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The one-stop clinics of hysteroscopic surgery

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Recent developments of bipolar electrosurgical technology and small-diameter scopes with working channels and continuous-flow systems, as well as a different, but less traumatic approach to the uterine cavity significantly changed the way intra-uterine pathology is diagnosed and treated. These changes rendered unnecessary anaesthesia and cervical dilatation improving patient tolerance and safety of hysteroscopic procedures now feasible in an office setting and contributed to the introduction of the concept of a single procedure in which the operative part is perfectly integrated in the diagnosis (« See-and-treat hysteroscopy » or « One-stop clinic hysteroscopy »). At present, an increasingly number of intra-uterine pathologies can be treated by office operative hysteroscopy, namely larger polyps and even submucous myomas up to 1,5-2 cm.

The authors reviewed the literature and discuss techniques and indications for office operative hysteroscopy.

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INTRODUCTION

Endoscopic techniques for diagnosis and treatment of several gynaecological pathologies have gained importance in recent years and are, at present, considered as the gold standard approach for the majority of benign diseases. Main advantages are the direct evaluation of body cavities in a potentially less invasive way and frequently the possibility of immediate treatment [1, 2]. The resolution of organ-specific difficulties and continuous technical developments has contributed to the acceptance of conventional hysteroscopic procedures as the gold standard for diagnosis and especially for the treatment of benign intra-uterine pathologies. Concerns with patient's tolerance to these procedures because of the size of the instruments, the use of speculum, and tenaculum to fix the cervix and the frequent need of cervical dilatation have limited wide acceptance of diagnostic hysteroscopy as a first-line diagnostic tool in an office setting [1] and for operative procedures, the resectoscope played a major role in the resolution of intra-uterine pathologies [3-6], forcing the hysteroscopist to use this large-diameter instrument and to dilate the cervical canal requiring general anaesthesia and the operating room, even in the presence of small lesions.

The availability of high-resolution mini-endoscopes [1], smaller surgical sheaths with surgical 5 Fr channels and continuous flow features with a total diameter of ~5 mm, as in the old generation of diagnostic scopes, and changes in the technique using the vaginoscopic approach and atraumatic insertion of the instruments [7], have led to the development of mini-hysteroscopy. This technique rendered the procedures less painful and better tolerated [8-10] and together with the widespread use of saline solution [11], the development of new surgical instruments, namely those using bipolar energy (Versapoint System) [12] have increased the feasibility and acceptability of the office diagnostic and operative hysteroscopy in a manner that the latter can be performed at the same time or right after diagnostic examination (« one-stop » or the « see-and-treat » approach) [13] without cervical dilatation and anaesthesia and analgesia.

This article reviews summarizes the most significant data from literature regarding office hysteroscopic procedures namely considering the one-stop approach.

HISTORY

Hysteroscopy meaning the use of an instrument to visualize the uterine cavity was first performed by Pantaleoni in 1869. However, it was necessary to wait more than 100 years before clinical importance of hysteroscopy became apparent, thanks to developments in optic systems, which made it possible to obtain satisfactory visualization of the uterine cavity [14]. Between the end of the 1970s and the beginning of the 1980s, due to technical improvements, a modern hysteroscopic approach was reported by various authors [15-19]. This technique, now considered a conventional approach, didn't suffer considerable changes for the next 10 years or more as no significant technologic improvements of hysteroscopes were reported throughout the 1980s and electronic devices, such as electronic pumps or endocameras, were not yet available at a reasonable price. In the 1970s, Lindeman started to use CO^2 for uterine distension but since the end of the 1980s, low viscosity and especially watery solutions were increasingly used. At the beginning of the 1990s, new scopes were introduced with a diameter ranging between 1.2 and 3 mm and operative sheaths with a diameter equal to or less than 5 mm (corresponding to the final diameter of the classic diagnostic hysteroscope) and 5 Fr channels allowing the physician a visual examination of the uterine cavity and if necessary the possibility to immediately perform operative procedures. Initially these procedures were mainly targeted biopsies but, after acquiring some experience in handling an operative hysteroscope equipped with miniaturized instruments, other procedures to treat benign intra-uterine pathologies, such as polyps and synechiae, were performed without analgesia or anaesthesia [1]. This approach has been defined as « see and treat » [13] or « one-stop hysteroscopy » making the distinction between diagnostic and operative procedure obsolete, because a single procedure is performed in which the operative part is perfectly integrated in the diagnostic work-up.

