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# Diagnostic Hysteroscopy in Diagnosis Nulliparous Infertile Patients

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**Abstract**

Diagnostic hysteroscopy is an intrauterine examination without providing therapy, using two methods: traditional hysteroscope insertion and no-touch vaginoscopy. Traditional hysteroscopes use a vulsed cervix to facilitate insertion, while no-touch hysteroscopes use a saline distention medium to dilate the vagina. In multiparous women, cervical dilatation is not necessary. A systematic inspection of the tubal apertures and uterine cavity walls is performed using axial telescope motions. Anaesthesia is not necessary for this outpatient treatment. There are two types of small calibre diagnostic hysteroscopes: rigid and flexible. Rigid endoscopes have excellent resolution and wide-angle optics, while flexible endoscopes have 4 to 6 mm outer diameters and 3 to 4 mm outer diameters. Hysteroscopy can be performed in a standard office exam room, but procedure-only rooms offer convenience. Traditional office hysteroscopy uses carbon dioxide, but low-viscosity fluids and continuous flow hysteroscopes like the Disten-U-Flo system eliminate the need for a CO2 insufflating device and continue working even in bleedin.

**Keywords:** Hysteroscopy, Diagnosis, Infertility

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## 1. Introduction

The invention of hysteroscopy has made common gynecologic issues, like irregular uterine bleeding, easier to treat with less invasive methods. The widespread use of this significant technology can be attributed to several factors, including lower diameter hysteroscopes, increased emphasis on office-based operations, and increased physician training [1]. A hysteroscope is a telescope used to view the endometrial cavity, tubal ostia, endocervical canal, cervix, and vagina. It is inserted into the uterus through the vagina and cervix. Hysteroscopy can be used for either therapeutic or diagnostic purposes [2]. In gynecologic practice, diagnostic and surgical hysteroscopy have become commonplace due to their safety and effectiveness. Improvements in optic and fiber-optic technology, along with the development of modern surgical instruments, have significantly enhanced hysteroscopy surgical methods and visual resolution in recent decades. Numerous hysteroscopic procedures have taken the place of outdated, invasive methods like curettage and dilatation [3]. Office hysteroscopy has started to take over operating-room procedures as tools get smaller. There are always new tools and methods being developed, and there is probably no end to the possibilities for advancement. While there is still a dearth of high-quality clinical evidence supporting such advantages, this summary offers what has been demonstrated [4].

## 2. Instrumentation:

Hysteroscopy was transformed into a diagnostic and therapeutic tool that can and should be utilized in every gynecological practice by new advancements in equipment and techniques. The field of female infertility and intrauterine surgery underwent significant changes, particularly with the continued advancement of office hysteroscopy devices. [5]. With the introduction of hysteroscopic morcellation, most patients now have the option of hysteroscopic surgery without requiring gynecologists to have substantial training or experience. The increasing number of randomized controlled trials (RCTs) in this area is contributing to better clinical performance of hysteroscopy and raising patient outcomes [1].

