THERAPEUTIC HYSTEROSCOPY

Indications and Techniques

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Foreword

Amazing advancements in the technology of pelvic endoscopy have occurred over the past 2 decades. Today's gynecologists accurately diagnose and treat many pelvic disorders by means of laparoscopy, culdoscopy, salpingoscopy, and hysteroscopy. For many years hysteroscopy was hindered by limitations. The problems of inadequate lighting and insufficient uterine distention have been overcome, and today this form of endoscopy has gained widespread acceptance. The increasing popularity of this instrumentation has created a demand for a definitive textbook on the principles of diagnostic and therapeutic hysteroscopy.

The significant contributions of Alvin M. Siegler, Rafael F. Valle, Hans J. Lindemann, and Luca Mencaglia to the advancements in laparoscopy and hysteroscopy have established them as international authorities on endoscopy. They helped pioneer the use of hysteroscopy and today are much sought after lecturers and medical writers. They are superbly qualified to write a state-of-the-art textbook on this type of endoscopy and have developed a well-written, smooth-flowing textbook.

The initial chapters describe the latest advancements in instrumentation and the refinements in media distention. Each succeeding, well-referenced chapter deals with specific disorders that lend themselves to management by hysteroscopy, such as metroplasty, intrauterine adhesions, and abnormal uterine bleeding. The many excellent illustrations fully complement the text and make it enjoyable to read. It represents a current, comprehensive source of ready information on hysteroscopy.

This important book is designed for serious students of reproductive surgery and all those interested in reproductive medicine. It will be a welcome addition to the personal libraries of residents-in-training, clinicians, and educators.

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Preface

Hysteroscopy has evolved from a diagnostic procedure into a therapeutic approach for a variety of gynecologic conditions. Instruments specifically designed for hysteroscopic operative procedures have been developed. The indications for therapeutic hysteroscopy are increasing and its proper applications can improve the patient's gynecologic care. These facts should stimulate the gynecologist to become proficient with hysteroscopy for the diagnosis and the treatment of many intrauterine abnormalities.

There are major advantages to a transcervical approach including the avoidance of a laparotomy with the potential sequelae that can follow an abdominal operation. Hysteroscopic operative techniques have been refined, and, with experience, good postoperative results and low morbidity have become evident.

A hysteroscopic metroplasty can be performed on the septate uterus to facilitate and improve the subsequent reproductive outcome. In selected patients, symptomatic, submucous, nonmalignant tumors can be located and removed under hysteroscopic control. The accepted method of therapy for intrauterine adhesions requires their identification and subsequent lysis using the hysteroscope and accessory instruments. Foreign bodies "lost" in the uterine cavity and occult or embedded IUDs can be identified and removed with minimal trauma under direct vision. Endometrial ablation is a procedure used to induce amenorrhea or hypomenorrhea in patients experiencing abnormal uterine bleeding, who are not candidates for a hysterectomy, and have not responded to medical therapy or curettage. This operation can be accomplished using either electrosurgery or laser photocoagulation.

As the physician's approach to some of these intrauterine problems is refined and the technique becomes more widespread, other therapeutic applications of the hysteroscope are being investigated. These include tubal cannulation and the application of new reproductive technology such as placement of gametes into the fallopian tubes and embryo transfer. Because of the simplicity of a transcervical approach to the uterotubal ostia, hysteroscopy has been utilized as a possible method for sterilization or a technique for contraception.

Each of these procedures is fully described in this book, and the trained hysteroscopist should be able to gradually incorporate some of them into the practice of gynecologic endoscopy.

We emphasize that the gynecologist must have previously become proficient using hysteroscopy as a diagnostic method before undertaking operative, therapeutic techniques. The time has come for the use of the hysteroscope to be expanded to treat many gynecologic diseases that heretofore required a laparotomy, which involves longer hospitalization, increased costs, and the possible postoperative formation of pelvic adhesions.

