Volume 71, Number 2
OBSTETRICAL AND GYNECOLOGICAL SURVEY

CME REVIEW ARTICLE 4

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Pain Management for Gynecologic Procedures in the Office

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Importance: Satisfactory pain control for women undergoing office gynecologic procedures is critical for both patient comfort and procedure success. Therefore, it is important for clinicians to be aware of the safety and efficacy of different pain control regimens.

Objective: This article aimed to review the literature regarding pain control regimens for procedures such as endometrial biopsy, intrauterine device insertion, colposcopy and loop electrosurgical excisional procedure, uterine aspiration, and hysteroscopy.

Evidence Acquisition: A search of published literature using PubMed was conducted using the following keywords: "pain" or "anesthesia." These terms were paired with the following keywords: "intrauterine device" or "IUD," "endometrial biopsy," "uterine aspiration" or "abortion," "colposcopy" or "loop electrosurgical excisional procedure" or "LEEP," "hysteroscopy" or "hysteroscopic sterilization." The search was conducted through July 2015. Articles were hand reviewed and selected by the authors for study quality. Meta-analyses and randomized controlled trials were prioritized.

Results: Although local anesthesia is commonly used for gynecologic procedures, a multimodal approach may be more effective including oral medication, a dedicated emotional support person, and visual or auditory distraction. Women who are nulliparous, are postmenopausal, have a history of dysmenorrhea, or suffer from anxiety are more likely to experience greater pain with gynecologic procedures. Evidence for some interventions exists; however, the interpretation of intervention comparisons is limited by the use of different regimens, pain measurement scales, patient populations, and procedure techniques.

Conclusions and Relevance: There are many options for pain management for office gynecologic procedures, and depending on the procedure, different modalities may work best. The importance of patient counseling and selection cannot be overstated.

Target Audience: Obstetricians and gynecologists, family physicians

Learning Objectives: After completing this activity, the learner should be better able to select appropriate pain control measures for awake patients undergoing gynecologic procedures in the office, compare the efficacy and safety of different pain control regimens, and identify factors that may increase or decrease the pain experienced with various procedures.

The U.S. Food and Drug Administration has not approved the use of misoprostol for cervical ripening as discussed in this article. Please consult the product's labeling for approved information.

All authors and staff in a position to control the content of this CME activity and their spouses/life partners (if any) have disclosed that they have no financial relationships with, or financial interests in, any commercial organizations pertaining to this educational activity.

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Gynecologic procedures are commonplace for women across the age spectrum. Many of these procedures, such as intrauterine device (IUD) insertion, endometrial biopsy, and colposcopy, are routinely conducted in the office setting. Others, such as uterine aspiration, loop electrosurgical excisional procedure (LEEP) of the cervix, and hysteroscopic sterilization, are conducted in either the office or the operating room. Most women, given appropriate counseling and pain management, should be able to undergo these procedures in the outpatient

setting. In doing so, outpatient gynecologic procedures can increase both patient and provider convenience, avoid the risk of general anesthesia, and decrease health care costs. However, a prerequisite for office-based gynecologic procedures is patient selection and attention to patient comfort. In this article, we review the origin of procedural pain in gynecology and discuss evidence-based practices to decrease pain and anxiety during procedures in the outpatient setting.

BIOLOGY OF PAIN

The perception of pain during gynecologic procedures originates from manipulation of the cervix and/or uterus. Sympathetic fibers from T10 to L2 innervate the uterine fundus by entering through the uterosacral ligaments via the inferior hypogastric plexus and by nerves from the ovarian plexuses at the cornua.[1] Parasympathetic fibers from S2 to S4 travel through the broad ligament to enter the cervix at the 3-o'clock and 9-o'clock positions. These provide innervation of the upper vagina, cervix, and lower uterine segment. The lower vagina and vulva are supplied by the pudendal nerve (S2, S3, and S4).

