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Review

The Intrauterine Device Serves as Long-term Contraception

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A B S T R A C T

An intrauterine device, commonly referred to as an IUD, is a small T-shaped apparatus placed into the uterus, providing a long-term method of preventing pregnancy. Additionally, it can aid in managing menstrual cycles and alleviating discomfort. There are two primary varieties: the copper IUD, which operates without hormones by releasing copper ions and the hormonal IUD, which contains levonorgestrel and works by thickening cervical mucus and thinning the uterine lining. This device is typically inserted by a gynecologist during an outpatient procedure, commonly near the end of a woman's menstrual period and boasts several benefits, including high efficacy, prolonged duration of effectiveness and the restoration of fertility post-removal.

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1. Introduction

An intrauterine device (IUD) is a small plastic item placed within the uterus via the vaginal canal. IUDs gained traction as a birth control method during the 1980s and while they remain a favored option globally, only a limited number of women in the U. S. utilize them[1].

The practice of placing foreign objects in the uterus for contraception has a history spanning thousands of years, with ancient camel drivers employing this approach for their animals. However, the precise mechanism by which this method works is still not entirely clear. It was initially believed that a foreign object inside the uterus hindered the development of an ovum on its journey through the fallopian tubes. More recently, it is understood that the IUD not only inhibits fertilization but also induces a localized sterile inflammatory response that thwarts implantation. When copper is incorporated into the device, it seems to influence the mobility of sperm, reducing their chances of successfully navigating through the uterine cavity to reach the ovum.

A healthcare professional, such as a physician, nurse practitioner or nurse-midwife, must perform the fitting of an IUD. This process begins with a Pap smear and a pelvic examination. The device is generally positioned prior to engaging in sexual intercourse after menstruation, allowing the healthcare provider to ensure that the individual is not pregnant at the time of placement.

A regular X-ray illustrates the intrauterine system (IUS) located in the pelvic region, positioned at a transverse angle within the right side of the pelvis[2]. In this elevated and lateral position, along with this orientation, it is very improbable that the device remains inside the uterus, particularly since the ultrasound findings indicate a uterus of normal size. The recent ultrasound results verify that the uterus is devoid of contents. Conversely, a previous report had indicated that the device was situated at the uterine cornu. Therefore, it can be inferred that although the apparatus was initially inserted into the uterus, it has since shifted through the myometrium into the peritoneal cavity.

1.1. Contraception

The most commonly utilized strategies for managing fertility encompass (1) barrier methods, (2) oral contraceptive pills, (3) intrauterine devices, (4) long-acting progestins, (5) sterilization procedures and (6) abortion methods[3].

Oral contraceptives are commonly utilized for the purpose of preventing pregnancy as well as managing dysmenorrhea and bleeding that is not associated with ovulation. Combination oral contraception features synthetic estrogen (such as ethinyl estradiol or mestranol) along with synthetic progestins. Certain progestins have a natural androgenic effect. Both low-dose norgestimate and third-generation progestins (like desogestrel, gestodene and drospirenone) exhibit a lower androgenic profile; levonorgestrel tends to be the most androgenic progestin and should be avoided by patients displaying hyperandrogenic symptoms. The three primary types of formulations are fixed-dose estrogen-progestin, phasic estrogen-progestin and progestin-only.

While they are generally considered safe, individuals using oral contraceptives may face risks such as venous thromboembolism, high blood pressure and gallstones. The likelihood of experiencing a heart attack or stroke escalates with both smoking and aging. Common side effects-including irregular bleeding, absence of menstruation, breast discomfort and weight increase-often improve with a change in the contraceptive formulation.

Certain absolute contraindications for oral contraceptive use include a history of thromboembolic events, cardiovascular disease, breast cancer or other estrogen-sensitive tumors, liver dysfunction, high triglyceride levels, significant smoking in individuals over 35 years old, unexplained uterine bleeding or confirmed or suspected pregnancy. Relative contraindications encompass high blood pressure and the use of anticonvulsant medications.

New contraceptive options include a weekly patch, a monthly injection and a monthly vaginal ring. Progestins for extended use can be given as Depo-Provera or via a subdermal implant.

Emergency contraceptive pills, which contain only progestin, can be administered within 72 hours after unprotected sexual intercourse in order to prevent pregnancy. Mifepristone (RU486) is an alternative but is not accessible in many countries.

