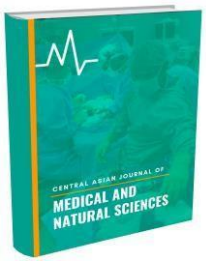

CENTRAL ASIAN JOURNAL OF MEDICAL AND NATURAL SCIENCES
https://cajmns.centralasianstudies.org/index.php/CAJMNS
Volume: 05 Issue: 04 | October 2024 ISSN: 2660-4159

.

Article

Intrauterine Device Malposition Research: The Involvement of Three-Dimensional Ultrasound Imaging

Wasan Mahmood Abed[1]*, Mariam Sudan Ibrahem[2]

1,2 Senior Specialist Obstetrics and Gynecology Al Falluja General Hospital
* Correspondence: Lujainarrak@gmail.com

Abstract: This study aimed to identify the frequency of intrauterine contraceptive device (IUCD) malposition and the primary contributing factors using advanced diagnostic techniques. The research specifically focused on assessing the effectiveness of three-dimensional (3D) ultrasonography in detecting and evaluating IUCD malposition and its consequences. A cross-sectional study was conducted from January to June 2022 in the gynecology and obstetrics departments of Al Falluja General Hospital, Salahuddin General Hospital, and a private ultrasonography clinic. Data were collected through direct interviews, medical history reviews, physical examinations, and both 2D and 3D ultrasound imaging. The study involved 100 women, with a focus on demographic factors, symptoms, and the accuracy of IUCD placement as observed through ultrasound imaging. The results demonstrated that 33% of the women experienced IUCD malposition, with 3D ultrasonography significantly improving detection accuracy compared to 2D ultrasound. The study also found a significant association between IUCD malposition and symptoms such as pain and bleeding, as well as certain uterine abnormalities. These findings suggest that 3D ultrasonography is superior in detecting IUCD malposition, which could lead to better management and treatment outcomes for affected women.

Keywords: IUCD malposition, 3D Ultrasonography, Contraceptive Devices, Gynecological Imaging, Uterine Abnormalities.

Citation: Wasan Mahmood Abed. Intrauterine Device Malposition Research: The Involvement of Three-Dimensional Ultrasound Imaging. Central Asian Journal of Medical and Natural Science 2024, 5(4), 556-565

Received: 4th Oct 2024
Revised: 10th Oct 2024
Accepted: 16th Oct 2024
Published: 23th Oct 2024

1. Introduction

The intrauterine contraceptive device (IUCD) is considered a very acceptable and effective method of contraception [1] since it is durable, inexpensive, and trustworthy [2]. The modern IUCD was first created as a T-shaped device that mirrored the uterus's natural curve. It became well-known in the 1960s and was a crucial component of family planning since it was less harmful to the heart than oral contraceptives. [3]

The insertion of an intrauterine contraceptive device (IUD) is typically simple and safe. The primary benefit of IUDs is that they are long-lasting and reversible, which minimizes the need for follow-up clinical examinations. Despite these benefits, IUDs can also have negative side effects, such as misplacement; expulsion, displacement, embedment, and perforation are the most common issues, with IUD loss being the primary concern. Uterine perforation is linked to causes like breastfeeding, postpartum status, and inexperienced healthcare professionals. Many of the lost IUDs are located in the uterus. As ultrasound is frequently employed to identify women with gynecological issues, it can easily differentiate an IUD located in the uterus, this is appropriate because the device can be followed by the ultrasound. Ultrasound is frequently employed as a means of control

to eradicate dangers like the perforation of the uterus during procedures related to reproductive medicine and assisted reproduction. Two-dimensional ultrasound scans may not accurately visualize internal contraceptives (ICs); data indicates that 2% of the cases of internal contraceptive misplacement are missed by 2D ultrasound[4]. Conversely, 3D US increases the effectiveness of 2D US by restoring coronal images and facilitates the determination of the location of the IUCD relative to the uterine chamber[5]. This information is important in order to determine the position of the device with respect to the uterine chamber [6].

Aim of the study

The study aims to identify the frequency of IUCD misplacement and the main contributing factors using precise diagnostic techniques.

Objectives

The study aims to assess the effectiveness of 3D ultrasonography in detecting and assessing IUCD malposition and consequences, in addition to identifying the most common risk factors and IUCD malposition presentations.

