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Review

An Overview of Outpatient Hysteroscopy

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Abstract

Objective: Hysteroscopic procedures are minimally invasive procedures that enable to assess the uterine cavity (diagnostic hysteroscopy) and to treat intrauterine lesions (operative hysteroscopy). In recent years have witnessed a steady increase in the number of procedures performed via minimally invasive surgery (MIS) including hysteroscopies. Most outpatient hysteroscopies are painless, without complications, and not only allow to diagnose but also treat several intrauterine pathologies. Vaginoscopy hysteroscopy without using speculum, tenaculum and other potentially painful instrumentation should become the default method for outpatient hysteroscopy. This 'no-touch' technique is faster in contrary to standard hysteroscopy and is associated with less pain. **Mechanism**: A wide range of feasible procedures, constantly improved endoscopic equipment and tools, improving the technical conditions of the procedure, as well as short hospitalization time and a quick recovery period, are just some of the benefits of hysteroscopic surgeries. **Findings in Brief**: Performing hysteroscopy in an outpatient setting without general anesthesia addictionally reduces treatment cost and avoid of possible complications of general anesthesia. **Conclusions**: Performing hysteroscopy in an outpatient setting without general anesthesia (with the patient's consciousness preserved during the surgery) reduces treatment cost and shortens the duration of hospitalization and convalescence, thus increasing patient satisfaction with care.

Keywords: outpatient hysteroscopy; office hysteroscopy; minimally invasive surgery; minihysteroscopy

1. Introduction

Hysteroscopic procedures are minimally invasive procedures that enable to assess the uterine cavity (diagnostic hysteroscopy) and to treat intrauterine lesions (operative hysteroscopy) [1]. Currently, considerable emphasis has been placed on the so-called minihysteroscopy (office hysteroscopy and outpatient hysteroscopy). Performing hysteroscopy in an outpatient setting without general anesthesia (with the patient's consciousness preserved during the surgery) reduces treatment cost and shortens the duration of hospitalization and convalescence, thus increasing patient satisfaction with care [2,3]. Avoidance of possible complications of general anesthesia, reduction of the patient's fear before surgery, and the possibility of using the operating room and "traditional" hysteroscopy for more clinically complex cases or in the case of contraindications to minihysteroscopy are some of the many advantages of this form of hysteroscopy.

The concept of minihysteroscopy is not new as it dates back to 1990 [4]. The motto of the practitioners of minihysteroscopy is see and treat, which means that during the examination, we can simultaneously detect the pathological abnormality within the uterine cavity and remove it promptly. Most hysteroscopies, not only diagnostic but also surgical, can be successfully performed without any anesthesia. This is because the innervation of the endometrium as well as that of pathologies such as adhesions or connective tissue septa is practically minimal. The innervation of the uterine wall is located deeper in the myometrial layer [5].

Another undeniable advantage of minihysteroscopy is that the dedicated instrumentation and the simplicity of the procedure that allow for a much faster learning curve for trainees [6].

1.1 Indications

Hysteroscopy is a minimally invasive endoscopic method used in gynecology diagnostics and conducting procedures in the uterine cavity (operative hysteroscopy). The most common indication for diagnostic hysteroscopy is abnormal uterine bleeding, infertility and recurrent pregnancy loss [7–9]. Common procedures include endometrial polypectomy [10], submucous fibroids removal [11], also endometrial ablation [12], removal of lost intrauterine devices [13]. Hysteroscopy afford to remove uterine adhesions [14]. In the context of infertility diagnostics, outpatient diagnostic hysteroscopy is a promising future tool for evaluation of tubal patency [15,16]. Hysteroscopic tubal patency assessment has the potential to be faster, more convenient and cost-effective than laparoscopic chromopertubation, which, to date, is the gold standard [17]. Hystero-

scopic tubal assessment can be observational (swirl test) but also interventional (air bubble infusion, selective Fallopian tubal cannulation, assessment shifts in the cul the sac volume after hysteroscopy [15,16]. Hysteroscopic evaluation of tubal patency seems to be highly accurate and sensitive for detecting fallopian tubal obstruction and a promising, clinically relevant field for future clinical research.

1.2 Surgical Instruments

Resectoscopes, rigid hysteroscopes (containing a working channel), and, less frequently, flexible hysteroscopes are used for diagnostic and operational minihysteroscopy. In particular, new small-diameter hysteroscopes equipped with a working channel into which various mechanical tools can be inserted not only allow to examine the cervical canal and uterine cavity but also enable to perform biopsy or treatment of benign diseases or scar loss after cesarean section [6,18]. Flexible hysteroscopes are much thinner than traditional ones (diameter of 3.2–3.5 mm), which facilitates passage through the internal junction of the cervix; however, their disadvantages include higher cost, lower durability, and lack of possibility to sterilize them in autoclaves [1]. An obvious advantage of miniaturization of hysteroscopic equipment is the reduction of pain, which enables to perform the procedure without anesthesia [19].

