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REVIEW ARTICLE

Updates in office hysteroscopy: a practical decalogue to perform a correct procedure

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Abstract
Nowadays, hysteroscopy is the gold standard for the diagnosis and treatment of intrauterine pathologies as it represents a safe and minimally invasive procedure that allows the visualization of the entire uterine cavity. Numerous technological innovations have occurred over the past few years, contributing to the development and widespread use of this technique. In particular, the new small-diameter hysteroscopes are equipped with an operating channel in which different mechanical instruments can be inserted, and they allow not only to examine the cervical canal and uterine cavity but also to perform biopsies or treat benign diseases in a relatively short time without anesthesia and in an outpatient setting. In this scenario, the operator must be able to perform hysteroscopy in the correct way to make this procedure increasingly safe and painless for the patient. This review aims to describe the ten steps to perform a correct office hysteroscopy, starting from patient counseling to the therapy after the procedure.

Keywords Office hysteroscopy · Intrauterine pathologies · See and treat · Outpatient · Minimally invasive surgery

Introduction

With the recent technological advancements, hysteroscopic surgery is evolving as an increasingly safe and less invasive procedure. Since 1990, a new philosophy has emerged in the field of hysteroscopy: the "office hysteroscopy", also called "outpatient hysteroscopy" [1]. The highest realization of the outpatient philosophy is represented by the "see and treat" hysteroscopy, which simplifies the distinction between diagnostic and operative procedures, introducing the concept of a single procedure in which the operative part is perfectly integrated with the diagnostic workup [2, 3]. In fact, applying this novel approach in the office setting, the operator has the opportunity to carry out not only diagnostic biopsies of the endometrium, but he is also able to "treat" what he "sees" during the examination; he can perform challenging endometrial polypectomies, myomectomies, remodeling of the uterine cavity, removal of mild or severe synechiae as well as resection of retained products of conception (RPOC) [4].

The technological innovation that has most contributed to the development of this technique is the production of small-diameter, continuous-flow hysteroscopes, provided with an operating channel that makes it possible to insert mechanical instruments [5, 6].

With new hysteroscopes, it is possible not only to examine the cervical canal and uterine cavity but also to perform biopsies or treat benign diseases in a relatively short time without any premedication or anesthesia [7].

This is because the sensory innervation of the uterus mainly regards the myometrium, while the endometrium and the fibrous tissue of septa and synechiae are almost insensitive [8].

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The mechanical operating tools as scissors and forceps have long represented the only way to realize the "office hysteroscopic surgery" philosophy, but the advent of bipolar technology, with the introduction of a series of electrodes with a size of only 5 Fr, has allowed increasing the number of diseases treated in outpatient settings, reserving the use of resectoscope and the operating room for a few selected cases [4].

This new surgical approach has made it possible to reduce surgical costs and reset the days of hospitalization. Moreover, the new and more manageable tools have reduced the learning curves of the operators [9, 10].

One of the main reasons that still prevent the diffusion of "office surgery" to a broad spectrum of patients is the conviction that a hysteroscopic procedure performed in an outpatient setting and, therefore, without anesthesia could be painful, thus preferring sometimes the traditional approach [11]. Nonetheless, several pharmacological treatments have been proven to be successful in lowering pain during and after the examination. The use of rectal indomethacin, ropivacaine or levobupicavaine diluted in the saline distension medium [12], before examination preparation of the cervix with vaginal misoprostol [13], the use of multimodal local anesthesia [14] as well as the use of premedication by means of diclofenac potassium or tramadol are all effective methods to reduce pain [15, 16]. Moreover, non-pharmacological strategies for pain relief during in-office hysteroscopy may represent a safe and new approach to avoid discomfort [17]: the use of warmed saline solution as distension medium [18], listening to light music during the examination [19], the administration of transcutaneous electrical nerve stimulation (TENS) showed reduced pain and discomfort perception during the hysteroscopic examination [20, 21].

Many efforts have been made over the years to make hysteroscopy increasingly efficient, safe, and less painful for patients [17]. In this article, we describe ten steps to perform a correct office hysteroscopic procedure.

Counseling with the patient before and during the examination

Each patient should be adequately informed and prepared about the procedure he is going to do, and it would be appropriate to dedicate adequate time to the initial interview to dispel any doubts and to answer the questions of the patients exhaustively. It is advisable to reassure the patient, but avoiding false information for the sole purpose of alleviating anxiety: it is necessary to explain that the procedure is simpler and faster when the patient is relaxed and cooperative, but it may cause, in some moments, menstrual-like discomfort or pain [17]. Pain during hysteroscopy is mainly due to the introduction of the hysteroscope through the cervical canal, especially at the level of the internal uterine orifice, to the contractile activity of the myometrium, caused by the distension of the uterine cavity induced by the distension medium and to the direct stimulation of the uterine walls when they come in contact with the tip of the hysteroscope or operating instruments [1]. It is also essential to explain that the disadvantage of enduring any slight pain or discomfort is counterbalanced by avoiding the use of general anesthesia and the operating room [22].

The patient should sign an informed consent with the explanation of the procedure and the associated risks, including the risk of abortion in case of an initial pregnancy [23].

Recent scientific shreds of evidence have shown that talking and reassuring the patient during the procedure (vocal–local anesthesia), the presence of a nurse next to the patient or providing her with a monitor to understand what is happening and allowing her to participate actively can help to bear the pain [17, 24, 25]. It is also essential to warn the patient that the procedure will be immediately interrupted at request.

Patient preparation

The patient is placed in a gynecological position, preferably on a table, allowing to eventually change the position and facilitate adjustment of the telescope's inclination during its passage through the cervical canal in the uterine cavity. As such, it is advisable to use thigh supports, and the patient's pelvis must stick out from the bed [1, 4]. The hysteroscope should be free to move in every dimension, and the position should allow wide external movement for minimum and regular internal movement with reduced discomfort. The gynecologist is positioned between the legs of the patient. Hysteroscopy should be scheduled in the early proliferative phase of the cycle, since it is possible to better identify possible pathologies with a thinner endometrium [1, 4, 10]. In the case of blood loss or when a thinning of the endometrium is desired, various pharmacological agents such as progestins, danazol, and GnRH agonists have proved to be effective [26]. The patient should also be asked to empty their bladder before the procedure to provide less discomfort.

The advantage of perioperative antibiotic prophylaxis and disinfection of the external genitals before hysteroscopy in the prevention of infectious complications is not demonstrated [27].