## 3. Hysteroscopes and sheaths:

Derived from the cystoscope, the rigid, direct optical hysteroscope obtains a wide-angle view of the uterine cavity by using fluid- or gas-distending media. With the aid of a set of lenses and prisms, this hysteroscope provides the operator with an exceptionally sharp, illuminated image. Although narrower rigid scopes with fibre optics and an outside diameter of 1.9 mm have been created, the most often used optical hysteroscopes have an outer diameter of 3–4 mm [3].Gas was used as a distending medium in the development of fiber-optic hysteroscopy, a simple technique for seeing the uterus. Because the images from fibre-optic hysteroscopy are a composite of individual fibres, they have a lesser contrast and resolution than those from direct optical hysteroscopy, making it less effective for assessing the uterine cavity [6].Hysteroscopes that are optical or fiber-optic are both monocular and have limited depth perception. They come in a range of viewing angles, from 0 to 70. The most used scopes for diagnostic procedures are thirty-degree models. During operations, smaller angles of deflection are employed. Attaching the hysteroscopes to video surveillance systems is a simple process[2]. A metallic sleeve or sheath is used to insert, firmly fasten, or permanently adhere to the hysteroscope. For a simple introduction of the sheath into the uterine cavity, detachable obturators are available. Obturators are particularly handy when using large sheaths or when dilatation is challenging [4]. The outer diameter of diagnostic sheaths typically ranges from 2.5 to 5.5 mm, whereas the outer diameter of operating sheaths is between 5.5 - 9.0 mm. Stopcocks or ports are installed in both the operating and diagnostic sheaths to allow the introduction of extending media [1]. Current sheaths for diagnostic and operational procedures have double, separated ports, and offer a constant, laminar flow of distending fluid. Continuous flow with independent in- and outflow channels guarantees the proper irrigation and imaging of the uterine cavity and allows ideal intrauterine pressure and degree of cavity distension. Different stopcocks can be used to control in- and out-flow. One or more operative instruments are intended to be able to pass through operative sheaths. Rigid operative instruments can be inserted directly into a right-angle hysteroscope; the outer diameter of these sheaths is 5–9 mm [7]. The focus of recent advancements in hysteroscopes and sheaths has been to reduce the outer diameter while maintaining picture quality. The inflow channel is frequently intended to serve as the working route for the insertion of surgical tools, even though more recent hysteroscopes have distinct in- and outflow channels [8].When instruments are put into a narrow outer diameter fluid flow channel, the instruments might mostly obscure the channel, making sight difficult. Hence, channel size shouldn't be further reduced by further decreasing the outside diameter of hysteroscopes; instead, optical chip technology in hysteroscopes, such the Invisio® Digital Hysteroscope (GyrusACMI/Olympus, Tokyo, Japan), can lead to greater improvement. [3].

**4. Operative instruments and catheters:**

For hysteroscopic surgery, a variety of rigid, semi-rigid, and flexible instruments have been created or modified. The grasping forceps, biopsy forceps, and scissors are examples of the semi-rigid and rigid devices. The operating channel, which is frequently also the combined flow channel for fluid, is used to insert most instruments. They should be handled with extra caution because the shaft, handle, and tips are easily breaking [1]. Hysteroscopic sheaths can also be used to implant flexible, specially designed catheters for tubal cannulation, selective chromopertubation, or tubal sterilisation. The most widely used approach is the hysteroscopic sterilisation method known as Essure® (Conceptus, Mountain View, CA, USA), which has been available for more than a decade. Using a disposable delivery method, the device's two micro-inserts for intraluminal tubal occlusion are positioned [6]. A nickel-titanium expanding outer coil, an inner coil made of stainless steel, and fibres made of polyethylene terephthalate coiled into and around the inner coil make up each micro-insert. The outer coil of the micro-insert grows to a diameter of 1.5–2.0 mm after it is freed from the delivery system, allowing it to be anchored in the proximal fallopian tube's varied sizes and shapes. The micro-inserts are inserted via the utero-tubal junction to the more proximal part of the Fallopian tube under hysteroscopic guidance [9]. Usually within three months, the polyethylene terephthalate fibres cause luminal blockage by stimulating localised fibroblast growth. When opposed to laparoscopic procedures, one drawback of hysteroscopic methods is that women must have a specific reference test (such as transvaginal ultrasound or hysterosalpingography) a few months following the procedure to be certain of an effective tube blockage [2]. Another disadvantage is that around 5% of women will not be able to have effective bilateral occlusion during the initial surgery; ejection, perforationisplacement, and difficulty to visualize or access the tubal ostia are among the reasons for failure. The patient and the physician should talk about this option. At a later time, another attempt at Essure® installation or laparoscopic sterilization may be made [1].

