Linda D. Bradley ▪ Tommaso Falcone

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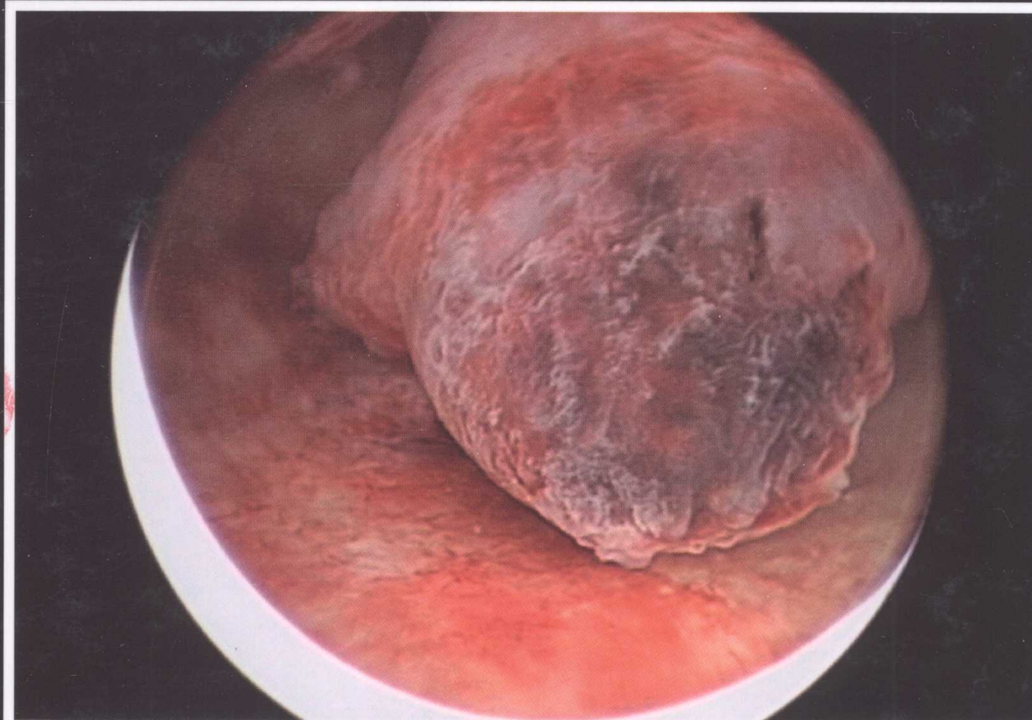
HYSTEROSCOPY



Office Evaluation and Management of the Uterine Cavity

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HYSTEROSCOPY: Office Evaluation and Management of the Uterine Cavity

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This book is dedicated to Dr. Jay Cooper, who was an icon in the field of hysteroscopy. It honors the legacy of a man whose career embodied a commitment to the power and possibilities of hysteroscopy.

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Foreword

Even though hysteroscopy has been available since 1869 when Pantaleoni visualized and treated an endometrial polyp, it has struggled to be widely adapted as a gynecological surgical tool. This would see counterintuitive in view of the fact that the uterus is a major organ in gynecology and direct visualization of its interior should be an advantage to the gynecologist.

When one looks at the history of hysteroscopy there have been periods when enthusiasm for its use has increased only to either plateau or decline. Why were there ups and downs and will these swings in popularity hold in the future?

While this introduction is basically seen through the eyes of a physician from the United States, many of the reasons for the variability of acceptance of hysteroscopy are probably universal. Unmet expectations and competition from other procedures are past factors that are still in play. But in spite of these continued pressures, I believe it will continue to become an even greater part of the arsenal of every gynecologist.

But let's look back over modern hysteroscopy starting with the mid 1950s. Early reports of distention of the uterine cavity by a balloon or no distention with the hysteroscope directly in contact with the endometrial surface did not allow a direct view or the potential to operate. Because of these limitations hysteroscopy did not achieve wide popularity. It is interesting to note that many of the early papers dealt with hysteroscopy during pregnancy, for which it is not currently used.

By the 1960s the problems of uterine distention had been worked out and technical advances in endoscopes and fiber optic light made direct visualization of the uterine cavity more easily accomplished and surgical procedures feasible.