In the last few years, new hysteroscopic instruments have been developed that enable simultaneous resection and removal of resected lesions (HTRs: hysteroscopic tissue removal systems), which are commonly called as "shavers" [20]. They resemble rigid hysteroscopes and are equipped with a system of continuous fluid flow in the uterine cavity. They have the advantage of not requiring diathermy for lesion resection, which reduces the risk of thermal damage to the endometrium adjacent to the lesion. Long-term benefits of HTRs include reduced risk of intrauterine adhesions. HTRs are particularly useful in the removal of large submucous myomas; compared to the use of a conventional resectoscope and a hysteroscopic morcellator, procedures using HTRs have been shown to be shorter, with fewer removals and reinsertions required for the elimination of the resected fragments, which significantly improves patient comfort [21].

The disadvantage of "shavers" is the high cost of the instrument; the lack of diathermy can also be a potential disadvantage, for example, bleeding cannot be quickly stopped by coagulation of the vessels. It is also more difficult to remove type 2 myomas with a shaver than with a traditional resectoscope [22].

1.3 Cervical Preparation—Controversy

To date, no consensus has been established regarding the necessity or complete abandonment of cervical preparation before minihysteroscopy. Most researchers have not confirmed the positive effects of prostaglandins on pain reduction, reduction of procedure failure rates, or reduction of complications such as cervical injury [23,24]. Royal College of Obstetricians and Gynaecologists/British Society for Gynaecological Endoscopy (RCOG/BSGE) also not endorse routine cervical preparation due to the absence of any evidence of benefit in terms of reduction of pain, rates of failure or uterine trauma [25]. The decision to use prostaglandins for cervical dilation should consider the possible side effects of these drugs, such as lower abdominal pain, diarrhea, increased body temperature, or heavy bleeding from the genital tract [26]. One group of patients in whom prostaglandins may be beneficial are postmenopausal women with significant cervical canal stenosis [27]. However, the administration of 400 μg of misoprostol 12 h before the procedure should be preceded by estrogen supplementation (25 μg of estradiol administered vaginally for 2 weeks before the planned hysteroscopy). The administration of prostaglandins alone does not seem to be of much benefit [28].

Some alternative seems to be using laminaria tents in priming the cervix before hysteroscopy, because of fewer adverse effects compared to prostaglandins [29]. However, it requires admitting the patient to the hospital the day before the procedure to insert the tent, which is impossible in the case of outpatient hysteroscopy.

1.4 Pain Complaints

An analysis of over 30,000 outpatient hysteroscopies by Bettocchi *et al*. [30] showed that pain was the main reason for failure and for not continuing the procedure. It therefore seems to be important to develop effective strategies to eliminate pain. The first moment when patients may report discomfort is during the insertion of the vaginal speculum and cervical tenaculum forceps. Vaginoscopy, recommended by Bettocchi, allows exclusion of these potentially painful procedures [31]. Because of the use of hysteroscopes ranging in size from 5 to 9 mm, it is possible to perform the procedure without the use of a speculum and tenaculum forceps by inserting the hysteroscope directly into the uterine cavity through the vagina and cervix.

The pain experienced by patients during hysteroscopy is also related to the stage of forcing the internal cervical orifice; apart from mechanical dilatation, sudden stretching of the uterine cavity walls by the introduced medium is another factor that triggers pain [4]. Cervical preparation with prostaglandins has not been demonstrated to be effective in pain reduction [28]. On the contrary, randomized studies have demonstrated that the use of thinner hysteroscopes (sheath diameter below 4 mm) is associated with significantly lower pain sensations than that experienced following the use of larger diameter hysteroscopes with additional paracervical anesthesia [32].

Paracervical block with lidocaine may be helpful in reducing the pain associated with tenaculum forceps insertion and passage through the internal cervical orifice, but

some investigators have shown that the administration of anesthesia itself may be experienced as more painful than the procedure itself, especially for diagnostic hysteroscopy [33]. In contrast, the use of local anesthetics sprayed on the cervical surface and administered into the cervical canal (lidocaine and mepivacaine) is not effective in reducing pain [24].

