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## Sexually Transmitted Infections, Pelvic Inflammatory Disease, and the Role from Intrauterine Devices: Myth or Fact?

Newton Sergio de Carvalho\*, Adriane Barbosa Botelho, Danielle Priscila Mauro, Kelly Alessandra Ferreira, Luciana Chamone Amaro, Paula Cristina Mendes, Renato Rezende Savian and Beatriz Freias de Carvalho

Department of Gynecology and Obstetrics, Clinics Hospital, Federal University of Parana, Brazil

\*Corresponding author: Newton Sergio de Carvalho, PhD, Full Professor of Gynecology and Obstetrics, Infectious Diseases in Gynecology and Obstetrics Sector, Department of Gynecology and Obstetrics, Clinics Hospital, Federal University of Parana/ UFPR, Curitiba, PR, Brazil, Tel: +556681233430; E-mail: renatosavian@gmail.com

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### Abstract

Connections among Intra Uterine Devices (IUD), Sexually Transmitted Diseases (STDs) and Pelvic inflammatory disease (PID) still bring doubts for health professionals; Our goal is to understand better these associations. We searched the PubMed database for articles including evidence about these topics. A common outcome found is the superiority of levonorgestrel (LNG) IUD over NOVA T (copper) device regarding clinical performance and PID rates. The modern IUDs do not elevate the risk of getting PID; however this risk is higher when a patient has a STI at the time she gets an IUD. It is wise requiring a STI test, principally for cervicitis, before placing an IUD. The epidemiologic data suggests this management mainly for woman with a new sexual partner, or with multiple sexual partners, and under age 25. It is also correct inserting an IUD and test for STI at the same day: if positive results come, antibiotics can be used. Old papers usually show a higher risk for PID in IUD users, an outcome not found in recent researches that have improved methodology and therefore are more reliable. However, the investigation concerning the STI and cervicitis remain as an important point to investigate before decision to IUD use.

**Keywords:** Intrauterine device; Genital tract infections; Pelvic inflammatory disease; Sexually transmitted infections; Cervicitis

### Introduction

Ease of use, low cost, high efficacy and safety are important features of an Intrauterine device (IUD), recognized as the most commonly used method of long-acting reversible contraception (LARC) [1]. It is as effective as surgical sterilization with the advantage of being a nonsurgical option for pregnancy prevention [1]. Globally, 22.8% of women using contraception use IUC (Intrauterine Contraception) [2]. Interestingly, factors

such as geographic differences, government policy and healthcare professionals' education level are more influent than medical eligibility criteria regarding the practical use of IUC [2].

Some contraindications for its use are pregnancy, undiagnosed genital tract symptom (bleeding, discharge), significant distortion or enlargement of the uterine cavity due to myomas, cavity length <6 cm or >10 cm, susceptibility to infection (leukemia, AIDS) and young age [3].

There are two main types of intrauterine devices: a copper-releasing IUD and steroid-releasing IUD [2]. The first one is a device with a silver-cored copper wire wound around the vertical stem. The copper surface area is 200 mm [2]. The other device has the same polyethylene skeleton and the steroid is homogeneously dispersed in a polydimethyl- siloxane reservoir covered by a rate-limiting membrane on the vertical arm of the device [3]. The life span is at least five years for both [3].

Pelvic inflammatory disease (PID) is an infection disorder, which affects the female upper genital tract [4]. It usually occurs as an ascending infection from the endocervix and vagina, resulting in endometritis, salpingitis, tubo-ovarian abscess, parametritis, oophoritis and/or pelvic peritonitis [1,4]. There is a considerable amount of agents implicated in PID's pathology, including sexually transmitted organisms such as *Neisseria gonorrhoeae* (GC) and *Chlamydia trachomatis* (CT) [4]. Microorganisms found in the vaginal flora (e.g. anaerobes, *Gardnerella vaginalis*, *Haemophilus influenza*, enteric Gram-negative rods and *Streptococcus agalactiae*) could also result in PID [4]. The high impact of PID in public health is related with its high incidence, sequelae of infertility, ectopic pregnancy and chronic pelvic pain [4]. It is most common in young, nulliparous and sexually active women with multiple partners [4].