A number of factors can influence a woman's perception of procedural pain (Table 1). Higher pain scores are often associated with nulliparity, history of dysmenorrhea, preprocedural anxiety, and postmenopausal status.[1,2] Lower pain scores are associated with shorter procedural time, increased provider experience, and history of vaginal delivery.[3,4] The relationship between the provider and the patient can also influence the pain experienced. Women manage pain best if they have been thoroughly counseled and know what to expect in terms of procedural steps and time. Nonpharmacologic interventions can be helpful adjuncts to manage pain control during office-based procedures where the patient is awake. Verbal support techniques ("verbocaine") can range from distraction of the patient through conversation to gentle language to positive suggestion.[1] Gentle language is a technique to avoid using negatively loaded statements while coaching a patient through a procedure, for example, "sting and burn" when injecting local anesthesia.[5] Instead, one can say, "This is the medicine numbing your cervix; you may feel cramping or pressure for a moment; this will pass as the numbness spreads."[1] Gentle language has been shown to reduce pain during local anesthetic injection and venous blood sampling,[6,7] although not colposcopy.[8] Positive suggestion is similar to gentle language but goes further in terms of describing procedural steps in positive ways while bolstering patient coping skills.[1] An extension of these methods is to have a trained person sit with the patient to provide emotional support during the procedure.[9] Finally, a heating pad can be helpful for uterine cramping.[10]

TABLE 1
Factors Associated With Pain Perception

Increased Pain	Decreased Pain
Nulliparity	Vaginal delivery
Postmenopausal status	Skilled provider
History of dysmenorrhea	Shorter operative time
Anxiety	Older patient age
Anticipated pain	

OPTIONS FOR PHARMACOLOGIC PAIN CONTROL IN THE OFFICE

The options for pain control in the office setting range from local anesthesia alone to oral medications to intravenous sedation. This article will focus only on local anesthesia, oral medications, and intramuscular medications, given that most offices limit themselves to these modalities for regulatory reasons. Patient selection is an important aspect for both safety of and pain management for office procedures. In general, candidates for office-based procedures should be healthy or with only mild medical problems (American Society of Anesthesiologists Physical Status Classification System category I or II).[11,12] In addition, patient self-assessment of pain tolerance and baseline anxiety will help identify those women who may require higher levels of anesthesia and may be best served in an operating room setting.

A paracervical block with lidocaine is a commonly used part of analgesia in many outpatient gynecologic procedures. Lidocaine is the most common local anesthetic agent used because of low cost, stability, and low risk of allergic or adverse reactions. The maximum dose of lidocaine without epinephrine is 4.5 mg/kg, with a maximum dose of 300 mg.[13] This translates to 30 mL of 1% lidocaine or 15 mL of 2% lidocaine. While the paracervical block has been shown to be effective for many gynecologic procedures, the block itself causes considerable discomfort.[14] Adding sodium bicarbonate as a buffering agent to lidocaine results in decreased pain during injection (1 mL of 8.4% sodium bicarbonate per 10 mL of local anesthetic).[15,16] At low serum levels of lidocaine, patients may experience tingling of the lips, tinnitus, and dizziness. This is not uncommon when using paracervical blocks during pregnancy because of the vascularity of the cervix. At higher levels of lidocaine, patients may experience visual disturbances, confusion, seizure, or cardiorespiratory arrest. Techniques to lower the risk of lidocaine toxicity include adding vasopressin or epinephrine to reduce systemic

absorption and aspirating before injecting to reduce the risk of intravascular instillation.[1]

Oral medications commonly utilized include nonsteroidal anti-inflammatory drugs (NSAIDs) either in oral or intramuscular form such as ibuprofen, naproxen, and ketorolac. Acetaminophen is inferior to ibuprofen for uterine pain but is an option for women who cannot tolerate NSAIDs.[17] Oral opioids and benzodiazepines are also sometimes offered in the outpatient setting. For perioperative use, lorazepam, an intermediate-acting benzodiazepine, is generally preferable to the long-acting diazepam. Many providers use 1 to 2 mg of lorazepam for anxiolysis.[1] Oral medications do not have immediate onset like do intravenous formulations; therefore, they should be taken 30 to 60 minutes before the procedure.