**5. Resectoscope:**

A variation of the urologic resectoscope is the hysteroscopic resectoscope. It should be learned before undergoing any surgical operations as it needs practice to assemble. The sheath contains two intake and outflow ports for extending media, and its outer diameter is between 7 and 9 mm. The resectoscope has a continuous flow system that offers superior irrigation during surgical procedures [6]. The sheath can remain in place when the resectoscope is withdrawn if surgical debris or so-called 'chips' obstruct the operative field. This preserves cervical dilatation while enabling the removal of substantial tissue. The surgeon can move the surgical electrode inside and outward by inserting electrosurgical tools or electrodes into an attachment on a spring handle [2]. When performing monopolar high frequency electrosurgery, it is necessary to ground the patient and employ a non-conductive, non-electrolyte medium for distending. Using saline-distending medium, bipolar resectoscopes are more contemporary. While intravasation and electrolyte blood imbalances make bipolar procedures less dangerous, increased gas bubbles might impair vision, and gas emboli can even induce lung capillary spasms that could disrupt lung gas diffusion [3]. Smaller outer diameter and bipolar electrosurgery are the foundation of new advances in resectoscopy. Since there are no electrolyte changes when using bipolar procedures with saline irrigation and distention, the consequences of fluid intravasation are lessened. Monitoring of fluid inflow and outflow is still necessary [1]. If there is an excessive intravasation, diuretics (such as intravenous furosemide 20 mg) can usually be used to treat the isotonic fluid overload. As a result, a greater level of intravasation during surgery is acceptable. The top limit of saline intravasation is often mentioned in most protocols and guidelines as being around 2500 ml [9].

