and political jealousies. In 1826 Pierre Ségalas, a physician from Strassburg, attempted cystoscopy by means of a long silver tube, which he called the *speculum urethrocysticum*. Candles were again used as the light source, and they proved to be insufficient for adequate examination of the bladder interior. By 1853 a Frenchman, Antonin J. Desormeaux, developed a cystoscope based on a single tube with the light source at right angles to it and a reflecting mirror with a central perforation for viewing of the bladder interior (Fig. 1-3). The light in this instrument was derived from an alcohol-turpentine lamp and was reflected by means of a mirror and lens system. Desormeaux's gastrogen lamp, as he called it, pro-

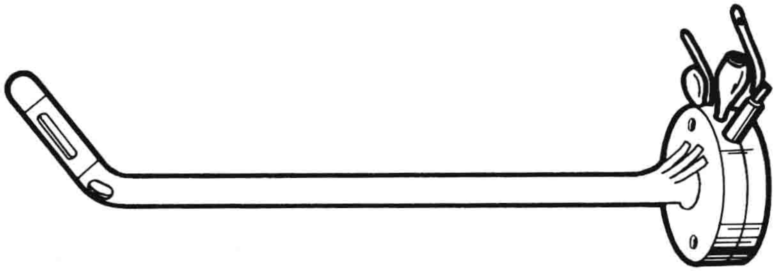

Fig. 1-4. The Nitze direct vision cystoscope with terminal optical system and a platinum filament lamp with water cooling.

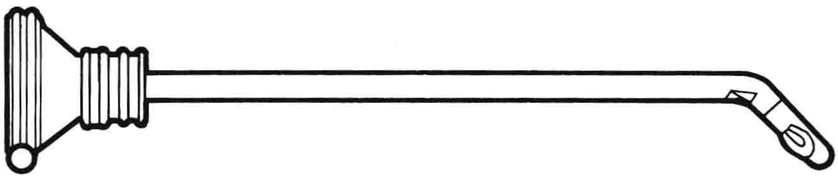

Fig. 1-5. The Nitze cystoscope with Edison lamp.

vided views of the female bladder and male urethra. Because this was the first working instrument, Desormeaux has been known as the "father of endoscopy."

Illumination, however, proved to be inadequate for thorough evaluation of the bladder interior. Brück, a German dentist, attempted to enhance bladder illumination by placement of platinum loops in the adjacent anatomic structure, the rectum. For obvious reasons, namely rectal burns, this technique proved to be most unsatisfactory. Trouvé, a Parisian, went one step further and placed the platinum loops directly in the bladder. Here again, however, tissue burns prohibited the extensive use of this illumination technique.

Max Nitze of Austria introduced the endoscope that is the basis of today's cystoscopic instruments (Figs. 1-4 and 1-5). This instrument utilized a platinum loop attached to the end of the cystoscope, which was cooled by a water irrigant. Its visual field, however, was quite small, which limited its usefulness, Nitze, in conjunction with a Viennese instrument maker, Joseph Leiter, refined these instruments using improved lens systems. These first cystoscopes were actually miniature telescopes with a direct light source and

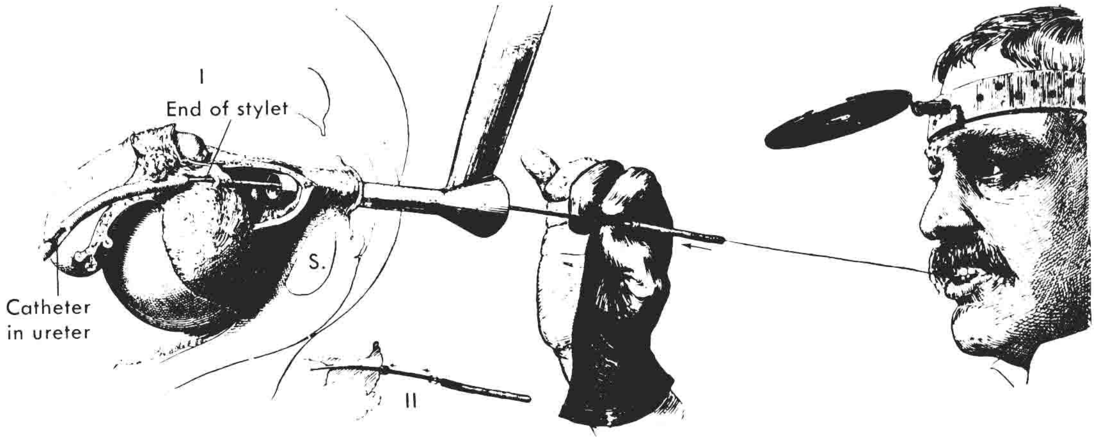

Fig. 1-6. Second step in catheterization of the ureter. The stylet is held fixed by the teeth, its other end being in the intramural part of the ureter. The catheter is stripped off the stylet with the gloved hand. Part II shows a small rubber cuff pushed along the catheter to the external urethral orifice after withdrawal of the speculum.

water irrigating systems to cool the platinum lamp. Edison's invention of the incandescent bulb was subsequently put to use by Nitze and others and incorporated into the cystoscope.