TENACULUM PLACEMENT

Tenaculum placement on the cervix is typically the first step of procedures involving the uterine instrumentation. Some providers choose to use atraumatic tenaculums (such as the Bierer tenaculum or Goldstein cervical stabilizer) rather than single-tooth tenaculums, believing that they are less painful and do not cause bleeding. Anesthetic options for the tenaculum site include topical and injected local anesthetics. The use of 2% lidocaine gel on the anterior lip of the cervix 3 minutes prior to tenaculum placement has been found to be no better than placebo gel in studies of IUD insertion.[18,19] On the other hand, 2 mL of injected 1% lidocaine decreased pain during tenaculum placement when compared with no injection in a trial evaluating paracervical block for IUD insertion.[20] Furthermore, a recent randomized controlled trial among 70 women compared a 2-mL injection of 1% lidocaine and 1 mL of 2% lidocaine gel to the anterior lip of the cervix for tenaculum placement.[21] Pain was measured on a 0- to 100-mm visual analog scale (VAS), and the tenaculum was placed immediately after medication administration. The results showed that women who received the injection had significantly less pain at the time of tenaculum placement compared with women who received the lidocaine gel (12.3 vs 36.6 mm, $P < 0.001$).

The use of topical anesthetics is usually more effective if enough time is allowed to elapse prior to tenaculum placement or higher doses are used. The product label for 2% lidocaine gel quotes a 3- to 5-minute time for the onset of action when used on mucosal surfaces.[22] In the trial above, sufficient time was not allowed to elapse prior to placement of the tenaculum, therefore rendering the lidocaine gel ineffective. Older studies have shown effectiveness for tenaculum site pain with lidocaine-prilocaine cream applied via cervical cap 10 or 30 minutes prior,[23,24] 20% benzocaine gel applied 1 to 2 minutes prior to tenaculum placement,[25] and 10% lidocaine spray (3 metered sprays to the ectocervix 1 minute prior).[26] Another study evaluated patient self-administration of 2% lidocaine gel vaginally 5 minutes prior to IUD insertion and found that mean pain scores for tenaculum placement were 32 mm in the lidocaine arm and 56 mm in the placebo group ($P = 0.030$).[27] Because this technique does not require a speculum examination prior to the waiting period, it may be more acceptable to patients. In summary, topical local anesthetics do not appear to be as effective for decreasing pain with tenaculum placement as injected anesthetics depending on the specific medication and intervening wait time. Lidocaine injection is a convenient approach when a full paracervical block is also planned with no waiting required between administration and tenaculum placement.

ENDOMETRIAL BIOPSY

Endometrial biopsy is a routine office-based procedure for the evaluation of abnormal uterine bleeding. This procedure is usually conducted using a Pipelle or Explora curette, both of which cause a similar degree of pain.[28] The procedure is brief, with the aspiration portion of the biopsy completed within 1 to 2 minutes, but half of women describe their experience as "moderately" or "severely" painful.[29] A significant source of pain during endometrial sampling is placement of the tenaculum on the cervix. In 1 study, 107 women were randomized to tenaculum or no tenaculum placement during biopsy. Women who underwent biopsy without tenaculum placement showed significantly lower pain scores on a 0- to 10-point scale than did women with tenaculum placement (4.6 vs 7.7, $P = 0.001$).[30] Furthermore, of 61 women, only 3 biopsies could not be completed without the tenaculum. Therefore, women undergoing endometrial sampling in the office should not undergo tenaculum placement unless necessary for entry into the uterine cavity.

Interventions that have been studied to reduce pain with endometrial biopsy include misoprostol for cervical ripening, intrauterine lidocaine infusion, paracervical block, and preprocedure NSAIDs. Two studies evaluated the effect of premedication with 200 μg of misoprostol to reduce pain prior to endometrial biopsy. Regardless of route of administration, no benefit was demonstrated, and there is possible harm given that misoprostol itself causes cramping.[31,32] Several trials demonstrated a modest benefit on pain with an intrauterine lidocaine infusion when compared with saline.[33,34] This is most commonly administered transcervically with a

syringe attached to an angiocatheter, which is left in place between 3 and 5 minutes prior to endometrial biopsy to prevent backflow out of the cervical os. According to a recent systematic review by Mercier and Zerden,[35] intrauterine anesthesia for endometrial biopsy appears to be an effective technique for pain reduction with minimal adverse effects. The anesthetic does not affect pathologists' interpretation of endometrial samples. Most studies have evaluated the slow infusion of small quantities (≤5 mL) of 2% lidocaine with a 5-minute wait prior to endometrial biopsy. The use of adjunctive medications such as NSAIDs or misoprostol varied in each study. The reductions in pain compared with a saline infusion varied from 20 to 25 mm on a 100-mm VAS.[35] Some studies found a beneficial effect only when intrauterine lidocaine infusion was combined with preprocedure NSAIDs[29] or in certain populations (eg, premenopausal women only).[36]