Classification of contraceptive methods

Contraceptives are categorized into two types: long-acting (such as implants, IUDs and sterilization) and short-acting (such as condoms, pills, injections, spermicides and other modern methods). While short-acting technologies are crucial to spacing out births and delaying, long-acting technologies are primarily employed to reduce the rate of birth[7].

Types and mechanism of action:

IUCDs are divided into two groups by the World Health Organization (WHO) (10): hormonal and non-hormonal. Hormone-releasing IUDs, such as levonorgestrel, are classified as hormonal IUCDs. Copper-bearing IUDs are among the non-hormonal IUCDs.

If available, a common method of birth control is the hormonal intrauterine device. It is a small, flexible, T-shaped plastic device with a vertical shaft that is filled with hormones and delivers a small amount of levonorgestrel into the uterus [8]. The Mirena IUD provides about 52 mg of levonorgestrel over five years, while non-hormonal IUDs use copper in many procedures to produce contraceptive protection [9].Table 1

The IUCD is the most widely used long-acting method of contraception in the world, with user percentages ranging from less than 2% to over 40% [10]. In both industrialized and emerging nations, its popularity is growing. After the Mirena® brand was launched in the US in 2001, the percentage of American women who used IUCD rose from 2% in 2000 to over 12% in 2014. Accessibility is nevertheless severely hampered by high product costs in low- and middle-income nations, notwithstanding these advancements [8].

The 2018 Iraq Multiple Indicator Cluster Survey found that 52% of the married Iraqi women had previously employed contraceptives.

Placement and positioning:

IUCD insertion can be done at any time throughout the menstrual cycle when pregnancy has been ruled out. After hormonal IUCD implantation, backup contraception must be used for seven days. A minimum depth of 6 cm is established in an outpatient setting using sterile procedures and a uterine sound [9]. A T-shaped IUCD with horizontal arms placed vertically inside the uterine cavity against the fundus is the optimal configuration [12].

Advantages:

The commonly used IUCD approach offers great contraceptive effectiveness for several years with only one injection and little side effects [13]. Additional advantageous applications for the non-hormonal IUCD include sterilization and long-term use [10]. Furthermore, the hormonal IUCD has fewer adverse effects than other hormonal therapies

and has unique therapeutic benefits such reduced bleeding and alleviation of menstrual pain [8]. Endometriosis, a disorder where endometrial tissue is located outside the uterus and causes infertility and pelvic pain, is treated with surgery, hormonal medications such as progestogen levonorgestrel, or a combination of the two [14].

Disadvantages and complications:

Problems including discomfort, Cramping and excessive bleeding may lead to the discontinuation of non-hormonal IUCDs in the first year, this is because these devices are negatively affected by user satisfaction and preference. However, the failure rate is typically low (around 0.2% for hormonal IUDs and 0.8% for non-hormonal IUDs) when used normally. However, the position can be incorrect and this can lead to problems. Table 2.

When deciding on the placement of an intrauterine contraceptive device (IUCD) in a woman, the period during which the procedure is conducted should be considered in conjunction with the postpartum period and breastfeeding, these factors may influence the probability of expulsion. Immediately following the birth of a child, its placement is more likely to be expelled than a later placement. Breastfeeding may cause structural and hormonal changes in the mother's body that increase the likelihood of expulsion of the IUD following childbirth[16]. IUD misplacement is a dangerous condition that necessitates surgical removal, this is especially true of IUDs that are external to the uterus. This delay increases the likelihood of unconventional birth and the associated risks, which can lead to psychological and financial burden on the patient. Using the incorrect method of insertion or timing increases the probability of IUD displacement[1].

Between 0.05 and 13 uterine perforations are expected to be caused by an IUCD for every 1000 insertions; this might have dangerous repercussions, such as the IUCD spreading to adjacent organs including the bladder and sigmoid colon [2].

Contraindications:

The principal arguments against the usage of IUCD are as follows [17]: 1. The pregnancy is still going 2. discharge from the vagina 3. The current pelvic inflammation 4. Sepsis in its latter stages after parturition 5. 6. A pregnant trophoblastic disease instance that is ongoing 7. Cervical cancer cases reported to date 8. Untreated endometrial cancer Irregular vaginal bleeding 9. Abnormalities in the uterus 10.