In 1885 a Frenchman, Boisseau du Rocher, developed a large-caliber cystoscope that provided improved visual fields of the bladder. This instrument permitted another Frenchman, Poirer, to pass small catheters through the cystoscope and thus intubate the ureters, performing retrograde ureteral catheterization. Ureteral catheterization, however, remained technically difficult because small catheters could not be maneuvered readily within the bladder (Fig. 1-6). The development in the 1890s of an instrument by Casper, later improved by Albarran, provided a telescope with an operating lever. This was the Albarran telescope, which has evolved into an operating, catheterizing, or convertible telescope. Ureteral catheters, biopsy forceps, or fulgurating electrodes could be easily maneuvered within the bladder by means of a deflector lid that was controlled by an operating handle.

At the end of the nineteenth century American urologists were entirely dependent on instruments imported from Europe. Furthermore, they found these instruments to be delicate and often in need of repair. In 1900 W. K. Otis in conjunction with R. Wappler developed the first American cystoscope. This instrument provided an improved lens system that did not invert

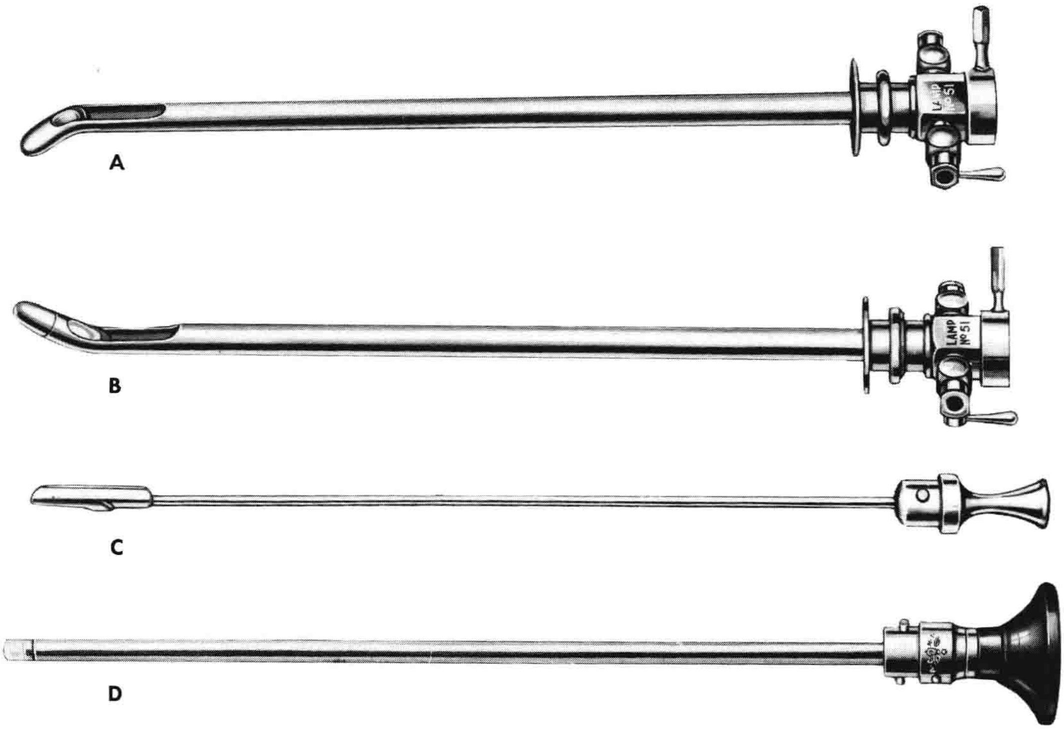

Fig. 1-7. Incandescent Brown-Buerger cystoscope. A, Convex Brown-Buerger sheath; B, concave Brown-Buerger sheath; C, obturator for Brown-Buerger sheath; D, right-angle telescope. (Courtesy American Cystoscope Makers, Inc., Stamford, Conn.)

the image as did previous instruments. During the same period, an instrument for ureteral catheterization was developed by F. T. Brown. L. Buerger and Wappler later refined Brown's instrument. Known as the Brown-Buerger cystoscope, it has become the primary cystoscope of contemporary practice (Fig. 1-7).

By 1908 the cystoscope provided the urologist with a good light source and visual field. The availability of the Albarran telescope enabled urologists to maneuver small catheters and electrodes within the bladder. The next phase of endoscopic development was the use of electric current to coagulate bladder lesions. Edwin Beer, in 1908, and Keyes, in 1910, reported the successful treatment of bladder tumors by means of electrocoagulation with special cystoscopic conducting wires. In 1909 Hugh Young of Johns Hopkin used a cystoscopic punch with which obstructing tissue could be removed from the bladder neck. Cystoscopic treatment of prostatic obstruction was, however, limited by the lens system of the Brown-Buerger telescope. These telescopes provided right-angle vision, which allowed visualization of the bladder interior but not the prostatic urethra. This obstacle was overcome in 1923 by McCarthy's development of the Foroblique telescope, which provided a forward and slightly oblique view of the bladder neck, the prostatic urethra, and the urethra.

