REVIEWS

The Effects of Hormonal Contraceptives on Female Sexuality: A Review

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ABSTRACT

Introduction. Hormonal contraceptives can influence female sexual function.
Aim. The goal of this article was to provide a comprehensive review of the effects that various hormonal contraceptives may have on female sexual function.
Methods. A Medline search was conducted using several terms related to and including the terms contraception, oral contraceptive, female sexual function, dyspareunia, libido, and sexual desire.
Results. A thorough review of the effects of hormonal contraceptives on female sexual function.
Conclusions. The sexual side effects of hormonal contraceptives are not well studied, particularly with regard to impact on libido. There appears to be mixed effects on libido, with a small percentage of women experiencing an increase or a decrease, and the majority being unaffected. Healthcare providers must be aware that hormonal contraceptive can have negative effects on female sexuality so they can counsel and care for their patients appropriately. **Burrows LJ, Basha M, and Goldstein AT. The effects of hormonal contraceptives on female sexuality: A review. J Sex Med 2012;9:2213–2223.**

Key Words. Contraception; Libido; Female Sexuality; Dyspareunia; Desire; Oral Contraceptives

Introduction

On May 9, 2010, the oral contraceptive pill celebrated its 50th anniversary. Today, the oral contraceptive pill, otherwise know as "The Pill" is used by millions of women in the United States and by over 100 million women worldwide. Several books have been written about various social aspects of the pill, and over 44,000 scientific publications on oral contraceptives have been archived in PubMed over the past half century [1].

Some authorities on the development and impact of the pill argue that the pill, at least from a social standpoint, has been misunderstood. Nancy Gibbs of TIME magazine and author of the cover story about the 50th anniversary of the pill has pointed out that some of the biggest misconceptions about the pill is that it somehow caused the sexual revolution. However, the birth control pill was initially prescribed almost exclusively to married women and most college campuses did not offer it [2].

While the pill has been misrepresented in a social context, ironically, it is also misunderstood with regard to its impact on female sexuality. In fact, the specific effects of the pill on female sexuality are not well understood. Of the thousands of scientific studies that have examined the various effects of the pill, surprisingly, few have assessed the impact on female sexual function, with most reports focusing on contraceptive safety and efficacy, weight gain, bleeding irregularities, nausea, and effects on mood. This review will examine the potential positive and negative effects of combined oral contraceptives (COCs) and other forms of hormonal contraception on female sexuality.

A Brief History of the Development of Oral Contraceptives

To understand the impact of the pill on female sexuality, it is helpful to understand the context in which the pill was developed and introduced. In 1914, a nurse named Margaret Sanger envisioned a "magic pill" that would prevent pregnancy; she eventually coined the term "birth control" and is considered one of the founders of the birth control movement. In 1917, Sanger met Katharine McCormick, a wealthy woman and the second woman to graduate from The Massachusetts Institute for Technology with a degree in biology. McCormick and Sanger, both feminists with strong beliefs that women should have reliable contraception, developed a strong friendship which helped fuel their subsequent efforts to assist in the development of the pill. Sanger, financially backed by McCormick, was a highly energetic woman, and brought social awareness to the birth control movement. She was arrested at least twice in her endeavors, but she eventually founded the Panned Parenthood Federation of America.

In the 1930s, physiologist Gregory Pincus discovered that injecting animals with progesterone (synthesized from wild yams), could block ovulation. In 1951, Sanger introduced Pincus to McCormick who then provided generous financial support for his work. In 1952, Pincus and McCormick approached John Rock, one of the nation's preeminent infertility specialist, to lead clinical research in female subjects. At the time, Rock was using progesterone as an *infertility* treatment. Rock was working under the theory that administering progesterone for a few months to suppress ovulation and by then withdrawing it, that a "rebound effect" would (ideally) facilitate conception. Pincus and Rock learned that they were using similar methods to achieve opposite results, and they subsequently established a collaborative relationship.