Some studies have shown a significant reduction in pain associated with forcing the internal cervical orifice and uterine distension if the procedure was performed with the patient's bladder filled [34]. The role of passive stretching of the uterus from the outside through a filled bladder and how this approach can reduce pain sensation is extremely intriguing, especially since this procedure is devoid of side effects and cost; however, it requires further research. Similarly, the role of the application of body-warmed media into the uterine cavity is promising as demonstrated by Almeida and Evangelista [35,36], but further multicenter studies are needed to incorporate such guidelines into recommendations.

Regarding the pharmacological treatment of perioperative pain, 400–600 mg of ibuprofen or another nonsteroidal analgesic in an appropriate dose is recommended; the drug should be administered approximately 1 h before hysteroscopy, either orally or intravenously [37]. On the other hand, Muzii *et al*. [38] recommend the administration of 800 mg of ibuprofen 2 h before surgery. This significantly reduces pain during surgery but is not relevant for postoperative pain reduction. In the da Silva *et al*. [39] analysis, non-steroidal anti-inflammatory drugs, with oral administration were shown as the most effective in reducing pain in contrast to other routes. In this analysis was demonstrated that opioids given 40 to 60 minutes before hysteroscopy, reduce the pain during and after operation [39]. The administration of opioid analgesics is currently not recommended for outpatients hysteroscopy due to the possibility of several side effects [40]. The use of antianxiety drugs does not offer pain reduction [41]. On the contrary, studies on TENS (transcutaneous electrical nerve stimulation) have shown promising results, and this technique seems to be both effective and safe [42]. Nonpharmacological management, e.g., music, conversation, and support by the medical personnel during the procedure, can also significantly reduce anxiety and pain during hysteroscopy, which has also been demonstrated in other surgical procedures with the patient awake [43]. This reduces the need for pharmacological pain relief and increases patient satisfaction with the care received [44].

Postoperative complaints may also include pain radiating to the shoulders that results from irritation of the vagus nerve. Replacing carbon dioxide with a liquid medium and maintaining intrauterine pressure below 70 mmHg can decrease the risk of these complications [45].

1.5 Possible Complications

Complications of hysteroscopy are very rare. The two largest multicenter studies that included evaluation of 13,600 diagnostic hysteroscopies and 21,476 operative hysteroscopies showed that the overall rate of all complications was 0.28% and 0.22%, respectively [46]. Significantly more number of complications were associated with operative hysteroscopy (0.95% vs. 0.13%; $p < 0.01$).

The most common complications of minihysteroscopy include vasovagal reaction (0.21–1.85% of all operations), manifested by bradycardia, nausea, dizziness, and loss of consciousness [1]. The procedure of choice is to remove the hysteroscope, place the patient in the Trandelenburg position, and assess her vital signs. The symptoms usually disappear within a few minutes; persistent bradycardia is an indication for intramuscular administration of atropine up to the maximum dose of 3 mg [47].

The next most common complication is uterine perforation (0.12–1.61%). The risk factors for perforation are cervical stenosis, congenital uterine malformations, altered uterine shape such as in the case of myomas, and significant anterior or posterior uterine malformations. Most perforations occur during the release of intrauterine adhesions. The procedure depends on the extent of perforation, the site of uterine wall discontinuity, and the age of the patient. In patients of childbearing age, restoration of the uterine wall continuity with sutures is recommended because a history of perforation may cause uterine rupture during pregnancy [48]. In situations where a perforation is detected in the fundus region with a diagnostic hysteroscope or during probing of the uterine cavity, in an asymptomatic post-pubertal woman, a wait-and-see approach can be adopted. After 24-h observation, when abdominal bleeding is excluded, the patient can be discharged as not requiring surgical intervention. Injury to the anterior or posterior uterine wall requires exclusion of bladder and rectal injury; it may require cystoscopy and rectoscopy [1]. Lateral wall injury, however, may lead to injury to the branches of the uterine artery; this requires observation to check for the formation of hematoma in the broad ligament. Wall injury by diathermy usually requires exploratory laparoscopy. Active bleeding from vessels located in the uterine cavity requires intervention through placement of a Foley catheter into the uterine cavity, which should be maintained for up to 24 h [1].

One of the rarest and most serious complications is gas embolism, which is caused by the administration of carbon dioxide or, less commonly, a liquid medium containing gas bubbles (0.03–0.09%). Risk factors for this clinical situation include the maintenance of excessive high intrauterine pressure as well as repeated insertion and removal of the hysteroscope and surgical instruments into the uterine cavity. Hence, to avoid this complication, the CO_2 flow rate should not exceed 100 mL/min, and the pressure in the uterine cavity should not be above 100 mmHg [49].