Many studies have been carried out to assess whether compounds such as vaginal prostaglandins, misoprostol or mifepristone are effective in cervical preparation before the hysteroscopic procedure, but results are conflicting. To date, cervical preparation before office hysteroscopy does not seem to bring benefits in terms of pain reduction, failure rate, and traumatic injuries [28, 29].

Work with the right tools

From the point of view of the necessary technological equipment, the five key elements for an optimal vision are the hysteroscope (with the optics inside), endocamera, monitor, light source, light cable. Hysteroscopes are subdivided into flexibles hystero-fiberscopes, which are rarely used because of their high cost, lack of durability and the impossibility to sterilize in an autoclave, and rigid rod lens optical system available with different viewing angles (0°, 12°, 30°, 70°) [10, 30]. The most commonly used hysteroscopes to perform outpatient diagnostic and operative procedures are:

- Bettocchi continuous-flow outpatient operating hysteroscope Measure 5 and Measure 4 (Karl Storz SE & Co.KG, Tuttlingen, Germany): The first consists of a 2.9 mm optic with a 30° hole-oblique vision. The single-flow operating sheath for irrigation is 4.3 mm in diameter and can be used as an inner sheath in combination with the 5 mm operating sheath for aspiration, inducing a continuous-flow system to wash the uterine cavity. It has a working channel of 5 French (approximately 1.6 mm) and an ideal oval profile for atraumatic insertion into the cervix. Its smaller version consists of a revolutionary 2 mm optic that reduces the total diameter of the hysteroscope to 4 mm [30, 31] (Fig. 1a).
- BETTOCCHI® Integrated Office Hysteroscope (B.I.O.H.®) (Karl Storz SE & Co.KG, Tuttlingen, Germany): It is fitted with a handle compatible for use with the Bettocchi system and includes an operating sheath, fiber optic light connector and connectors for irrigation and suction tubes [30, 31].

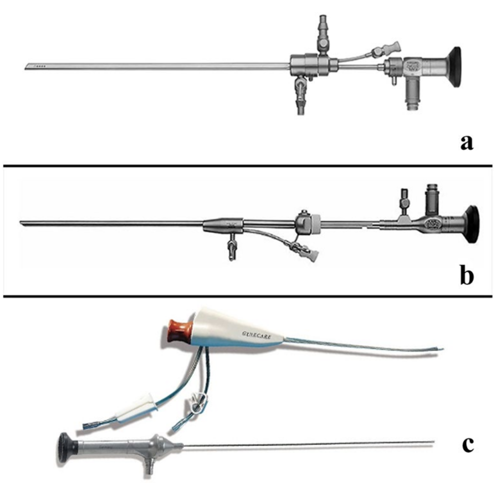

Fig. 1 **a** Bettocchi continuous-flow outpatient operating hysteroscope Measure 5 (Karl Storz SE & Co.KG, Tuttlingen, Germany). **b** TROPHYscope CAMPO Compact Hysteroscope® (Karl Storz SE & Co.KG, Tuttlingen, Germany). **c** GYNECARE VERSASCOPE™ Hysteroscopy System (Ethicon Inc., Johnson & Johnson, NJ, USA)

- The TROPHYscope CAMPO Compact Hysteroscope® (Karl Storz SE & Co.KG, Tuttlingen, Germany): It has a thin outer diameter of 2.9 mm and can be loaded either with a diagnostic sheath or a 4.4 mm operating sheath. The TROPHYscope® may be used without sheath for diagnostic hysteroscopy in single-flow mode. In case of necessity, the continuous-flow diagnostic sheath or a continuous-flow operating sheath can be used in conjunction with the compact hysteroscope [32] (Fig. 1b).
- GYNECARE VERSASCOPE™ Hysteroscopy System: It is a 3.2 mm semirigid mini-hysteroscope. It has a 1.9 mm fiber optic diameter with a 0° viewing angle (which becomes 10° once inserted into the sheath) and a single-use outer sheath with irrigation and suction channel to create a continuous-flow circuit. This sheath is equipped with an additional expandable plastic channel through which 7 Fr semirigid mechanical instruments can be inserted. The quality of vision of the Versascope system has recently been improved with the introduction of a new Alphascope mini-optic. However, being a fiber system, the image cannot compete in terms of quality with a hysteroscope based on a lens optics. Since the suction channel, and not the irrigation channel, constitutes the operating channel, it allows maintaining the same image quality during the entire procedure, even when the operating instruments are inserted [33] (Fig. 1c).

The critical element in choosing a valid hysteroscope lies in the presence of continuous flow through inflow and outflow channels and an operating channel. The presence of an operating channel in which it is possible to introduce 5–7 Fr mechanical instruments makes it easy to carry out diagnostics and operating procedures at the same time, according to the “See and Treat” principle, without retracting the instrument from the uterine cavity to change sheath [33].

Regarding the endocamera, the KARL STORZ Image1 S™ SPIES video system (STORZ Professional Image Enhancement System, Karl Storz SE & Co.KG, Tuttlingen, Germany) represents the most advanced modular imaging platform at the moment, ensuring exceptional image quality in high definition (full HD standard) together with the possibility to choose between a wide variety of innovative visualization systems (CLARA, CHROMA, SPECTRA A, SPECTRA B) which lead to a better perception of depth and allow an accurate study of vascularization [30].

Distension media and intrauterine pressure

Carbon dioxide (CO_2) and saline solution are the most commonly used distension media in outpatient hysteroscopy [34]. Although CO_2 is generally well tolerated and does not alter the intrauterine vision, recent evidence in literature seems to indicate that uterine distension with saline solution is preferable in outpatient hysteroscopy, especially during operating procedures. In addition to better tolerability and reduced costs, the use of the liquid distension medium offers the possibility of removing blood, clots and debris from the cavity during the procedure, as well as using bipolar instruments [35].

Regarding the pain associated with the use of a liquid distension medium concerning the gaseous one, there are no statistically significant data to recommend the use of one for the other [36]. However, the use of the saline solution is associated with a reduction of the duration of the procedure and eliminates the shoulder pain reported by the patient during and after the procedure as a consequence of the CO_2-induced irritation of the phrenic nerve [34, 35].