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Rafael F. Valle
Hans J. Lindemann
Luca Mencaglia

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A special thanks is given to Leon Chesley, Ph.D., in appreciation for his willingness to read the entire manuscript and improve our ability to express ourselves in a more concise manner.

The Department of Medical Illustrations of the State University of New York, Health Science Center at Brooklyn was most diligent in their efforts to reproduce and insure the quality of the illustrations.

We wish to acknowledge with appreciation the efforts of Stephanie Manning of The C.V. Mosby Company who inspired us to write this book and facilitated its publication. Barbara Merritt, Senior Production Editor, collated the text and illustrations with patience and a dedication to excellence.

Finally we express an everlasting thanks to our families, to Marcia, Hertha, and Laura who always have encouraged efforts to improve the quality of health care for women.

Contents

1 *Historical Survey*

Describing himself as a Doctor of Medicine and Surgery, a member of various learned societies, a practicing physician and obstetrician from Frankfurt-am-Main, Bozzini[5] published a classical treatise in 1807 on the "light conductor." In the preface he wrote "every invention owes its origin to a happy combination of various circumstances; it is always born like a child, and like a child it keeps becoming more nearly perfect by stepwise progression." The light-conductor was a vase-shaped lantern made of tin and covered with leather (Fig. 1-1). In the center of the lantern was a wax candle fixed in a metal tube that was forced upward by a spring. The lantern had three apertures: two on one side separated by a septum and one on the opposite side.

FIG. 1-1 Instruments described by Bozzini in 1807 treatise.[5] Vase-shaped apparatus was 37 cm high, 3.2 cm in depth, and 8 cm in width.

The flame from the candle was at the left, below the two apertures that served as an outlet for the different specula. The specula were also divided by a septum; one canal conducted the light into the hollow organs, the other one made observation possible. Bozzini described this apparatus as "a simple device for the illumination of inner cavities and interstices of the living animal body." He declared that surgical diagnoses would become more certain, since the extent, the character, and the form of tumors and diseased states could be seen. "The trained touch of the obstetrician, now reinforced by the eye or guided by it, will scarcely be capable of a mistake any longer. Uterine hemorrhages which develop from various spots in the uterus, their site of origin and extent can be determined and more effective measures applied." Successful experiments were done on patients who had diseases of the rectum and uterus but Bozzini's invention fell victim to professional jealousy, court intrigue, and the battle between conservatism and liberalism in the medical community. Bozzini's early death at 35 years of age from typhoid fever ended his attempts to improve and fight for the light conductor, but his idea of endoscopy survived him (Fig. 1-2).[33]

Aubinais[2] was apparently the first person to describe an attempt to look inside the uterus of a pregnant woman. In 1863, using candle light reflected by a mirror, he was able to look through the anterior abdominal wall. He termed the procedure *uteroscopy.* Two years later Désormeaux,[8] using an endoscope, reported on the diagnosis and treatment of diseases of the urethra and bladder. A cylindrical tube was inserted into the urinary bladder and a mirror was used to reflect light.

In 1869, Pantaleoni performed an endoscopic examination of the uterine cavity in a 60-year-old patient who complained of postmenopausal bleeding.[30] Preoperatively he inserted a "sponge tent" to dilate the endocervical canal. Pantaleoni discovered "a polypous vegetation at the bottom of the cavity towards the posterior part of the fundus uteri." He used a slight variation of the cylindrical tube of Désormeaux that was 20 cm long and 12 mm wide. He then introduced a caustic substance through the tube. He believed that this technique brought a new system of exploration and cure.

No new advocates of this technique were forthcoming and 10 years later Munde,[27] professor of gynecology at Dartmouth College, wrote in his textbook, *Minor Surgical Gynecology,* that "if one compares the information derived from this way compared with that obtained by using the tip of the index finger, the proverbial eye of the gynecologist, then it has to be said that this fleeting glimpse is of little value." Munde used an instrument similar to the one devised by Skene for examining the urinary bladder.

