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The Choice between Intrauterine Contraceptive Device Options: A Narrative Review

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Abstract

Deciding on intrauterine device selection requires consideration of multiple factors beyond contraceptive efficacy. Device frame dimensions relative to uterine cavity size, differences in bleeding and pain profiles between copper and levonorgestrel-releasing devices, rates of mechanical complications, and patient-specific anatomic factors are not often adequately addressed during contraceptive counseling despite their influence on device tolerance and continuation. In this narrative review, multiple search strategies were used to examine published literature on commercially available intrauterine contraceptive devices in the United States, focusing on device size compatibility with uterine dimensions, complication rates (perforation, expulsion, malposition, embedment, and fracture), side effect profiles, pain during insertion, cancer risk, and emergency contraception use. Clinical data are provided which may be useful to present for patient counseling regarding their intrauterine contraceptive choices, given that potential long-term consequences are known to exist.

Though our collective knowledge on this subject continues to expand, there exists an abundance of information from the past use of available options for these long-acting reversible contraceptive methods, with the convenience and ease of use from which patients can benefit.

Keywords: Contraception, Hormonal contraception, Copper IUD, Levonorgestrel IUD, Cancer risk, Uterine size, Emergency contraception

Introduction

When a patient presents for contraceptive counseling, a physician should provide the current relevant information to enhance the subsequent shared decision-making that may ensue. The information provided may even somewhat contradict that which may have been provided by peer communications, social media, and vendor marketing [1]. Long-Acting Reversible Contraception (LARC) has become popularized in recent times [2], and the specific Intrauterine Device (IUD) choices that are currently available are worthy of a detailed objective discussion of all of the pertinent clinical aspects that are involved. This is especially true given recent noteworthy trends and the Food and Drug Administration Adverse Event Reporting System (FAERS) information that has been described [3]. This narrative review specifically examines IUD-related clinical problems and complications to provide clinicians with comprehensive evidence for patient counseling. PubMed and Web of Science databases were used from 2000 through 2025, particularly including the specific topics mentioned in this review, as listed below. Although IUDs are highly effective contraceptive methods, understanding device-specific complications, side effects, and patient factors that affects performance is essential for optimal device selection and patient satisfaction. This narrative review addresses device sizing considerations relative to uterine anatomy, mechanical complications (e.g. perforation, expulsion, malposition, embedment, fracture), side effect profiles between device types, pain management strategies for insertion, and hormonal safety concerns including cancer risk.

The findings in the most recent FAERS report, that IUD breakage of the Copper IUD (T380) was disproportionately higher than that of the Levonorgestrel-Releasing Intrauterine System (LNG-IUS) device, was similarly found in another

retrospective survey, though the disproportion which was reported in it was even greater (i.e. a 40-fold difference) [4]. It can be noted however, that the FAERS report is based on consumer and clinician voluntary posting, which is different from a systematic surveillance of a small sample of IUD and LNG-IUS users. It has been reported that complications can occur from breakage or fracture, which can lead to hysteroscopy or laparoscopy or both. Failure of removal of a fractured IUD can even lead to a hysterectomy after an IUD insertion [5]. This is just one device complication among others which will be discussed in detail in what follows.

Review

Intrauterine device contraception effectiveness versus sterilization

When speaking of intrauterine contraception and the similarly effective LARC method of subdermal contraceptive implant use, it is fair to compare the effectiveness of preventing births with permanent sterilization measures, with there being no significant effectiveness difference between devices [6]. While long-term comparative trials of IUD use versus permanent sterilization are lacking, available evidence suggests comparable contraceptive effectiveness. As such, it may appear that sustained use of IUDs can prevent unwanted pregnancy similar to what is provided with permanent sterilization options [7].

Size factor (uterus vs. device)

A comprehensive evaluation of uterine cavity dimensions and IUD sizing was conducted by Wildemeersch et al. [8], who assessed 400 nulliparous women seeking IUD insertion using 2D and 3D ultrasound. Their multicenter study reported cavity sizes of 7–14 mm at the low end, substantially smaller than previously thought and smaller than standard IUD dimensions. This study emphasizes that the cavity width in nulliparous women often cannot accommodate large-frame devices (32 mm) without potential for malposition or embedment. The size discrepancy between available device frames and actual uterine dimensions, particularly in nulliparous women, represents a possibly underappreciated factor in device selection that warrants greater investigation and may explain the higher complication rates observed in some populations. This matter was further addressed by Goldstuck [9].