Regarding intrauterine pressure, hyperextension of the uterine cavity induced by elevated and uncontrolled pressure causes pain due to stimulation of myometrial reflex contractility and trans-tubal spillage of the distension medium. An average intrauterine pressure lower than the 70 mmHg present inside the tubes prevents, in fact, the passage of the distension medium within the peritoneal cavity, thus avoiding both the risk of vagal reaction and pain [37].

The saline solution can be delivered at atmospheric pressure (using two 3 or 5 L bags connected through a "Y" urological set and positioned 1 m and 50 cm above the patient) or by pressure generated by a bag squeezer. However, when a clear field of vision and a constant and optimal uterine distension is desired, the use of an electronically controlled irrigation and suction device is always recommended. Moreover, accurate control of intracavitary pressure and fluid balance is crucial since it allows to minimize the risk of intravasation syndrome [38].

Regarding the study of the uterine cavity, modulating the intracavitary pressure, using low pressures or emptying and replacing the fluid can help the operator to identify any protruding formations or irregularities [37].

Vaginoscopic approach: access to the uterine cavity and diagnostic phase

The vaginoscopic approach, proposed by Bettocchi in 1995, led to the elimination of the vaginal speculum and the clamp for the cervix [39].

Many retrospective and randomized studies have shown that the vaginoscopic approach is highly effective and faster than the traditional approach with a clear reduction of pain and discomfort [40]. Considering that the patients who undergo hysteroscopy are often very anxious, reducing the painful sensation during the first phase of the procedure, it will be easier to get better overall performance [41]. The vagina, being a virtual cavity, can be stretched from the liquid distension medium released by the hysteroscope at the same pressure of 30–40 mmHg used for distension of the uterine cavity. The modulation of the hysteroscope progression should be in agreement with the posterior anatomical orientation of the vaginal canal.

The identification of the cervix and the external uterine orifice is easier to gain by obtaining the landmark represented by the cervicovaginal reflection of the posterior vaginal fornix.

The endoscope will then be guided towards the external uterine orifice maintaining the vision of the cervical canal at 6 o'clock in the case of 30° optics and letting the distension medium make way for the hysteroscope. The widening of the transverse diameter at medium endocervical level induces the operator to rotate the hysteroscope in a counter-clockwise direction, bringing the end of the front lens (30°) at 4 o'clock and favoring the vision of the right cervical wall and the simultaneous comparison of the major diameter of the hysteroscope (with an oval shape) with the largest diameter of the cervical canal [42, 43]. Access to the cervical–isthmic junction occurs through a further minimal counter-clockwise rotation of the hysteroscope that brings the end of the front lens at 3 o'clock, maintaining the privileged vision of the right wall, adapting the atraumatic progression of the hysteroscope to the identified endocervical anatomy. In fact, with an oval profile hysteroscope, a 90° rotation of the instrument on the endocamera is sufficient to align its major axis with the major transverse axis of the internal uterine orifice that appears oval due to the curvature of the physiological version of the uterus (anteversion or retroversion). During the passage of the hysteroscope in the cervical canal, it is possible to find synechiae or stenoses that prevent passage in the uterine cavity [42, 44]. In these cases, it is an excellent rule to cut the synechiae and the stenosis of external and internal uterine orifices with the help of operating tools such as the 5 Fr scissors, instead of trying to break and overcome them with force to avoid pain and discomfort in the patient. After passing the internal uterine orifice, a few seconds wait will be sufficient to obtain the distension of the endometrial cavity. It is essential to let the distension medium wash the uterine cavity, and it is necessary to identify the tubal ostia. The 30° optic allows easy visualization of all the uterine walls by rotating the optic gently on its axis to the right and the left [42].

On the contrary, the same vision with a 0° optics is possible only by moving the entire instrument to the right or the left with lateral movements that can determine a greater stretching of the muscular fibers of the cervix and, therefore, discomfort to the patient.

Endometrial biopsies

One of the main advantages of outpatient hysteroscopy is the possibility to perform targeted biopsies under endoscopic vision on specific endometrial areas, while biopsies performed with curettes, Novak's cannula or aspiration cannulas, are blind biopsies and require the application of the speculum and cervical forceps causing pain and discomfort to the patient [45, 46]. The three-common endometrial targeted sampling techniques are described:

- Punch biopsy: It uses a hysteroscopic biopsy forceps with short jaws and sharp edges. The jaws of the forceps are closed on the biopsy target and retracted through the operative channel, keeping the hysteroscope in place. This modality, which is simple from the technical point of view, presents the limit of the volumetric smallness of the endometrial tissue usually obtained [47].
- Grasp biopsy: It uses a hysteroscopic forceps with greater length jaws. The forceps are positioned with open jaws at the level of the tissue and pushed in the context of the tissue for a variable length from 5 to 10 mm and subsequently closed. The forceps are not entirely retracted into the operative channel, and the recovery of the biopsy sample, maintained between the jaws of the forceps, occurs under vision through the simultaneous externalization of the hysteroscope and the forceps. This technique allows the removal of more significant tissue than punch biopsy, but its effectiveness may be limited, lacking the cutting action in the case of fibrotic tissues. The 7 Fr instruments have the notable advantage of a wider opening and an increased volume for collected tissue. Among 5 Fr instruments, the grasping forceps with teeth (even called "crocodile" forceps) are preferred as they can collect a larger amount of tissue thanks to the double length of the two jaws and the presence of small teeth on both sides of the jaws to keep hold of the material obtained [47, 48].
- Cutting biopsy: It uses a hysteroscopic scissor for the preparation of the endometrial flap representative of the target, followed by the externalization through forceps. It is probably the most efficient technique in terms of quality and volume of tissue taken, but it is invasive, it needs two instruments in sequence with prolonged times and can cause more bleeding [30, 49].

Another surgical forceps recently designed for biopsies is the Biopsy snake grasper sec. VITALE® (Centrel S.r.l., Ponte San Nicolò, Padua, Italy) [6], by a sleeve with an opening along the whole width and a flat tip with serrated edges, fixed to one end, with a U-shaped joint and two sharp-edged jaws that completely retract the tip when clenched (Fig. 2a, b).

Another possibility of endometrial biopsy, with the measure of endometrial height, is to move all hysteroscope against the uterine wall, making a groove and an endometrial cantle that will be withdrawn with grasping. In this case, all of the hysteroscope is withdrawn, with the tissue in contact with the optic, closing the distension medium inflow. When the endometrium is atrophic, and an atypical area needs to be biopsied, bipolar electrodes might be used [49].