Another 10 years passed before Morris[26] published a paper in *Transactions of the American Association of Obstetricians and Gynecologists* on the use of endoscopic tubes for inspection of the urinary bladder and the uterine cavity. He used a straight cylindrical tube of thin, silver-plated brass 22 cm long and 9 mm wide. The tube was beveled smoothly at the uterine (distal) end. The obturator inside the tube was withdrawn after the instrument had been introduced into the uterine cavity, leaving the hollow tube as the endoscope (Fig. 1-3). Morris observed the endometrium and the tubal ostia using a light reflected through an ordinary head mirror. Ancillary instruments could be used to remove pathologic specimens through the endoscope.

FIG. 1-2 Self-portrait of Bozzini (about 1805) from the town archives in Frankfurt.[33] (From Rathert P, Lutzeyer W, and Goddwin WE: Philipp Bozzini (1773-1809) and the Lichtleiter, Urology 3:113, 1974.)

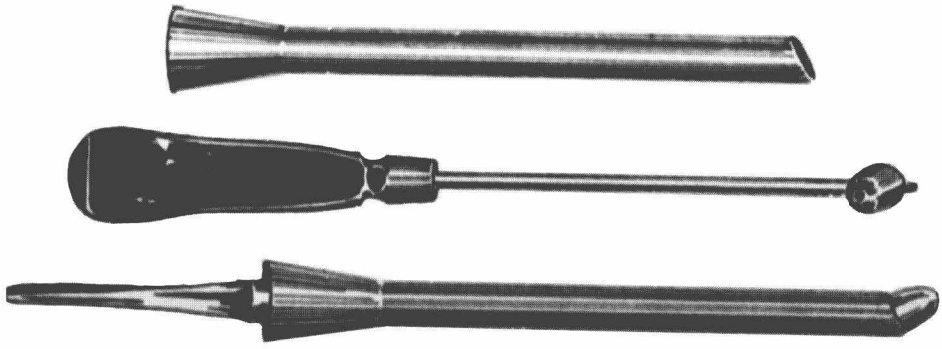
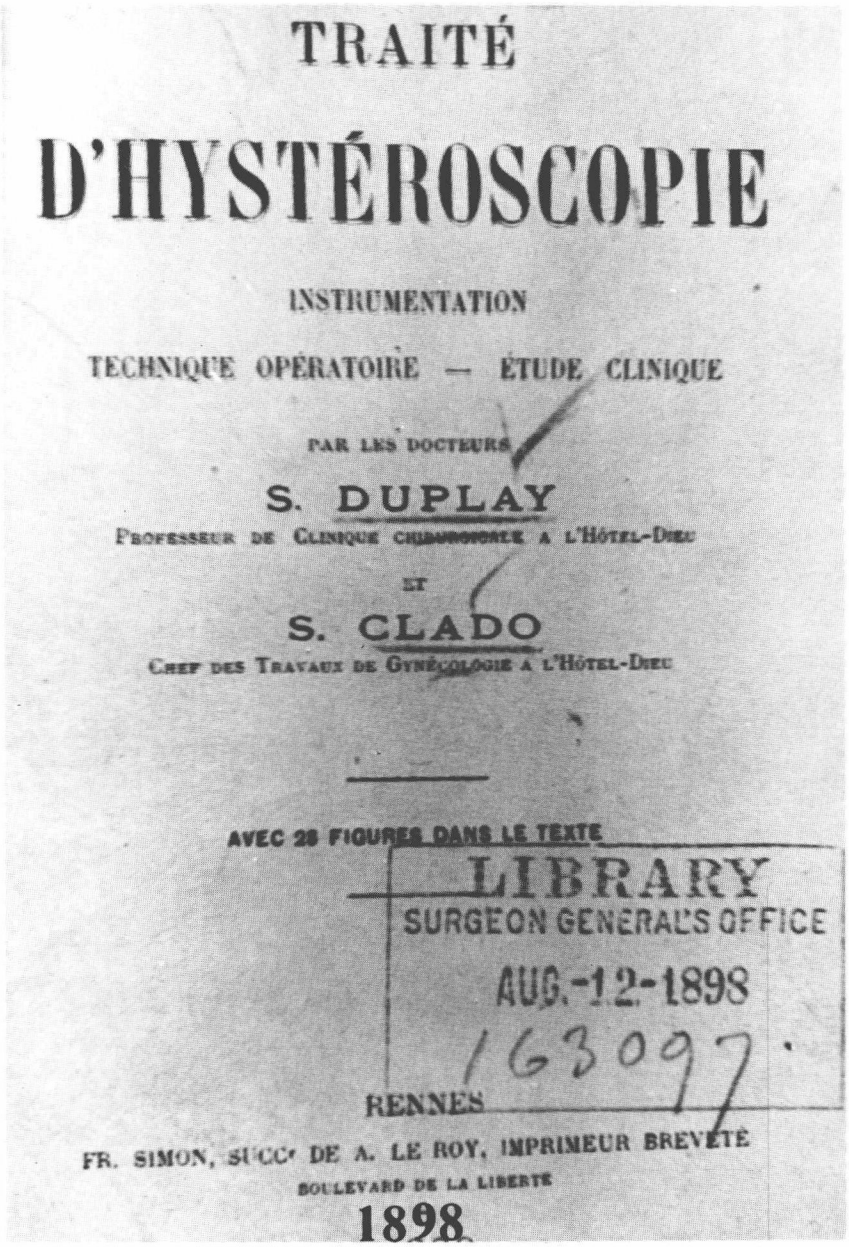