More recently, smaller scopes and continuous flow operative sheaths continue to be developed and a variety of 5F catheter mechanical instruments and especially 5F catheter bipolar electrodes are available.

TECHNIQUES AND INDICATIONS

Distension media

When performing operative hysteroscopic procedures, it is best if a non-viscous, physiologic solution is used, i.e. saline or Lactated Ringers as opposed to CO_2 gas. CO_2 can be used for diagnostic hysteroscopy but is difficult to use in the presence of blood or mucous and according to randomized studies saline is better tolerated than carbon dioxide and does not impair visual quality [11, 21-24].

Adequate distension pressure (50-70 mm HG) can be achieved in the office by the use of gravity or a pressure bag, however distension obtained using an electronic suction-irrigation pump that can maintain a constant intra-uterine pressure around 30 to 40 mm Hg is advisable, avoiding over distension of the muscle fibers and reducing patient discomfort [1].

Diagnostic hysteroscopy - Standard/conventional approach

In the standard access a diagnostic hysteroscope with a total diameter of 5 mm, consisting of a 4-mm rod lens system scope inserted in a simple sheath, necessary to guide the distension media into the uterine cavity, is used to approach to the cervix and the uterine cavity. A speculum is inserted in the vagina to visualize the portio and the external cervical os (ECO), whereas a tenaculum is used to facilitate the insertion of the diagnostic hysteroscope. This procedure was not well tolerated, in some series 35 % of women rated the pain as severe and 17 % experienced vasovagal syncope [25, 26]. To avoid pain related to the application of the tenaculum, traction on the cervix, and stimulation of the muscle fibers of the cervical canal, local anaesthesia (paracervical block) was frequently used [27-29], although the usefulness of these procedures remains controversial. Paracervical block seems not to reduce pain and may increase vasovagal syncope rate [27]. Results from studies regarding the use of lingocaine spray are discordant [30-32].

Technical changes, especially the reduction of scopes diameter, but also lack of use of tenaculum have reported to improve patient tolerance and efficacy in retrospective studies and in randomized prospective trials [2, 9-10].

Vaginoscopic approach

The vaginoscopic approach, first described by Bettocchi et al. [7], involves placement of a of 30° hysteroscope, usually a mini-hysteroscope into the vagina without using a speculum. The scope is guided into the posterior fornix of the vagina while the fluid creates vaginal distension, that is slowly withdrawn until the cervix is identified and finally is visually guided into the cervical canal without the use of a tenaculum and then progression is performed under direct visualization. This technique avoiding introduction of speculum and use of a tenaculum has permitted complete elimination of pain related to these procedures.

It is advisable to use a 30-degree lenses to ensure a correct examination of the uterine cavity with minimal instrument manipulation, since a view of the whole cavity and tubal ostiae can be gained simply by rotating the instrument on its axis, without need to make any other lateral movement of the scope, which could cause pain to the patient.

The comparison of both techniques in relation to patient tolerance, failure rate and diagnostic accuracy favour the vaginoscopic approach as reported by several retrospective and prospective non randomized [9, 33] and a recent randomized study [34]. Only one randomized study [35] reported no significant difference between the two procedures probably due to the insufficient statistical power of the study.

Targeted hysteroscopic biopsies (THB)

In the last 7 years, the availability of small-diameter scopes and smaller than 5-mm diameter sheaths with 5 Fr operative channel has allowed physicians to perform more frequently targeted hysteroscopic biopsies to confirm the visual diagnosis. After a thorough hysteroscopic examination of the uterine cavity, biopsies of endometrial diffuse lesions may be performed using sampling devices like Novak or Pipelle.