Reports began to appear in the literature describing what could be seen and therefore diagnosed by the hysteroscope but little about operative possibilities. It was the easy access to the tubal ostia and the potential of developing a transcervical sterilization technique that, in the early 1970s, captured the imagination of some early users of hysteroscopy. And it was the possibility of transcervical sterilizations that caused the first real spurt of interest and growth among general gynecologists to learn hysteroscopy.

Unfortunately electrical energy was used in the attempt to close the tube. This resulted in poor closure rates as well as patient injuries. It is generally stated that electrical methods were dropped because of these risks. However, even if technical advances might have provided better control and overcome these problems, it was the high interstitial ectopic pregnancy rate resulting from tubal damage without necessarily closure that condemned this method of sterilization to failure.

Although various mechanical plugs were also proposed to block the ostia, none literally stayed in long enough to be considered for clinical trials. Other intrauterine surgical procedures such as septum resection and adhesiolysis were starting to be done but the average gynecologist saw few of these patients and the interest in learning hysteroscopy diminished. The value of hysteroscopy as a diagnostic tool was not widely appreciated during this time and most physicians relied on the blind D&C to evaluate their patients with abnormal uterine bleeding.

Next, a small surge of interest in hysteroscopy again occurred with the potential of another sterilization technique—the silicone plug. This procedure never became available to general gynecologists in the United States and soon died because of the lack of a commercial sponsor.

The next huge upswing of interest in learning hysteroscopy occurred with the description of the Nd:yag laser endometrial ablation technique as a method of managing menorrhagia. This was a procedure for which every gynecologist had patients in the need of help and they were eager to remain competitive. But the equipment was expensive and the necessary skill level for good results was a drawback that discouraged its advancements. The recognition that the urological resectoscope, an instrument available for years in every operating room, could be used for endometrial ablation and other intrauterine surgical procedures caused another increase in those learning operative hysteroscopy.

But hysteroscopic endometrial ablation remained a deceptively skill-dependent procedure and produced marginal results along with the potentially significant complications for poorly trained surgeons was a draw back and the initial enthusiasm for this procedure soon waned. When global endometrial ablation techniques were developed they were quickly accepted since they required little skill and could be done by most gynecologists.

While the global endometrial ablation techniques resulted in no new enthusiasts for the resectoscope they did require surgeons to know what the uterine cavity looked like and resulted in more gynecologists performing hysteroscopy at the time of tissue sampling. This had the positive results of increasing physician's comfort level for doing diagnostic hysteroscopy and has probably been a platform for further growth in this procedure.

The probable reason that hysteroscopy has been slow in being incorporated into gynecologic practice as a diagnostic procedure lies in the competition of supposedly equally effective procedures. The sonohysterogram is commonly used in place of diagnostic hysteroscopy because most gynecologists already have ultrasound equipment and it is better reimbursed. But with hysteroscopy, direct visualization is more accurate and allows a directed biopsy to be taken.

The need to be experienced in the use of the resectoscope has further decreased because there are now competing techniques for the destruction of submucosal myomas. So there continues to be the inevitable ebb and flow of uses for the hysteroscope.

But at this time the first big driving force for learning hysteroscopy has come full circle—a transcervical sterilization technique has been the impetus. But this alone would not have been enough to encourage physicians to bring sterilizations as well as endometrial ablations into their practice. It has been the ease of doing these procedures and the better reimbursement for office procedures that will make hysteroscopy attractive to forward thinking gynecologists.

FRANKLIN D. LOFFER, MD

Preface

The role of hysteroscopy in the care of the patient with abnormal uterine bleeding, postmenopausal bleeding, infertility, sterilization, and in patients desiring endometrial ablation is emerging. Detection of intracavitary lesions is possible with hysteroscopy with high sensitivity.

We undertook this project with you in mind. It is practical, illustrated, and authoritative. Accompanying videos further clarify the important role of hysteroscopy in the care of our patients. Together our contributors share myriad clinical pearls to improve patient care and to minimize complications of hysteroscopy.

