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An Overview on Pain Associated with Hysteroscopy

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Abstract:

Outpatient hysteroscopy has become a cornerstone diagnostic and therapeutic procedure in modern gynecological practice due to its high accuracy, safety profile, and cost-effectiveness. Despite its advantages, pain remains the most significant limiting factor affecting patient tolerance, satisfaction, and procedural success. Pain during hysteroscopy arises from multiple sources, including cervical manipulation, uterine distension, endometrial instrumentation, and patient-related factors such as anxiety and cervical anatomy. Various strategies have been explored to minimize pain, ranging from procedural modifications—such as vaginoscopic technique, miniaturized instruments, and choice of distension medium—to pharmacological and non-pharmacological analgesic methods. These include systemic analgesics, antispasmodics, local anesthetic techniques, and adjunctive measures like transcutaneous electrical nerve stimulation. This review aims to provide a comprehensive overview of the mechanisms of pain during hysteroscopy and to critically evaluate current evidence-based approaches for pain management in outpatient settings, with the goal of improving patient comfort and procedural outcomes.

Keywords: Outpatient hysteroscopy; Pain management; Vaginoscopic approach; Local anesthesia; NSAIDs; Transcervical intrauterine lidocaine

Introduction:

Outpatient hysteroscopy is a safe and widely accepted procedure for both diagnostic and therapeutic purposes in ambulatory gynecological care. It is commonly indicated for abnormal uterine bleeding, suspected uterine pathology, and subfertility, offering superior accuracy compared to pelvic ultrasound in evaluating the endometrial cavity. Additionally, it has high diagnostic accuracy for endometrial cancer and does not worsen prognosis in early-stage cases. Conducting hysteroscopic procedures in an outpatient setting reduces the reliance on operative theaters, optimizing healthcare resources and minimizing risks associated with general anesthesia. Endometrial polyps, among the most frequently diagnosed uterine pathologies, can be successfully resected in over 80% of cases in an outpatient setting **(1).**

The "see-and-treat" approach facilitates early diagnosis and management of premalignant and malignant conditions, reducing the need for multiple hospital visits and preventing prolonged symptoms such as abnormal bleeding and anemia. However, patient selection is crucial, as factors like procedure duration, type of uterine pathology, cervical priming, surgical instruments, and operator expertise influence procedural success. Pain remains a key determinant of both patient satisfaction and procedure completion, often arising from genital tract instrumentation, uterine distension, and operative interventions. Anxiety can further amplify pain, which tends to be higher in operative hysteroscopy compared to diagnostic procedures. Studies indicate that patients undergoing hysteroscopic myomectomy and endometrial ablation report higher pain scores than those undergoing diagnostic hysteroscopy, highlighting the need for tailored pain management strategies to improve patient experience **(2).**

Etiology

The pain experienced is due to several factors including cervical instrumentation, uterine distension and peritoneal irritation from spill of dilatation media. Pain stimuli from the cervix and vagina are conducted by the pelvic splanchnic nerves whereas pain sensation from intraperitoneal structures, such as the uterine body, is conducted

by the hypogastric nerves. Destruction of the endometrium and endometrial biopsy can cause further pain as they may induce uterine contraction. Additional delayed pain is also caused by the release of prostaglandins from the cervical manipulation as well as distension of the uterus. Furthermore, blind cervical dilatation, cervical stenosis or tortuosity may increase chances of uterine lacerations **(3).**

Other factors that may impact on pain experienced include the type and size of hysteroscope used, choice of distension media and technique employed. It is recommended that miniature hysteroscopes (2.7 mm, with a 3 mm to 3.5 mm sheath) should be used for diagnostic outpatient hysteroscopy to reduce discomfort. Use of a vaginoscopic approach has also been advocated to reduce pain experienced. Systematic reviews have demonstrated varied results for difference in pain experienced based upon distension media used although fewer vasovagal episodes are reported with the use of saline when compared to carbon dioxide **(4).**

Factors affecting pain during hysteroscopy

One of the primary predictors of pain during hysteroscopy is cervical anatomy. Nulliparous women are more likely to experience severe pain compared to multiparous women, likely due to a narrower cervical canal. Similarly, cervical pathology, including stenosis or lesions, can increase pain levels by making the passage of the hysteroscope more difficult. The size of the hysteroscope also plays a role in patient comfort. Larger scopes tend to cause more pain, particularly in women with narrower cervical canals. The duration of the procedure is another influencing factor, with procedures lasting longer than two minutes being more frequently associated with severe pain **(5).**

In contrast, factors such as the menstrual cycle phase, menopausal status, and the presence of uterine pathology do not appear to have a significant impact on pain levels. While cervical pathology is linked to a higher risk of procedural failure, no direct correlation has been established between cervical pathology and intolerable pain requiring discontinuation **(6).**

