

## Making Do

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### The Case

A 56-year-old female with dysfunctional uterine bleeding and possible retained intrauterine device (IUD) was scheduled for elective hysteroscopy and dilation and curettage (D&C). Of note, she had recently completed a course of tetracycline for an asymptomatic infection with *Actinomyces israelii* discovered on Pap smear.

After the patient was in the operating room and prepared for the procedure, the team discovered that the equipment typically used for hysteroscopy was unavailable—the case had been listed only as a "D&C" on the operating room (OR) schedule, so the hysteroscopy set had not yet been sterilized after use earlier in the day. To avoid cancelling the procedure, the team borrowed sterile parts from various other hysteroscopy sets.

During insufflation of the uterus, the patient suffered cardiac arrest presumably related to air embolus. The patient was successfully resuscitated. After an 8-day stay in the intensive care unit, the patient was discharged home with no permanent sequelae.

Initially the team attributed the patient's decompensation to air introduced from the "makeshift" hysteroscopy set, which may not have been a truly "closed" system. However, post-operatively, the patient developed fevers, and blood cultures grew *Actinomyces*. The team then concluded that the event was more likely caused by intraoperative introduction of *Actinomyces*, due to incomplete eradication of this infection pre-operatively.

### The Commentary

Operative hysteroscopy permits evaluation of women with menstrual disorders, infertility, postmenopausal bleeding, and recurrent pregnancy loss. It is particularly useful when ultrasound is equivocal. In general, it is a safe, easily learned procedure that has excellent surgical outcomes.<sup>(1,2)</sup>

Initially, this patient presented with postmenopausal bleeding and "possible" imbedded IUD. In such situations, if the IUD cannot be located by visualization of the IUD string, then imaging studies are necessary before offering intrauterine manipulation. Transvaginal ultrasound provides the least invasive means to detect the presence and location of an IUD.<sup>(3)</sup> If equivocal, then hysteroscopy permits direct inspection of the endometrial cavity. In this case, office-based retrieval should probably have been attempted first.<sup>(2)</sup> If impossible or impractical, the patient should then have been scheduled in the OR for IUD removal with hysteroscopic visualization.

Unfortunately, this case had several problems that led to a major adverse event.

Most obviously, it is mandatory that the operating room, equipment, and team be fully prepared for scheduled cases. Present-day standards in gynecology emphasize the critical role of diagnostic hysteroscopy (with or without biopsy) in the evaluation and panoramic inspection of the endometrium. Although previously a popular method, a "blind D&C" is now seen as antiquated unless the patient has had a miscarriage.<sup>(4)</sup> Therefore, a schedule listing only a D&C should have raised a red flag in this 56-year-old patient. The nurses should have recognized the high probability that the patient was not pregnant and checked the pre-operative note to ascertain whether additional equipment was necessary. Moreover, the surgeon should have reviewed the OR schedule to ensure that the case was listed correctly and that hysteroscopic equipment and supplies were requested.

Newer hospital policies and federal requirements mandate that patients confirm the proposed surgery with critical hospital team members (nurse, anesthesiologists, and surgeon) on the day of the procedure. An informed and knowledgeable patient is an invaluable asset. If what the patient says and what the schedule reflects differ, then the situation can be clarified before the patient is anesthetized. Thus, an informed patient, astute nursing team, and vigilant surgeon increase the likelihood that the proposed procedure and available equipment match. Nevertheless, as depicted by Reason in his "Swiss Cheese Model," these safety mechanisms each have enough "holes" that sometimes all three protections will fail.<sup>(5)</sup>

In this case, recognizing that the appropriate equipment was not available before the patient was anesthetized could have been managed in several ways. The procedure could have been rescheduled, delayed, or postponed. Alternatively, if the patient were already anesthetized before the problem was detected, then a blind D&C might have been attempted with the aim of retrieving the IUD. If the IUD could be removed blindly, but hysteroscopy could not be completed to evaluate the endometrium for other causes of bleeding, then the patient could have been scheduled at a later date for office saline infusion sonography (SIS) or office hysteroscopy.<sup>(3,6)</sup> If the IUD could not be removed by blind D&C and if a working hysteroscope was not available, then the patient should have been awakened and informed about the situation.