In Rock's early experiments in infertility, he found that 10 mg of norethynodrel (a synthetic progestin) would effectively suppress ovulation. However, it was eventually discovered that the norethynodrel that had been used in his experiments was contaminated with mestranol, a synthetic estrogen (mestranol is metabolized to ethinyl estradiol [EE]). This findings lead to the use of mestranol in combination with norethynodrel as the ingredients in the first oral contraceptive pill that was used in the first clinical trial in 1956.

At the time when Rock and Pincus were collaborating, experimentation utilizing hormones to treat infertility was legal, however, using it for contraceptive purposes was not. Therefore, Rock and Pincus conducted the first clinical trial in Puerto Rico. By 1957, they had established that 150 μg mestranol and 10 mg norethynodrel were effective at blocking ovulation, and this formulation received approval for the treatment of "female disorders" (i.e., menstrual irregularities) in 1957.

In 1959, G.D. Searle & Co applied to the Food and Drug Administration (FDA) for approval to use the pill as a contraceptive, and this was granted (after some delay due to safety concerns) on May 9, 1960. The first oral contraceptive pill, called Enovid, contained 75 μg mestranol and 5 mg norethynodrel. Interestingly, even after receiving FDA approval, oral contraceptives were not available to married women in all states until Griswold v. Connecticut in 1965. This landmark case involved a Connecticut law that prohibited the use of contraceptives. The U.S. Supreme Court ruled that the Constitution protected a right to privacy and invalidated the law on the grounds that it violated the "right to marital privacy" [3]. The pill was not available to unmarried women in all states until Eisenstadt v. Baird in 1972 [4,5]. This was another important Supreme Court case that established the right of unmarried people to utilize contraception just as married couples, implying that unmarried couples had the right to engage in nonprocreative sex. Not long after the pill was approved, there were increasing concerns about side effects, including dizziness, weight gain, nausea, and thromboembolic events. At least initially, there were few concerns about negative effects on female sexual functioning, in fact, there was the opposite concern. In 1966, U.S. News and World Report ran a story asking "Can its availability to all women of childbearing age lead to sexual anarchy?"

Despite the scientific hurdles and social controversies that the pill has generated, it has become a permanent fixture in our medical practice and social culture. In 2008, The National Survey of Family Growth found that 82% of American women age 18–44 had used the oral contraceptive pill at some point in their life. Furthermore, the pill was the leading method of contraception in the United States and was being used by 17% of women (10.7 million) aged 15–44 years at the time. Lastly, among women under age 30, a higher percentage of women used the pill than any other method and at age 20–24, 26% were using the pill, much higher than the percent using any other method of contraception.

Mechanism of Action of COC

The primary mechanism of action of COC is by suppression of ovulation [6]. As described by Rivera et al., COC inhibits pituitary production and secretion of follicle-stimulating hormone (FSH) and luteinizing hormone (LH), and blunt the mid-cycle surge of both hormones. The result is inhibited follicular development, ovulation, and corpus luteum formation [7]. Consequently, there is a reduction of ovarian estradiol secretion and an absence of progesterone production. Inhibition of FSH and LH also blocks normal hypothalamic production of gonadotropin-releasing hormone. Additionally, in women using COCs, cervical mucus remains thick and highly viscous, and studies have shown that sperm penetration is inhibited as a result of the progestin's effect on mucus [7].

Hormonal Effects of COC

Over time, many formulations of COC have been developed, and today's pill contains lower doses of synthetic estrogen than Enovid; almost all COCs that are currently being used contain EE as the estrogen component. The primary way in which COCs differ among each other is in the progestin component. Progestins have been refined and improved upon since the pill was introduced. Newer pills containing progestins such as desogestrol, norgestimate, and drosperinone are less androgenic, which under certain circumstances is desirable, such as for the treatment of acne or hirsutism. For example, drospirenone is the only progestin FDA approved in the United States that blocks the androgen receptor and is truly antiandrogenic, even without the addition of EE [8]. However, as will be discussed further, medications that interfere with androgen levels will likely have a negative impact on female sexual function. Other combined hormonal contraceptive methods such as the contraceptive patch delivers 20 μg EE per day and the ring delivers 15 μg EE per day. The patch contains norelgestromin and the ring contains etonorgestrel as their progestin component.