To our residents and fellows, who are our future doctors, this book is also was conceived with you in mind. Learn to love, breathe, and consider hysteroscopy when imaging technology is not enough. Trust your eyes. Listen to your patients. Master hysteroscopy, so that you too can offer this excellent technique to your patients.

We thank all of our patients who have entrusted their care to us. Their stories, improved quality of life, and excellent outcomes from operative hysteroscopic and minimally invasive surgical procedures keeps us inspired.

Finally, to our families who support our careers and life outside of our home, we thank you.

LINDA D. BRADLEY, MD
TOMMASO FALCONE, MD

Acknowledgments

We are indebted to our patients who have entrusted their care to us. This book is dedicated to our medical students, residents, and fellows who will ultimately follow in our footsteps. May this textbook guide you in providing the most comprehensive gynecologic care for patients presenting with menstrual disorders, fibroids, or in need of infertility evaluation.

We thank our families for their support.

Linda D. Bradley, MD
Tommaso Falcone, MD

Contents

Chapter 1 Instrumentation in Office Hysteroscopy: Rigid Hysteroscopy

Stefano Bettocchi, Attilio Di Spiezio Sardo, and Oronzo Ceci

Hysteroscopy can be arguably regarded as the definitive procedure for evaluating the uterine cavity.[1,2] Diagnostic hysteroscopy is a safe and simple procedure that can almost always be carried out successfully in an office setting. The challenge is to increase the number of operative procedures. Office hysteroscopy has already shown good results as compared with outpatient hysteroscopy, with lower health care costs, less time off work, and equal patient acceptability.[3-5]

Although the literature suggests that office-based operative hysteroscopy without any form of analgesia or anesthesia is a well-tolerated procedure with a high success rate,[2,4-9] it continues, in general, to be considered by most gynecologists and patients to be an invasive and painful technique.

Pain experienced during hysteroscopy continues to represent the most common reason for failure,[10] and this can occur even if local anesthesia is used.[5] It is the main limiting factor to a large-scale use of office hysteroscopy, and many patients still prefer the inpatient approach, believing that it will be pain-free. In the last few years, to minimize patient discomfort and maximize the chance of success of the procedure and its widespread use, a new technique based on employing a small-diameter rigid or flexible hysteroscope, a liquid distention medium, and an atraumatic insertion technique (vaginoscopic approach) has been developed. This technique can completely eliminate any kind of premedication for diagnostic procedures and has a similar potential for many operative procdures.[11-14]

A thorough knowledge of the instrumentation is required to perform office-based hysteroscopy successfully. This chapter also reviews the personal approach used to carry out diagnostic and therapeutic procedures successfully.

VAGINOSCOPIC APPROACH

A new technique for introducing the hysteroscope into the external uterine orifice (EUO) (vaginoscopic or *no-touch* technique) was developed by Bettocchi and Selvaggi in 1995 to reduce patients' pain and discomfort.[11] This technique avoids the need to introduce a vaginal speculum to visualize the cervix and a cervical tenaculum to grasp the cervix. The vagina can be distended by introducing the distention medium through the hysteroscope placed in the lower vagina, at the same pressure (30-40 mm Hg) used for the subsequent distention of the uterine cavity. Unlike distention of the uterus, distention of the vagina does not provoke pain. The telescope is then driven to the posterior fornix to visualize the portio and slowly backwards to identify the EUO. When the EUO is visible, the scope is introduced into the cervical canal, and after distending it, the scope is carefully moved forward to the internal uterine orifice (IUO) and then into the uterine cavity with the least possible trauma.

A number of retrospective and randomized, controlled studies have demonstrated that this technique is faster and is associated with significantly less pain, permitting complete elimination of any type of premedication, analgesia, or anesthesia.[11,15-17] However, this approach requires a good knowledge of anatomy and of the instrumentation, as well as dexterity on the part of the operator (i.e., the correlation between what is seen on the screen and the actual position of the forward-oblique scope).[18]

The view through the forward oblique view lens, with a deflected view of 12 to 30 degrees (typical of all the modern lens-scope–based hysteroscopes), although particularly useful for examining the uterine cavity, can seriously impede the introduction of the scope into the EUO and into the narrow cervical canal.