1.2. Pregnancy

A frequent clinical scenario for a woman experiencing an ectopic pregnancy includes the well-known triad of missed menstrual period, abdominal discomfort and abnormal vaginal bleeding[4]. It is essential that all women presenting with these symptoms undergo evaluation to rule out ectopic gestation.

Serum quantitative hCG (human chorionic gonadotropin) levels are often utilized to assist in identifying women who may have ectopic pregnancies. An isolated hCG measurement is not particularly useful unless it exceeds the level at which an intrauterine pregnancy should be visible via ultrasound. This level may differ based on the specific hCG test utilized and the ultrasound approach. Obtaining two hCG measurements 48 hours apart yields more significant information. A common guideline is that values should double within that timeframe. However, care should be taken with pregnancies exhibiting a sluggish rise in hCG, as they might still be normal. A stabilization of hCG levels may indicate either an ectopic pregnancy or an abnormal intrauterine one; ultrasound can help in distinguishing between the two.

Serum progesterone levels can provide useful information for diagnosing ectopic pregnancies. A progesterone level below 15 ng/mL is found in 81% of cases of ectopic pregnancy, 93% of abnormal intrauterine pregnancies and only 11% of normal intrauterine pregnancies. Less than 2% of ectopic pregnancies, as well as about 4% of abnormal intrauterine pregnancies, will show progesterone levels of 25 ng/mL or higher. Therefore, a single progesterone reading under 15 ng/mL likely indicates an abnormal pregnancy and should lead to further assessment. Conversely, a reading exceeding 25 ng/mL is likely suggestive of a normal pregnancy.

1.3. Adhesions

Patients experiencing secondary amenorrhea might be facing this condition due to significant or obstructive adhesions within the uterus[5]. Typically, the patient's medical history will provide clues that lead to this diagnosis. The formation of scar tissue occurs when there is damage to the endometrium's basalis layer. Such damage may arise from surgical interventions, including abortion or dilation and curettage, retained pregnancy tissue or infection stemming from a prior injury to the endometrium. Amenorrhea can occur either due to widespread adhesions throughout the uterus or from blocking adhesions situated near the cervix's internal os. Identifying a suspicion of this issue is crucial in determining the cause.

Diagnosing the condition involves procedures such as hysterosalpingography or saline infusion sonograms, as well as repeated ultrasounds. Conducting serial ultrasounds over a month can help confirm whether the patient is experiencing menstrual cycles. During menstruation, the uterine cavity fills with blood, revealing the underlying cause. Management may entail dilating the cervix while resolving the obstructive lesions or performing surgery to remove the intrauterine adhesions. Employing ultrasound in the operating room can assist in guiding the dilators to reduce the chances of uterine perforation. Nonobstructive adhesions that are severe enough to completely halt menstruation are uncommon and often cannot be surgically corrected. Less severe adhesions typically do not lead to amenorrhea. The surgical removal of intrauterine adhesions poses various unanswered challenges, including the selection of cutting techniques, the utilization of postoperative stents like Foley catheters, the administration of estrogen or antibiotics and the optimal timing within the menstrual cycle for undertaking the procedure. None of these matters has been resolved with definitive level I evidence.

1.4. Uterine perforation

Suction dilation and curettage (D&C) is generally considered a safe procedure, carrying a 0. 5% risk of major complications[6]. Instances of identified uterine perforation during first-trimester suction D&C occur at rates ranging from 0. 8 to 4. 0 per 1,000 procedures. Perforation of the uterus can happen during any intrauterine intervention, such as cervical dilation, sounding, aspiration or sharp curettage. The most frequent site for uterine perforation is the fundus; however, perforation can happen at any point. Lateral perforations may lead to complications due to possible bleeding from uterine arteries. While some perforations

are identified during the procedure, others go unnoticed. Most patients with unrecognized perforations typically heal without complications and do not face long-term issues.

Risk factors that may contribute to uterine perforation include the inexperience of the provider, the advancement of gestational age, incorrect estimation of gestational age, significant uterine flexion, previous cervical cone biopsies or surgeries, cervical stenosis, being a teenager and the number of previous births. Procedure-specific risk factors for uterine perforation encompass forced mechanical dilation and insufficient cervical dilation.

The signs and symptoms associated with uterine perforation can be quite subtle. Indicators such as loss of resistance during dilation, instruments moving farther than anticipated within the uterus or a patient who is awake suddenly reporting a marked increase in pain should heighten the suspicion of perforation. Furthermore, perforation may lead to heightened vaginal bleeding or, in rare cases, the observation of intra-abdominal contents like adipose tissue or bowel.