Given that COCs inhibit LH, they decrease ovarian production of testosterone. The estrogen component, which is metabolized in the liver, leads to increased hepatic production of sex hormone binding globulin (SHBG). Although some progestins decrease SHBG, the overall effect of all COCs is an elevation in SHBG levels. Increased SHBG in turn leads to decreased levels of free testosterone. Thus, all COCs are antiandrogenic, although some formulations, depending on the specific progestin, are more so than others. Panzer et al. assessed the impact of COC on SHBG levels in women with sexual dysfunction and found that SHBG levels in women who had discontinued COC did not decrease by 6 months to values seen in women who had never used COC. The authors speculated that prolonged exposure to the synthetic estrogens in COC increased hepatic gene expression of SHBG, even after discontinuing COC [9].

Other hormonal form of contraception can affect SHBG levels as well. The combined contraceptive patch has been found to increase serum SHBG levels even more so than COC [10]. Similar result has been found with the vaginal ring. Sitruk-Ware et al. prospectively assessed the impact of vagina and oral administration of COC on estrogen-sensitive hepatic proteins. They found that the serum SHBG concentration increased by 56% in COC users and by 306% in the vaginal ring group [11]. Other studies have also found that the contraceptive patch increases SHBG more so than COC [12].

Coenen et al. assessed the effects of third generation progestins on androgen levels [13]. In this study, all pills were found to increase SHBG levels and decrease all androgens, including total and free testosterone. Other researchers have demonstrated this effect of COC on androgens, but to a lesser extent. However, these studies were performed before the introduction of third generation progestins [14]. In summary, it seems that the androgen environment is altered with all types of COCs; however, the newer pills seem to connote a more significant decrease in free testosterone and increase in SHBG levels [15].

Overall Benefits of COC

The oral contraceptive pill is a highly effective and reversible form of contraception. Unlike the male condom, the woman has control over this method of contraception. Although there are many formulations of COC, in clinical trials, when used perfectly, the failure rate is less than 1%. Additionally, they have a well-established safety profile with serious adverse events such as myocardial infarction and thromboembolic events occurring rarely [16]. It appears, however, that some third generation COC have a higher risk of thromboembolic than second generation COC. Lastly, there are many non-contraceptive health benefits associated with the pill, including a decreased overall risk of cancer as well as decreased mortality [17–19].

As noted earlier, since COCs were introduced half a century ago, there have been relatively few studies on their impact on female sexuality. Most

of these studies were not controlled trials and the results are conflicting, suggesting that there are many ways in which COC could positively or negatively affect female sexual function. Alternatively, there are so many factors that affect female sexual function that these factors may eclipse any effect (positive or negative) attributable to COC.

Positive Effects on Female Sexuality

One of the most common indications for COC is painful or troublesome benign gynecologic disorders such as endometriosis, dysmenorrhea, and menorrhagia. COCs are known to be effective in decreasing gynecologic pain caused by various disorders, as well as menstrual blood loss; however, there are few studies specifically evaluating the effect of COC on female sexual function when used to treat these disorders. Larson found that blood loss with menstruation is decreased in all women on COC by as much as 40% after 3 months of use [20]. A recent review of dienogest for the treatment of endometriosis found that women with endometriosis had a decreased incidence of dyspareunia after 24 weeks of dienogest use [21]. Although there are no large scale trials, it is reasonable to infer that relief of gynecologic pain might have a positive impact on sexual functioning. A review by Shifren and Avis on the effects of surgical menopause concluded that women who have had a hysterectomy for benign disease had improved psychological well-being and sexual function [22]. However, if they had depression or sexual dysfunction preoperatively, they were at increased risk for experiencing a worsening of mood and libido postoperatively.