In fact, when the endoscopist sees a panoramic view in the middle of the monitor with a 12-degree or 30-degree hysteroscope, the angle is incorrect. The required image (the EUO or the cervical canal) should appear in the lower half of the screen and not in its center (Fig. 1–1). In this way the scope will be located in the middle of the canal, avoiding stimulation of the muscle fibers.

MINIHYSTEROSCOPES

Two different types of hysteroscopes are used worldwide: flexible or rigid, which are made in different sizes. The standard rigid hysteroscopes, used for decades, had a diameter greater than 5 mm, with a 4-mm telescope. Over the last few years, smaller-diameter hysteroscopes have been introduced, reflecting the trend toward less-invasive diagnostic and operative procedures in all fields of medicine. The trend toward smaller instruments has largely contributed to the ability to perform hysteroscopy in the physician's office.[14]

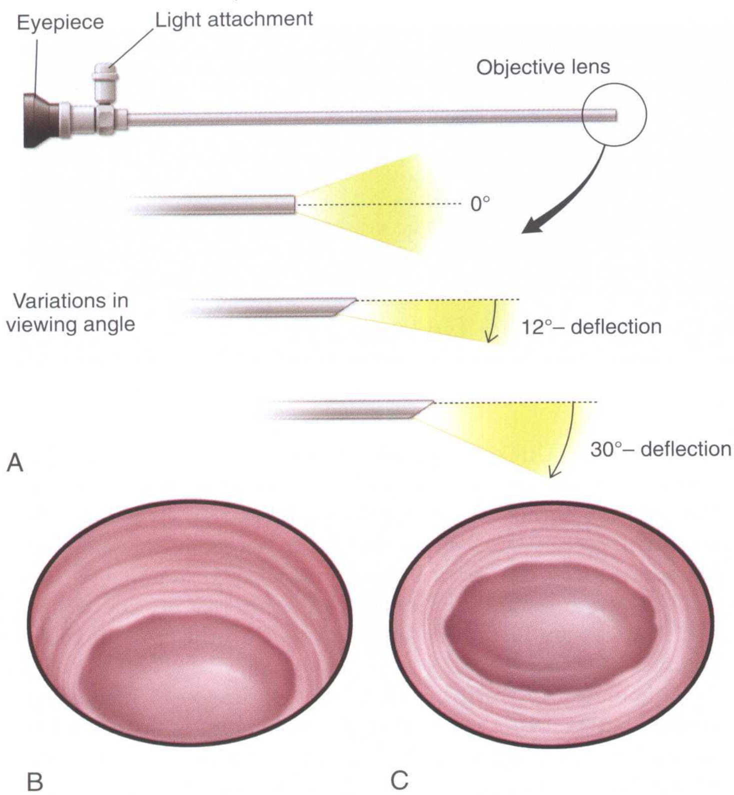

Figure 1–1. The view obtained from the telescope depends on the angle of the objective lens. A, Different angled telescopes. **B,** Correct view of an angled telescope inserted into the cervical canal. **C,** Incorrect view of the cervical canal from an angled scope.