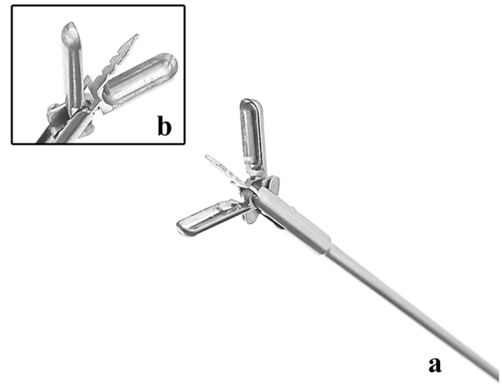

Fig. 2 **a** General view of the Biopsy snake grasper sec. VITALE® (Centrel S.r.l., Ponte San Nicolò, Padua, Italy). **b** Detailed view of the terminal end of the grasper

Outpatient operative hysteroscopy with cold mechanical instruments

The most commonly used mechanical instruments are represented by scissors and forceps [10]. Among these, the forceps with teeth, also called "crocodile forceps" is preferred to the spoon forceps, since it allows the removal of a higher quantity of tissue thanks to the double length of its jaws and to the presence of teeth on the internal surfaces, which retain the removed material. Recently, to remove polyp and myoma fragments in outpatient hysteroscopic surgery, a new range of specifically dedicated 5 Fr instruments have been developed, such as the forceps sec. Di Spiezio Sardo and the tenaculum forceps with protrusion sec. Hesseling/Di Spiezio Sardo [50]

Small endometrial and cervical polyps (< 0.5 cm) are preferably removed using 5 Fr or 7 Fr mechanical instruments such as sharp scissors or grasping forceps, primarily for cost reasons [1].

For endometrial polyps, the technique consists of grasping its base with open jaws, closing them and gently pushing toward the uterine fundus, while cervical polyps have to be treated with sharp scissors because of their fibrotic base [51].

Larger polyps (> 0.5 cm) can be removed intact by directly cutting the implantation base with scissors only if the internal uterine orifice is large enough to allow the extraction, and when necessary, they can be cut into multiple fragments by scissors and then detached from the base [52].

Furthermore, even the removal of small G0 myomas with the same technique described for polyps, the removal of IUD or foreign bodies and lysis of adhesions and small uterine septa can be carried out with mechanical instruments in favorable conditions [53].

Particularly useful in metroplastic procedures is the graduate intrauterine Palpator device that allows making more precise and accurate sections of the uterine septa [54]

Outpatient operative hysteroscopy with energy and advanced devices

In 1997, the introduction of a versatile electrosurgical bipolar system for hysteroscopy, the Versapoint (Gynecare, Ethicon, NJ, USA), represented a turning point in outpatient operative hysteroscopy [55]. There are three Versapoint 5 Fr electrodes available: the "Twizzle", specifically used for precise and controlled vaporization, the "Spring", used for the diffused vaporization of the tissue and the "Ball" electrode, used to coagulate the tissue [56]. In 2005, a new electrosurgical generator was introduced (Autocon II 400, Karl Storz SE & Co.KG, Tuttlingen, Germany), equipped with specific second-generation miniaturized electrodes (5 Fr), such as the straight electrode and the hook electrode.

Moreover, the advent of new technologies is further changing the approach of outpatient hysteroscopic surgery. The new bipolar 16 Fr mini-resectoscope (Karl Storz SE & Co.KG, Tuttlingen, Germany), due to its small diameter, offers the possibility to perform resection outside the operating room without anesthesia and with little or without cervical dilation [57].

The original Gubbini® Mini Hystero-Resectoscope (GUBBINI® system; Tontarra, Medizintechnik, Tuttlingen, Germany), which was initially introduced in 2010, offers a working diameter of 16 Fr. The GUBBINI line was extended over the years by three slightly modified hybrid instruments sets, applicable in both mono or bipolar surgical environment, offering a full range of accessories [58] (Fig. 3a, b).

Until 2005, the only possible approach for the removal of intrauterine pathologies was resectoscopy; nowadays, it is still considered as the most versatile technique for operative hysteroscopy. Almost all advanced hysteroscopic procedures can be carried out using a resectoscope, limiting the cost for additional equipment. However, in order to perform advanced resectoscopic procedures in-office setting with less distress for the patient, it is mandatory to have surgeons who are well-trained in resectoscopy. In 2005, an alternative surgical method was marketed: the intrauterine tissue retrieval system [3, 59].

This system is made of a unique cutting-aspiration technique that removes the tissue utilizing continuous irrigation with a normal saline distension media flow. For this reason, the resection of selected tissue is achieved mechanically, avoiding the use of bipolar energy and the risk of thermal and electric damage. However, compared to standard resectoscopy, it is not possible to coagulate bleeding vessels. Nowadays, all the advantages of intrauterine tissue retrieval systems are available in office settings thanks to the commercialization of the new in-office intrauterine morcellators.

The TruClear™ Elite Hysteroscope (Medtronic INC, Minneapolis, USA) hysteroscopic tissue removal uses this mechanical approach to remove intrauterine tissue [60]. For this reason, no damage risks are coming from thermal energy [59] (Fig. 4a, b).

The Integrated Bigatti Shaver (IBS®) (Karl Storz SE & Co.KG, Tuttlingen, Germany) with an optical system that features an outer diameter of 6 mm is inserted into the minimally dilated cervix. The shaver works with the UNIDRIVE S III (Karl Storz SE & Co.KG, Tuttlingen, Germany) motor unit. It is controlled by a footswitch, which simultaneously activates a robust 4 mm blade and a double roller pump suction, thus ensuring the removal of intrauterine diseases without HF energy and maintaining an optimal vision. It works in combination with HYSTEROMAT E.A.S.I ® (Karl Storz SE & Co.KG, Tuttlingen, Germany) which immediately

Fig. 3 **a** The Gubbini® Mini Hystero-Resectoscope (GUBBINI system; Tontarra, Medizintechnik, Tuttlingen, Germany). **b** Elliptic formed tip for an easier introduction into the cervical channel

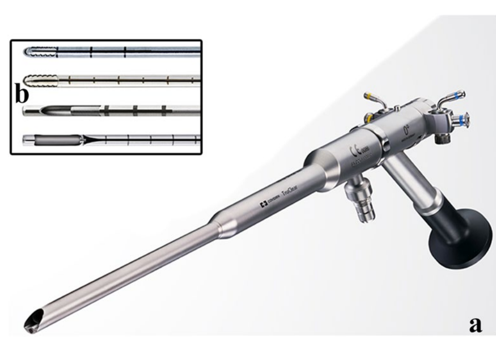

Fig. 4 **a** TruClear™ Elite Hysteroscope (Medtronic INC, Minneapolis, USA). **b** Focus on the available blades shapes (from top to bottom): TruClear™ soft tissue shaver mini, soft tissue shaver plus, dense tissue shaver mini, dense tissue shaver plus

removes the tissue and maintains the desired intrauterine pressure [61].

