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# An Overview of Office Hysteroscopy

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**Abstract: Background:** Hysteroscopy is used to visually examine the uterine cavity for structural defects, lesions, and other pathology. Pantaleoni conducted the first hysteroscopy in 1869, and subsequent advancements in technology have significantly expanded the capabilities of this procedure. Advancements in hysteroscopic equipment, including scopes, optics, distention media, and analgesics, have enhanced the practicality of office hysteroscopy (OH) and improved comfort for patients. The benefits of OH include the ability to forgo general anesthesia, increased convenience for both the patient and physician, quicker recovery time, and increased cost-effectiveness compared to the operating room (OR)

**Keywords:** Office Hysteroscopy

## Introduction

Hysteroscopy is a minimally invasive procedure used to visually examine the uterine cavity for structural defects, lesions, and other pathology. The first hysteroscopy was conducted in 1869 by Pantaleoni, and subsequent advancements in technology have significantly expanded the capabilities of this procedure [1].

Office Hysteroscopy (OH)

Advancements in hysteroscopic equipment, including scopes, optics, distention media, and analgesics, have enhanced the practicality of office hysteroscopy (OH) and improved comfort for patients [2]. The benefits of OH include the ability to forgo general anesthesia, increased convenience for both the patient and physician, quicker recovery time, and increased cost-effectiveness compared to the operating room (OR) [3].

Uses and Efficacy of Office Hysteroscopy

Hysteroscopy has a broad range of applications for both diagnosis and treatment (Figure 1). Typical uses include diagnosis and management of abnormal uterine bleeding and postmenopausal bleeding, including polyps, submucosal fibroids, and thickened endometrium. OH can also be used to diagnose and remove intrauterine lesions or foreign bodies, such as intrauterine devices (IUDs), adhesions, retained products of conception (POCs), or uterine septum [4].

Most importantly, OH can be used to rule out abnormalities to prevent unnecessary trips to the operating room. OH has also been found to be both safe and effective, with a complication rate of 0–1.5%. Studies have revealed high success rates for diagnostic OH, as high as 94.8% [4].