There are two categories of the IUD – one is the copper T380 device, marketed as the Paragard®, and ones that are levonorgestrel intrauterine systems (LNG-IUS), or hormone-containing devices which come in two different sizes – the larger frame Mirena® (32 mm in width) and the smaller frame Kyleena® or Skyla® (28 mm in width). The two different sizes may be important, in that the average diameter of the multiparous uterus is 32 mm (easily accommodating the Paragard® or Mirena®), while the average width of the nulliparous uterus is 27 mm (better accommodated by the smaller-frame Kyleena® or Skyla®), as sonographically measured by Dr. Benacerraf [10]. The sonographically identifiable width of the uterus described here is the interostial distance between the two tubal ostia. This uterine size difference with respect to parity status is commonly ignored by physicians when counseling patients, and it seems also ignored in the marketing to physicians by either device brand. The device complications that are possible with the use of either device type include expulsion, malposition, perforation, embedment, and fracture, as has often been reported. While any Copper IUD or LNG-IUS device associated complication rates may have been compared, the actual device frame size has been less commonly systematically analyzed, given that the LNG-IUS devices can have different dimensions (i.e. small- or large-size), whereas the T380 has only one such large-frame size (in the American market). Therefore, a comparison of specific device frame size and the relative incidence of complications have not yet been adequately investigated, though this would indeed be possible, given the number of users and complications known to exist. It can be noted that between 2017 and 2019, 10.4 % of women used a LARC method in the United States [11]. While there is no evidence of a difference in the risk of perforation between insertion of device types [12], and no difference in the risk of device expulsion with regard to age or parity status [13], the difference in the risk of embedment is suggested by the FAERS report, which may relate to the possible device and uterine size discrepancy.

The coronal view (C-V) of the uterus obtained with Three-Dimensional Transvaginal Sonography (3DTVS) appears to be the best imaging tool to detect malposition and related IUD complications [14]. Device embedment has been reported to occur, and has been discussed [15]. In such a case, exertion placed for withdrawal of the device with a grasping forceps on the device string, as is typically done for device removal, can result in device fracture if embedment of the device had occurred. This would explain the occurrence of any reported device breakage. Device malposition has been commonly reported in patients who complain of pain after device insertion, described in a case series [16]. Malposition has been described to occur with either device type [17,18], and routine sonographic detection of this has been suggested following placement, at least in cases where there are complaints of pain 6-weeks following insertion [19]. Symptomatic malposition typically manifests within 1 year of placement and is a common reason for unscheduled device removal. In one case series [20], malposition occurred more frequently with LNG-IUS than with copper IUD.

When this occurs, it is not surprising that this can be also associated with abnormal uterine bleeding (AUB). Information and recommendations from manufacturers regarding the

possible size impact for women appears to be absent at the online sites for medical practitioners [21–23], and future investigations seem warranted.

Uterine cavity distortion

Recommendations for selection of IUD/LNG-IUS candidates may be somewhat confusing, in that it is stated that the Paragard® is contraindicated if "abnormalities of the uterus resulting in distortion of the uterine cavity" exists [21]. The Mirena® is contraindicated if a "congenital anomaly or acquired uterine anomaly distorts the uterine cavity" [22]. However, that an anomaly may exist in a woman without her being aware of it seems quite possible, given a report describing the incidence of unsuspected uterine anomalies or fibroids found in a case series of 517 sonographically examined symptomatic IUD users, which was associated with a rate of 19% of sonographically detected malpositioned IUDs, and an increase in bleeding and pain associated with this IUD malposition [24]. Sonographic uterine assessment is generally not indicated without identified complaints and is therefore not routinely performed prior to IUD insertion. The incidence of uterine anomalies (e.g. bicornuate, arcuate, septate, etc.), often unknown to an individual, can range from 3–5% of women, depending on the population surveyed, and definitions applied [25,26]. Given the finite incidence of inapparent uterine anomalies that exists, and the propensity of IUD malposition that may occur after insertion, with accompanying pain and bleeding, pre- and/or post-insertion sonography has been suggested [14,15]. A contrary perspective has been published however, although that was based on a very small sample size, and therefore may not be clinically meaningful [27].