Methods for pain management during hysteroscopy

I. Proper patient preparation and counseling for reducing anxiety levels

Pre-procedural anxiety is a significant factor influencing pain during hysteroscopy, with higher anxiety levels correlating with increased intraprocedural pain and a greater likelihood of requiring analgesics. Anxiety related to pain also predicts a preference for future procedures to be performed under general anesthesia. Additionally, prolonged procedure duration and longer pre- procedural waiting times are associated with increased pain and anxiety levels. Patients with a history of dysmenorrhea, adenomyosis, chronic pain conditions, or anxiety may be at higher risk of experiencing severe pain and should receive special consideration **(2).**

Several strategies can help reduce anxiety before and during hysteroscopy. Effective patient counseling, minimizing waiting and procedure times, and ensuring a comfortable examination environment can improve patient experience. Surgeon experience plays a crucial role in managing anxiety and optimizing procedural efficiency. The "vocal-local approach," where the clinician communicates with the patient throughout the procedure, has been shown to reduce pain. If the patient agrees, real-time explanations of the hysteroscopy findings, potentially displayed on a monitor, can provide reassurance and emotional support, ultimately lowering anxiety and pain levels **(3).**

II. Proper hysteroscopic application through:

a) Cervical preparation

Cervical stenosis presents in up to 30% of hysteroscopy cases and is a major cause of failed outpatient hysteroscopy. Cervical dilatation, often required in these cases, increases the risk of uterine perforation and can cause significant pain and discomfort due to the need for mechanical manipulation with dilators and tenacula. Cervical preparation has been shown to reduce procedure duration and the need for mechanical cervical dilatation **(7).**

Cervical preparation can be done through:

- Pharmacological cervical preparation methods e.g.) misoprostol, prostaglandins. However, there is insufficient evidence to support the routine use of misoprostol in outpatient hysteroscopy. While misoprostol is associated with mild side effects such as abdominal pain, fever, and vaginal bleeding,. A 2015 Cochrane Database Systematic

Review concluded that misoprostol is more effective in reducing the need for cervical dilatation and intraoperative complications compared to dinoprostone and osmotic dilators, particularly in cases where mechanical cervical dilatation is anticipated **(7).**

- Osmotic dilators are another effective method for cervical preparation, but they require a separate visit for insertion, which may be inconvenient for patients **(8).**

b) Uterine distension medium

The pressure of the uterine distension medium directly correlates with the level of pain experienced during hysteroscopy, but a balance must be maintained between minimizing discomfort and ensuring adequate visualization of the uterine cavity. Lower intrauterine pressure has been associated with reduced intra-procedural and post-procedural pain. A 2021 systematic review found that normal saline significantly decreases post-procedural pain compared to carbon dioxide, though it does not have a significant impact on intra-procedural pain. Additionally, the Cochrane Database Systematic Review in 2021 concluded that normal saline is associated with fewer adverse events, such as shoulder-tip pain and vasovagal reactions, making it a preferable choice for uterine distension. Furthermore, vaginoscopy is more easily performed using a fluid distension medium rather than carbon dioxide **(9).**

Although warming saline before use is a common practice in outpatient hysteroscopy, current evidence does not strongly support its effectiveness in pain reduction. Most studies comparing warm saline to room-temperature saline have shown no significant difference in pain levels. However, warm saline may still be preferred in clinical practice due to its potential to enhance patient comfort **(9).**

c) Vaginoscopic approach in outpatient hysteroscopy

The vaginoscopic approach is the recommended standard for outpatient hysteroscopy by the Royal College of Obstetricians and Gynaecologists (RCOG), the American College of Obstetricians and Gynecologists (ACOG), and the American Association of Gynecologic Laparoscopists (AAGL). This technique is associated with less pain, reduced incidence of vasovagal reactions, shorter procedural time and Comparable efficacy to traditional approaches **(10).**

The vaginoscopic approach provides greater flexibility for procedures, particularly in cases where the uterus is acutely anteverted or retroverted **(10).**

d) Miniaturized instruments in hysteroscopy

The use of miniaturized instruments in hysteroscopy offers several advantages, including enhanced feasibility of vaginoscopy, reduced pain due to smaller instrument diameter and simultaneous tissue removal and retrieval, reducing reinsertion of instruments **(11).**

III. **Transcutaneous electrical nerve stimulation (TENS)**

Transcutaneous electrical nerve stimulation (TENS) is widely used for managing both acute and chronic pain. It is non-invasive, safe, easy to use, and generally well-tolerated. TENS has demonstrated effectiveness in various settings, including labor pain management and symptomatic relief of primary dysmenorrhea. A randomized, double-blinded, placebo-controlled trial involving 380 women in 2017 showed that TENS significantly reduces pain and increases patient satisfaction during hysteroscopy **(12).**