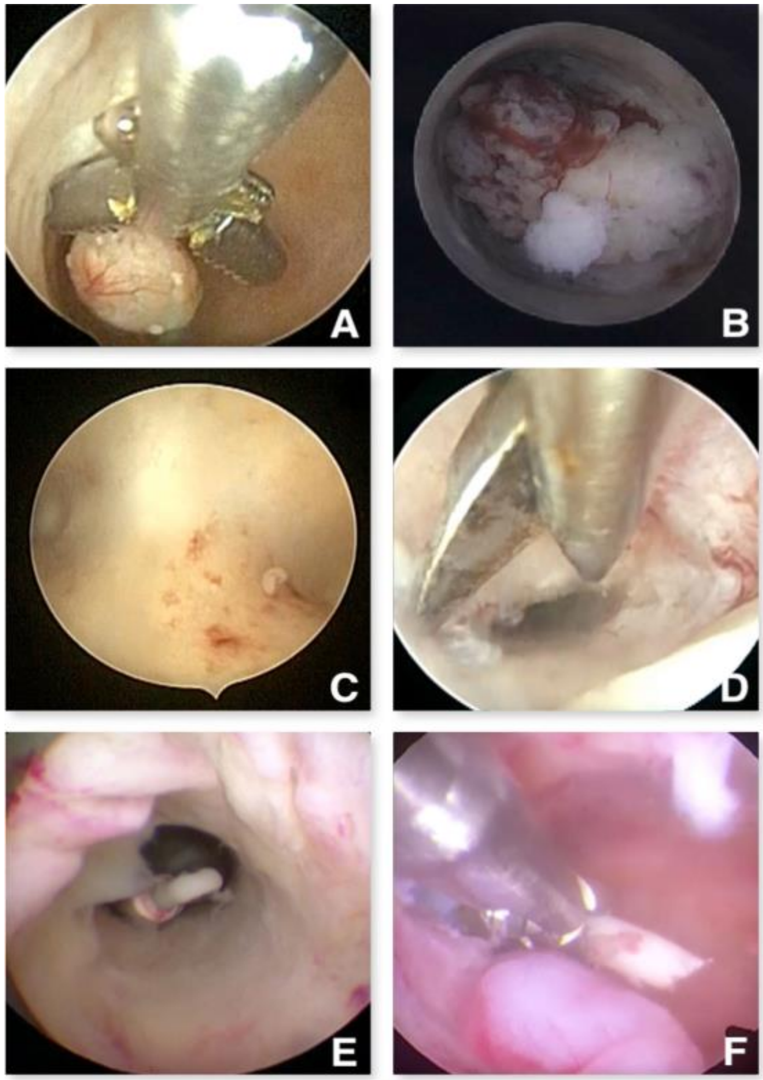


Fig. 1 Hysteroscopic images of various intrauterine pathology taken in the office. A Grasping a small intrauterine polyp. B Endometrial cancer missed by endometrial biopsy. C Medium uterine septum removed in the office. D Lysis of adhesions in the lower uterine segment to pass the hysteroscope. E A retained IUD with previously avulsed strings. F A grasper removing an embedded IUD arm [3].

General considerations for the use of diagnostic and operative hysteroscopy include managing distending media, timing for optimal visualization, and cervical preparations [3].

Distending Media

The uterus requires distention for adequate visualization of the cavity during hysteroscopy. Historically, carbon dioxide gas and high-viscosity fluid media, such as dextran, were used [5].

Hysteroscopic Distending Media:

Low-Viscosity Fluid Media: Electrolyte-Poor Fluid (e.g., glycine, 1.5%; sorbitol, 3%; and mannitol, 5%)

Maximum Fluid Deficit: 1,000 mL

Advantages:

Compatible with radiofrequency energy

Monopolar devices require electrolyte-poor fluids
Disadvantages and Safety Precautions: Excessive absorption of these fluids can cause hyponatremia, hyperammonemia, and decreased serum osmolality with the potential for seizures, cerebral edema, and death.
Complications: Excessive absorption of these fluids can lead to hyponatremia, hyperammonemia, and decreased serum osmolality, with the potential for seizures, cerebral edema, and death [5].
Low-Viscosity Fluid Media: Electrolyte-Containing Fluid (e.g., normal saline, sodium lactated solution)
Maximum Fluid Deficit: Maximum fluid deficits with isotonic solutions are based only on expert opinion but consensus would be approximately 2,500 mL
Advantages:
Readily available
Isotonic
Media of choice during diagnostic hysteroscopy and in operative cases where mechanical, laser, or bipolar energy is used
Disadvantages and Safety Precautions: Although the risk of hyponatremia and decreased serum osmolality can be reduced by using these media, pulmonary edema and congestive heart failure can still occur. Careful attention should be paid to fluid input and output, with particular attention to the fluid deficit.
Complications: Fluid overload causing pulmonary edema and congestive heart failure [5].
Optimization of Visualization
In premenopausal women with regular menstrual cycles, the optimal timing for diagnostic hysteroscopy is during the follicular phase of the menstrual cycle after menstruation. Pregnancy should be reasonably excluded before performing hysteroscopy [6].
Hysteroscopy during the secretory phase of the cycle may make diagnosis more difficult because a thickened endometrium may mimic polyps. Some women with unpredictable menses can be scheduled at any time for operative hysteroscopy, but ideally, patients who are actively bleeding may not undergo the procedure because adequate visualization could be impaired. Pretreatment with progestins or combined oral contraceptives may improve visualization by thinning the endometrium [7]. Data supports that pretreatment with progestins can improve visualization at the time of polypectomy and increase surgical satisfaction compared with timed procedures, even with short courses of therapy [8].
Although pretreatment with gonadotropin-releasing hormone (GnRH) agonists also thins the endometrium and may reduce blood loss and improve visualization with submucous myomectomy, they are not routinely recommended because of adverse effects; however, in patients with severe anemia, they are beneficial for surgical preparation and optimizing hemoglobin levels before surgery [9].
Preoperative Ripening of the Cervix
There is insufficient evidence to recommend routine cervical ripening before diagnostic or operative hysteroscopy, but it may be considered for those patients at higher risk of cervical stenosis or increased pain with the surgical procedure. The potential benefits should be weighed against the increased risk of adverse effects of the medication [10].
Options for cervical preparation methods include sublingual, oral, or vaginal prostaglandin, such as misoprostol; and vaginal osmotic dilators, such as laminaria. A 2015 systematic review concluded that the use of misoprostol for preoperative ripening is more effective than placebo or no treatment and is associated with fewer intraoperative complications; however, it is associated with a higher rate of adverse effects, including mild abdominal pain, increased body temperature, and vaginal bleeding [11].
In women undergoing diagnostic hysteroscopy in the operating room or the office setting, misoprostol has been studied at various dosages, most frequently 200–400 micrograms orally or vaginally, and has demonstrated a decrease in procedural times, improved ease of cervical entry, and decreased pain scores [12].
Intravaginal misoprostol administration of 400 micrograms has been shown to decrease pain during and after office hysteroscopy when administered at least 4 hours before the procedure, likely because of the decreased