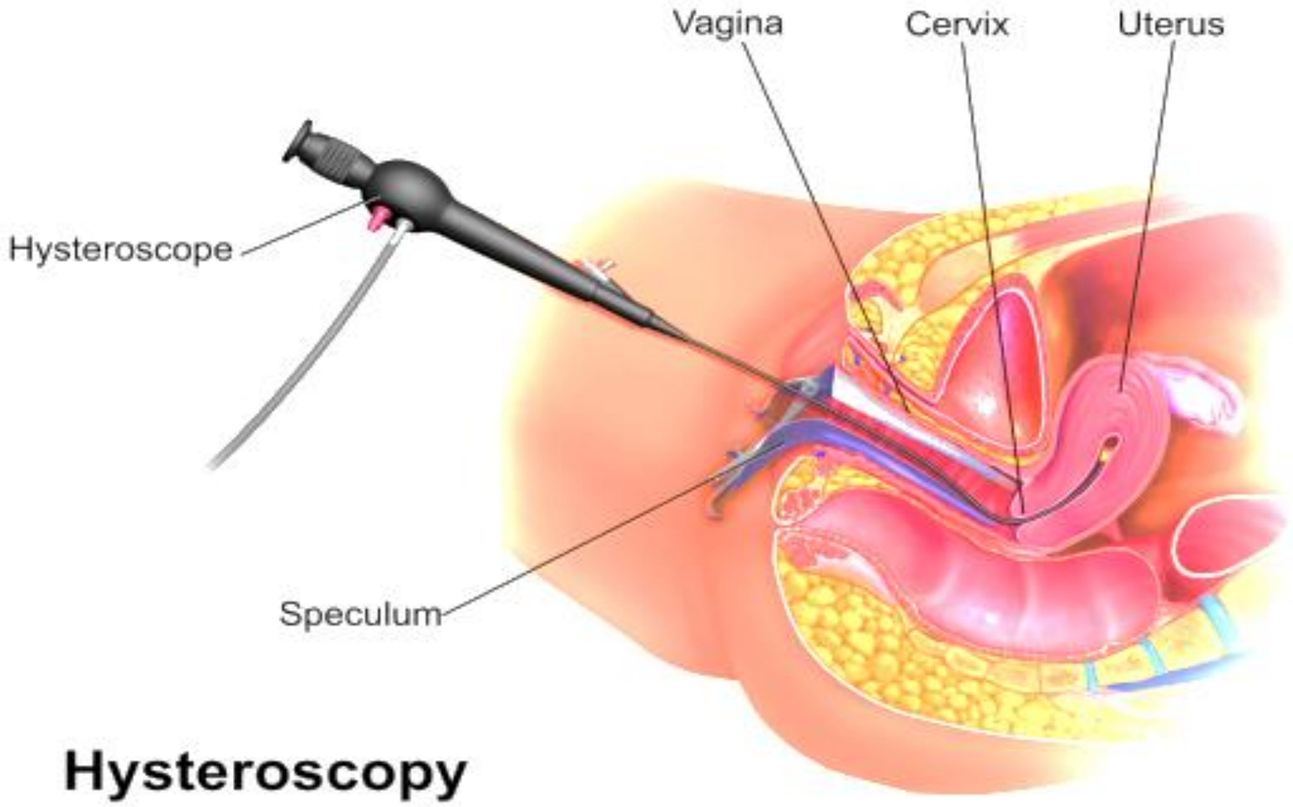


**Figure 1:** Hysteroscopy [1].

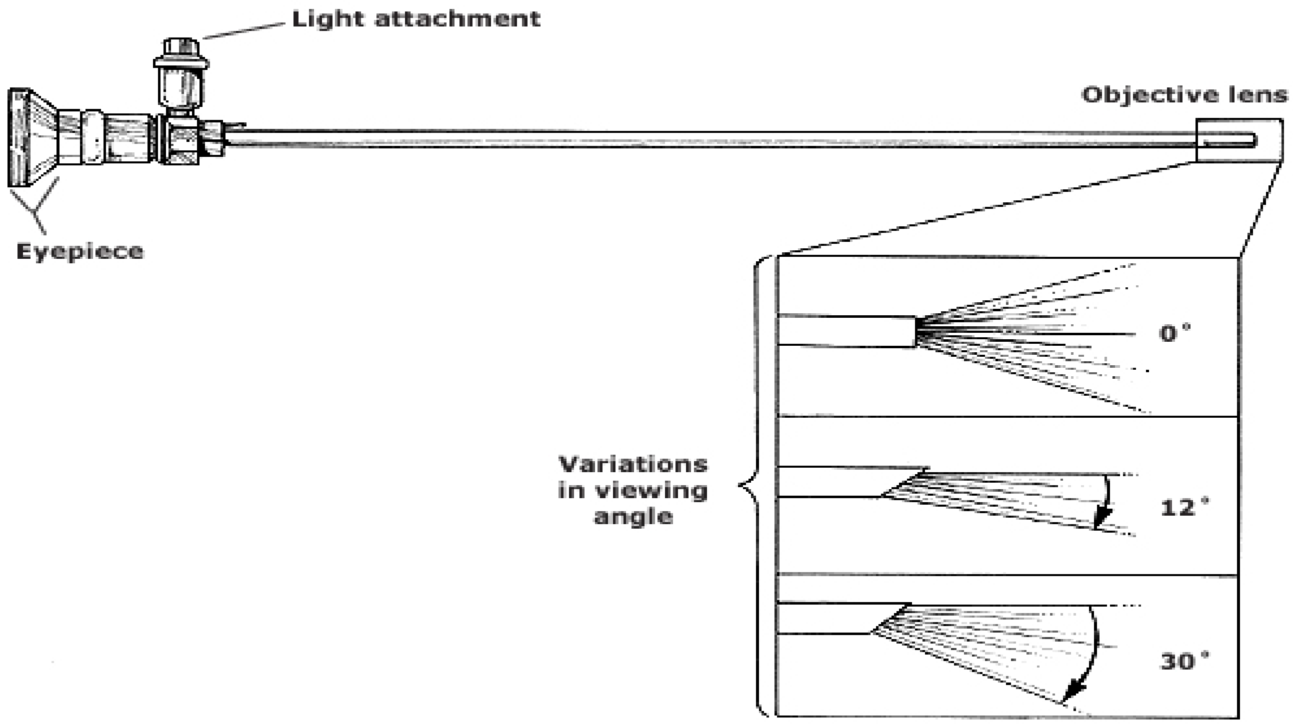


**Figure 2:** Hysteroscope with different viewing angles.

**Figure 3:** Resectoscope [10].

## 6. Electrocautery and laser:

The hysteroscope and resectoscope can be used with electrocautery devices such a button (or "mushroom") electrode, roller ball, and loop or needle electrode. For endometrial ablation, the roller ball and the loop electrode are both suitable. Furthermore, the needle may be used to remove tiny polyps and uterine septa, and the loop can be used to remove endometrial polyps and submucous myomas[2]. The application of the button electrode causes the arteries or endometrial lining to coagulate. Nowadays, bipolar electrodes are favoured since, when saline is used for cavity distension and irrigation, the intravasation risks are the same as with resectoscopy, but less dangerous [4]. There are no benefits to using lasers over electrocoagulation, such as argon, potassium-titanyl-phosphate, yttrium-aluminum-garnet, and neodymium. The usage of these lasers has all but vanished due to their increased cost and hazard. [6]. Neither lasers nor electrocautery equipment have seen any significant developments recently. When comparing bipolar electrodes to monopolar electrodes, the primary drawback is the increased amount of gas bubbles that form, which can obscure vision. Even though electrodes have advanced, the issue is still not entirely resolved [1].