Thanks to these new technologies, it is possible to perform easy or difficult endometrial polypectomies in an outpatient setting. Larger polyps up to 2 cm can be easily removed just with a bipolar energy approach. Very large polyps are preferably treated with a shaving system [62, 63].

Depending on the internal uterine orifice size, slicing of the polyp is done with the 15 Fr office resectoscope or with the Twizzle by cutting the polyp from its free edge to its base into multiple fragments, large enough, to be pulled out of the uterine cavity using 5 Fr grasping forceps [64].

Nowadays, thanks to those new mechanical and bipolar devices, it is possible to perform challenging myomectomies in the office. To slice the myoma, either a shaver, a 15 Fr office resectoscope, or a bipolar needle like the Versapoint Twizzle electrode can be used with similar surgical outcomes [65].

Thanks to the new instruments, it is now also possible to remove placental residues, treat endometrial thickenings, and correct small isthmoceles with less pain or discomfort for the patient [10].

At the same time, acquired and congenital uterine cavity deformations (i.e., Asherman syndrome, dysmorphic uterus or septate uterus), are also accessible surgeries for an outpatient approach. Since Asherman syndrome is the most difficult to treat and related to more post-surgical complications, the use of small instruments such as microscissors, electrodes, together with real-time ultrasound evaluation is mandatory to achieve a regular morphology of the uterine cavity [66].

Moreover, when performing outpatient hysteroscopic metroplasty for septate uteri, the use of 3D ultrasonography provides objective measurements of the uterine septa [54]. Thus, combined to intraoperative objective data from graduate intrauterine palpator allows the achievement of complete removal of the uterine septum with just one outpatient surgical step.

The medical report

The medical report represents one of the most critical steps not only from a legal, medical point of view but also for the patient and other health professionals.

It should first include the description of the instruments used: hysteroscope, optics, distension medium, and any mechanical or energy tools. Subsequently, the technique used for the access to the cervical canal should be reported, plus the morphology of the cervical canal and the uterine cavity should be carefully described. It is an excellent rule to report the visualization of both the tubal ostia. Describe accurately any neoformations, their vascularization, and the technique used for their removal. Report whether biopsies or other materials have been sent for histological examination. Attach always high-quality pictures of the external uterine orifice, cervical canal, internal uterine orifice, uterine cavity, tubal ostia, and any intracavitary formation; otherwise, the operator could provide the patient a video of the procedure [30]

Counseling and therapy after the procedure

At the end of the exam, the patient should be invited to leave the operating room with caution, especially in case of protracted or painful procedures, as a vasovagal syndrome can occur at the time of postural change. It is important to carefully explain the procedure and warn the patient that she might have small bleedings, even for more than 7 days after the procedure. In the absence of contraindications, the administration of NSAIDs to the patient after the execution of the hysteroscopic procedure can reduce the pain associated with the procedure [67].

In the case of metrorrhagia or endometrial thickenings, the application of medicated IUD or the prescription of E/P or other progestin therapies can be evaluated [68].

The antibiotic therapy is not usually recommended, except in case of complications such as perforation, particularly invasive procedures or when a genital/pelvic infection is suspected [69].

Conclusions

Office hysteroscopy is an extremely exciting and rapidly advancing field of gynecologic practice, and there is a general consensus that it is the current gold standard for the evaluation of the uterine cavity and subsequent detection of intrauterine diseases. Today, thanks to the technological advancements and increased operator experience, conditions that have traditionally represented a unique challenge for gynecologists can be treated safely in the outpatient setting. Outpatient hysteroscopy practitioners should have the proper skills and expertise to perform hysteroscopy and this practical decalogue comes from the desire to help operators to perform a correct procedure.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Research involving human participants and/or animals This article does not contain any studies with human participants or animals performed by any of the authors.