need for dilation [13]. Data supports that with the addition of 25 micrograms vaginal estrogen 14 days before the procedure, along with 400–1000 micrograms vaginal misoprostol 12 hours before the procedure, ease of cervical dilation and reduction in pain was substantial in postmenopausal patients [14].

In women undergoing operative hysteroscopy, misoprostol administration at various dosages and by different routes has been shown to decrease the need for mechanical dilation over placebo [15].

A comparison of osmotic dilators versus misoprostol demonstrated a decreased need for mechanical dilation with a similar side effect profile for osmotic dilators; however, an additional office visit for osmotic dilator placement before hysteroscopy may make this a less desirable choice for patients and healthcare providers [10]. Also, if the patient does not undergo surgery for any reason, the dilator will need to be removed.

Some clinicians may consider adding a vasoconstricting agent, such as vasopressin or epinephrine, to the local anesthetic to aid with cervical dilation. Potential benefits of vasoconstrictor use include a reduction in procedural blood loss and fluid absorption, an increase in the duration and potency of anesthesia, and a decrease in systemic absorption and toxicity of the local anesthetic [16]. An additional cited advantage of intracervical dilute vasopressin is a reduction in the force required for mechanical cervical dilation, although there is variability in dosage in practice. For example, a randomized, double-blind study of 52 women used 20 mL of a dilute solution (4 units of 0.05 units/mL of vasopressin in 80 mL of normal saline) [16].

Cautious administration of these agents is recommended, especially in the office setting, given the possibility of rare but serious cardiovascular events, including bradycardia, hypotension, or hypertension, and cardiac arrest [16].

Special Considerations for Office Hysteroscopy

Many diagnostic hysteroscopy and operative hysteroscopic procedures are being shifted from the operating room to an office-based setting. In randomized trials, patients reported a preference for office-based hysteroscopy, and office-based procedures are associated with higher patient satisfaction and faster recovery when compared with hospital-based operative hysteroscopy [3].

Other potential benefits of office hysteroscopy include patient and physician convenience, avoidance of general anesthesia, less patient anxiety related to familiarity with the office setting, cost effectiveness, and more efficient use of the operating room for more complex hysteroscopic cases. If the technology is available, office hysteroscopy for the treatment of endometrial polyps should be considered [3]. Office hysteroscopic polypectomy has been shown to be safe, well tolerated, and more cost-effective compared with traditional inpatient hysteroscopic polypectomy [17].