FIG. 1-3 Instruments used by Morris in 1893 to perform hysteroscopy.[26]

Before the turn of the century, the first book on hysteroscopy was written by Duplay and Clado[9] (Fig. 1-4). This book with 28 illustrations described instruments, techniques, and clinical studies of 28 women. Duplay and Clado used an open-ended tube with a battery light source. Ten years later, another French physician, David,[7] wrote his master's thesis on hysteroscopy. For the first time a lens was built into the endoscope, but the illumination system was mounted externally. David explored the entire uterine cavity in a methodical fashion (Fig. 1-5). His thesis included color illustrations of abnormalities, intrauterine adhesions, polyps, submucous myomas, and even the appearance of a uterine perforation.


TRAITÉ

D'HYSTÉROSCOPIE

INSTRUMENTATION

TECHNIQUE OPÉRATOIRE — ÉTUDE CLINIQUE

PAR LES DOCTEURS

S. DUPLAY

PROFESSEUR DE CLINIQUE CHIRURGICALE A L'HÔTEL-DIEU

ET

S. CLADO

CHEF DES TRAVAUX DE GYNÉCOLOGIE A L'HÔTEL-DIEU

AVEC 28 FIGURES DANS LE TEXTE

FR. SIMON, SUCC^r DE A. LE ROY, IMPRIMEUR BREVETÉ
BOULEVARD DE LA LIBERTÉ
1898

FIG. 1-4 Title page from original book written by Duplay and Clado in 1898.[9]