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References

1. Campo R, Santangelo F, Gordts S, Di Cesare C, Van Kerrebroeck H, De Angelis MC, Di Spiezio Sardo A (2018) Outpatient hysteroscopy. Facts Views Vis Obgyn 10(3):115–122
2. Bettocchi S, Nappi L, Ceci O, Selvaggi L (2003) What does 'diagnostic hysteroscopy' mean today? The role of the new techniques. Curr Opin Obstet Gynecol 15(4):303–308. https://doi.org/10.1097/01.gco.0000084241.09900.c8
3. Vitale SG, Sapia F, Rapisarda AMC, Valenti G, Santangelo F, Rossetti D, Chiofalo B, Sarpietro G, La Rosa VL, Triolo O, Noventa M, Gizzo S, Laganà AS (2017) Hysteroscopic morcellation of submucous myomas: a systematic review. Biomed Res Int 2017:6848250. https://doi.org/10.1155/2017/6848250
4. Salazar CA, Isaacson KB (2018) Office operative hysteroscopy: an update. J Minim Invasive Gynecol 25(2):199–208. https://doi.org/10.1016/j.jmig.2017.08.009
5. Di Spiezio Sardo A, Sharma M, Taylor A, Buck L, Magos A (2004) A new device for "no touch" biopsy at "no touch" hysteroscopy: the H pipelle. Am J Obstet Gynecol 191(1):157–158. https://doi.org/10.1016/j.ajog.2003.11.026
6. Vitale SG (2019) The biopsy snake grasper sec. VITALE: a new tool for office hysteroscopy. J Minim Invasive Gynecol. https://doi.org/10.1016/j.jmig.2019.12.014
7. Centini G, Troia L, Lazzeri L, Petraglia F, Luisi S (2016) Modern operative hysteroscopy. Minerva Ginecol 68(2):126–132
8. Brauer MM (2017) Plasticity in uterine innervation: state of the art. Curr Protein Pept Sci 18(2):108–119. https://doi.org/10.2174/1389203717666160322145411
9. Vitale SG, Caruso S, Vitagliano A, Vilos G, Di Gregorio LM, Zizolfi B, Tesarik J, Cianci A (2019) The value of virtual reality simulators in hysteroscopy and training capacity: a systematic review. Minim Invasive Ther Allied Technol. https://doi.org/10.1080/13645706.2019.1625404
10. Connor M (2015) New technologies and innovations in hysteroscopy. Best Pract Res Clin Obstet Gynaecol 29(7):951–965. https://doi.org/10.1016/j.bpobgyn.2015.03.012
11. Paulo AAS, Solheiro MHR, Paulo COS, Afreixo VMA (2016) What proportion of women refers moderate to severe pain during office hysteroscopy with a mini-hysteroscope? A systematic review and meta-analysis. Arch Gynecol Obstet 293(1):37–46. https://doi.org/10.1007/s00404-015-3836-5
12. Senturk MB, Guraslan H, Babaoglu B, Yasar L, Polat M (2016) The effect of intrauterine lidocaine and rectal indomethacin on pain during office vaginoscopic hysteroscopy: randomized double-blind controlled study. Gynecol Obstet Invest 81(3):280–284. https://doi.org/10.1159/000441787
13. Fouda UM, Elsetohy KA, Elshaer HS, Hammad BEM, Shaban MM, Youssef MA, Hashem AT, Attia AH (2018) Misoprostol prior to diagnostic office hysteroscopy in the subgroup of patients with no risk factors for cervical stenosis: a randomized double blind placebo-controlled trial. Gynecol Obstet Invest 83(5):455–460. https://doi.org/10.1159/000480234
14. Keyhan S, Munro MG (2014) Office diagnostic and operative hysteroscopy using local anesthesia only: an analysis of patient reported pain and other procedural outcomes. J Minim Invasive Gynecol 21(5):791–798. https://doi.org/10.1016/j.jmig.2014.03.006
15. Abbas AM, Elzargha AM, Ahmed AGM, Mohamed II, Altraigey A, Abdelbadee AY (2019) Oral diclofenac potassium versus hyoscine-*N*-butyl bromide in reducing pain perception during office hysteroscopy: a randomized double-blind placebo-controlled trial. J Minim Invasive Gynecol 26(4):709–716. https://doi.org/10.1016/j.jmig.2018.08.001
16. Hassan A, Wahba A, Haggag H (2016) Tramadol versus Celecoxib for reducing pain associated with outpatient hysteroscopy: a randomized double-blind placebo-controlled trial. Hum Reprod 31(1):60–66. https://doi.org/10.1093/humrep/dev291
17. Amer-Cuenca JJ, Marín-Buck A, Vitale SG, La Rosa VL, Caruso S, Cianci A, Lisón JF (2019) Non-pharmacological pain control in outpatient hysteroscopies. Minim Invasive Ther Allied Technol. https://doi.org/10.1080/13645706.2019.1576054
18. Evangelista A, Oliveira MA, Crispi CP, Lamblet MF, Raymundo TS, Santos LC (2011) Diagnostic hysteroscopy using liquid distention medium: comparison of pain with warmed saline solution vs room-temperature saline solution. J Minim Invasive Gynecol 18(1):104–107. https://doi.org/10.1016/j.jmig.2010.09.009
19. Angioli R, De Cicco Nardone C, Plotti F, Cafa EV, Dugo N, Damiani P, Ricciardi R, Linciano F, Terranova C (2014) Use of music to reduce anxiety during office hysteroscopy: prospective randomized trial. J Minim Invasive Gynecol 21(3):454–459. https://doi.org/10.1016/j.jmig.2013.07.020
20. De Angelis C, Perrone G, Santoro G, Nofroni I, Zichella L (2003) Suppression of pelvic pain during hysteroscopy with a transcutaneous electrical nerve stimulation device. Fertil Steril 79(6):1422–1427. https://doi.org/10.1016/s0015-0282(03)00363-7
21. Lisón JF, Amer-Cuenca JJ, Piquer-Martí S, Benavent-Caballer V, Biviá-Roig G, Marín-Buck A (2017) Transcutaneous nerve stimulation for pain relief during office hysteroscopy: a randomized controlled trial. Obstet Gynecol 129(2):363–370. https://doi.org/10.1097/AOG.0000000000001842
22. Mairos J, Di Martino P (2016) Office hysteroscopy. An operative gold standard technique and an important contribution to patient safety. Gynecol Surg 13:111–114. https://doi.org/10.1007/s10397-015-0926-0
23. Propst AM, Liberman RF, Harlow BL, Ginsburg ES (2000) Complications of hysteroscopic surgery: predicting patients at risk. Obstet Gynecol 96(4):517–520. https://doi.org/10.1016/s0029-7844(00)00958-3
24. Keogh SC, Fry K, Mbugua E, Ayallo M, Quinn H, Otieno G, Ngo TD (2014) Vocal local versus pharmacological treatments for pain management in tubal ligation procedures in rural Kenya: a non-inferiority trial. BMC Womens Health 14:21. https://doi.org/10.1186/1472-6874-14-21
25. Ogden J, Heinrich M, Potter C, Kent A, Jones S (2009) The impact of viewing a hysteroscopy on a screen on the patient's experience: a randomised trial. BJOG 116(2):286–292; discussion 292–293. https://doi.org/10.1111/j.1471-0528.2008.02035.x
26. Laganà AS, Vitale SG, Muscia V, Rossetti P, Buscema M, Triolo O, Rapisarda AM, Giunta L, Palmara V, Granese R, Frangež HB, Romano A (2017) Endometrial preparation with Dienogest before hysteroscopic surgery: a systematic review. Arch Gynecol Obstet 295(3):661–667. https://doi.org/10.1007/s00404-016-4244-1
27. ACOG Committee on Practice Bulletins–Gynecology (2009) ACOG practice bulletin no. 104: antibiotic prophylaxis for gynecologic procedures. Obstet Gynecol 113(5):1180–1189. https://doi.org/10.1097/aog.0b013e3181a6d011
28. Nada AM, Elzayat AR, Awad MH, Metwally AA, Taher AM, Ogila AI, Askalany AN, Mohsen RA, Mostafa M, Abdelaal H (2016) Cervical priming by vaginal or oral misoprostol before operative hysteroscopy: a double-blind, randomized controlled trial. J Minim Invasive Gynecol 23(7):1107–1112. https://doi.org/10.1016/j.jmig.2016.08.002
29. Cooper NA, Smith P, Khan KS, Clark TJ (2011) Does cervical preparation before outpatient hysteroscopy reduce women's pain