Data in the literature support that blind sampling of endometrium either by dilation and curettage [36-39], or using endometrial sampling devices, such as the Vabra, Pipelle or Novak [43] does not ensure adequate, representative sampling of the endometrial cavity for the detection of intra-uterine pathologies especially for endometrial focal lesions like endometrial polyps, focal endometrial hyperplasia and adenocarcinoma, that can easily be missed [38, 40-42]. THB have been reported to be more reliable when compared with blind procedures [36, 38-39, 41-43].

Originally, THB is performed with a biopsy forceps that bites deep into the endometrium and then is removed closed, through the operative channel while the hysteroscope remains inside the uterine cavity, the « punch » biopsy. During the extraction process, the small diameter of the operative channel shaves the protruding material away from around the tip of the forceps, so the final amount of tissue sent to the pathologist relates to the volume of the two jaws of the forceps and may be insufficient for diagnosis. Using this technique, it has been calculated that not less than 0,8 mm^2 of tissue must be obtained [44, 45].

To ensure that enough material is obtained, some modifications to the technique have been introduced by Bettocchi et al. [46] to perform a so-called « grasp » biopsy: the main difference is that the two jaws are closed and the whole hysteroscope is pulled out of the uterine cavity, without pulling the tip of the instrument back into the channel. In this way, the shaving process does not occur and the tissue surrounding tissue protruding outside the jaws can be retrieved.

Operative procedures: the see-and-treat philosophy

The availability of small-diameter scopes featuring working 5 Fr channels and continuous-flow systems, mechanical instruments and most recently the bipolar technology contributed to the reinforcement of the one-stop approach in an office setting, for a wide range of intra-uterine pathology with excellent patient satisfaction, reserving resectoscopy in the operating room, for rare and larger intra-uterine lesions. For the success and acceptance of this approach, correct indications and techniques have to be considered.

The feasibility, safety and tolerance of this approach have been successfully demonstrated by several works namely by Bethocci et al. [13, 48], that also contributed to define guidelines for indications and technical aspects.

Traditional mechanical surgery

In experienced hands, even these simple and delicate instruments enable one to perform many operative procedures in an office setting. Grasping forceps and scissors are excellent for treating adhesions and all anatomic impediments, and small endometrial polyps (~0,5 cm).

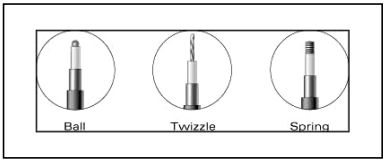
Advanced bipolar surgery

The Versapoint Bipolar Electrosurgical System (Gynecare, Ethicon, Somerville, New Jersey, USA) (Fig. 1), consists of a dedicated bipolar electrosurgical generator and three types of electrodes: the twizzle,

Fig. 1: The Versapoint System

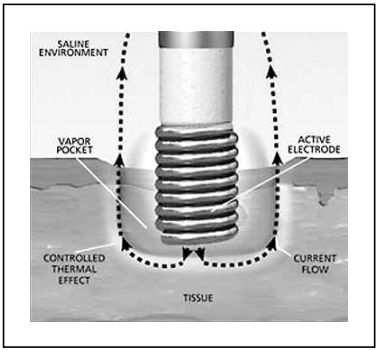
specifically for precise and controlled vaporization (resembling cutting), the spring, indicated for diffuse tissue vaporization and the ball, less used, for precise tissue vaporization and desiccation (Fig. 2). Each electrode consists of an active electrode located at the tip and a return electrode located on the shaft, separated by a ceramic insert (Fig. 3).

Fig. 2: Versapoint electrodes tips



Only tissue in contact with the active electrode in the electrical path circuit is desiccated or vaporized.

Fig. 3: Mechanism of action of Versapoint electrodes



The generator provides different modes of operation (waveform): the vapor/cut waveform, resembling a cut mode (the acronyms are VC1, VC2, VC3, where VC3 corresponds to the mildest energy flowing into the tissue); the blend waveform (BL1, BL2); and the desiccation waveform, resembling a coagulation mode (DES). The generator is connected to the 5F catheter electrode by a flexible cable. Once connected, the generator automatically adjusts to the default setting (VC1 and 100 W). After a test period, Bethochi et al. concluded that the default settings of the Versapoint bipolar electrical generator were incompatible with their techniques performed without any type of anaesthesia or analgesia, and decided to use the mildest vapor/cutting mode (VC3) and to reduce by half the power setting (50 W). For the same reasons, they chose the twizzle electrode over the spring, because in their experience the twizzle electrode is a more precise cutting instrument and with lower power settings, it can work closer to the myometrium with less discomfort and recommend the use of these settings for office procedures [13].