IV. Medications

a) Systemic analgesia:

Systemic analgesia plays a crucial role in pain management for outpatient hysteroscopy. The joint guideline by the Royal College of Obstetricians and Gynecologists (RCOG) and the British Society for Gynecological Endoscopy (BSGE) recommends administering non-steroidal anti-inflammatory drugs (NSAIDs) approximately one hour before the procedure. A systematic review and a meta-analysis demonstrated that pre-procedural administration of NSAIDs, in combination with TENS, significantly reduces pain during outpatient hysteroscopy without increasing adverse events. selecting the appropriate analgesic approach should be individualized, considering both

efficacy and patient tolerance **(13).**

- ✓ **Diclofenac:**

Diclofenac is an FDA-approved drug used in the treatment and management of acute and chronic pain associated with inflammatory conditions, especially those involving the musculoskeletal system. Diclofenac was synthesized in 1973 and is the most widely prescribed NSAID worldwide **(14).**

- **Mechanism of action**

Diclofenac is an NSAID belonging to the family of phenylacetic acids and acts to decrease inflammation as other class drugs do. It also has analgesic properties and antipyretic effects that are shared by other NSAIDs. Diclofenac employs its action by inhibiting the activity of cyclooxygenase-1 (COX-1) and cyclooxygenase-2 (COX-2) by inhibiting the synthesis of prostanoids such as prostaglandin-E2 (PGE2), prostacyclins, and thromboxanes, which are essential components of the inflammatory and nociceptive response **(15).**

Diclofenac's peripheral analgesic effects are attributable to its activity in decreasing the availability of sensitized peripheral pain receptors via down-regulation, which appears to be accomplished by stimulating the L-arginine nitric oxide cGMP pathway via activation of ATP- sensitive potassium channels. **(16).**

- **Administration**

Diclofenac preparations pair the drug with a salt such as sodium, potassium, or epolamine salt. Diclofenac sodium can be administered orally as a tablet or suspension, intramuscular in solution, intravenous in solution, transdermal in gel, or rectal routes as a suppository. Diclofenac potassium is available for oral a administration in oral tablet or suspension forms. Diclofenac epolamine is available as a transdermal patch **(17).**

- **Adverse effects**

Diclofenac, like other NSAIDs, carries a range of adverse effects due to its COX enzyme inhibition e.g.) myocardial infarction, stroke, and heart failure, particularly in patients with pre- existing cardiovascular conditions and with higher dose. On the gastrointestinal side, although diclofenac is less likely to cause severe complications compared to non-selective NSAIDs, long- term use may still result in GI injury such as ulcers, erosion, and bleeding due to decreased production of protective prostaglandins **(18).** Renally, diclofenac can impair kidney function by reducing prostaglandin synthesis, which can decrease renal perfusion and increase the risk of acute kidney injury, especially in patients with pre-existing kidney issues. Hepatically, while rare, long-term use can lead to liver damage and increased transaminase levels, with the potential for more serious conditions like hepatitis. Anaphylactic reactions, though uncommon, can occur, especially in individuals with a history of sensitivity to NSAIDs, presenting with symptoms like urticaria, bronchospasm, and hypotension. Additionally, NSAIDs may increase bleeding risks by inhibiting platelet aggregation, and in rare cases, can cause hematologic issues like neutropenia or aplastic anemia. Topical application of diclofenac may also cause mild to moderate skin irritation **(19).**

b) Hyoscine-N-Butyl Bromide:

Hyoscine-N-butyl bromide (HBB), is widely used as an antispasmodic agent. Its primary therapeutic action involves blocking the muscarinic receptors in smooth muscles, especially within the gastrointestinal, biliary, and urogenital systems, making it effective in treating conditions related to smooth muscle spasm **(20).**

- **Adverse effects**

Hyoscine-N-butyl bromide is generally well tolerated, but, like all medications, it has potential side effects. Most adverse effects are related to its peripheral anticholinergic properties, including dry mouth, blurred vision, urinary retention, and constipation. Due to its limited ability to cross the blood-brain barrier, central nervous system side effects like sedation and confusion are uncommon. However, patients with a history of glaucoma, myasthenia gravis, or urinary retention should use HBB with caution. In gynecological and obstetric settings, some side effects may include minor irritation at the injection or rectal administration site. Rarely, an allergic reaction may occur,

presenting as urticaria, rash, or in severe cases, anaphylaxis. These reactions are generally dose-dependent **(21).**

c) Local analgesia in outpatient hysteroscopy Routes of administration

Local anesthesia for outpatient hysteroscopy can be administered through several routes:

1. **Topical anesthesia:**

Topical anesthesia, such as lidocaine/prilocaine cream, has been used to reduce pain during endometrial biopsy and intrauterine device insertion. It is easy to use, has a low risk of serious side effects, and can be self-administered. Lidocaine spray has been reported to reduce pain related to tenaculum use. However, its effectiveness in hysteroscopy remains unclear, as topical anesthesia requires time to take effect and wears off quickly **(22).**