Other studies have demonstrated that intrauterine lidocaine infusion is equivalent to paracervical block for endometrial biopsy. In a Turkish study, 90 women undergoing endometrial biopsy were randomized to receive either paracervical block with 5 ml of 2% lidocaine injected superficially (0.5 to 1 cm) at 4 and 8 o'clock, intrauterine anesthesia with 5 mL levobupivacaine or no intervention with a 5-minute wait before biopsy.[37] Pain scores among women in the active arms (paracervical block and intrauterine anesthesia) were the same. The median pain score was 1 out of 10 in the intervention arms compared with 3 in the no-intervention arm. The study also noted that biopsy indication was a significant predictor of pain, with postmenopausal women experiencing greater pain than premenopausal women with heavy menstrual bleeding, which makes clinical sense. Another Turkish study randomized 120 women to 5-mL paracervical block using 2% lidocaine or 5 mL of intrauterine infusion of 2% lidocaine 5 minutes prior to biopsy. This study showed no difference in procedural pain between the 2 groups. It did, however, demonstrate a significant decrease in postprocedure pain measured 30 minutes after biopsy among women who received intrauterine anesthesia (4.3 vs 2.6, $P < 0.001$).[38] At this time, insufficient evidence exists to recommend universal application of paracervical block or intrauterine lidocaine prior to endometrial biopsy. Given that the application of the paracervical block causes pain, intrauterine infusion may be the preferred alternative. Intrauterine anesthesia may be appropriate for select patients with high anxiety or risk factors for procedural pain. Nevertheless, there have been no studies examining patient preference in terms of a longer procedure with anesthetic application compared with a shorter procedure with no anesthesia.

Intrauterine Device Insertion

The IUD has contraceptive efficacy equivalent to surgical sterilization with the advantage of being reversible and less invasive.[39] Many women, however, are deterred from this method out of fear of pain with IUD insertion. Furthermore, women who are nulliparous, remote from last delivery, or older than 30 years may experience more pain than their younger, parous counterparts.[3] A significant amount of research has been conducted around improving the experience of IUD insertion for women.[40] Preprocedural misoprostol for cervical ripening (off-label use) has not been shown to improve pain scores in both multiparous and nulliparous women seeking IUD insertion.[41,42] Prophylactic NSAIDs are frequently provided to patients prior to IUD insertion, with the goal of improving procedural and postprocedural pain. However, multiple studies have demonstrated a lack of benefit with ibuprofen for the insertion procedure itself.[3,40,43] One randomized controlled trial of 103 women found that either 550 mg of naproxen or 50 mg of tramadol 1 hour before IUD insertion in multiparous women reduced procedure pain compared with placebo. On a 0- to 10-point scale, mean pain scores were 2.3 in the tramadol group, 2.9 in the naproxen group, and 4.9 in the control group. Tramadol was statistically superior to naproxen, and both were statistically superior to the placebo. In a pilot randomized controlled trial, intramuscular ketorolac 30 mg given 30 minutes prior to procedure was found to be superior to saline for IUD insertion pain in 16 nulliparous women (5.8 vs 8.2, $P < 0.02$).[44] This same effect was not detected in the 51 multiparous women who were part of the trial, although multiparous women in the ketorolac arm had less pain at both 5 and 15 minutes after the procedure. The authors of this study are currently enrolling for a larger trial of ketorolac for IUD insertion pain among nulliparous women.

Many providers have looked to local anesthesia to improve the patient experience with IUD insertion. One randomized controlled trial of 50 women evaluated the impact of a 10-mL paracervical block of 1% lidocaine with IUD insertion.[45] Women reported pain using a 100-mm VAS. Women who received paracervical block reported a median score of 24 mm compared 62 mm in the control group. Although promising, this difference was not statistically significant ($P = 0.09$) because of the small sample size. Several randomized controlled trials examined the use of 2% lidocaine gel placed intracervically prior to tenaculum placement and IUD insertion.[18,19,46] None of the studies found improvement in pain scores with tenaculum placement or IUD insertion. Nelson and Fong[47] conducted a randomized controlled pilot study of 40 women to examine the