Polypectomy

Under direct visualization, the hysteroscope is advanced into the uterine cavity using an atraumatic approach. Once the hysteroscope is within the uterine cavity, a complete survey of the cavity should include visualization of both tubal ostium and a panoramic view from the cervix in order to precise, locate and characterize all pathology and determine the best approach.

Polyps with a narrow base up to approximately 0,5 cm (according to the internal cervical os-ICO diameter) should be removed using mechanical instruments [13]. The removal of larger polyps, namely those larger than ICO, using mechanical instruments is feasible however it's a difficult, time-consuming and poorly tolerated procedure [47, 48]. While it is tempting to grasp the base of the polyp with the grasping forceps, it is often more difficult to twist off at the base than anticipated and the base of the polyp should be cut with scissors and the polyp grasped with the grasping forceps, and then extracted by removing the polyp together with the entire hysteroscope system.

Larger polyps than 0,5 cm are generally removed using the Versapoint bipolar system. They are removed intact only if the ICO size is wide enough for their extraction. Otherwise, the polyp is sliced, from the free edge to the base, into two, three or more fragments in a way that they can be pulled out from the uterine cavity using 5F catheter grasping forceps with teeth. To remove the entire base of the polyp without going too deep into the myometrium, in some cases the

twizzle electrode was bent by 25 to 30 degrees, enough to obtain a kind of hook-electrode [13].

Several prospective studies report this procedure as a safe and effective alternative to resectoscopic polypectomy [13, 49-51]. Although there is no strict upper cut-off for polyp size, procedure limits in terms of patient compliance are, according to a prospective non randomized study [49], size of polyps and operating time; and the compliance seems to be worse for polyps larger than 2 cm and for operating time superior to 15 minutes. Menopausal status and previous vaginal deliveries don't appear to affect patient tolerance [49-51].

Cervical polyps deserve special mention. The procedure is relatively easy, painless and rapid but the recurrence rate is high as compared with the other procedures. The particular consistency of the tissue is to blame [48].

Hysteroscopic adhesiolysis

Anatomic impediments such as fibrotic processes involving the ECO and the ICO are more frequently found in menopausal women and represent generally an obstacle and a difficulty for hsyteroscopic procedures. The use of a small-diameter operative hysteroscope is a great advantage because it allows the physician to treat these lesions by cutting the « fibrotic ring » at two or three points (eg, at 3 and 9 hours) treating the problem before gaining a diagnostic view of the uterine cavity. The problem is to distinguish between fibrotic and muscular tissue to avoid causing pain [48].

Intra-uterine synechiae are generally treated using scissors, and cutting them in the middle. Due to the great risk of intra-uterine perforation with severe adhesions and the impossibility of performing laparoscopy, the procedure in an office setting should, in my opinion, be limited to the mechanical treatment of grade 1 adhesions (AFS classification 1988). Despite the advances in hysteroscopic surgery, the treatment of moderate to severe Asherman syndrome still presents a challenge and there are no strict guidelines for treatment [52, 54].

Some controversy has arise regarding the use of energy sources to cut intra-uterine adhesions as some authors state that this would increase the risk of adhesion reformation. However, there's no consensus and hysteroscopic lysis of adhesions with scissors, electrosurgery, or laser has been done to restore the size and shape of the endometrial cavity [53, 54]. Significantly obliterated cavities may require multiple procedures to achieve a satisfactory anatomical result. Postoperative mechanical distension of the endometrial cavity and hormonal treatment to facilitate endometrial re-growth appear to decrease the high

rate of adhesion reformation. Newer anti-adhesive barriers may also prevent the recurrence of intra-uterine adhesions [52]. As yet, studies have not confirmed which method of treatment is most likely to have a successful outcome, that is one where the uterus/cervix remain scar free and fertility is restored.