In this case, the team constructed a makeshift hysteroscope. When this sort of improvisation occurs, the surgeon must ensure that the system provides the same level of safety and efficacy as the prototype. Ingenuity is admirable if the hysteroscope works; however, if there is any doubt then the procedure should be abandoned and the patient rescheduled. Any malfunction of equipment should be documented. Most importantly, an incident report and full discussion of the technical problems should be reviewed with the operating room nurse manager. In so doing, similar errors may be prevented in the future.

Cardiac arrest occurred "during the insufflation of the uterus." Most likely, the arrest was caused by either air embolism or CO<sub>2</sub> gas embolization.<sup>(7,8,9)</sup> Could it have been that, in the chaotic operating room environment (likely in this mis-scheduled procedure), the laparoscopic insufflator—instead of the hysteroinsufflator—was used to distend the uterus? The laparoscopic insufflator flows at 1-15 L/minute; whereas, the hysteroscopic insufflator will maximally distend the uterus with 100 mL/minute. If the wrong insufflator were used, the patient could have received greater than ten times the normal flow rate, which can be hazardous, or even fatal. Another cause of cardiac arrest could have been air remaining in the hysteroscopic tubing, if it had not been purged prior to attaching it to the patient. Surgeons should make a habit of informing the circulating nurse of the appropriate connections needed. Additionally, the operative note should reflect which instruments and equipment were used.

The safest sequence of events in removing an IUD is as follows: make sure that all ambient air in the tubing is de-aerated by flushing the tubing copiously and ensuring that all bubbles are purged, use a fluid-based system (compatible with the electrosurgical device that may be needed), and perform the diagnostic hysteroscopy to localize the IUD. If CO<sub>2</sub> is preferred, it should be used only for diagnostic purposes. After instrumentation and removal of the IUD, I recommend switching from CO<sub>2</sub> to a fluid medium if further endometrial inspection is necessary. In this case, since the patient experienced postmenopausal bleeding, thorough inspection and endometrial sampling were necessary to exclude other causes of postmenopausal bleeding.

The caregivers in this case came to believe that the cause of the patient's deterioration was an introduced infection. Operative hysteroscopy may in fact stimulate a latent infection. However, postoperative infection is uncommon; most studies place the risk at 0.92% and 2.7%.<sup>(10)</sup> Generally, antibiotic prophylaxis is not indicated for operative hysteroscopy unless the patient has had a joint replacement, prior history of pelvic inflammatory disease, mitral valve prolapse, or residual tissue that remains after surgery.

Even though infection is possible, sepsis rarely occurs after operative hysteroscopy. While an unfortunate occurrence after this procedure, I believe that it was coincidental, and that the team's initial hypothesis for the cause of the deterioration—air embolism—was more likely. There was no evidence of cervical motion tenderness, fever, or pelvic pain prior to the procedure. Although localized endometritis due to the IUD may have caused the patient's bleeding <sup>(11)</sup>, an antecedent pelvic inflammatory process (particularly with actinomyces, usually a commensal pathogen <sup>[12]</sup>) is highly unlikely. It is also improbable that the makeshift hysteroscopy system itself led to sepsis, unless the equipment was not sterilized at all.

#### Take-Home Points

Gynecologists can improve outcomes and enhance patient safety with comprehensive pre-operative evaluation, patient education, and appropriate scheduling of planned surgical procedures. Adherence to absolute and relative contraindications is mandatory. The astute physician will remember that expertise lies not just in manual dexterity, careful surgical planning, and communication with the entire surgical team, but also in prompt evaluation and intervention of complications.

Linda D. Bradley, MD Director of Hysteroscopic Services Department Obstetrics & Gynecology Cleveland Clinic Foundation Cleveland, Ohio

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