Ultrasonography:

Over the years, substantial advancements in gynecological imaging methods have improved patient care and diagnostic accuracy. This is particularly true in situations involving IUCDs, when ultrasonography is first employed because of its affordability, radiation-free nature, and ability to provide a clear image of the pelvic anatomy [9].

The most effective technique for assessing the uterus's location and size, ruling out any issues, and identifying whether or not a pregnancy has occurred is transvaginal ultrasonography. The cervix is then seen using a speculum; sonographic pictures are used for guiding rather than continuous imaging, and at the conclusion, the transvaginal probe can be reinserted to verify the location of the device [18].

While 2D imaging is limited in its ability to assess illness in the coronal plane, 3D uterine imaging can rebuild this plane, especially when 2D imaging is aberrant, which aids in the more accurate definition of uterine abnormalities. The introduction of 3D ultrasonography early in the 1990s was a significant leap. Since then, a number of studies have demonstrated its value in tracking pregnancy issues and identifying fetal anomalies, which has led to its broad adoption in clinical settings [19]. 3D reconstructions are becoming increasingly popular for a more precise assessment of IUCD location, particularly in the coronal view [9]. The capacity to measure endometrial volumes, evaluate endometrial vascularity, and see the junctional zone are only a few advantages of 3D ultrasound. In addition, it can be used to assess uterine problems such as adhesions,

fibroids, polyps, adenomyosis, and scars from cesarean sections. The capacity of the 3D ultrasound to record the whole volume of the uterine anatomy facilitates the reconstruction of the coronal plane of the endometrial cavity [20].

A coronal view of the uterus is the best choice to visualize the whole IUCD—including the shaft and arms—within the endometrial cavity. To optimize diagnostic precision, imaging settings must be adjusted, and artifacts that might impair 3D ultrasound imaging accuracy must be identified. If artifacts are present in a volume that are not immediately apparent, it could be essential to review the image in the acquisition plane. The use of 3D ultrasonography by examiners is associated with a high learning curve, and the cost of 3D capable probes and equipment may limit its accessibility. This is expected to change, though, as the technology becomes more widely used and more reasonably priced.

Patients and method:

From the first of January to the last day of June 30, 2022, a cross-sectional study was carried out in the gynecology and obstetrics departments of Al Falluja General Hospital, Salahuddin General Hospital, and a private ultrasonography clinic.

After explaining the study's objectives in detail, patients participated in the discussion by giving their verbal consent to ensure an open, honest communication that would avoid bias. The research endeavor was conceived and subsequently sanctioned by the Scientific Advisory Board of the Faculty of Medicine, Tikrit University.

Information was attained through direct interviews, medical history, physical examinations, and ultrasounds, all of which were conducted in two or three dimensions. Questions that were closed in the questionnaire were designed by the researcher and approved by the supervisor. The process of collecting data took three steps. The first step was to gather medical information, including the patient's age, pregnancies, history of abortions, the number of cesarean sections, gynecological history, and the type of internal reproductive device, as well as the symptoms of gynecological issues, such as bleeding and discomfort in the pelvis. In the second step, the body mass index was derived from the height and weight. After recording weight and height, the body mass index (BMI) was calculated using the following formula: BMI = weight (kg) / height (m).2 (30) Step 3: The Use of Ultrasound Regardless of the purpose of the scan, each woman who had a gynecological ultrasound examination was given a 3D volume of the uterus along with the typical 2D ultrasound examination. We created a numerical system of abnormalities to facilitate the uniformity of IUCD visualizations. A 7-point system of evaluation was employed to assess the abnormalities of the IUCD in the 3D coronal view, the 2D sagittal and transverse views, and all three views. One point was dedicated to the lower and higher poles of the IUCD's axis in the sagittal plane, these points were awarded three points each for the purpose of overall axis visibility. One point was dedicated to the visibility of the right and left arms of the IUCD in the transverse plane, along with one point for the crossbar and the axis of connection. Four points were granted if the crossbar was completely accessible. The IUCD was evaluated using a pre-designed scale in the 3D coronal view. Any additional parts of the IUCD that were inserted into the myometrium, isthmus, or endocervix were considered to be malpositioned [21].