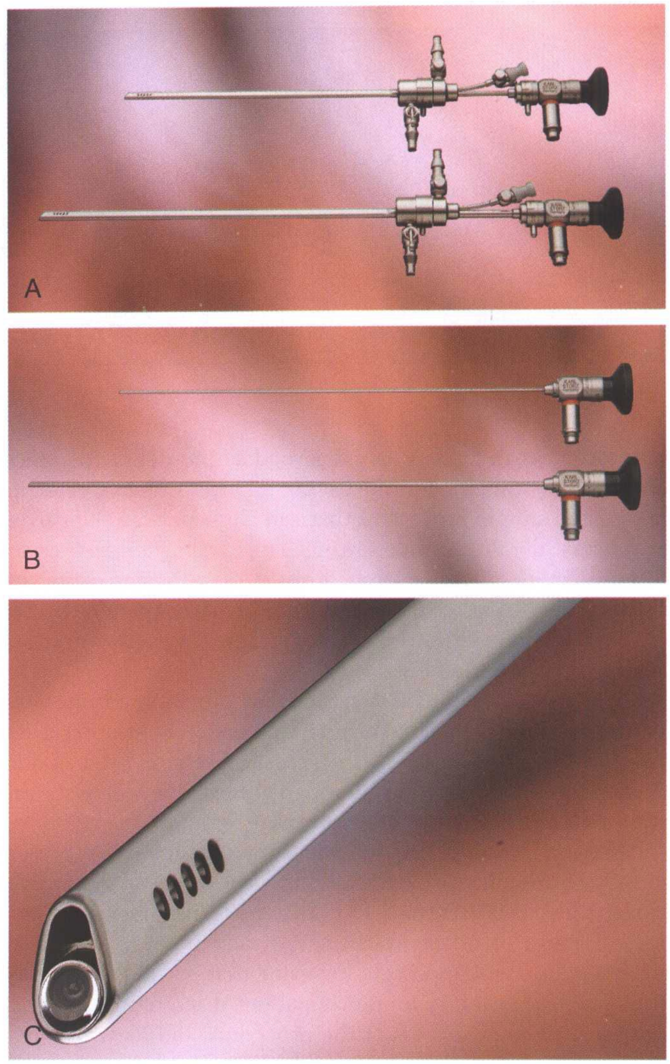

Figure 1–2. Typical instruments feature two sheaths, one for irrigation and another for suction. A, 4-mm and 5-mm sheaths. **B,** 2.9-mm and 2.0-mm rod lens telescope. **C,** The oval tip allows atraumatic introduction.

The new hysteroscopes have a diameter ranging between 1.2 and 3 mm (minitelescopes). It has been possible to produce very thin diagnostic sheaths and very thin operative sheaths with a diameter no greater than 5 mm. These small-diameter hysteroscopes include the working-channel and continuous-flow features.[18]

At the beginning, there were concerns about the quality of vision and illumination of the minitelescopes compared with standard 4-mm telescopes. However, it has been demonstrated that new lens-based minitelescopes (2.0-2.9 mm) have a very high visual quality with comparable or better brightness, angle of view, and field of view to those of standard 4-mm telescopes.[14]

Thus, the miniaturization of the scopes has enabled the physician to use, for a diagnostic procedure, an operative scope equipped with mechanical instruments and with a final diameter not exceeding 5 mm. The possibility of making a visual examination of the uterine cavity and at the same time exploiting the contextual operative facilities has provided endoscopists with the perfect diagnostic tool. They can examine the cavity and take biopsies or treat benign intrauterine pathologies such as polyps and synechiae relatively rapidly without any premedication or anesthesia.[18]

One of the most commonly used rigid hysteroscopes worldwide is the Office Continuous Flow Operative Hysteroscope, size 5, (Karl Storz, Tuttlingen, Germany), based on a 2.9-mm rod–lens system with 30-degree forward oblique view and an outer diameter corresponding to 5.0 mm (Fig. 1–2*A*). A thinner version has been developed based on a 2.0-mm rod–lens system scope that reduces the final diameter of the hysteroscope to 4.0 mm (Office Continuous Flow Operative Hysteroscope, size 4, Karl Storz) (Fig. 1–2*B*). Both instruments feature two sheaths (one for irrigation and another one for suction) and an operative 5-F canal (approximately 1.6 mm). They are oval, which is ideal for atraumatic insertion of the scope into the cervix (Fig. 1–2C).[18]

The IUO is normally oval, with a transverse main axis and a diameter of approximately 4 to 5 mm. Therefore, if we want to insert a round hysteroscope measuring 5 mm in diameter through it, we need to modify the spatial disposition of the muscle fibers, potentially causing pain to the patient. These two hysteroscopes have an oval profile and a total diameter of between 4 and 5 mm that conform more strictly to the anatomy of the cervical canal. Thus a simple rotation of the scope on the camera by 90 degrees is adequate to align the longitudinal main axis of the scope with the transverse axis of the IUO.