use of 1.2 mL of 2% lidocaine infused intrauterine prior to IUD insertion compared with saline. No difference was found between the 2 groups in terms of pain with insertion, which is perhaps due to the low volume compared with intrauterine infusions used during endometrial biopsy.[47] While few interventions exist to decrease pain with IUD insertion, the procedure is quick and requires few steps. Providers can reassure their patients that many benefits of this contraceptive option likely outweigh the short-lived discomfort of the insertion process. If pain control is needed, a paracervical block with 20 mL of 1% lidocaine including administering at the tenaculum site will provide some relief. In addition, NSAIDs prior to the procedure will decrease cramping after insertion, with naproxen and intramuscular ketorolac being 2 promising options.

Uterine Aspiration

Uterine evacuation in the office setting has become increasingly common with the availability of manual vacuum aspiration. This is commonly used for miscarriage management and first-trimester surgical abortion. The ability to provide this service in the office offers many advantages. The procedure is quick, lasting less than 10 minutes, allowing women to focus on healing and avoiding the risk of general anesthesia. Procedures need not be delayed because of operating room scheduling.[48] However, adequate pain control during uterine aspiration for awake patients is a major concern on the part of both patients and providers. The paracervical block is a commonly used tool to increase patient comfort during uterine aspiration. Until recently, however, the data were conflicting on its efficacy.[49] Then, in 2010, Renner and colleagues[14] conducted a randomized controlled trial of 120 women undergoing surgical abortion up to 10 weeks 6 days' gestation. All women received premedication with 800 mg ibuprofen and 1 mg lorazepam at least 30 minutes prior to aspiration. Women were randomized to receiving a 20-mL paracervical block of 1% buffered lidocaine or sham injection. The paracervical block included 2 mL at the 12-o'clock position of the anterior lip of the cervix prior to tenaculum placement followed by a 4-site injection at the 2-, 4-, 8-, and 10-o'clock positions of the cervicovaginal junction. These injections were placed deep (3 cm) with administration of anesthesia while withdrawing. They were also placed slowly over a 60-second period. The sham injection included the administration of 2 mL of 1% buffered lidocaine at the 12-o'clock position of the anterior lip of the cervix prior to tenaculum placement followed by touching the cervicovaginal junction with a capped needle at the 2-, 4-, 8-, and 10-o'clock positions. Three minutes following administration of paracervical or sham injection, cervical dilation was initiated. Pain was measured using a 100-mm VAS. Women reported significantly lower pain scores during cervical dilation (paracervical block mean 42 mm vs sham 79 mm, $P < 0.001$) and uterine aspiration (paracervical block mean 63 mm vs sham 89 mm, $P < 0.001$). This was the first randomized controlled trial with sham injection that demonstrated the efficacy of paracervical block.

Several studies have examined the addition of other forms of localized anesthesia in addition to paracervical block. Edelman and colleagues[50] evaluated the use of intrauterine lidocaine infusions for pain management during uterine aspiration. After finding no difference with a 10-mL 1% paracervical block plus 10-mL 1% lidocaine infusion,[13] the authors increased the dose to a 10-mL 1% paracervical block plus 5 mL infusion of 4% lidocaine. This dose resulted in reduced pain with cervical dilation (35 vs 55 mm, $P < 0.01$) and uterine evacuation (43 vs 71 mm, $P < 0.01$).[50] While no woman developed lidocaine toxicity with the dose of 300 mg, almost half reported numbness, tingling, and ear ringing. This intervention has yet to enter common clinical practice most likely because of the fact that additional safety studies should be conducted, and most facilities do not stock 4% lidocaine. Karasahin et al[51] conducted a small cohort study examining 2 pumps of 10% lidocaine spray to the cervix and upper vagina (20 mg) 2 minutes prior to the application of a 4-mL 2% lidocaine paracervical block (80 mg) at 11-, 1-, 4-, and 7-o'clock positions intracervically to saline spray and the same paracervical block. Procedural pain scores measured at 30 minutes postoperatively were significantly lower in the topical spray group (paracervical block plus lidocaine spray [2.35] vs paracervical block alone [6.56, $P < 0.01$]. This drastic difference in pain scores is surprising, given the intervention and lidocaine spray should be studied further in a randomized controlled trial. Finally, Cansino et al[52] conducted a randomized controlled trial to compare 600 mg ibuprofen with paracervical block containing 20 mL of 1% lidocaine to oral placebo and paracervical block containing a 20-mL mixture of 1% lidocaine and 30 mg of ketorolac. All women received 2 mg of lorazepam. There was improved pain control with cervical dilation in the lidocaine/ketorolac group (lidocaine/ketorolac 59.8 vs lidocaine/ibuprofen 74.8, $P = 0.03$). However, no differences were seen in overall procedure pain, postoperative pain, or patient satisfaction.