There is still a lot of conflicting information regarding those topics and many health care professionals are based their practices on old information [2,4]. For example, it is not uncommon seeing physicians refusing to give an IUD for young women or women without children, as well as teens looking for

contraception [2,4]. However, the recent papers are massively showing this is not a right management [2].

In this study, we attempted to evaluate and review the possible association between the use of IUD, genital tract infections and PID. Other aim of the study was compare the relations with infections between the two main types of IUD and incidence of PID. Further, we also studied new modalities of copper and hormonal IUDs, evaluating their clinical performance. First, we searched for relevant articles in any language in PubMed with the following terms: IUD, PID, infection, copper- releasing device, steroid – releasing IUD. Secondly, we used the MeSH (medical subject headings) Database to broaden our search. The articles where the target were commentaries, editorials and diagnostic or treatment technique were discharged.

## History

Richard Richter (1909) and Ernst Grafenberg (1929,1930) pioneered the use of IUDs [5]. Afterward, Tenrei Ota, in Japan, did an improvement in IUD design in 1933-1934 [6]. The new metallic device had a central disc attached by spokes to an outer ring, enhancing retention [6]. Despite the growing use of IUDs, their development stopped in view of Germany and Japan began military expansions abroad and opted for pronatalist actions [7]. The Nazi state between 1933 and 1940 resulted in a diaspora of German and Austrian liberal, socialist and Jewish gynecologists [7]. Social and legal restrictions in the US initially broke postwar IUD development [7]. In 1959, finally, two publications brought it back to progress [7].

Oppenheimer's paper, published in the American Journal of Obstetrics and Gynecology, illustrated an important change in attitudes of American gynecologists regarding the permissiveness and use of contraception [8]. Contraception was legalized in 1965 throughout The U.S [7]. After World War II, the plastics industry became strong in The United States and permitted tests with new IUD shapes: bows, spirals, coils and loops [7]. Later, an American IUD crisis happened because of high infection rates, reported by CDC (Centers for Disease Control), associated with Dalkon Shield: it had a multifilament tail encased in plastic that made colonization by microbes easier [7].

Dalkon Shield was the cause of PID for many women and also failed preventing pregnancy for many others [7]. One important fact is that this device was not tested for effectiveness and safety as we test new medical equipment nowadays [7]. It is reasonable Dalkon Shield deserved its bad reputation, however it is unfair saying the same for others devices [8,9]. Recent studies rather have demonstrated lower rates of pelvic infection, and also suggest an improved criteria for candidates for IUD [7].

## IUDs, STI and PID

Chlamydia and Gonorrhoea are the most common STIs in The U.S. Number of sexual partners and use of condoms are relevant factors related to the acquisition of an STI [2,4]. CDC (Centers for Disease Control and Prevention) recommends screening women

for *Neisseria gonorrhoeae* and *Chlamydia trachomatis* who have at least one of the following five risk factors: inconsistent condom use, age  $\leq$  25 years, history of a prior STI, new or multiple sexual partners, and exchanging sex for money, drugs, food or shelter[2,9]. Ethnicity and race are not specifically listed in the CDC's screening criteria, notwithstanding Hispanic and black women compose a population with a higher prevalence of STIs [4].

Aoun [10], in a multicenter retrospective chart, did not report statistical difference regarding PID between copper and levonorgestrel IUDs. Hu [11] studied results from IUD placement in 12 centers across China: both types of IUDs were effective, however, the hormonal device had a lower rate of removal showing to be a better option for wide use in this study of 1800 parous women.

Dardano [12] indicated that both copper-releasing and LNG-IUD offer low risk of PID among properly selected women, suggesting that the use of IUD can be expanded for women with some specific diseases and nulliparous women. In a 2000 [13] data, Merki-Feld concluded that besides Actinomyces-like organisms (ALOs) are a common finding in Papanicolaou-stained cervico-vaginal smears (PAP smears) of women using IUDs, the incidence of ALOs in LNG-IUD users was significantly lower than in ML375(copper-releasing) users. Furthermore, this lower incidence in the LNG-IUD users probably leads to less IUD removals, reinsertions and less pelvic-inflammatory-diseases [13].