Patient Counseling and Selection

Appropriate patient selection for office-based hysteroscopic procedures for women with known uterine pathology relies on thorough knowledge and understanding of the target pathology, size of the lesion, depth of penetration of the lesion, patient willingness to undergo an office-based procedure, physician skills and expertise, assessment of patient comorbidities, and availability of proper equipment and patient support [3].

For example, patients with medical conditions, such as sleep apnea or cardiopulmonary disease, may not be appropriate candidates for office-based intravenous sedation without the presence of an anesthesia care team. Consideration for performing hysteroscopy in an alternative setting, such as the operating room or ambulatory surgery center, should be made for patients who have anxiety or have previously failed or not tolerated the office-based procedure [3].

Vaginoscopic Approach to Hysteroscopy

Vaginoscopy is a surgical technique involving the insertion of a hysteroscope to visualize the vagina, cervix, uterine cavity, or all of these structures, without the use of a vaginal speculum or cervical tenaculum. Small diameter rigid or flexible hysteroscopes can be used as vaginoscopic instrumentation. A vaginoscopic technique involves gentle introduction of the hysteroscope into the vagina and use of distending medium, such as normal saline, to expand the vaginal canal. The vaginoscopic approach has been shown to reduce procedural pain substantially compared with traditional hysteroscopy [18].

Furthermore, no significant difference was found in the number of failed procedures when comparing vaginoscopic technique with traditional hysteroscopy [18]. Both ACOG and AAGL agree that vaginoscopy may be considered when performing office hysteroscopy because studies have shown that it can significantly reduce procedural pain with similar efficacy [19].

Minimizing fluid leakage from the vagina can be accomplished by manual compression of the labial tissue to narrow the vaginal introitus. The hysteroscope is directed toward the posterior vaginal fornix, and the external cervical os is identified. Guidance of the hysteroscope into the endocervical canal and subsequently into the uterine cavity is facilitated by knowledge of the uterine position and correction of anteflexion or retroflexion, if necessary [20].

Techniques to bring the uterus into an axial position include applying direct pressure above the pubic symphysis or full bladder distention to reduce uterine anteflexion, and placing anterior pressure digitally through the rectum to decrease uterine retroflexion [20].

Pain Management

The office hysteroscopy analgesia regimens commonly described in the literature include a single agent or a combination of multiple agents, including a topical anesthetic, a nonsteroidal antiinflammatory drug, acetaminophen, a benzodiazepine, an opiate, and an intracervical or paracervical block, or both. On the basis of the currently available evidence, there is no clinically significant difference in safety or effectiveness of these regimens for pain management when compared with each other or placebo [21].

Paracervical blocks have been shown to decrease pain at the time of tenaculum placement and passage of the hysteroscope through the external and internal os [22].

Other evidence has shown that office hysteroscopy may be tolerated without the use of any analgesia, although preexisting pain conditions, such as dysmenorrhea or chronic pelvic pain, may warrant its use. No single regimen or group of medications has been shown to be clinically superior to placebo [23].

Office Preparation

Patient safety and comfort must be prioritized when performing office hysteroscopic procedures. Patients have the right to expect the same level of patient safety as is present in the hospital or ambulatory surgery setting [3].

Office hysteroscopy should be performed in an appropriately sized, equipped, and staffed treatment room. Basic set-up requirements for in-office hysteroscopy include hysteroscopic instrumentation, camera and monitor, delivery system for distending media, and facilities to clean, disinfect, and sterilize equipment. There is insufficient evidence to recommend preferential use of a specific type of hysteroscope, and the choice of hysteroscope should be left to the discretion of the operator [19].

Cleaning of reusable hysteroscopic devices is necessary before disinfection or sterilization. Protocols for disinfection and sterilization of equipment may vary depending on the type of equipment used and should adhere to manufacturer's guidelines and comply with institutional, state, and federal regulations [19].

Prevention and Management of Complications

Perforation

The most common perioperative complication of hysteroscopic surgery is uterine perforation [24, 25]. Known risk factors for uterine perforation are blind insertion of instruments, cervical stenosis, anatomic distortion (e.g., leiomyomas and congenital anomalies, intrauterine adhesions, myometrial thinning, and uterine malposition [extreme anteversion or retroversion]) [11].