Given that COCs are a highly effective form of contraception, they may help eliminate the fear of pregnancy, presumably providing a more relaxed and enjoyable sexual experience. The National Survey of Family Growth found that half of all pregnancies (50 pregnancies per 1,000 women years) in the United States are unintended. Furthermore, it is the poorest women in the United States who are more likely to face unintended pregnancies; women living in poverty are four times more likely to become pregnant unintentionally [23]. Graham et al. studied the factors that affect women's sexual arousal in focus groups. The authors found that fears about unwanted pregnancy had a very negative impact on sexual arousal, particularly if one's partner did not share these concerns. Interestingly, they also found that women felt that a partner's shared concern about contraception could serve to buffer potential negative effects on their ability to feel aroused [24].

Personal appearance and self-esteem are what most likely affect sexuality. There are currently three COCs that are FDA approved for the treatment of moderate acne. They are Ortho Tricyclen (35 mg EE and 35 mg and varying doses of norgestimate), Estrostep (varying doses of EE and 1 mg norethindrone acetate), and Yaz (20 mg EE and 3 mg drospirenone) [25]. Two randomized, double-blind, placebo-controlled studies were performed to establish the efficacy if Ortho Tri-cyclen for the treatment of moderate acne which included a combined 507 women [26,27]. Although neither of these trials assessed the impact of COC on female sexuality, it is reasonable to consider that improved appearance would promote self-confidence and increase self-esteem, thereby having a positive effect on sexual function.

Negative Effects on Female Sexuality

In 1987, the Human Reproduction Program (HRP) and Division of Mental Health of the World Health Organization commissioned a review of the literature on the effects of oral contraceptives on the sexuality and well-being of women, which concluded that there was very little research in this area, particularly with respect to more modern, low-dose pills [28].

To address the lack of knowledge regarding the effects of the pill on female sexuality, the HRP suggested that two types of studies be performed to address these potential problems. (i) an assessment of the direct pharmacological or hormonal effect of COC on well-being and sexuality in women who have been sterilized, so that placebo control is possible and there are no complicating psychological implications of contraception and (ii) a study of women about to begin COC exclusively for contraceptive purposes, allowing for assessment of interactions between psychological factors and the direct hormonal effects of the pill. These studies were subsequently performed and will be discussed further.

Decreased Lubrication

In one of the earliest studies utilizing modern pills, McCoy and Matyas administered questionnaires to 364 women, age 18– 26, 30% of women were using COC [29]. Women using COC were significantly more likely to report decreased vagina lubrication. In a more recent study by Sabatini and Cagiano, the authors compared side effects and

sexual satisfaction in 280 women randomized to two different COCs as well as the vaginal ring (three groups). Both groups of COC users initially reported vaginal dryness, although this effect decreased by cycle 12 [30]. Given that androgens are required for the synthesis of the glycoproteins needed for mucous formation, this may explain the decreased lubrication noted by some women [31,32]. Furthermore, although it has not been proven, for this reason, it is possible that COC use may cause or predispose to atrophic vulvovaginitis.

Vestibular Pain

Several studies have found that COCs increase the relative risk of developing pain in the vulvar vestibule (provoked vestibulodynia, vestibulodynia) by four- to ninefold [33–35]. Furthermore, Bouchard et al. found that the likelihood of developing vestibulodynia was highest in women with the longest duration of pill use and in those women who initiated use of COCs at a young age [34]. Berglund et al. surveyed 172 women age 12–26 regarding their sexual habits, and questioned them specifically on vulvar pain. They found that one-third of women reported pain during and/or after intercourse and having used oral contraceptives for more than 2 years was a risk factor [36]. In a study comparing COC users vs. nonusers, Bohm-Starke et al. found that COCs increased sensitivity (mechanical pain threshold) in the vestibular mucosa [37]. The authors concluded that COC use may predispose women to vestibulodynia. There are also reports of women on COC with vestibulodynia who have had resolution of their pain when the pill was discontinued and SHBG and free testosterone levels were normalized [38].