Based in the study made by Guerreiro [14] in 1998, the prevalence of any genital tract infection was higher in users of IUD, but we notice that the confidence intervals were extended. Another study published in 1998 [15], demonstrated that previous infection, not at the time of IUD-insertion, with *Neisseria gonorrhoeae* and *Chlamydia trachomatis* are not related with an increased risk of PID after IUD insertion. It also indicates that clinicians should be vigilant in assessing IUD candidates, evaluating for cervicitis, and providing advisory regarding the need for immediate return if suspicious symptoms manifest [15]. Cropsey [16] study took place in a resident gynecology clinic where two contraceptive methods were offered: Depo-Provera (DMPA) or IUDs. Side effects were reported more frequently in IUD users; however, the rate of discontinuation of it was lower [16]. Further, overall rates of STDs were superior or equal for DMPA [16].

A recent large prospective cohort study called The Contraceptive CHOICE Project (CHOICE) [17] studied 9.000 women looking for a new method of reversible contraception. The frequency of self-reported PID was compared between the IUD users group and the population using other methods of contraception [17]. The PID rate was 1% below for the following groups: users who tested positive for CT (*Chlamydia trachomatis*) and/or GC (*Neisseria gonorrhoeae*) and those who tested negative [17]. This comprehensive research concluded that even for high-risk women, IUD is a good choice [17]. In another study, Hall [18] also reported very low rates of PID among nulliparous woman using IUD, despite the higher rates of symptoms as cramping or heavy menses for copper IUD users.

Many health professionals are still afraid of prescribing IUDs for teenagers; a population at risk that could be largely benefitted from this method [5]. A wide study [19] with 90.489 women compared three different age groups (15-19, 20-24 and 25-44 years-old) and PID occurred in less than 1% in all of them. Another conclusion was that levonorgestrel-releasing intrauterine system is better than copper IUD considering complications and discontinuation for all age groups [19].

A study published in 2015 [20] compared PID rates between women (15-45 years-old) who did same-day IUD placement and those who had a delayed insertion using as parameter the day they requested emergency contraception (EC) or pregnancy testing. There was no statistical difference regarding PID and the authors also suggest that worries about asymptomatic STI should not retard the use of IUDs and its use should not be narrowed for populations at low risk of STI [20]. A large study [21] with 22 908 IUD insertions showed a higher PID risk during 20 days after insertion, however the risk was low and remained stable for up to eight years of follow-up [21]. Further, it showed that the association between PID and IUDs is actually related to the insertion process and to history of STDs [21].

Sufrin [22] demonstrated the PID incidence within 90 days after IUD insertion among women who were and were not screened for GC and CT. No screening had a very near risk of PID as any screening and the low absolute chance of getting PID reinforce the risk-factor guided screening [22].

Forty-five experts from different centers around the world got together, in 2001 [23], to identify ways to surmount barriers to the use of IUDs. They reinforced that the no medicated IUD has no systemic side effects, can be safely used by breast feeding women, and seldom produces complications [23]. The Levonorgestrel-releasing IUD offers others health benefits: it importantly reduces menstrual blood loss and pain as well as provides endometrial protection for patients receiving estrogen replacement therapy or women receiving tamoxifen to treat breast cancer [23]. It has become well known that the IUD does not facilitate STIs or increase the risk of infertility: bacteria are the agents in the development of PID and associated infertility, while the IUD does little for the development of this pathology [23]. If no sexually transmitted bacteria are present at the time of IUD insertion, the IUD-related risk of PID is not important [23].

In 2003, Lago [24] performed a study aiming to assess the prevalence of bacterial vaginosis (BV) and other cervicovaginal infections, as well as the incidence of complications among new users of IUD, 1 and 6 months after its insertion, in the City of Campinas, Brazil. It showed that BV was associated with IUD use suggesting that women with IUD and BV may be at a higher risk for PID, especially if BV is presented at the time of the insertion, despite none case of PID were reported in the study, revealing some limitations such as absence in the second visit, absence of control group and previously screening [24]. They support the hypothesis that IUD might change the vaginal flora in a way that BV-associated bacteria develop [24].