Premedication with NSAIDs is an intervention that is effective in decreasing intraoperative and postoperative pain.[15,16,49] Naproxen 550 mg or ibuprofen 600 to 800 mg is administered by mouth between 30 and

60 minutes prior to aspiration. Oral administration of NSAIDs appears to be sufficient for preoperative medication. A randomized controlled trial of 94 women comparing 60 mg intramuscular ketorolac to 800 mg ibuprofen found no difference in cervical dilation, preoperative, or postoperative pain.[53] Furthermore, the ketorolac group reported greater arm pain. No other oral medications administered prior to uterine aspiration have been shown to affect procedural or postoperative pain scores. Romero et al[54] compared 50 mg tramadol to 800 mg ibuprofen administered 1 hour prior to procedure. There were no differences in intraoperative pain scores and lower postoperative pain scores in the ibuprofen group. Another study evaluated premedication with 10 mg hydrocodone/650 mg acetaminophen versus placebo administered 45 to 90 minutes prior to procedure in addition to the standard 800 mg ibuprofen and paracervical block.[55] There was no difference in pain scores at any time point. In addition, the narcotic group reported more postoperative nausea. Other studies have evaluated the effect of premedication with the oral anxiolytics, lorazepam (1 mg) and midazolam (10 mg), and have found no difference in intraoperative or postoperative pain or patient satisfaction.[56–58] Given the current evidence, patient comfort during office-based uterine aspiration can be maximized with preoperative NSAIDs and administration of paracervical block.

Colposcopy and LEEP

When women present for the evaluation and treatment of cervical dysplasia, they are often preoccupied with both their diagnosis and the anticipated pain of the procedure. Given that preprocedure anxiety can increase pain, interventions to reduce anxiety have been evaluated for colposcopy. A Cochrane review on the subject concluded that music and video colposcopy were the best interventions to reduce anxiety.[59] Visual distraction using a light diffuser with a pleasant picture over the ceiling light was found to reduce procedure pain slightly (median pain score of 1 vs 2 on a 0- to 10-point scale) but not anxiety.[60] Interventions to reduce pain during cervical biopsy and endocervical curettage are few. Oral analgesia, such as NSAIDs, topical lidocaine-prilocaine cream, or lignocaine or benzocaine sprays were found to be ineffective strategies for pain control during colposcopy.[61–63] Several randomized controlled trials have found that forced coughing during cervical biopsy is equivalent to injected 1% lidocaine. Two studies compared the administration of 0.5 to 2 mL of 1% lidocaine into the cervical stroma 1 minute prior to biopsy to forced coughing during biopsy. Both found no difference in procedural pain scores and prolonged procedure time of 1 to 2 minutes with the local anesthetic arm.[64,65] Naki et al[66] conducted a randomized controlled trial of 3 groups: (1) 1 mL of 1% lidocaine injected 1 minute prior to biopsy, (2) forced coughing during biopsy, and (3) no intervention. The group receiving local anesthesia had decreases in pain scores during biopsy (control 20.5, local anesthesia 12.7, forced coughing 18.4; $P = 0.016$). However, their colposcopy times were at least 1 minute longer. Therefore, nonpharmacologic interventions such as forced coughing, music, video colposcopy, and visual distraction are the best for colposcopy.