Statistical analysis:

The process of data entry and analysis was conducted using the Social Science Package (SPSS) version 22. Descriptive analysis concerned with the frequency and percentage. Constant variables were documented as mean ± standard of deviation (SD). The chi-square test, Fisher's exact test, and t-test were employed to assess the significance of the differences between the study groups. P values less than 0.05 were considered significant.

2. Materials and Methods

Research Methodology:

The research employed a cross-sectional study design, conducted from January 1 to June 30, 2022, in the gynecology and obstetrics departments of Al Falluja General Hospital, Salahuddin General Hospital, and a private ultrasonography clinic. The study aimed to assess the effectiveness of three-dimensional (3D) ultrasonography in detecting intrauterine contraceptive device (IUCD) malposition and its associated risk factors.

Participants:

The study involved 100 women who visited the aforementioned healthcare facilities for gynecological issues during the study period. Participants were selected based on their consent and availability for the study. The inclusion criteria included women who had an IUCD in place and were willing to undergo both 2D and 3D ultrasound examinations.

Data Collection:

Data were gathered through a structured process involving three main steps:

1. Medical History and Physical Examination:
    a. Patients were interviewed directly to collect detailed medical histories, including age, gravidity, history of abortions, number of cesarean sections, and gynecological history. Symptoms related to gynecological issues, such as pelvic pain and abnormal bleeding, were also recorded.
    b. Physical examinations were conducted to assess general health and gather additional relevant data.
2. Anthropometric Measurements:
    a. The body mass index (BMI) of each participant was calculated based on recorded height and weight, using the formula: BMI = weight (kg) / height (m)^2.
3. Ultrasound Examination:
    a. Each participant underwent both two-dimensional (2D) and three-dimensional (3D) ultrasound examinations of the uterus. The ultrasound imaging was performed to evaluate the position and condition of the IUCD.
    b. A 7-point evaluation system was employed to assess the IUCD's position and detect any abnormalities. The evaluation included the visibility of the IUCD's axis in the sagittal plane and the arms in the transverse plane, with specific points allocated for overall axis visibility.

Data Analysis:

The collected data were analyzed using the Statistical Package for Social Science (SPSS) version 22. Descriptive statistics, such as frequency and percentage, were used to summarize the data. Continuous variables were presented as mean ± standard deviation (SD). The chi-square test, Fisher's exact test, and t-test were utilized to determine the significance of differences between the groups. A p-value of less than 0.05 was considered statistically significant.

The analysis focused on comparing the accuracy of 2D versus 3D ultrasonography in detecting IUCD malposition and evaluating the association between malposition and various risk factors, such as symptoms and uterine abnormalities.

3. Results

The present study comprised 100 women, over half of whom fell in the age group of 20-29 years and more than half were overweight as shown in Table .1. In contrast, 22% of the individuals experienced bleeding and 24% had pain complaints; while fibroid was incidentally picked up during ultrasound examination in 9% of patients as detailed in Table 2.

The conspicuity is much higher when using 3D ultrasound compared to the use of 2D ultrasound (see Table.3). Out of the total number of individuals who exhibited malposition in IUCD, which was 33 (33%), there were 11 individuals with normal placements observed on 2D ultrasound while using 3D ultrasound; refer to Table .4.

Table 1: Demographics of participants: age, BMI, and history of pregnancy

Qualities of the individuals involved		**N**	**%**
Age group (years)	<20	7	7.0
	20-29	58	58.0
	30-39	28	28.0
	≥40	7	7.0
Body mass index	Underweight	0	0.0
	Normal weight	39	39.0
	Overweight	51	51.0
	Obese	10	10.0
Gravidity	3	3	3.0
	4	34	34.0
	5	28	28.0
	6	17	17.0
	7	11	11.0
	8	3	3.0
	9	4	4.0
Abortion	0	88	87.0
	1	1	1.0
	2	8	8.0
	3	3	3.0
Cesarean section	0	69	69.0
	1	13	13.0
	2	11	11.0
	3	7	7.0

Table 2: Symptoms and uterine abnormalities

Chronic disease		**N**	**%**
anomalies in the uterus (N=11)	Fibrous	9	9.0
	September	2	2.0
	Rectangular in shape	2	2.0
Symptoms (N=25)	Pain	24	24.0
	Bleeding	22	22.0

Some women experienced many symptoms and multiple abnormalities in their uterus.