experience? A systematic review. BJOG 118(11):1292–1301. https://doi.org/10.1111/j.1471-0528.2011.03046.x
30. Nappi C, Di Spiezio Sardo A (2014) State-of-the-art hysteroscopic approaches to pathologies of the genital tract. Endo-Press, Tuttlingen
31. Di Spiezio Sardo A, Bettocchi S, Spinelli M, Guida M, Nappi L, Angioni S, Sosa Fernandez LM, Nappi C (2010) Review of new office-based hysteroscopic procedures 2003–2009. J Minim Invasive Gynecol 17(4):436–448. https://doi.org/10.1016/j.jmig.2010.03.014
32. De Wilde RL (2014) Office hysteroscopy: trophyscope CAMPO compact hysteroscope ((R)): manufacturer: KARL STORZ, Tuttlingen, Germany. J Obstet Gynaecol India 64(4):301–303. https://doi.org/10.1007/s13224-014-0593-5
33. Di Spiezio Sardo A, Zizolfi B, Lodhi W, Bifulco G, Fernandez L, Spinelli M, Nappi C (2012) See and treat 'outpatient hysteroscopy with novel fibreoptic' alphascope. J Obstet Gynaecol 32(3):298–300. https://doi.org/10.3109/01443615.2011.645922
34. Craciunas L, Sajid MS, Howell R (2013) Carbon dioxide versus normal saline as distension medium for diagnostic hysteroscopy: a systematic review and meta-analysis of randomized controlled trials. Fertil Steril 100(6):1709–1714 e1701–1704. https://doi.org/10.1016/j.fertnstert.2013.07.2003
35. Umranikar S, Clark TJ, Saridogan E, Miligkos D, Arambage K, Torbe E, Campo R, Di Spiezio Sardo A, Tanos V, Grimbizis G, British Society for Gynaecological Endoscopy/European Society for Gynaecological Endoscopy Guideline Development Group for Management of Fluid Distension Media in Operative H (2016) BSGE/ESGE guideline on management of fluid distension media in operative hysteroscopy. Gynecol Surg 13(4):289–303. https://doi.org/10.1007/s10397-016-0983-z
36. Cooper NA, Smith P, Khan KS, Clark TJ (2011) A systematic review of the effect of the distension medium on pain during outpatient hysteroscopy. Fertil Steril 95(1):264–271. https://doi.org/10.1016/j.fertnstert.2010.04.080
37. Karaman E, Kolusari A, Cetin O, Cim N, Alkis I, Karaman Y, Guler S (2017) What should the optimal intrauterine pressure be during outpatient diagnostic hysteroscopy? A randomized comparative study. J Obstet Gynaecol Res 43(5):902–908. https://doi.org/10.1111/jog.13293
38. Shirk GJ, Gimpelson RJ (1994) Control of intrauterine fluid pressure during operative hysteroscopy. J Am Assoc Gynecol Laparosc 1(3):229–233. https://doi.org/10.1016/s1074-3804(05)81015-1
39. Bettocchi S, Selvaggi L (1997) A vaginoscopic approach to reduce the pain of office hysteroscopy. J Am Assoc Gynecol Laparosc 4(2):255–258. https://doi.org/10.1016/s1074-3804(97)80019-9
40. Guida M, Di Spiezio Sardo A, Acunzo G, Sparice S, Bramante S, Piccoli R, Bifulco G, Cirillo D, Pellicano M, Nappi C (2006) Vaginoscopic versus traditional office hysteroscopy: a randomized controlled study. Hum Reprod 21(12):3253–3257. https://doi.org/10.1093/humrep/del298
41. Kokanali MK, Cavkaytar S, Guzel AI, Topcu HO, Eroglu E, Aksakal O, Doganay M (2014) Impact of preprocedural anxiety levels on pain perception in patients undergoing office hysteroscopy. J Chin Med Assoc 77(9):477–481. https://doi.org/10.1016/j.jcma.2014.07.004
42. Bettocchi S, Bramante S, Bifulco G, Spinelli M, Ceci O, Fascilla FD, Di Spiezio Sardo A (2016) Challenging the cervix: strategies to overcome the anatomic impediments to hysteroscopy: analysis of 31,052 office hysteroscopies. Fertil Steril 105(5):e16–e17. https://doi.org/10.1016/j.fertnstert.2016.01.030
43. Bifulco G, Piccoli R, Lavitola G, Di Spiezio Sardo A, Spinelli M, Cavallaro A, Nappi C (2010) Endocervicoscopy: a new technique for the diagnostic work-up of cervical intraepithelial neoplasia allowing a tailored excisional therapy in young fertile women. Fertil Steril 94(7):2726–2731. https://doi.org/10.1016/j.fertnstert.2010.03.079
44. Cooper NA, Smith P, Khan KS, Clark TJ (2010) Vaginoscopic approach to outpatient hysteroscopy: a systematic review of the effect on pain. BJOG 117(5):532–539. https://doi.org/10.1111/j.1471-0528.2010.02503.x
45. Bettocchi S, Di Spiezio Sardo A, Guida M, Bifulco G, Borriello M, Nappi C (2007) Could office endometrial biopsy be accurate as EBHR for assessing the preoperative tumor grade? Eur J Surg Oncol 33(8):1047–1048. https://doi.org/10.1016/j.ejso.2007.01.019
46. Martinelli F, Ditto A, Bogani G, Signorelli M, Chiappa V, Lorusso D, Haeusler E, Raspagliesi F (2017) Accuracy of pre-operative hysteroscopic guided biopsy for predicting final pathology in uterine malignancies. J Cancer Res Clin Oncol 143(7):1275–1279. https://doi.org/10.1007/s00432-017-2371-0
47. Bettocchi S, Di Venere R, Pansini N, Pansini MV, Pellegrino A, Santamato S, Ceci O (2002) Endometrial biopsies using small-diameter hysteroscopes and 5F instruments: how can we obtain enough material for a correct histologic diagnosis? J Am Assoc Gynecol Laparosc 9(3):290–292
48. De Franciscis P, Riemma G, Schiattarella A, Cobellis L, Guadagno M, Vitale SG, Mosca L, Cianci A, Colacurci N (2019) Concordance between the hysteroscopic diagnosis of endometrial hyperplasia and histopathological examination. Diagnostics (Basel) 9(4):142. https://doi.org/10.3390/diagnostics9040142
49. Dakhly DM, Abdel Moety GA, Saber W, Gad Allah SH, Hashem AT, Abdel Salam LO (2016) Accuracy of hysteroscopic endomyometrial biopsy in diagnosis of adenomyosis. J Minim Invasive Gynecol 23(3):364–371. https://doi.org/10.1016/j.jmig.2015.11.004
50. Vilos GA, Abu-Rafea B (2005) New developments in ambulatory hysteroscopic surgery. Best Pract Res Clin Obstet Gynaecol 19(5):727–742. https://doi.org/10.1016/j.bpobgyn.2005.06.012
51. Stamatellos I, Stamatopoulos P, Bontis J (2007) The role of hysteroscopy in the current management of the cervical polyps. Arch Gynecol Obstet 276(4):299–303. https://doi.org/10.1007/s00404-007-0417-2
52. Litta P, Cosmi E, Saccardi C, Esposito C, Rui R, Ambrosini G (2008) Outpatient operative polypectomy using a 5 mm-hysteroscope without anaesthesia and/or analgesia: advantages and limits. Eur J Obstet Gynecol Reprod Biol 139(2):210–214. https://doi.org/10.1016/j.ejogrb.2007.11.008
53. Deans R, Abbott J (2010) Review of intrauterine adhesions. J Minim Invasive Gynecol 17(5):555–569. https://doi.org/10.1016/j.jmig.2010.04.016
54. Di Spiezio Sardo A, Zizolfi B, Bettocchi S, Exacoustos C, Nocera C, Nazzaro G, da Cunha Vieira M, Nappi C (2016) Accuracy of hysteroscopic metroplasty with the combination of presurgical 3-dimensional ultrasonography and a novel graduated intrauterine palpator: a randomized controlled trial. J Minim Invasive Gynecol 23(4):557–566. https://doi.org/10.1016/j.jmig.2016.01.020
55. Bettocchi S, Ceci O, Di Venere R, Pansini MV, Pellegrino A, Marello F, Nappi L (2002) Advanced operative office hysteroscopy without anaesthesia: analysis of 501 cases treated with a 5 Fr bipolar electrode. Hum Reprod 17(9):2435–2438. https://doi.org/10.1093/humrep/17.9.2435
56. Vilos GA (1999) Intrauterine surgery using a new coaxial bipolar electrode in normal saline solution (Versapoint): a pilot study. Fertil Steril 72(4):740–743. https://doi.org/10.1016/s0015-0282(99)00329-5
57. Papalampros P, Gambadauro P, Papadopoulos N, Polyzos D, Chapman L, Magos A (2009) The mini-resectoscope: a new instrument for office hysteroscopic surgery. Acta Obstet Gynecol Scand 88(2):227–230. https://doi.org/10.1080/00016340802516585