Loop electrosurgical excisional procedure has become the most frequently used method of cervical conization in the office setting. A recent Cochrane review of 17 randomized controlled trials examined several strategies to increase patient comfort during LEEP conization.[61] Naproxen 550 mg 30 minutes prior to the LEEP was not found to benefit women during the procedure but reduced the need for medications afterward. Local anesthesia with a vasoconstrictor yields better pain control and less blood loss than local anesthesia alone. Local anesthesia was found to result in lower pain scores when injected directly into the cervical stroma rather than in the cervicovaginal junction. One small study found that buffered lidocaine was not superior to unbuffered lidocaine for LEEP procedures in contrast to studies of the paracervical block for uterine aspiration.[67]

There are many research gaps regarding pain control in the evaluation and management of cervical dysplasia. Current evidence does not support the routine use of any systemic or local anesthesia during colposcopy. It does support the use of intracervical local anesthesia with vasoconstrictor, such as 1% lidocaine with 1:100,000 epinephrine, prior to LEEP, for both pain management and hemostasis.

Hysteroscopy

Hysteroscopy is indicated to evaluate and treat a number of gynecologic conditions, such as abnormal uterine bleeding and infertility. Sterilization can also be performed through the hysteroscope. There are multiple points during hysteroscopy that can cause patient discomfort. Women can experience pain during tenaculum placement, introduction of the hysteroscope, distension of the uterine cavity, intrauterine procedures, and withdrawal of the hysteroscope. In 2010, a Cochrane review of 24 studies evaluated best practices for pain control during hysteroscopy.[68] Local anesthesia via paracervical block provided consistent decreases in intraoperative and postoperative pain scores. There were mixed data on efficacy of intracervical blocks and no

evidence to support the use of intrauterine anesthesia or topical gels, sprays, or creams. A meta-analysis of 15 studies in 2010 by Cooper and colleagues[69] confirmed these findings. Premedication with opioid analgesics or NSAIDs do not confer benefit in pain management during office hysteroscopy.[70,71] Misoprostol for cervical ripening prior to diagnostic hysteroscopy neither reduce pain nor facilitate the procedure for hysteroscopes with diameters of less than 6 mm.[72]

Hysteroscopic technique can affect the amount of pain experienced in the office. Performing hysteroscopy without a speculum or tenaculum (vaginoscopy technique) causes less pain than traditional hysteroscopy.[2,73] One trial randomized 126 women to vaginoscopy without anesthesia and the traditional approach with speculum, tenaculum, and 10 mL 3% mepivacaine intracervical block.[74] The hysteroscopy was performed with normal saline and a rigid 3.7-mm hysteroscope. The women in the vaginoscopy group had mean pain scores of 3.8 compared with 5.3 in the traditional group on a 0- to 10-point scale. Furthermore, the outer diameter of the hysteroscope will influence the pain experienced as the instrument is passed through the internal os of the cervix. Trials comparing the traditional 5-mm rigid hysteroscope to the 3.5-mm rigid minihysteroscopes consistently show decreased pain with the smaller-diameter instrument.[2] In a study of 6017 procedures with a minihysteroscope compared with 4204 with a 5-mm hysteroscope, rates of successful introduction of the scope into the uterine cavity and satisfactory examinations were higher with the minihysteroscope than with the 5-mm hysteroscope group (99.5% vs 72.5%, $P \leq 0.001$, and 98.5% vs 92.3%, $P < 0.001$). Pain was measured on the following scale: 0 = no pain, 1 = low pain, 2 = moderate pain, 3 = severe pain. The mean pain score in the minihysteroscope group was 0.10 (SD, 0.34) compared with 1.1 (SD, 0.53) in the traditional group ($P < 0.001$). In addition, vagal reactions were more common in the traditional group (2.8% vs 0.17%, $P < 0.001$).[75] All procedures in this study were performed with the vaginoscopic technique using normal saline, and pain was measured on a scale of 0 to 3. Finally, warming the distension fluid to 37.5°C compared with room temperature has not been found to reduce pain.[76]