Table 3: The kind of intrauterine contraceptive device and conspicuousness are associated.

	Conspicuity of IUCDs		**P-value**
	2D ultrasound) Mean (±SD	3D ultrasound) Mean (±SD)	
All IUCD	3.2 (1.0)	5.9 (0.8)	0.001
Hormonal IUCD	4.1 (0.9)	6.3 (0.8)	0.001

Non-hormonal IUCD	2.6 (0.6)	5.7 (0.7)	0.001

Table 4: The incorrect position of the internal contraceptive device, as observed by 2D and 3D ultrasound.

	3D ultrasonography		Total	P value
	Typical location N (%)	Malfunction N (%)		
regular posture	67 (100.0)	11 (33.3)	78 (78.0)	0.001
Inaccurate placement		0 (0.0)	22 (66.7	

Table 5: The association between uterine abnormalities and the position of the intrauterinedevice.

		3D ultrasound		Overall	P-amount
		Malfunction N (%)	Typical location N (%)		
Fibrous	Yes	7 (21.2)	2 (3.0)	9 (9.0)	0.005
	No	26 (78.8)	65 (97.0)	91 (91.0)	
September	Yes	1 (3.0)	1 (1.5)	2 2.0)	1.00
	No	32 (97.0)	66 (98.5)	(98 (98.0)	
Rectangular in shape	Yes	1 (3.0)	1 (1.5)	2 (2.0)	1.oo
	No	32 (97.0)	66 (98.5)	98 (98.0)	

The findings were able to prove that the pain (P value = 0.001), bleeding pain (P value = 0.001), missing IUCD line (P value = 0.001) and discomfort caused by IUCD misplacement (P value = 0.001) had significant relationship.

		3D ultrasound		Total	P-value
		Malposition N (%)	Normal position N (%)		
gushing blood	Yes	20 (60.6)	2 (3.0)	22 (78.0)	0.001
	No	13 (39.4)	65 (97.0)	78 (78.0)	
Anguish	Yes	22 (66.7)	2 (3.0)	24 (76.0)	0.001
	No	11 (33.3)	65 (97.0)	24 (24.0)	
IUCD strings gone	Yes	25 (75.8)	3 (4.5)	28 (28.0)	0.001
	No	8 (24.2)	64 (95.5)	72 (72.0)	

4. Discussion

IUCDs, or intrauterine contraceptive devices, are a mainstay of contraceptive treatments worldwide [22], prized for their price and durability. A thorough assessment is necessary since IUCD mispositioning can lead to issues and reduced efficacy [23]. In a unique study done in Iraq, the value of 3D ultrasound in assessing IUCD malposition, prevalence, and associated risk factors was emphasized, underscoring its superiority over 2D ultrasound in diagnosing malposition. Previous research has shown how valuable 3D

ultrasound is for clinical practice by showcasing how well it can see the kind and location of IUCD [24]. Approximately thirty-three percent of women suffered from IUCD malposition; the most common types were low-lying, high-lying, and incomplete embedment. Research from different countries showed that IUCD malposition rates differed, with the cervix or lower uterine portion housing the bulk of malposition devices [25]. According to Sabrina et al., low-lying IUCD is the most typical malposition [23]. There is no discernible connection between IUCD type and malposition, according to research by Sabrina et al. [23] and Varun et al. [26]. Missing strings, pain, and bleeding were shown to be common signs of IUCD malposition, according to studies by Varun et al. [26]. Further study indicates that concerns including vaginal discharge, irregular menstruation, lower abdominal pain, and expulsions were common when using an IUCD. Research carried out in the United States has also shown a connection between bleeding, pain, and missing strings and IUCD malposition [23]. Swati et al. reported expulsions, irregular menstruation, and pain related to IUCD malposition, which is consistent with Sabrina et al.'s findings; nevertheless, the current study found no meaningful correlation with uterine abnormalities [23]. However, a higher prevalence of fibroids—especially submucosal ones—was positively connected with IUCD malposition, according to an American study [23]. This finding was further supported by another study, which suggests that women who are overweight or obese are more likely to have fibroids. According to Courtney et al. [27], there is a substantial association between BMI and IUCD malposition, but not between the two variables and women's age. However, a study conducted by Malana et al. found that women with IUCD malposition [28] tended to be younger than those with normal placements, and both studies highlighted the correlation between IUCD malposition and the number of cesarean sections conducted [23].