FLEXIBLE HYSTEROSCOPES

Flexible hysteroscopes with a smaller diameter have demonstrated some advantages over the standard rigid ones in several studies. Above all, they are less invasive because there is no need for cervical dilation and no need to use a tenaculum if the uterus is acutely anteflexed. These features are associated with less pain. However, use of flexible hysteroscopes is potentially hampered by higher costs for purchase and maintenance of the equipment; increased effort for cleaning, disinfection, and sterilization; a reduced image size on the monitor screen compared with full-size standard hysteroscopy; and greater fragility of the equipment.[14]

A semirigid 3.2-mm fiberoptic minihysteroscope (Versascope, Gynecare, Ethicon Inc., Somerville, N.J.) has been developed. It consists of a 1.8-mm telescope with a 0-degree angle of vision and a single disposable outer sheath. This sheath has an additional expanding plastic collapsible outer sheath that permits insufflation of CO_2 gas or low-viscosity fluids under a continuous-flow system for uterine distention. Additionally, it provides operative capabilities with 7-F semirigid instruments (biopsy cup, scissors, and graspers) or 5-F bipolar electrodes.

ELECTRONIC SUCTION–IRRIGATION PUMP AND CONTINUOUS FLOW SYSTEM

The uterine cavity can be distended with CO_2 gas or liquid solution. Normal (0.9%) saline is often preferred in office hysteroscopy, particularly when operative procedures have to be performed. Although some expert hysteroscopists prefer CO_2, most prefer a liquid-based distending medium. Patient tolerance appears to be better, visibility is better, clearing of blood and debris is easier, and it is possible to use bipolar 5-F instruments.[19-24]

A correct flow of between 200 and 350 mL/min, together with a negative aspiration pressure of around 0.2 bar, is normally sufficient to obtain good dilatation of the uterine cavity with an intrauterine pressure of approximately 30 to 40 mm Hg. These pressures are lower than the 70-mm Hg pressure within the tubes, thus preventing the distention medium from passing into the abdomen and potentially causing pain or triggering a vagal reflex.[18]

A problem can occur when the cervical canal and the IUO are the same size as or smaller than the hysteroscope. The liquid enters the uterine cavity but cannot flow out or pass through the uterine tubes into the abdomen. The view will be unclear due to the presence of mucosal debris. In these cases, many endoscopists raise the flow and therefore also the pressure. However, because the compressed liquid cannot flow out of the cervical canal, it is forced into the abdomen through the uterine tubes, potentially causing pain and risk to the patient.

Liquid distention is normally used together with an electronically controlled irrigation and suction device (e.g., Endomat; Karl Storz). The different parameters on the device (flow, pressure, aspiration) are set to obtain an average distention of 24 to 45 mm Hg. In the past, before the continuous-flow sheath became available, we were compelled to use the single-flow sheath designed for CO_2 examinations. In these cases the saline solution was insufflated at atmospheric pressure (two 5-liter bags connected by a urologic Y outflow and hung 1.5 m above the patient). By so doing we obtained a flow of 150 to 200 mL/min with a resulting endouterine pressure of around 40 mm Hg, which created no problems. This technique worked if there was a positive difference between the diameter of the instrument and the diameter of the cervical canal. The liquid could flow out of the uterine cavity through the small space between the sheath and the cervical canal. In most cases, however, the size of the cervical canal was insufficient to obtain this effect, and so the result was stagnation of the liquid and consequently a poor view. Moreover, to perform even basic operative procedures (biopsies), the use of a continuous-flow system together with an electronic suction–irrigation device is extremely important to ensure a clear view in cases of bleeding or debris.[18]

OFFICE OPERATIVE HYSTEROSCOPY

Since the 1980s, operative hysteroscopy using scissors, resectoscopic monopolar electrodes, and laser fibers has offered the only chance to treat intrauterine septa, adhesions, myomas, and polyps in women with abnormal uterine bleeding, infertility, or recurrent pregnancy loss. This approach required cervical dilation, nonelectrolytic solutions, local or general anesthesia, and an operating room, resulting in elevated health care costs. In our institution we developed a system to treat these abnormalities in the office setting without cervical dilation and consequently with no need for anesthesia or analgesia. This new philosophy (see-and-treat hysteroscopy) reduces the distinction between a diagnostic and an operative procedure, introducing a single procedure in which the operative part is perfectly integrated in the diagnostic work-up.[18]