Perforation risk

Though there is a finite risk of uterine perforation with any device insertion, that risk is very small (~1 in 500 insertions), with a higher risk if inserted within one year postpartum [28]. There appears to be no major difference in perforation risk between types. In reported cases of perforation, there appears to be limited risk of serious consequences, although removal typically requires laparoscopy [10]. Clinically apparent perforation may occur at the time of insertion, though evidence of "migration" of a device from an intrauterine to an extrauterine position may more commonly occur, according to many case reports in the literature [29]. The distinction between a clinically apparent perforation from insertion and the migration of the device has not been adequately defined.

Pain of device insertion

Pain from device insertion is commonly perceived by a patient, and this potential should always be disclosed to the patient during counseling for any intrauterine contraceptive device choice. It is clear however, that there is a significant difference in perceived pain between a nulliparous and parous woman, independent of age [30]. It is also apparent that anticipated pain can predict the perception of pain which is reported [31]. A variety of techniques have been used to minimize such pain, yet there is no current definitive recommendation that seems most favorable [32,33], beyond using "verbal" analgesia [34]. There are three components of the perceived pain of device insertion: 1) using the tenaculum on the cervix to stabilize the uterus during insertion; 2) insertion of the introducer through the cervical canal, and 3) touching of the fundal uterine wall (either from uterine sounding or release of the device in the uterine cavity). Any method of mitigation of the pain of IUD insertion must address each of these pain components.

Use of suction for uterine stabilization has been attempted [35], rather than using a tenaculum for that purpose. Use of lidocaine infiltration of the cervix has also demonstrated some benefit for this aspect of pain (grasp of the cervix with tenaculum) [36]. This would address the first component mentioned. Attempts have been made to avoid uterine sounding prior to device placement, with insertion being done under sonographic guidance [37–39], which addresses the pain of the first and possibly third pain components. All of these pain components would be mitigated by systemically administered analgesia (e.g. with conscious sedation) [40], since prior self-administered non-steroidal anti-inflammatory (NSAID) medication, as has been recommended by device vendors, appears to have limited consistent success in elimination of device insertion pain [41]. While the use of lidocaine infiltration of the cervix prior to placement of the tenaculum during device insertion has been shown to have some success [33], use of a lidocaine paracervical block may have a greater degree of sensory block, and may address the other pain components of device insertion as well [42].

The difference that exists between the pain perceived during device placement of a nulliparous versus a multiparous woman may be partly explained by the possible difference in caliber size or tissue stiffness of the cervical canal, which seems to be increased after a single childbirth, according to the collective experience of gynecologists who perform outpatient procedures during which instruments or catheters are inserted into the uterine cavity (e.g. hysteroscopes, curettes, Pipelle catheters, etc.). A new measurement methodology may be available to assess this difference between the nulliparous and multiparous cervix (i.e. sonographic elastography) to explain this matter [43], in terms of tissue stiffness and accommodation, though this technology has yet to be applied to this factor. Inserting the contraceptive device insertion tube through the cervical canal may be an example of this possible distinction, and the caliber size differences between device types vary. Investigations have shown differing results regarding pain perception on insertion between devices [29,44]. As mentioned, the clinical experience of many gynecologic

providers suggests that differing caliber size between different device introducer tubes may matter in terms of perceived discomfort with insertion through the cervical canal, especially for the nulligravid patient. For example, the Kyleena® insertion tube measures 3.8 mm in diameter [21], whereas the one for the Mirena measures 4.4 mm [19], and that for the Paragard® may be even larger than that (diameter not specified at online site) [20]. Any investigation analyzing differences in pain perception with devices should keep these facts in mind, for accuracy in determining associated device insertion pain. It can be noted that the American College of Obstetricians and Gynecologists (ACOG) has posted recommendations that may apply to insertion of contraceptive devices [45].