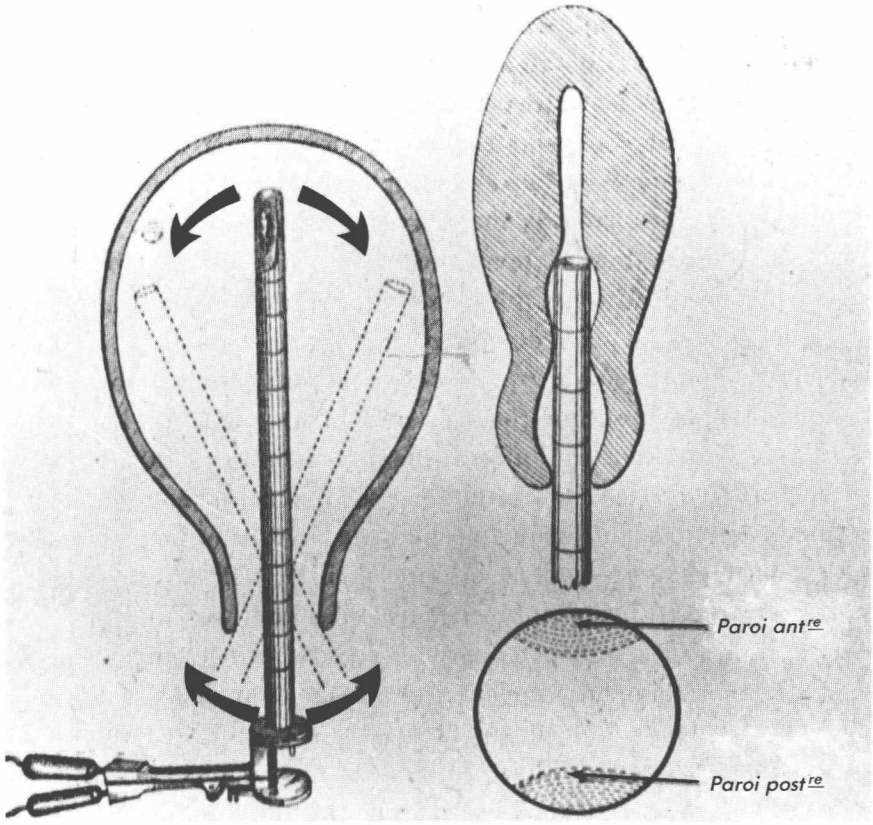


FIG. 1-5 Schematic representation of manipulation of hysteroscope within the uterine cavity. (From David C: L'endoscopie utérine [hystéroscopie]. Applications au diagnostic et au traitement des affections intra-utérines. Master's thesis, University of Paris, Paris, 1908, G Jacques.)

During the next decade a light source became part of the endoscope. A water rinsing system was incorporated to distend the uterine cavity and to wash away the blood and mucus.[4] In 1925, Rubin[34] used carbon dioxide (CO_2) to distend the uterine cavities of 35 women in an office setting as part of individual infertility studies. He noted that CO_2 insufflation through a 15 Fr modified McCarthy cystourethroscope required an intrauterine pressure of about 60 mm Hg to distend the uterine cavity in a procedure lasting only a few minutes. Rubin described the potential values of endometroscopy for the following: (1) catheterization of the tubal ostia, (2) tubal cannulation to overcome proximal tubal obstruction, (3) cauterization as a method of tubal sterilization, and (4) the possible removal of submucous tumors.

Rubin's paper, presented before the fiftieth annual meeting of the American Gynecological Society in 1925, was discussed by Heineberg and Ansbach from Philadelphia, both of whom had used hysteroscopy in their practices for 10 years. Dickinson, the final discussant commented, "finally we can see the inside of the uterine cavity and the tubal ostia. Therefore this marks a tremendous advance."

Adequate illumination and sustained distention of the uterine cavity were problems that prevented consistent success with hysteroscopy. Except for the contributions by Heineberg,[17] Rubin,[34] and Norment,[28] the American literature contains meager information about hysteroscopy before 1950. The discovery of the cold quartz light source by Forestier et al.[13] in 1952 and fiberoptics by Hopkins and Kapany[18] in 1965 brought endoscopy to a new level of reproducibility (Table 1-1). The use of colloid media[23] and the reintroduction of CO_2 with a properly calibrated apparatus to control intrauterine pressure and limit the flow rates to less than 100 ml/min improved the quality of the view of the uterine cavity and the safety of the procedure (Table 1-2).[19,31]

FUTURE OF HYSTEROSCOPY

In the future, gynecologists must become convinced that hysteroscopy is valuable enough to be incorporated into clinical practice. For too many years and perhaps with good reason, there has been a reluctance to add this relatively minor, surgical procedure to the standard skills of the gynecologist. Having accomplished the diagnostic technique, the physician can proceed to develop skills of therapeutic hysteroscopy, including lysis of intrauterine adhesions, metroplasty, submucous myomectomy and polypectomy, and endometrial obliteration as therapy for menorrhagia. Therapeutic hysteroscopy has had a prolonged gestation. Perhaps the time has come to increase the use of this endoscopic method in selected patients to obviate the need for laparotomy, uterine incisions, and even hysterectomy.