Mechanical operative instruments (scissors, biopsy cup, grasping, corkscrew) have long been the only way to apply the see-and-treat procedure in an outpatient setting (Fig. 1–3).[25] The advent of bipolar technology, with the introduction of several types of 5-F electrodes (Fig. 1–4), has increased the number of pathologies that can be treated by office operative hysteroscopy, reserving the use of the resectoscope and operating room to a few particular cases.[26]

The Versapoint System

The advantages of bipolar over monopolar technology are well accepted in the medical field. The most important benefit in hysteroscopy is the use of saline solution rather than nonionic distention media (e.g., glycine, sorbitol, mannitol), as well as the

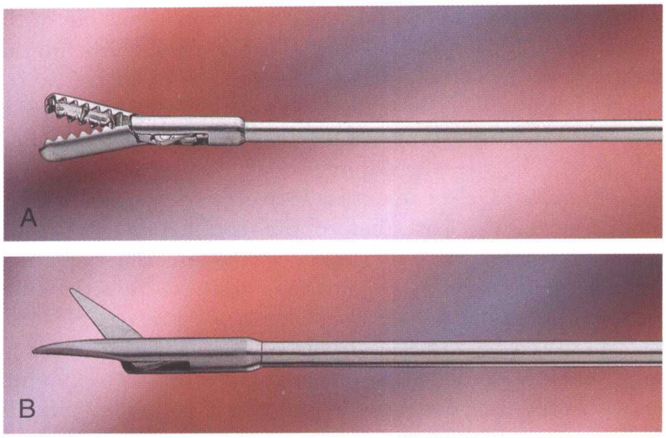

Figure 1–3 **A,** Biopsy and grasping forceps (5 F). **B,** Scissors (5 F).

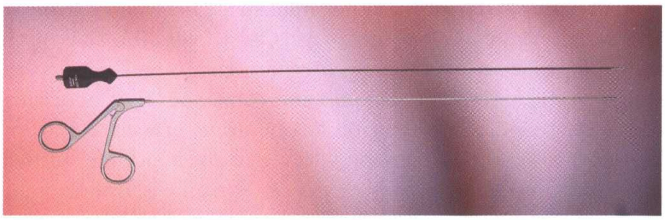

Figure 1–4 Bipolar electrodes.

reduction of energy spread to the tissue during resection. A versatile electrosurgical system dedicated to hysteroscopy, the Versapoint Bipolar Electrosurgical System (Gynecare; Ethicon) was introduced in 1997. It consists of a high-frequency bipolar electrosurgical generator and coaxial bipolar electrodes that cut, desiccate (coagulate), and vaporize tissue.

The flexible bipolar electrode, 1.6 mm in diameter (5 F) and 36 cm long, can be used through any operating hysteroscope. Each electrode consists of an active electrode located at the tip and a return electrode located on the shaft, separated by a ceramic insert. The coaxial bipolar mode involves the completion of the circuit from the active tip to the coaxial return (2 mm proximally), using normal saline distending solution. When the electrode is activated in a conducting solution such as saline, an extremely high impedance vapor pocket is generated that surrounds and insulates the active electrode, preventing completion of the circuit until tissue contact is achieved. After tissue contact, the circuit is completed and the tissue between the active and return electrode is cut, desiccated, or vaporized accordingly.

This system avoids both stray electrical energy and the risks of nonelectrolyte distending media. Because the device vaporizes the tissue, the procedure can be accomplished more quickly, because vision is not obscured by chips. More precise vaporization also avoids cutting into the myometrium. Although the tissue is vaporized, it is possible to obtain tissue for pathologic examination.

There are three types of electrodes: the Twizzle, specifically for precise and controlled vaporization (resembling cutting), the Spring, used for diffuse tissue vaporization, and the Ball, to coagulate tissues. The Twizzle electrode is preferred to the others because it is a more precise cutting instrument and it can work closer to the myometrium with a lower power setting and consequently with less patient discomfort.

The generator provides different modes of operation (waveform): the vapor cut waveform, resembling a cut mode (the acronyms are VC1, VC2, and VC3, where VC3 corresponds to the mildest energy flowing into the tissue), the blend waveform (BL1, BL2), and the desiccation waveform (DES), resembling a coagulation mode. The generator is connected to the 5-F electrode via a flexible cable. Once connected, the generator automatically adjusts to the default setting (VC1 and 100 W).