2. **Intracervical and paracervical anesthesia:**

Intracervical injection of local anesthesia at the 12 o'clock position provides pain relief, while paracervical anesthesia—administered at the cervicovaginal junction at the 3, 5, 7, and 9 o'clock positions—is effective for cervical procedures and hysteroscopy. It is recommended to wait approximately 7 minutes after administration before beginning the procedure to allow the anesthetic to take full effect. However, the injection itself can cause pain and requires proper timing **(23).**

3. **Intrauterine fundal anesthesia:**

This method is used in procedures such as outpatient endometrial ablation and manual vacuum aspiration. Anesthesia is injected under direct hysteroscopic visualization into the myometrium near each tubal ostium. The rationale is based on the differing nerve innervation of the uterus: the uterine fundus is primarily supplied by T10–L1, while the lower uterus and cervix are innervated by S2–S4. Paracervical anesthesia alone may not provide sufficient pain relief for procedures involving the uterine fundus. Intrauterine fundal anesthesia is considered safe and non-inferior to paracervical anesthesia alone, though more research is needed to establish its efficacy as a sole method **(24).**

4. **Transcervical intrauterine lidocaine instillation:**

Lidocaine, a tertiary amine anesthetic derived from xylidine, is commonly used for local anesthesia and is often combined with epinephrine to extend its duration by counteracting its vasodilatory effects **(25)**.

Transcervical intrauterine lidocaine instillation has emerged as a promising method for analgesia during diagnostic hysteroscopy **(26).**

- **Mechanism of action**

Lidocaine is a local anesthetic that works by inhibiting sodium influx into nerve cells, thereby blocking the transmission of pain signals. When lidocaine is instilled directly into the uterine cavity via the transcervical route, it targets the sensory nerve fibers responsible for transmitting pain from the uterine lining, helping to reduce pain during the procedure **(27).**

- **Efficacy of transcervical intrauterine lidocaine**

Transcervical intrauterine lidocaine instillation is generally considered effective in reducing pain during diagnostic hysteroscopy. It is particularly helpful in alleviating pain during the most painful phases of the procedure, such as **hysteroscope insertion** and **uterine distension**. The instillation of lidocaine into the uterine cavity provides targeted pain relief, helping to make the procedure more comfortable for the patient. This method has also been shown to help reduce **vasovagal reactions**, such as dizziness, nausea, and fainting, which are often triggered by pain or anxiety during the procedure. By managing pain more effectively, lidocaine may help prevent or mitigate these distressing side effects **(28).**

- **Advantages of transcervical intrauterine lidocaine instillation**

1. **Ease of use**: The procedure is simple to perform, requires minimal preparation, and offers a rapid onset of action, making it ideal for outpatient settings.

2. **Cost-effective**: Lidocaine is affordable, widely available, and easy to administer, which makes it an economical choice for pain management during outpatient hysteroscopy.
3. **Minimal side effects**: Intrauterine lidocaine instillation is generally well-tolerated with very few side effects. The most common side effect is a mild, brief **burning sensation** upon administration, but serious adverse reactions are rare.
4. **Improved patient comfort**: In addition to pain relief, the use of transcervical lidocaine significantly improves overall patient comfort, resulting in higher satisfaction with the procedure **(29).**

- **Limitations of transcervical intrauterine lidocaine instillation**

Despite its benefits, there are some limitations to the use of intrauterine lidocaine for pain management in hysteroscopy **(30):**

- **Cervical pain**: While intrauterine lidocaine is effective for uterine pain, it may not adequately address pain associated with **cervical manipulation**, such as tenaculum placement or the insertion of the hysteroscope. Additional analgesic methods may be needed to alleviate cervical discomfort.
- **Variable effectiveness**: The effectiveness of intrauterine lidocaine can vary based on factors such as **uterine size** and **position**, the **complexity of the procedure**, and individual patient differences. For more complex procedures, additional pain management strategies may be required.

- **Adverse effects and safety**

Serious adverse effects of local anesthesia in hysteroscopy are uncommon. However, vasovagal reactions such as nausea, vomiting, dizziness, sweating, bradycardia, and hypotension can occur. The risk of adverse events can be minimized by using standardized administration techniques and appropriate dosages **(31).**

V. Multimodal Analgesia

Multimodal analgesia, a common approach in perioperative pain management, is also used in hysteroscopy, though evidence on its effectiveness is limited. One study evaluating a multimodal approach—including lidocaine gel on the speculum, intracervical and paracervical blocks, and lidocaine gel applied to the cervical canal—found that pain from anesthesia administration was not significantly higher than pain from the procedure itself **(32).**

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