## 7. Morcellation

After grabbing the free tissue components with forceps, or the loop-electrode in the case of the resectoscope, the sliced tissue must be evacuated from the uterine cavity by removing the hysteroscope. While removing tissue under visual control—as opposed to using a curette—is the most efficient method, it requires many stages that can be hard to do, tiring over time, and difficult to master [11]. These factors contribute to the long learning curve of operational hysteroscopy and the low number of gynaecologists performing this procedure. As a result, less dangerous and simpler to learn alternative procedures are required [9].Some of the previously mentioned problems might be resolved with the hysteroscopic morcellator [8]. A foot pedal is used to initiate and control the inner tube's rotation, which is propelled mechanically by an electrically powered control unit and spins within the outer tube in a certain direction. The morcellator is placed within a portable motor drive unit that is linked to the control unit. Each tube has a window aperture with cutting edges at the end. The tissue is drawn into the window aperture, sliced, and "shaved" as the inner tube rotates thanks to a vacuum source attached to it [3]. There is no lateral thermal or electrical energy distribution in the system, nor is electrocoagulation used. The myometrial contracts spontaneously to achieve hemostasis. The excised tissue is collected in a tissue-trap, released via the device, and made accessible for pathology investigation. There is a very small number of holes required because just one introduction is required [2]. A simple working channel with a continuous flow 8–9 mm rigid hysteroscope is used to insert the 4.0 mm morcellator into the uterine cavity. An obturator located in the hysteroscope's outer sheath is used to provide an atraumatic insertion following the dilation of the uterine cervix's internal opening. For irrigation and distension, saline solution is utilized [11]. The recent release of the reduced outer diameter TRUCLEARTM system, with a 5.0-mm hysteroscope and a 2.9-mm cutting blade for office or ambulatory usage with no or local anesthesia, represents a new advancement in hysteroscopic morcellation. In this method, retained pregnancy products, tiny myomas, and polyps can be eliminated. MyoSure®, a new morcellator system from Hologic (Bedford), was just released [4].

## 8. Distension and irrigation:

Through respiration, carbon dioxide ($CO_2$) is quickly taken and readily expelled from the body. In small-diameter scopes, the gas readily passes through tiny channels, making it suitable for optical-based diagnostic hysteroscopy. However, there is no way to remove blood from the scope using this procedure. To control flow and set a maximum intrauterine pressure limit while using $CO_2$, a hysteroscopic insufflators is necessary [1]. The symmetric distention of the uterus with fluid and its efficient capacity to push blood, mucus, bubbles, and minute tissue pieces out of the visual field give fluid the edge over gas. When using low viscosity fluids like saline for uterine distention, a pressure of 60–80 mm Hg is often sufficient [12]. Various delivery systems are designed to suit the media used for uterine distention and to accurately record volumes of inflow and outflow. This recording is important because fluid can leave the uterus by means of a fluid outflow channel, a mechanical morcellator, cervical or tubal leakage, or intravasation [6]. With a cuff, hanging, gravity-fed fluid delivery containers may be raised or compressed, although their accuracy in measuring intrauterine pressure might be uncertain. For liquid media, there are pumps available to measure volume and pressure. The hysteroscope's inner sheath allows the media to typically flow into the uterus. A perforated outer sheath is employed for media collection or extraction. The laminar flow produced by this design maintains the clarity of the visual field. Isotonic, conductive, low viscosity fluids like normal saline and lactated Ringer solution can be employed for mechanical and bipolar surgical operations as well as diagnostic hysteroscopy [2]. Mannitol (5%), sorbitol (3–5%), and glycine (1.5%) are hypotonic, non-conductive, low-viscosity fluids that should only be utilised in conjunction with monopolar surgical operations. While these are exceedingly unusual in office operations, significant quantities of low-viscosity, electrolyte-free fluid may be absorbed, leading to volume overload with water intoxication, pulmonary oedema, hyponatremia, hypo-osmolarity, and cerebral oedema [9]. When the plasma sodium concentration drops to 5 mmol/l, the first symptoms to appear are nausea and malaise, which is related to the intravasation of 500 ml of electrolyte-free fluids. If the plasma sodium concentration is between 10 and 15 mmol/l, this may be followed by headache, lethargy, and obtundation, and finally seizures, coma, and respiratory arrest. [11].