Management of uterine perforation is dependent on the location, cause, and severity of the uterine perforation. Each step of hysteroscopy, including mechanical cervical dilation, uterine sounding, hysteroscope insertion, or the use of electrosurgery or tissue removal devices, may result in compromise of the uterine myometrium. Although data on the incidence of false passage creation during hysteroscopy are lacking, this complication may occur in cases of difficult uterine entry, which may increase the risk of uterine perforation. In a systematic review, the use of preoperative misoprostol reduced rates of false passage formation but did not reduce rates of uterine perforation during operative hysteroscopy [11].

Major bleeding, suspicion of visceral injury, or perforation by an electrosurgical electrode may warrant immediate surgical intervention.

Infection

Antibiotic prophylaxis is not recommended for routine hysteroscopic procedures. Hysteroscopy is contraindicated during an active pelvic infection and in women with prodromal or active herpes infection. Infectious complications related to hysteroscopic procedures are uncommon with rates of post-procedure infection (e.g., endometritis or endomyometritis, urinary tract infections) ranging from 0.01% to 1.42% [26].

In randomized trials, the administration of antibiotic prophylaxis has not been shown to reduce postoperative infection after diagnostic hysteroscopy or operative hysteroscopy [27].

Electrosurgical Injury

Serious injury by electrosurgical electrodes can occur during operative hysteroscopic procedures, typically in the setting of uterine perforation. Exploratory surgery may be indicated if clinically significant bleeding arises, or if there is suspicion of thermal damage to visceral structures. Lower genital tract structures (e.g., vagina or perineum) also may be at risk for thermal injury [28].

Potential risk factors include cervical overdilation, instrument insulation defect, or electrode activation when the external sheath is not sufficiently advanced in the cervical canal [28].

Fluid Overload

Excessive absorption of distending fluid can result in severe complications, including pulmonary edema, neurologic complications, and death. Use of electrolyte-free, hypotonic distending media is associated with a greater risk of hypotonic hyponatremia and cerebral edema. Complications from fluid overload may be minimized with careful perioperative planning, use of a fluid management system, and evaluation of the intracavitary lesions to be removed [3].

Fluid deficit is affected by the size and number of the lesions removed, the depth of myometrial resection, the number of myometrial sinuses opened, and the intrauterine pressure. Preventive measures include limiting excess fluid absorption, recognizing and treating fluid overload promptly, and selecting a distending medium that minimizes risk. Vasopressin injection in the cervical stroma may reduce the volume of fluid intravasation [3].

The best way to limit excess fluid intravasation is to monitor the fluid deficit closely and frequently throughout the procedure. Management of fluid overload includes termination of the procedure; assessment of hemodynamic, neurologic, respiratory, and cardiovascular status; measurement of serum electrolytes and osmolality; and consideration of diuretic administration. Newer fluid management systems have made fluid monitoring more accurate; however, some of these systems may be expensive and not readily available in all settings [3].

Guidelines for Fluid Monitoring and the Limits of Fluid Excess

Intravenous hydration of patients undergoing hysteroscopy should be closely monitored preoperatively and intraoperatively. Hysteroscopic fluid absorption should be closely monitored intraoperatively.

Lower fluid deficit thresholds should be considered for elderly patients, patients with comorbid conditions, patients with cardiovascular or renal compromise, and when procedures take place in an outpatient setting with limited acute care and laboratory services.

In healthy patients, the maximum fluid deficit is 1,000 mL for hypotonic solutions, 2,500 mL for isotonic solutions, and 500 mL for high-viscosity solutions. However, if the fluid deficit reaches 750 mL of a hypotonic solution, 2,000 mL of an electrolyte solution, or 300 mL of a high-viscosity solution, consideration should be given to stopping further infusion and concluding the procedure. Ideally, include the anesthesia personnel in this discussion, if applicable.