Side effect profiles

The major difference between these two categories of intrauterine contraceptive devices relates to the typical side effects of dysmenorrhea and heavy menstrual bleeding, which commonly occur with the Copper IUD, but markedly less for the LNG-IUS [2,46–51]. These side effects (pain and bleeding) are often reason for its discontinuation, as seen in these case series. In addition, other side effects have been reported, relating to possible hormonal medication impact, such as some sexual problems, though device differences in this regard are not evident, and the LNG-IUS may even offer improved sexual responsiveness [52,53]. **Table 1** displays the relative side effects of the two types of intrauterine contraceptive devices which have been reported from numerous sources. It is reasonable to use this summary to describe the possible patient impact of device usage, as has been documented and cited. The continuation rate of particular devices may also be useful for patient counseling for device choice [54]. Patient satisfaction with the device that is used is measurable, as is the rate of continuation of the device, which is referenced and compared in the literature [55]. Providers can greatly influence the contraceptive choices that patients make, with only routine counseling [56].

Postpartum vs. Interval IUD insertion

The specific postpartum placement of an IUD has been compared between immediate and delayed insertion (i.e. before maternal hospital discharge vs. at the postpartum visit). Data have clearly shown that the delayed insertion is a more popular choice and is associated with a favorable lesser incidence of expulsion and malposition, apparently independent of the type of device [57]. The lack of patient preference difference between demographic groups is essential to understand. Certainly the convenience of immediate insertion is well understood, and counseling about IUD insertion should indeed include the different complication rates, but encouraging continuous contraception with a LARC method in general may be reasonable advice, when comparing all contraceptive choices.

LNG-IUS function and nomenclature

The mechanism of the contraceptive effectiveness of both the Copper IUD and LNG-IUS is the uterine environment created which is hostile to embryonic implantation [58]. The LNG-IUS mechanism differs substantially from systemic progesterone contraception. While systemic levonorgestrel from the LNG-IUS may contribute minimally to contraceptive effectiveness through peripheral effects, the predominant mechanism is local intrauterine action. As noted by Goldstuck [9], the levonorgestrel-releasing aspect was developed simultaneously with other IUD innovations, though it worked for contraception through fundamentally different mechanisms than systemic hormonal contraceptives. The periodic ovulation inhibition seen with LNG-IUS is secondary to local effects rather than the primary mechanism of action, distinguishing it from oral contraceptives where ovulation suppression is the principal contraceptive mechanism. However, there is a marked difference between the amount of intrauterine levonorgestrel and its availability in serum for the LNG-IUS [59]. The nomenclature used for the LNG-IUS devices

Table 1. Relative side effects reported.

Source	Copper IUD	LNG-IUS
Baker 2022 [2]	Increased dysmenorrhea, increased bleeding	Decreased dysmenorrhea, decreased bleeding
Kelekci 2011 [47]	Increased dysmenorrhea, increased bleeding	Decreased bleeding, improvement of dysmenorrhea (compared to prior to device)
Hubacher 2009 [48]	9% of patients reported "serious" pain, 23% D/Ced use in 1st year	
Yucel 2018 [49]		Reduced dysmenorrhea and dyspareunia in patients with endometriosis
Chen 2018 [50]	Increased bleeding/spotting, increased dysmenorrhea	Less bleeding/spotting, no dysmenorrhea

is based on the amount of levonorgestrel hormone contained within the device (e.g. 52 mg for the Mirena®, or 19.5 mg for the Kyleena®, or 13.5 mg for the Skyla®), rather than the associated daily release of levonorgestrel which may be more related to its function – 21–7 mcg for the Mirena®, 17.5–7 mcg for the Kyleena®, and 14–5 mcg for the Skyla®. For all devices, the amount of levonorgestrel released per day diminishes after its insertion, as just indicated here.

Emergency contraception

While the comments made about the Copper IUD and the LNG-IUS relate to their provision of ongoing contraception, the role in emergency contraception is worth additionally noting. Emergency contraception (EC) refers to the unprotected sex that may have occurred, or the immediately known failure with use of a contraceptive method (e.g. condom breakage), when pregnancy is not desired. Originally, only the Copper IUD was offered for emergency contraception, though it has recently been suggested that the LNG-IUS can also be considered for this role, given the non-inferiority of its placement for the desire for contraception after unprotected intercourse when compared to the Copper IUD [60]. The parity status of the patients in this comparison study was not considered, but only the primary outcome related to pregnancy protection in this emergency setting was recognized. There may still be controversy with regard to this emergency contraceptive use of the LNG-IUS, given a report challenging this [61]. It can be noted that the Centers for Disease Control and Prevention (CDC) statement regarding Medical Eligibility for Contraception (MEC) issued in 2024 [62]. only recommends the Cu IUD for EC use, though the American Association of Family Medine (AAFM) recommends either device for this purpose [63].