## 9. Conclusions

The emergence of more advanced fluid-management systems has led to significant improvements in patient safety as they measure input and output fluids more precisely and reliably. Additionally, most enhancements increase ergonomy, which makes systems less difficult for medical workers.

## References

[1] R. Tinelli, F.G. Tinelli, E. Cicinelli, A. Malvasi, A. Tinelli. (2008). The role of hysteroscopy with eye-directed biopsy in postmenopausal women with uterine bleeding and endometrial atrophy. Menopause. 15(4): 737-742.

[2] R. Campo, S. Gordts, H. Van Kerrebroeck, F. Santangelo, M. Chiara. (2021). Advanced Hysteroscopy. The EBCOG Postgraduate Textbook of Obstetrics & Gynaecology: Gynaecology. 2: 385.

[3] A. Mahmud, J. Clark, M. Connor, An introduction to hysteroscopy. In *Diagnostic and operative hysteroscopy*, 2020; pp 1-5.

[4] S. van Wessel, T. Hamerlynck, B. Schoot, S. Weyers. (2018). Hysteroscopy in the Netherlands and Flanders: a survey amongst practicing gynaecologists. European journal of obstetrics & gynecology and reproductive biology. 223: 85-92.

[5] O. Tsonis, F. Gkrozou, L. Lavasidis, M. Paschopoulos. (2023). The history of hysteroscopy as an endoscopic method. Ginekologia i Poloznictwo. 18(2): 1-6.

[6] M. Zimmer, M. Pomorski, P. Kamiński, J. Doniec, H. Huras, P. Sieroszewski, J. Sikora, R. Stojko, A. Ludwin, M. Radwan. (2019). Polish Society of Gynecologists and Obstetricians Guidelines for the application of hysteroscopy in gynecology. Ginekologia Polska. 90(8): 482-489.

[7] R. Manchanda, G. Valenti, A. Rathore, J. Carugno, P. Török, G. Riemma, M.C. De Angelis, G.A. Vilos, L.A. Pacheco, S.G. Vitale. (2022). Distension media delivery systems in hysteroscopy: past, present and future. Minimally Invasive Therapy & Allied Technologies. 31(1): 1-12.

[8] H. Dong, Y. Wang, M. Zhang, M. Sun, Y. Yue. (2021). Whether preoperative hysteroscopy increases the dissemination of endometrial cancer cells: a systematic review and meta-analysis. Journal of Obstetrics and Gynaecology Research. 47(9): 2969-2977.

[9] S. Krishnakumar, R. Krishnakumar, R. Kaveri, A. Joshi. (2021). Hysteroscopy in Postmenopausal Group. Hysteroscopy Simplified by Masters. 203-209.

[10] R. Manchanda, R. Sharma. (2021). How to Set up High-Tech Hysteroscopy Unit. Hysteroscopy Simplified by Masters. 27-37.

[11] S. Tandulwadkar, P. Deshmukh, P. Lodha, B. Agarwal. (2009). Hysteroscopy in postmenopausal bleeding. Journal of gynecological endoscopy and surgery. 1(2): 89.

[12] L. Zhang, M. Wang, Q. Zhang, W. Zhao, B. Yang, H. Shang, X. Shang, Y. Ma, B. Wang, L. Feng. (2019). Estrogen therapy before hysteroscopic adhesiolysis improves the fertility outcome in patients with intrauterine adhesions. Archives of Gynecology and Obstetrics. 300: 933-939.