Viberga [25] performed a research in 2004 and suggests that IUD use is not associated with PID in low-risk younger women, however in women > 35 years, the risk increases. Viberga also

studied the microbial characteristics of PID and the possible impact of an IUD on the microbial environment in women presenting with PID [26]. Based on that study, published in 2005 [26], IUD users among women with PID had expressively more *Fusobacteria* spp. and *Peptostreptococcus* spp.. The study also supports the hypothesis that using an IUD together with the presence of anaerobic/aerobic microbes combination may facilitate the development of PID [26].

There are some studies regarding use of IUDs in adolescents, a high risk population for not planned pregnancy. In Bayer [27] study, PID was diagnosed in 4.6% of post-IUD insertions which represents a successful rate. Alton [28] followed patients of 21 years-old or less for 8 years and presented different results: prior STI was a risk factor for infection; however, the IUD is not the responsible for this risk and actually may be protective.

De Araújo [29] reported an experience regarding the use of copper IUD in a Family Planning Unit with a high prevalence of metabolic syndrome, a situation that could represent a contraindication for the hormonal IUD. There was no case of PID in his population [29].

Gemzell-Danielsson [30] compared two low-dose levorgestrel-releasing IUD and the regular levonorgestrel-releasing intrauterine system. All hormonal IUDs (LNG-IUS12, LNG-IUS16 and the LNG-IUD with the usual dose – 52 mg) provided an effective contraception and were well tolerated. Rate of infections were similar and cases of PID rarely occurred [30].

## Conclusion

IUD is an effective contraceptive method adopted by a great number of women. In this review, there was still some researches showing a higher prevalence of PID in IUD users. The greater risks were detected in the first month after IUD insertion, in women older than 35 years, and associated to infections caused by *Neisseria gonorrhoeae* and *Chlamydia trachomatis* found in the cervix mainly before the insertion

On the other hand, many papers did not relate an increased prevalence of PID in IUD users and suggest that IUD do not represent a risk of tubal occlusion. According to one of the papers, women who received IUD (compared to other methods) reported more side effects; despite they were less likely to discontinue the use of contraception. The papers studying adolescent and/or young women suggest earlier IUD discontinuation for this population compared to an older one and it was reported more side effects in groups of young women. The main causes of discontinuation are cervicitis, excessive uterine bleeding and dysmenorrheal.

Only one article compared same-day and delayed IUD placement for women seeking emergency contraception or asking for a pregnancy test: there were no differences regarding PID comparing these two situations.

Several studies have data showing a better clinical performance (contraceptive efficacy, protective effective against PID) of LNG-IUD when compared to Nova T. Many papers highlighted the use of copper IUDs as an effective method and

tend to put Nova T as a better option compared to Gyne T380 Slimline.

After this analysis, despite there were some reviewed articles indicating an association between the use of IUD and occurrence of PID, in many of them this association does not really exist. It is clear the relation of LNG IUD and lower rates of PID and also better outcomes in comparison with NOVA T device. Old papers have higher rates of PID for IUD users. However, recent papers, that have improved methodology, infrequently show this correlation.

We already can say what really causes PID is not the use of modern IUDs, but STIs. Further, as many studies showed, IUDs do not elevate the risk of getting a genital tract infection. However, if a woman has an undiagnosed STI at the time an IUD is placed, the risk of getting PID is higher and this could be the target of PID linked to IUD. Again, it is not the IUD singly. Thus, healthcare professionals should require a STI test before placing an IUD, mainly for woman with a new sexual partner, or with multiple sexual partners, and under age 25. Many countries have the routine of Chlamydia screening at age under 25 as a usual procedure. In order to avoid delays in obtaining contraception, it is practical and correct to insert an IUD and test for STI at the same day. If the results are positive for STI, the woman can take antibiotics to cure the infection without having to take the IUD out.

It seems papers from the last 10 years are more reliable since they are dealing better with PID diagnosis, contraceptive comparisons, selection and diagnosis bias compared to previous researches.

## Authors Contribution

N.S.C designed the study. A.B.B, D.P.M, K.A.F, L.C.A, P.C.M.F, R.R.S, B.F.C collected and assembled data, interpreted results and drafted the paper. N.S.C also reviewed the paper. All authors approved the final version of the paper.

## Conflicts of Interest

We have no conflicts of interest to disclose.

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