It can be noted that the choice of using the copper IUD may often be based on the woman's desire not to use the hormone-containing IUD, suggesting a concern for the possibly associated risk of breast cancer. While the contraindication to the use of the LNG-IUS would be a known progestin-dependent neoplasm, the incidence of this particular problem has never been reported among reproductive age women who wish to use an IUD for pregnancy protection, but this potential risk is mainly what may be of concern. Quantification of this possible risk is desirable for a choice of this LARC method to be made, and further exploration of this is warranted.

Cancer risk

Hormonal contraception in general (oral and intrauterine) has not been shown to have any cancer risk [64]. A meta-analysis of investigations evaluating the cancer risk of LNG-IUS involving over 144,000 patients failed to identify evidence of such cancer risk [65]. For those patients with a history of breast cancer, in whom LNG-IUS was placed, there appeared to be no incidence of recurrence [66]. In fact, a lower-than-expected incidence of endometrial and ovarian cancer was found in patients with LNG-IUS [67]. This was also found in another study as well [68]. Although that study reported a slightly increased over than expected incidence of breast cancer in the subjects of the investigation (0.1 % of the subjects), the known confounding variables were not controlled for in the study that was based on LNG-IUS purchases. A different study confirmed there to be no added risk of breast cancer from the use of the LNG-IUS [69]. Also, another report showed a reduced incidence of endometrial cancer when an LNG-IUS was used in women with a history of breast cancer who were on onco-protective tamoxifen, compared to what might have been expected [70]. To add to the confusion in the medical literature on this issue, yet another comparison can be considered, recognizing the need to study this further [71]. Addressing this concern even further, an investigation of over two million women with endometriosis, abnormal bleeding, or uterine leiomyomas showed an increased breast cancer risk among LNG-IUS users, for women with those diagnoses [72].

It may be important to consider the evidence that progestins, as an endocrinologic category, has not shown there to have an increased risk of breast cancer [73.] While another meta-analysis showed a slightly increased risk of breast cancer in older women with LNG-IUS, caution was raised regarding methodological issues in some of the included studies. Caution was also urged to balance contraceptive effectiveness with this potential oncogenic risk [74]. In this context, it may be important to recognize the many risk factors associated with breast cancer, such as age, personal history of breast cancer, the BRACA 1 and 2 genetic mutations, family history of breast cancer, obesity, dense breasts, reproductive history, and exogenous hormone therapy. Available evidence does not meaningfully and consistently show that LNG-IUS as one of them, except for two reports with each having methodologic concerns regarding control for those known risk factors. Concern for the possibility of breast cancer risk when deciding on contraception is completely understandable, but decision-making should be based on the widely available evidence that exists to date.

Conclusion

Though there may be some confusion about cancer risk from the use of the LNG-IUS device in the medical literature, much data exists that suggests it to be minimal, if it even exists at all. If a physician faces a decision to be made (before any decision-sharing with a patient) between a medication/device causing excessive dysmenorrhea and menorrhagia and one having a likely less intense such side-effect profile, with both medication/devices providing equivalent pregnancy protection, how should clinicians offer patient guidance? Given the multiple risk factors for breast cancer that exist, and the difficulty of specifying the actual added risk that may

exist for the LNG-IUS, unbiased evidence should be provided. If a patient has any important risk factor for breast cancer, as any of those mentioned above, the Copper IUD can be considered rather than the LNG-IUS. To further minimize risk of an intrauterine contraceptive device, however, the issue of IUD frame size may also be important to consider.

Author Contributions

Elliot M. Levine, MD: Project development, conceived of project.

Carlos M. Fernandez, MD: Reference collection and review.

Teresa Tam, MD: Manuscript writing/editing.

Declarations

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Conflict of Interest

Authors deny any conflicts of interest.

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