Table 1-1 One Hundred and Sixty Years in the Development of Hysteroscopy (1809-1969)

Before 1900	1900-1909	1910-1919	1920-1929
Aubinais[2]	David[7]	Heineberg[17]	Gauss[14]
Beuttner[4]		Seymour[39]	Mickulicz-Radecki[24]
Bozzini[5]			Rubin[34]
Désormeaux[8]			Schroeder[37]
Duplay/Clado[9]			
Morris[26]			
Pantaleoni[30]			

1930-1939	1940-1949	1950-1959	1960-1969
Haselhorst[16]	Norment[28]	Bank[3]	Aguero[1]
Litwak[20]		Englund[11]	Burnett[6]
Schack[35]		Gribb[15]	Edström/Fernström[10]
Segond[38]		Forestier[13]	Esposito[12]
		Palmer[29]	Lyon[21]
		Wulfson[41]	Marleschki[22]
			Mohri et al.[25]
			Schmidt-Matthiesen[36]
			Menken[23]
			Silander[40]

Table 1-2 Historical Development of Media for Hysteroscopy

Author	Year	Contribution
Heineberg[17]	1914	Water rinsing system
Rubin[34]	1925	Insufflation with CO_2
Gauss[14]	1928	Pressurized water rinsing system
Norment[28]	1950	Transparent plastic/rubber balloons
Marleschki[22]	1966	Glass shield (contact)
Menken[23]	1968	Polyvinylpyrrolidine
Edström/Fernström[10]	1970	High molecular dextran (Hyskon)
Lindemann[19]	1971	Pneumohysteroscopy with CO_2
Porto/Gaujoux[31]	1972	Cervical adaptor with CO_2
Quinones[32]	1972	5% glucose solution

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2 Instruments

Hysteroscopy requires appropriate equipment, including an endoscope, a distending medium for panoramic hysteroscopy, an appropriate light source, and ancillary instruments for operative interventions.

HYSTEROSCOPES

All hysteroscopes should enable the gynecologist to have an undistorted clear observation of the uterine cavity. They transmit light for illumination and carry the image to the viewer's eye. The optical components of the hysteroscope include lenses and prisms. The illumination component is provided by fiberoptics.[6,15,16] Until 1975 doublet and single lenses were used in some rigid hysteroscopes (Fig. 2-1). With the rod lens system designed by Hopkins,[9,10] the lens thickness is larger than its diameter with small air spaces in between (Fig. 2-2). This innovation provides a larger viewing angle. A brighter image is transmitted by the long cylinders of superior optical quality glass. Another system used is the graded refractory index (GRIN) system which includes a narrow rod of glass with a refractory index that progressively decreases from the axis to the periphery. The GRIN system is used predominately with slender optical systems such as needle endoscopes.[14]

The proximal end of the hysteroscope contains several important optical components. The prism is used to form an upright image of the object and the lens magnifies the image. The overall magnification of the endoscope is the product of the magnification of the objective lens and the eyepiece. Normal overall magnification of the panoramic hysteroscope is about unity at a normal working distance (about 200 mm). The magnification is inversely proportional to the distance of the object to the lens. The precise magnification for the hysteroscope can be determined only if the distance to the object is known and these objects (i.e., polyps, myomas, etc.) are located at different distances from the objective lens. Most rigid hysteroscopes generally do not employ variable focus optics, and the viewer must be capable of seeing large depth of field (images falling within the range of the accommodation of the eye between infinity and 250 mm). In addition, hysteroscopes are monocular, providing little depth perception for the viewer; interpretation of depth comes with experience.