Following the development of the McCarthy telescope, M. Stern invented the first resectoscope, which used high-frequency current that could cut prostatic tissue. Stern's instrument and the McCarthy lens system enabled the urologist to perform transurethral resections (TURs). The early TUR, however, was fraught with hazards of hemorrhage that were due in part to the inability of electric current to control bleeding vessels. In 1931 T. M. Davis utilized his skills as an electrical engineer and surgeon to improve the electrosurgical unit. This modification enabled the urologist to use a high-frequency current for cutting tissue and a highly damped diathermy current for control of bleeding vessels.

The development of the Stern-McCarthy resectoscope in conjunction with electrosurgical units provided the urologist with instruments that could readily remove obstructing prostatic tissue caused by cancer or benign prostatic enlargement. The resectoscope was further modified by Baumrucker, Nesbit, and Iglesias so that the urologist could resect large quantities of the prostate gland within a short operating time. Thompson developed a cold punch resectoscope with which prostatic tissue was resected by a tubular knife while bleeding was controlled with electrical current.

Though the optic system, light source, and electrosurgical systems enabled the urologist to perform adequate endoscopic surgery, several problems remained that were potential threats to the patient's well-being. One problem was caused by the absorption of the irrigating fluid (sterile water) during a TUR of the prostate gland. In some patients, the absorption of large quantities of sterile water resulted in red blood cell destruction (hemolysis), which in turn caused kidney and heart failure. In the 1950s the use of isosmotic solutions as irrigating fluid markedly reduced the risk of red blood cell destruction during a TUR of the prostate gland. In order to make the irrigating solutions isosmotic, saline solution could *not* be used, because it would interfere with the electrosurgery. Thus, other electrically inert solutes were required. These included an inert sugar, sorbitol, and an amino acid, glycine, which is now available in sterile irrigating fluids as a premixed isosmotic solution.

Urologic endoscopic procedures have continued to progress, with an improved light source and lens system and safer electrosurgical units. The light source has been greatly improved by the use of fiberoptics, which are

Fig. 1-8. The fiberoptic telescope. (Courtesy American Cystoscope Makers, Inc., Stamford, Conn.)

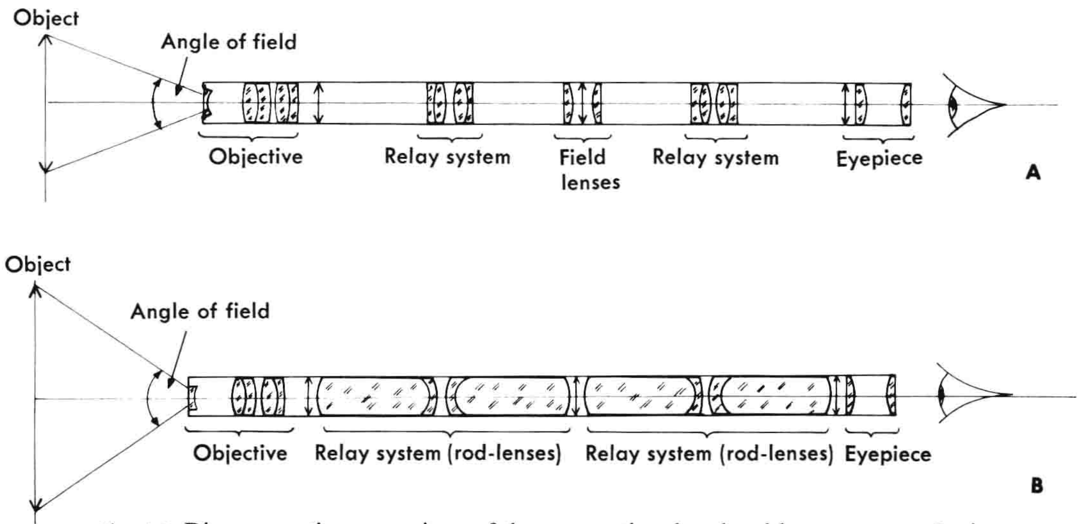

Fig. 1-9. Diagrammatic comparison of the conventional and rod-lens systems. Optics of a traditional cystoscope, A, and a rod-lens system, B. (Courtesy Karl Storz Endoscopy–America, Inc., Los Angeles, Calif.)

now incorporated in cystoscopes and resectoscopes. Fiberoptic illumination consists of an external high-intensity lamp that transmits light into and through small glass microfibers built into the cystoscope or telescope (Fig. 1-8). In the 1960s an improved lens system was introduced utilizing a wide angle and clearer vision (Fig. 1-9). Transistor circuits have improved electrosurgical units so that they are smaller and have safer grounding. Most recently, Iglesias' development of continuous bladder irrigation has shortened transurethral surgery time.

The availability of safer anesthetic agents, antibiotics, and other drugs has also provided the urologic team with an improved armamentarium for the care of the patient during urologic endoscopic procedures.