It is possible to draw the conclusion that 3D ultrasonography is superior to 2D ultrasonography in detecting IUCD malposition in women who exhibit symptoms or not.

A multitude of factors have been linked to the incidence of IUCD malposition, suggesting that 3D ultrasonography should be used regardless of symptoms. Other risk factors and imaging techniques should be the subject of future investigation.

5. Conclusion

The study concludes that three-dimensional (3D) ultrasonography is significantly more effective than two-dimensional (2D) ultrasonography in detecting intrauterine contraceptive device (IUCD) malposition. The findings indicate that IUCD malposition is a common issue, affecting 33% of the study participants. The use of 3D ultrasound greatly enhances the accuracy of detecting these malpositions, which are often associated with symptoms such as pelvic pain, abnormal bleeding, and specific uterine abnormalities, including fibroids.

The study highlights the importance of utilizing 3D ultrasonography in clinical practice to improve the diagnosis and management of IUCD-related complications. Given the high incidence of malposition and its potential consequences, the research suggests that 3D ultrasound should be considered a standard diagnostic tool for women with IUCDs, regardless of whether they present with symptoms. This approach could lead to better patient outcomes and more effective contraceptive management.

REFERENCES

1. A. D. K. S. S. K. G. L. T. D. Sanders JN, "Bleeding, cramping, and satisfaction among new copper IUD users: a prospective study," PLoS One, vol. 13, no. 11, p. e0199724, 2018.
2. B. C. M. R. G. A. Braaten KP, " Malpositioned Intrauterine Contraceptive Devices: Risk Factors, Outcomes, and Future Pregnancies.," Obstetrics & Gynecology., vol. 118, no. 5, pp. 1014-20. , 2011.
3. Birth Control and Family Planning Using Intrauterine Devices (IUDs), 2018.