58. Casadio P, Gubbini G, Morra C, Franchini M, Paradisi R, Seracchioli R (2019) Channel-like 360 degrees isthmocele treatment with a 16F mini-resectoscope: a step-by-step technique. J Minim Invasive Gynecol 26(7):1229–1230. https://doi.org/10.1016/j.jmig.2019.04.024
59. Emanuel MH, Wamsteker K (2005) The intra uterine morcellator: a new hysteroscopic operating technique to remove intrauterine polyps and myomas. J Minim Invasive Gynecol 12(1):62–66. https://doi.org/10.1016/j.jmig.2004.12.011
60. Ceci O, Franchini M, Cannone R, Giarre G, Bettocchi S, Fascilla FD, Cicinelli E (2019) Office treatment of large endometrial polyps using truclear 5C: feasibility and acceptability. J Obstet Gynaecol Res 45(3):626–633. https://doi.org/10.1111/jog.13874
61. Bigatti G (2010) IBS® Integrated Bigatti Shaver, an alternative approach to operative hysteroscopy. Gynecol Surg 8(2):187–191. https://doi.org/10.1007/s10397-010-0634-8
62. Bigatti G, Franchetti S, Rosales M, Baglioni A, Bianchi S (2014) Hysteroscopic myomectomy with the IBS® integrated Bigatti Shaver versus conventional bipolar resectoscope: a retrospective comparative study. Gynecol Surg 11(1):9–18. https://doi.org/10.1007/s10397-013-0827-z
63. Rovira Pampalona J, Degollada Bastos M, Mancebo Moreno G, Ratia Garcia E, Buron Pust A, Mateu Prunonosa JC, Guerra Garcia A, Carreras Collado R, Bresco Torras P (2015) Outpatient hysteroscopic polypectomy: bipolar energy system (Versapoint(R)) versus mechanical energy system (TRUCLEAR System(R))—preliminary results. Gynecol Obstet Invest 80(1):3–9. https://doi.org/10.1159/000377700
64. Dealberti D, Riboni F, Cosma S, Pisani C, Montella F, Saitta S, Calagna G, Di Spiezio Sardo A (2016) Feasibility and acceptability of office-based polypectomy with a 16F mini-resectoscope: a multicenter clinical study. J Minim Invasive Gynecol 23(3):418–424. https://doi.org/10.1016/j.jmig.2015.12.016
65. Di Spiezio Sardo A, Mazzon I, Bramante S, Bettocchi S, Bifulco G, Guida M, Nappi C (2008) Hysteroscopic myomectomy: a comprehensive review of surgical techniques. Hum Reprod Update 14(2):101–119. https://doi.org/10.1093/humupd/dmm041
66. Khan Z, Goldberg JM (2018) Hysteroscopic management of Asherman's syndrome. J Minim Invasive Gynecol 25(2):218–228. https://doi.org/10.1016/j.jmig.2017.09.020
67. Allen RH, Micks E, Edelman A (2013) Pain relief for obstetric and gynecologic ambulatory procedures. Obstet Gynecol Clin N Am 40(4):625–645. https://doi.org/10.1016/j.ogc.2013.08.005
68. Gallos ID, Krishan P, Shehmar M, Ganesan R, Gupta JK (2013) LNG-IUS versus oral progestogen treatment for endometrial hyperplasia: a long-term comparative cohort study. Hum Reprod 28(11):2966–2971. https://doi.org/10.1093/humrep/det320
69. Agostini A, Cravello L, Shojai R, Ronda I, Roger V, Blanc B (2002) Postoperative infection and surgical hysteroscopy. Fertil Steril 77(4):766–768. https://doi.org/10.1016/s0015-0282(01)03252-6