Uterine metroplasty

Cutting a uterine septum with blunt or sharp-tipped scissors is very similar to lysing intra-uterine adhesions and due to the nature and enervation of septal tissue, office procedures should be performed with scissors and probably applied only to limited-based small septa whose apex is easily visible. A thorough previous evaluation of the duplicated uterus is mandatory to differentiate septate from a bicornuate uterus. The presence of vascularized tissue, sensitive innervation, and the appearance of the tissue at the incision of a supposed septum during an office hysteroscopic procedure are additional criteria used to differentiate these two conditions [55].

The scissors are used to cut the septum midway between the anterior and posterior uterine walls. The septum is cut until the fundus is reached or there appears to be normal vasculature within the septal tissue. No follow-up hysteroscopy is needed in these patients, as it is rare to have scar tissue development in these patients.

Hysteroscopic myomectomy

The development of smaller diameter scopes with working channels and continuous flow systems together with the establishment of bipolar technology, have made possible the office hysteroscopic removal of small (1,5-2 cm) totally intracavitary fibroids (G0) as well as those with minimal intramural involvement (G1), thus avoiding both cervical dilation and any anaesthesia or analgesia [13, 56]. However, the rate of successful procedures in terms of patient compliance is worse than for polyp removal [13] and only few studies have investigated the effectiveness of this new approach [13, 56]. So although feasible, larger prospective studies are needed to better evaluate the tolerance, effectiveness and cost savings [57] and establish consistent indications for the procedure.

A similar technique to that described for polypectomy is applied to submucosal myomas up to 2 cm and partially intramural up to 1,5 cm with the difference that, because of their higher tissue density, they must first be divided into two half-spheres and then each of these be sliced as described previously. Particular attention has to be paid to the intramural part of the myoma, if present. To avoid any myometrial

stimulation or damage, it's advisable to first gently separate the myoma from the capsule using mechanical instruments (grasping forceps or scissors). Once the intramural section became submucosal, it's sliced with the Versapoint twizzle electrode [13].

An alternative approach could be to vaporize small myomata with a bipolar electrode (Versapoint - Gynecare Inc). This technique does not require fibroid chip removal and makes impossible pathological examination an important disadvantage.

Hysteroscopic sterilization

Since the FDA approval of Essure devices for permanent birth control, several authors reported their data demonstrating the feasibility and safety of the procedure in an office setting with a high patient satisfaction [58-63]. Using the vaginoscopic procedure, the entire procedure can be performed in approximately eight minutes and the patients can return to normal activity within 15 to 30 minutes. This method is now a valuable and efficacious alternative to laparoscopic tubal ligation especially for women with increased surgical risk.

CONCLUSION

Technical improvements, namely the development of smaller diameter hysteroscopes with working channels and continuous flow systems and changes in technique of uterine access with the « non-touch » approach, improved patient tolerance and promoted a wider acceptance from gynaecologists towards office hysteroscopic procedures. At present it's possible to treat intra-uterine pathologies in office setting without analgesia and or local anaesthesia.

This new philosophy (« see-and-treat hysteroscopy ») reduced the difference between a diagnostic and an operative procedure introducing the concept of a single procedure and integrated the operative aspect in the diagnostic work-up.

For long time mechanical instruments were the only way to apply the see-and-treat procedures in office setting and still remain the best choice for the treatment of anatomical abnormalities and small polyps. Recently a new tool, using the bipolar technology (the Versapoint System) was introduced and increased the number of pathologies treated by office operative hysteroscopy that now include large polyps and myomas < 1,5 cm [57]. This promising approach is a feasible and safe

alternative to the use of resectoscope. However, the lack of larger comparative prospective or randomized studies, and data suggesting a poorer patient compliance for treatment of myomas [13], and the importance of size of polyps and operating time as limits of patient procedure compliance [49], should urged us to perform larger studies that would help us to establish evidence-based guidelines for the procedure.

Keywords: office hysteroscopy, mini-hysteroscopy, operative procedures, patient acceptability, submucous myomas, uterine polyps, intra-uterine adhesions, uterine malformations, Versapoint electrode

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