4. D. S. S. A. S. S. G. S. E. C. S. D. e. a. Grimbizis G, "The Thessaloniki ESHRE/ESGE consensus on diagnosis of female genital anomalies†," Human reproduction (Oxford, England)., vol. 31, 2015.
5. E. A. E. S. Elsokary A, " Evaluation of Post-Placental IUD Insertion during Cesarean Section at a Tertiary Care Hospital in Egypt," Open Journal of Obstetrics and Gynecology, vol. 10, no. 4, pp. 516-25., 2020.
6. E. MS, "Comparison between the traditional non-guided and a novel ultrasound-guided technique for office fitting of intrauterine contraceptive devices," International Journal of Gynecology & Obstetrics, vol. 132, no. 4, pp. 895-905, 2018.
7. E. Y. J. G. C. K. W. M. B.-B. E. e. a. Averbach SH, "Expulsion of intrauterine devices after postpartum placement by timing of placement, delivery type, and intrauterine device type: a systematic review and meta-analysis," American journal of obstetrics and gynecology, vol. 223, no. 2, pp. 177-88. , 2020.
8. F. D. K. A. A. K. V. U. Gerkowicz SA, "Uterine structural abnormality and intrauterine device malposition: analysis of ultrasonographic and demographic variables of 517 patients," American journal of obstetrics and gynecology., vol. 220, no. 2, pp. :183. e1-. e8. , 2019.
9. F. N. Connolly CT, "Incidence and Risk Factors for a Malpositioned Intrauterine Device Detected on Three-Dimensional Ultrasound Within Eight Weeks of Placement," Journal of Ultrasound in Medicine, vol. 41, no. 6, pp. 1525-36. , 2022.
10. G. Q.-y. W. W. H. L.-l. Chen X-y, "Three-dimensional ultrasonography versus two-dimensional ultrasonography for the diagnosis of intrauterine device malposition," International Journal of Gynecology & Obstetrics, vol. 128, no. 2, pp. 157-9, 2015.
11. H. B. A. H. F. C. Abou-Setta AM, "Levonorgestrelreleasing intrauterine device (LNG-IUD) for symptomatic endometriosis following surgery.," Cochrane Database of Systematic Reviews, vol. 1, 2013.
12. H. L. P. M. F. M. U. C. D. P. R. e. a. Graupera B, "Normal and abnormal images of intrauterine devices: Role of threedimensional sonography," Journal of Clinical Ultrasound., vol. 40, no. 7, pp. 433-8. , 2012.
13. H. M. C. B. Z. L. K. Y. Nowitzki KM, "Ultrasonography of intrauterine devices.," Ultrasonography, vol. 34, no. 3, pp. :183-94, 2015.
14. J. A. N. A. N. S. G. N. S. S. VARUN N, "Approach Towards Misplaced or Malposition IUCD: Lessons Learned," Journal of Clinical & Diagnostic Research, vol. 13, no. 5, 2019.
15. J. G. R. B. R. F. N. A. N. M. e. a. Danna K, "Introducing the hormonal Intrauterine Device in Madagascar, Nigeria, and Zambia: results from a pilot study," Reproductive Health, vol. 19, no. 1, p. 4., 2022.
16. K. J. P. K. D. G. F. X. J. D. Moro F, "Ultrasoundguided retrieval of lost intrauterine devices using very fine grasping forceps: a case series.," Journal of Family Planning and Reproductive Health Care., vol. 41, no. 3, p. :205 , 2015.
17. K. K. H. B. J. Lichtenstein Liljeblad K, "Effectiveness, safety and overall satisfaction of early postpartum placement of hormonal IUD 31 compared with standard procedure: An open-label, randomized, multicenter study," Acta Obstetricia et Gynecologica Scandinavica., 2022.
18. N. A. G. N. Varun N, "Misplaced IUCD: a case report," Int J Reprod Contracept Obstet Gynecol, vol. 6, no. 11, pp. 5155-7, 2017.
19. N. Z. A.-n. S. Abdelaziz W, "Factors affecting contraceptive use among currently married women in Iraq in 2018," Journal of Biosocial Science, pp. 1-14. , 2022.
20. O. O. S. O. Adedini SA, "Trends, patterns and determinants of long-acting reversible methods of contraception among women in sub-Saharan Africa," PloS one, vol. 14, no. 6, p. e0217574. , 2019.
21. P. R. H. L. S. I. T. B. G. A. e. a. Grigore M, "The added value of three dimensional ultrasonography in uterine pathology," Experimental and Therapeutic Medicine, vol. 22, no. 5, pp. 1-6., 2021.
22. Retained Intrauterine Device (IUD): Triple Case Report and Review of the Literature, 2018.
23. S. K. T. L. Evans AT, "Ultrasound assessment of the intrauterine device. Obstetrics and Gynecology Clinics," Obstetrics and Gynecology Clinics, vol. 46, no. 4, pp. 661-81., 2019.
24. S. T. B. B. Benacerraf B, "Three-dimensional ultrasound detection of abnormally located intrauterine contraceptive devices which are a source of pelvic pain and abnormal bleeding," Ultrasound in Obstetrics and Gynecology, vol. 34, no. 1, pp. :110-5. , 2009.
25. S. T. D. E. C. T. B. D. Moshesh M, "Factors associated with low-lying intrauterine devices: a cross-sectional ultrasound study in a cohort of African-American women," Contraception, vol. 98, no. 1, pp. :25-9. , 2018.
26. W. M. J. G. T. N. B.-B. E. J. D. e. a. Jatlaoui TC, "Intrauterine Device Expulsion After Postpartum Placement: A Systematic Review and Meta-analysis," Obstetrics and gynecology, vol. 133, no. 3, pp. 338-41., 2016.

27. X. M. D. X. L. Y. T. Y. W. X. Sun X, "Clinical characteristic and intraoperative findings of uterine perforation patients in using of intrauterine devices (IUDs)," Gynecological Surgery, vol. 15, pp. 1-7. , 2018.
28. Y. J, "Understanding benefits and addressing misperceptions and barriers to intrauterine device access among populations in the United States," Patient preference and adherence, vol. 8, pp. 947-57., 2014.