When there is a suspicion of perforation, the procedure must be halted immediately. If possible, a pelvic ultrasound conducted during the procedure can prove beneficial. This ultrasound can help visualize the posterior cul-de-sac to detect any free fluid or blood accumulation and ascertain if the procedure has been completed or if any intrauterine tissue is still present. In the event of perforation before suctioning, the procedure should be ceased and monitoring should take place. If the patient remains stable during observation, the procedure can potentially be repeated after a week to allow the perforation to heal. An experienced clinician may opt to continue the procedure under ultrasound guidance if deemed suitable.

1.5. Infections

Infections may encompass those of the soft tissue and perineal area, bacterial vaginosis, abscesses of the vulva and Bartholin glands, endometritis, pyometra, salpingitis, tubo-ovarian abscesses, adnexal abscess, pelvic inflammatory disease (which includes pelvic cellulitis and abscess), amnionitis, septic pelvic thrombophlebitis, infections related to intrauterine contraceptive devices, septic abortion and postoperative obstetric and gynecological infections[7]. To prevent contamination of specimens by normal genital bacteria, culdocentesis, laparoscopy or quantitative endometrial cultures of transcervical samples may be utilized.

The main anaerobic bacteria found in these polymicrobial infections consist of P. bivia, P. disiens, Peptostreptococcus, Porphyromonas and Clostridium species. Actinomyces species and Eubacterium nodatum are often found in infections linked to intrauterine devices. Mobiluncus species can also be involved in cases of bacterial vaginosis. Aerobes that may be isolated include Enterobacteriaceae, Streptococcus species, Neisseria gonorrhoeae, Chlamydia species and Mycoplasma genitalium.

The presence of gas within tissues, the formation of abscesses and the existence of a foul-smelling discharge is frequently connected with anaerobes. Management strategies include the use of antimicrobials that can effectively target both aerobic and anaerobic organisms, as well as sexually transmitted pathogens. Outpatient treatment options may include cefoxitin, ceftriaxone or other third-generation cephalosporins administered parenterally, combined with doxycycline, either with or without metronidazole. Inpatient treatment protocols may involve cefoxitin, cefotetan or ampicillin-sulbactam alongside doxycycline, along with clindamycin or metronidazole combined with doxycycline and gentamicin.

1.6. PID

Any examination of gynecological infections requiring urgent attention should start with an analysis of pelvic inflammatory disease (PID)[8]. Each year, PID accounts for around one million cases, leading to 160,000 hospital admissions and over 100,000 surgical interventions. Beyond the significant personal, physical and emotional turmoil that PID causes, the financial burden on both individuals and society is considerable.

It is crucial for healthcare professionals to identify specific risk factors that could lead to a heightened chance of developing PID. One of the key risk elements is age. Younger females are more susceptible to acquiring PID due to a higher occurrence of sexually transmitted infections, a reduced prevalence of protective chlamydial antibodies, larger areas of cervical ectopy and a greater permeability of cervical mucus. Adolescents who are sexually active face a threefold increase in the likelihood of being diagnosed with PID compared to women aged 25 to 29. Having multiple sexual partners, frequent sexual activity and a quick succession of new partners within the last month seem to elevate the risk of contracting PID. The understanding of the relationship between intrauterine devices (IUDs) and the risk of PID is currently being reassessed. The main concern lies around the time of the device's insertion. This is thought to be linked to the introduction of vaginal and cervical pathogens into the endometrium during the placement of the IUD. Nonetheless, in regions where sexually transmitted diseases are common, the utilization of an IUD appears to slightly raise the PID risk. Other elements related to a greater potential for PID include douching, smoking and timing in relation to menstruation. It has been noted that symptoms manifest considerably more frequently in women experiencing chlamydial or gonococcal salpingitis within a week before menstruation than at different times in the cycle.

1.7. IUGR

Intrauterine growth restriction (IUGR) stands out as a significant cause of both perinatal mortality and morbidity[9]. Recognizing that the fetus is growing inadequately during pregnancy serves as a vital quality measure in maternal care.

The term small for gestational age (SGA) refers to a fetal estimated weight (EFW) that falls below the 10th percentile as determined by ultrasound. This classification does not necessarily indicate pathological growth issues and may merely reflect a fetus that is at the lower boundary of the normal range. Diagnosing an SGA fetus can occur with fetal abdominal circumference (AC) or EFW being less than the 10th percentile, while severe SGA is defined as an EFW or AC below the 3rd percentile.