Another risky complication is the so-called operative hysteroscopy intravascular absorption syndrome (OHIA), which occurs at the frequency of 0.2% of all hysteroscopies [50]. Significant volumes of fluid medium are absorbed due to pressure gradient (low pressure of fluid in the venous vessels and high pressure of fluid in the uterine cavity). It occurs significantly more frequently in cases of extensive and deeply penetrating lesions of the uterine myometrium (e.g., type 2 subserosal myomas) and in cases of endometrial electroresection (contact of the medium with open venous sinuses of the myometrium), when high intrauterine pressures are used that exceed the mean arterial pressure, and the risk of this complication increases proportionally to the duration of surgery.

Massive absorption of the hypotonic medium (glycine, mannitol, or sorbitol) leads to hyponatremia manifested by headache, nausea, vomiting, and weakness. When sodium levels fall below $<$120 mmol/L, decreased plasma osmolarity leads to cerebral edema, including the risk of brain herniation [49]. Massive absorption of the isotonic medium (0.9% sodium chloride solution or Ringer's fluid) does not cause electrolyte disturbances but may lead to hypervolemia with pulmonary edema and heart failure [49].

To avoid these complications, according to the international consensus, the fluid deficit (difference between the volume of fluid pumped into the uterus and the volume of fluid drained from the uterus) should not exceed 1000 mL using the hypotonic medium (glycine, mannitol, or sorbitol) and 2500 mL using the isotonic medium. The above values apply to healthy women of reproductive age [51]. For older women and women with heart disease or kidney disease, the fluid deficit should not exceed 750 and 1500 mL, respectively [51].

The above-mentioned complications are classified as early complications, while late complications include iatrogenic adhesions after hysteroscopy and pelvic inflammatory disease (PID). The formation of adhesions after hysteroscopy is a rare complication; most commonly adhesions are formed after the removal of multiple submucosal myomas. However, there is no evidence that any kind of adhesion prophylaxis is associated with a significant reduction in adhesion formation, and such management is not currently recommended [52].

Complications of pelvic organ inflammation are also a very rare complication of hysteroscopy ($<$1%), and the incidence of severe infections requiring treatment (PID or fallopian tube abscess) is extremely low (0.2%) [53]. Prophylactic antibiotic therapy after these procedures is not recommended. Perioperative antibiotic prophylaxis is also not required [54].

It is also not essential to routinely perform cervical cultures. However, visualization of the vaginal area by using a speculum and vaginal washing with a disinfectant solution for disinfection of the mucous membrane is recommended. Florio *et al*. [55] evaluated the occurrence of infection symptoms after hysteroscopy. Their study included 42,934 patients undergoing hysteroscopy, both diagnostic and operative, during which a liquid medium or carbon dioxide was used, and no antibiotic prophylaxis was administered either before or after the procedure. At 3 weeks after surgery, the occurrence of symptoms of infection such as fever, lower abdominal pain, and abnormal vaginal discharge were assessed. The patients were also clinically examined by performing pelvic ultrasound and by taking vaginal swabs. Only 25 women (0.06%) had an infection with fever, which was rarely associated with dysuria or lower abdominal pain.

2. Conclusions

Most outpatient hysteroscopies are painless, without complications, and not only allow to diagnose but also treat several intrauterine pathologies. Vaginoscopy hysteroscopy without using speculum, tenaculum and other potentially painful instrumentation should become the default method for outpatient hysteroscopy. This 'no-touch' technique is faster in contrary to standard hysteroscopy and is associated with less pain [56]. To improve the course of the operation and to reduce the risk of its failure and the occurrence of discomfort, the patient should be kept conscious to make her aware of the operation process. Contraindication for minihysteroscopy is the patient's considerable fear of the procedure and a history of unsuccessful procedure; such patients should be referred for traditional hysteroscopy with intravenous anesthesia and anesthetic protection. Moreover, women with cervical canal occlusion and multiple comorbidities that increase the risk of complications should be qualified for in-hospital hysteroscopy [49,57].

Abbreviations

HTRs, hysteroscopic tissue removal systems; OHIA, operative hysteroscopy intravascular absorption syndrome; MIS, minimally invasive surgery; PID, pelvic inflammatory disease; TENS, transcutaneous electrical nerve stimulation.

Author Contributions

NIK and KCW designed the research study. AN and KW analyzed the data, searched publications in PubMed. MW provided help and supervised the study. NIK, KCW wrote the manuscript. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript.

Ethics Approval and Consent to Participate

Not applicable.

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Conflict of Interest

The authors declare no conflict of interest. KCW and MW serving as one of the Guest Editors of this journal. We declare that KCW and MW had no involvement in the peer review of this article and has no access to information regarding its peer review. Full responsibility for the editorial process for this article was delegated to MHD.

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