The Versapoint system has been used to treat a variety of intrauterine lesions after administering conscious sedation, with or without a paracervical block; general anesthesia; and recently, even without any analgesia or anesthesia. Bettocchi and colleagues have demonstrated that by lowering the power of the generator from the default setting of VC1/100 W down to the mildest level, VC3, and reducing the power setting to half (50 W), with the Twizzle electrode it is possible to produce minimal dissection of the tissue (resembling a precise cut), with minimal generation of bubbles obscuring the visual field, and with high patient tolerance.[26]

Other Miniaturized Bipolar Electrodes

A new generation of electrical generators, allowing the use of bipolar energy on miniaturized electrodes, has been produced (Autocon 400 II, Karl Storz). Because of the increased efficiency and the different quality of the energy produced, it has been possible to develop a second generation of 5-F bipolar electrodes (Karl Storz). The main advantage of these instruments is that they are reusable and therefore reduce the costs of office operative procedures. The application of this electrode and the technique used to perform the procedures is the same of those described for the Versapoint system.

OPERATIVE TECHNIQUES

Biopsy

The availability of the new smaller hysteroscopes, including a 5-F operative channel, has enabled the surgeon to perform targeted hysteroscopic biopsies to confirm the endoscopic visual diagnosis. In the standard, widely used punch biopsy technique, the biopsy forceps are pushed into the endometrium and are closed. The instrument is extracted through the operative channel while the hysteroscope remains inside the uterine cavity.

After years of confusion about the value of targeted hysteroscopic biopsies and their inadequacy in terms of the quantity of tissue biopsied (with the standard technique, the final amount of tissue available to be sent to the pathologist is strictly related to the internal volume of the two jaws of the forceps), Bettocchi and colleagues proposed the grasp biopsy technique as a means of collecting enough endometrium for a correct histologic examination. The biopsy forceps are placed, with the jaws open, against the endometrium to be biopsied; then they are pushed into the tissue and along it for about 0.5 to 1 cm, avoiding touching the muscle fibers. Once a large portion of mucosa has been detached, the two jaws are closed and the whole hysteroscope is pulled out of the uterine cavity, without pulling the tip of the instrument back into the channel. In this way, not only the tissue inside the forceps jaws but also the surrounding tissue protruding outside the jaws can be retrieved, thus providing the pathologist with a larger amount of tissue.[18]

Polypectomy

Small polyps (<0.5 cm) can be removed using 5-F mechanical instruments (sharp scissors and/or crocodile forceps). Cervical polyps have to be treated with sharp scissors because of their fibrotic base, which precludes the use of grasping forceps. For endometrial polyps, the technique consists of grasping the base with open jaws, closing the jaws, and gently pushing toward the uterine fundus. The procedure has to be repeated several times until the polyp is detached from its implant in the endometrium.[25]

Larger polyps can be removed intact with the Versapoint Twizzle electrode if the internal cervical os size is wide enough for their extraction. Otherwise, they are sliced from the free edge to the base into two or three fragments large enough to be pulled out through the uterine cavity using 5-F grasping forceps with teeth. To remove the entire base of the polyp without going too deep into the myometrium, in some cases the Twizzle electrode is bent by 25 to 30 degrees, enough to produce a kind of hook electrode.[26]

Myomectomy

A technique similar to polypectomy is applied on submucosal myomas, with the difference that, because of their higher tissue density, they are first divided into two half-spheres and then each of these is sliced as described for polyps. Particular attention has to be paid to the intramural part of the myoma, if present. To avoid any myometrial stimulation or damage, the myoma is first gently separated from the pseudocapsule using mechanical instruments (grasping forceps or scissors) as for cold loop resectoscopic myomectomy. Once the intramural section becomes submucosal, it is sliced with the Versapoint Twizzle electrode.[26]

SUMMARY

This chapter has reviewed the rigid instruments required for proper in-office hysteroscopy. Furthermore, instruments are available that allow in-office operative hysteroscopy. Although flexible hysteroscopy is also a popular form of office-based diagnostic hysteroscopy, this approach does not allow operative procedures of any significance. For these, rigid instrumentation will be required.

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