IUGR should not be equated with SGA, as it indicates a pathological situation in which a fetus fails to reach its genetically determined growth capacity. It is essential to distinguish between growth restriction and SGA because this altered growth pattern in utero can lead to significant fetal distress, in addition to the complications linked with SGA. Serial ultrasound evaluations track IUGR, which is determined by a decrease in AC and/or EFW growth rate when assessed with at least a three-

week interval between measurements. Since there is no clear objective definition for reduced growth velocity at this time, visual interpretation of AC and EFW growth patterns continues to be the conventional clinical approach. As detailed further below, abnormal findings in placental artery Doppler studies can indicate the presence of pathological mechanisms within the placental vascular system and these findings are crucial in identifying pregnancies with a heightened risk of perinatal mortality. Recognizing SGA remains vital, as the chances of IUGR are significantly increased in severe situations.

1.8. Fetal Death

Intrauterine death can lead to significant obstetric and psychological consequences[10]. In the UK, it is rare for intrauterine death to go unnoticed for multiple days, but if it does happen, it poses a serious threat to life, as the mother may face the risk of developing disseminated intravascular coagulation (DIC) and sepsis.

The mother may suspect fetal death in the later stages of pregnancy if she notices a lack of fetal movements. This diagnosis is confirmed via ultrasound, which shows no fetal heartbeat. Typically, the pregnancy would have been going smoothly until just before the fetal death and receiving this diagnosis can be emotionally devastating for both the mother and her partner. The emotional and physical health of the parents should be taken into account.

Following the diagnosis of intrauterine death, labor is generally induced as soon as possible, with appropriate pain relief provided. The Royal College of Obstetricians and Gynaecologists recommends vaginal delivery, though some women may require a cesarean section for maternal reasons. The release of tissue thromboplastin from the fetus can disrupt coagulation, which typically does not happen until three to five weeks after intrauterine death or may originate from the placenta in cases of placental separation. Coagulopathy may also arise from an intrauterine infection or uterine perforation and in some instances, it can happen without any identifiable risk factor.

Various complications related to labor and delivery may occur, such as prolonged labor, delivery challenges and postpartum hemorrhage. The use of oxytocics is not restricted due to fetal welfare concerns, but there is a need to weigh the risk of excessive uterine contractions potentially leading to uterine rupture, especially in women who have had multiple births or have a uterine scar. In rare cases, the obstetrician may need to carry out destructive procedures on the fetus to facilitate vaginal delivery or perform a hysterotomy. The care provided to the mother during labor can be distressing and traumatic, not just for her and her partner but also for the medical staff involved.

2. Treatment

The intrauterine system (IUS) needs to be removed. If it were still in the uterus, outpatient hysteroscopic retrieval could have been an option, but currently, a laparoscopy is necessary[2].

In this instance, the laparoscopy displayed blood-tinged free fluid in the pouch of Douglas, along with scarring on the right fundal part of the uterus. The IUS was located covered by omentum in the right lower abdomen and was easily taken out laparoscopically.

Since the woman had intended to use the IUS for contraception and to manage her menorrhagia and given that the uterus seemed to have healed, a new IUS was placed under laparoscopic guidance at that moment. Antibiotics were administered to prevent the risk of infection.

After an IUS or IUCD (intrauterine contraceptive device) is put in place, it is important for women to be counseled to have their general practitioner verify that the threads remain visible following their initial menstrual cycle. After this, the majority of women feel comfortable and capable of examining the threads by themselves.

3. Conclusion

The intrauterine device, also known as a spiral, is a method of contraception employed by women to avoid becoming pregnant. Currently, there are numerous approaches with varying mechanisms, ranging from mechanical to hormonal, including options used during sexual activity and those intended for long-term use. At present, the hormonal spiral is the most commonly utilized method. This device is a T-shaped plastic piece inserted into the uterus. The effectiveness of this method relies on its correct positioning. The key distinction between the hormonal and copper spirals lies in the fact that the hormonal version releases levonorgestrel, a type of progestin hormone. Only a small fraction enters the bloodstream, while the majority of the hormone acts locally, carrying out its purpose. In comparison to the hormonal spiral, the concentration of levonorgestrel in the bloodstream is considerably greater with oral contraceptives, such as the pill. The copper spiral serves as an alternative, releasing a minimal amount of copper and suitable for women who prefer not to use the hormonal spiral or cannot do so.

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