In an outpatient setting with limited acute care and laboratory services, consideration should be given to discontinuing procedures at a lower fluid deficit threshold.

An automated fluid monitoring system facilitates early recognition of excessive deficit in real-time totals.

An individual should be designated to measure intake and outflow frequently and report the deficit to the operative team.

If the maximum fluid deficit occurs, especially with hypotonic solutions, evaluation of the patient's hemodynamic, neurologic, respiratory, and cardiovascular status is necessary along with assessment of signs and symptoms of fluid overload. Measurement of serum electrolytes and osmolality should be performed, administration of diuretics considered, and further diagnostic and therapeutic intervention begun as indicated. The use of intravenous furosemide may aid in diuresis, with clinical improvement occurring in 15–20 minutes. Further treatment of fluid overload or hyponatremia may require administration of corrective fluids, consultation with medical specialists, and transfer to a critical care setting [3].

Air and Gas Embolism

Air or gas embolism may result from the introduction of $CO_2$ as a hysteroscopic distending medium, room air during instrumentation of the cervix or uterus, gaseous byproducts created during monopolar or bipolar electrosurgery, or initial placement of the patient in the Trendelenburg position [29].

The chemical properties of gases affect the risk of embolism. The solubility of $CO_2$ in blood is higher than oxygen; therefore, the risk of an air embolism derived from room air (containing oxygen and nitrogen) is greater than the risk of a carbon dioxide gas embolism [29].

Severe complications of air or gas embolism include cardiac or pulmonary failure or death. The most common symptoms of air or gas embolism are described as dyspnea and chest pain, although in the anesthetized patient, a decrease in end-tidal carbon dioxide pressure or alteration in hemodynamic status (hypotension, tachycardia) should raise clinical suspicion of an embolism event. A churning or splashing auscultatory sound (a "mill-wheel" murmur) is a classic physical examination finding, although it may not be detected in all cases. Although the reported incidences of emboli have been variable in the literature, the rate of clinically significant gas embolism is low [30].

Risk reduction strategies for the prevention of air or gas embolism include purging air from hysteroscopic tubing and instruments; minimizing repetitive insertion of instruments through the cervix, which may introduce air into the uterus in a "piston-like" manner; removing intrauterine gas bubbles; and limiting intrauterine pressure [30].

Acute management of air and gas embolism consists of both supportive care and active measures, including prompt termination of the procedure, deflation of the uterine cavity, and the elimination of sources of fluid and gas. Durant's maneuver, described as placement of the patient in the left lateral decubitus and Trendelenburg position, can be performed to promote migration of air or gas toward the right ventricle to reduce obstruction at the right ventricular outflow tract [29].

Hemorrhage

Cervical laceration, uterine perforation, adhesiolysis, and resection of cavitary lesions are the common causes of hemorrhage. For the management of hemorrhage, various intraoperative hemostasis measures can be employed, depending on the severity, nature, and location of bleeding; however, insufficient data exist regarding the effectiveness of these techniques. Examples include electrocautery applied to the source of bleeding, use of an intrauterine balloon (Foley catheter), uterine artery embolization, injection of vasopressin or epinephrine, tranexamic acid, and hysterectomy [3].

Vasovagal Reaction

Triggering of the parasympathetic nervous system during manipulation of the cervix and instrumentation of the cervical canal or uterine cavity can lead to a vasovagal reaction.

Upon recognition of vasovagal signs (hypotension, bradycardia) or symptoms (nausea, vomiting, diaphoresis, pallor, or loss of consciousness), the procedure should be stopped, and patient assessment and supportive care should be undertaken (vital signs including pulse and blood pressure, and "ABCs"—airway, breathing, and circulation). The majority of vasovagal reactions resolve with supportive measures, such as raising the patient's legs or placement in the Trendelenburg position. If symptoms or bradycardia persist, atropine may be administered as a single dosage of 0.5 mg intravenously every 3 to 5 minutes, not to exceed a total of 3 mg [30].

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