Hysteroscopic sterilization is a specialized form of operative hysteroscopy that offers women permanent sterilization in the outpatient setting, thereby avoiding the risks of abdominal surgery and anesthesia. Unfortunately, current research on pain control in the office during this procedure is limited. The available device, Essure micro-insert device (MID), utilizes a 5-mm rigid hysteroscope for application. Chudnoff et al[77] randomized 80 women to 11-mL paracervical block of 1% lidocaine or saline. All women received 60 mg ketorolac preoperatively. Initially, 1 mL of the paracervical block was placed at the anterior lip of the cervix, followed by 5 mL at the 4- and 8-o'clock positions in the cervicovaginal junction. The procedure started 3 to 5 minutes after the paracervical block. Pain was measured on a 10-cm VAS. The investigators reported decreased pain scores during tenaculum placement (lidocaine 0.97 vs saline 3.00, $P < 0.001$) and passage of the hysteroscope into the uterus (lidocaine 1.79 vs saline 4.10, $P < 0.001$) There were no differences in pain during deployment of MID or postprocedural pain. Thiel et al[78] conducted a randomized controlled trial of 87 women comparing intravenous sedation with fentanyl and midazolam to oral analgesia with 5 mg oxycodone and 500 mg naproxen given 1 hour prior to procedure. All patients received a paracervical block to 8 mL of 1% lidocaine with 2 mL to the anterior lip of the cervix. The only decrease in pain was during the insertion of the second MID. Finally, Isley and colleagues[79] conducted a study of 58 women receiving 800 mg ibuprofen, 2 mg lorazepam, and a 10-mL paracervical block of 1% lidocaine who were randomized to a 5-mL intrauterine infusion of either 4% lidocaine or saline. There were no differences in pain at any point during the procedure.

Given the current evidence, a paracervical block with 1% lidocaine provides the best pain control during hysteroscopy. While NSAIDs are used as an antispasmodic during hysteroscopic sterilization, there is no evidence that preoperative NSAIDs reduce procedural pain during hysteroscopy. There is substantial evidence that hysteroscopic technique affects pain, with smaller-diameter hysteroscopes and the vaginoscopic approach being preferred.

New Directions/Emerging Evidence

An inhaled mixture nitrous oxide/oxygen gas (NO) has long been used as an option for outpatient analgesia in other specialties. With the resurgence of NO for pain relief during labor in the United States[80,81] and recent Food and Drug Administration approval of new equipment to safely deliver the gas, studies evaluating this option for gynecologic procedures in the office are emerging.[82] Nitrous oxide/oxygen gas reduces both pain and anxiety with an onset of action of 2 to 3 minutes, and dosing can be titrated. Typically, NO is administered as a 50/50 nitrous oxide/oxygen mix, but the concentration of nitrous oxide can be increased to a maximum of 70%. When administered as a 50/50 mix, it is considered only minimal sedation.[82] The advantages to NO are that patients do not experience respiratory depression; the drug is rapidly cleared from

the lungs, so patients can drive themselves; and intravenous access is not needed.

Currently, the use of nitrous oxide for pain management in first-trimester aspiration abortion is under investigation. One Italian trial compared a 50/50 nitrous oxide/oxygen inhaled mixture to placebo among 72 women who also received a paracervical block and intravenous paracetamol. They did not find any significant differences in pain scores.[83] Singh and colleagues[84] recently conducted a pilot study that randomized 20 women to either a 70/30 nitrous oxide/oxygen inhaled mixture or preoperative 5/325 mg hydrocodone-acetaminophen and 1 mg lorazepam. While mean pain scores were similar, patient satisfaction was higher in the NO group. These investigators are performing further studies for both uterine aspiration and IUD insertion. Inhaled NO appears to be a promising method of pain control during hysteroscopy as well. Del Valle Rubido and colleagues[85] conducted a prospective cohort study of 106 women undergoing hysteroscopic polypectomy comparing a 50/50 nitrous oxide/oxygen inhaled mixture, 10-mL 1% lidocaine paracervical block, and no intervention. Using a 3.5-mm rigid hysteroscope, pain control in the NO group was superior to paracervical block and no intervention (median pain score on 0- to 10-point scale 3 vs 5 vs 6). This group also had the fewest adverse effects or complications. Further studies will be needed to determine what role inhaled NO can play in office gynecologic procedures.

CONCLUSIONS

Patient comfort during office-based gynecologic procedures is multifactorial. Patient selection and awareness of factors that may contribute to operative pain are instrumental in providing women with a positive procedural experience. In addition, there are many preoperative and intraoperative methods of pain management, depending on the type of gynecologic procedure. However, even with optimal implementation of evidence-based strategies, women continue to experience pain during office-based procedures. Further research to identify novel and safe methods of analgesia for endometrial biopsy, IUD insertion, uterine aspiration, and other procedures is warranted.

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