Alternatively, others have not found an association between COC use and vestibular pain. Lee et al. assessed genital sensation in low-dose (20 μg EE) COC users and COC nonusers [39]. They found no difference in vestibular pain thresholds among the COC users vs. the nonusers. Edgardh and Abdelnoor assessed risk factors for vestibulodynia in a case control study of 45 women. They found that nulliparity and bacterial vaginosis were risks factors, and oral contraceptive use was not [40].

Anatomical Changes

A recent study by Battaglia et al. prospectively assessed the effects of 30 mg EE and 3 mg drospirenone (Yasmin) on sexual behavior as well as the thickness of the labia minora and vaginal introitus area. After 3 months, the subjects experienced worsening pain with intercourse and the thickness of the labia minora and the vaginal introitus area had significantly decreased in comparison with the baseline values [41].

Mixed Effects on Female Sexuality

Libido

Perhaps no other side effect of COC has received as much attention as its potential effects on female sexual desire. Low sexual desire is believe to be the most common sexual problem among women, with prevalence rates ranging from 20% to 30% [42]. It is known that androgen insufficiency contributes to decreased libido [43]. However, despite the fact that COCs have been shown to decrease androgen levels, COCs have not consistently and reliably been shown to be associated with decreased libido in women. Furthermore, many factors other than hormonal etiologies are known to impact female sexual desire.

Positive or No Effect on Libido

By the 1970s, millions of American women using were using COC. In the early 1960s, researchers started to publish studies on the effects of COC on female sexuality which yielded conflicting results, although these studies may no longer be relevant as today's pills contain different formulations from those used 30 years ago. In 1976, two review articles examining the effects of COC and female sexuality did not find a negative association [44,45] Both articles concluded that the majority of women do not experience negative sexual side effects, although a small subset of women seem to experience decreased sexual desire due to COC.

In 1990, Alexander et al. compared 18 COC users to 13 nonusers. They found that COC users had lower total and free testosterone levels but these levels did not correlate with sexual desire or frequency [46]. In 1991, Bancroft et al. assessed the effects of COC on androgens and female sexuality. They compared 55 COC users to 53 nonusers and found that free testosterone levels were lower in COCs users, but this group had more frequent intercourse and more interest in erotic images [14]. The authors concluded that the women who were not using COC may have been more likely to be sexually conservative and postulated that various psychosocial factors might override the effects of androgens. Although both of the studies were relatively small and nonrandomized, they demonstrated that despite the fact that COCs

are associated with decreased bioavailable androgens, there was no negative impact on libido in COC users.

McCoy and Matyas in their questionnaire-based study, hypothesized that because COCs are known to decrease free testosterone, the COC users would experience fewer thoughts and fantasies than nonusers. Contrary to their prediction, COC users reported higher frequency of sexual thoughts, fantasies, and interest than nonusers [29].

More recent studies have also found positive effects of COC on female sexuality. Caruso et al. prospectively assessed the effects of Yasmin (30 μg EE and 3 mg drosperinone) on sexual behavior in 80 women age 19–31. Compared with baseline, women reported increased sexual enjoyment, orgasm frequency, and satisfaction with sexual activity; desire did not change while on medication [47]. Another study on Yasmin comparing 61 users and 65 nonusers found an improvement in sexual arousal [48]. A recent study comparing Yasmin with another pill with 30 μg EE and 150 μg levonorgestrel (LNG) found that in both groups, the majority of women experienced no change in libido with a small percentage of women in each group experiencing either an increase or a decrease [49]. Two very recent trials by Caruso et al. assessing the effects of specific COC on quality of sexual life demonstrated a positive effect on libido. One trial followed 57 women taking estradiol valerate and dienogest (a newer progestin), for six cycles; compared with baseline, subjects demonstrated an improvement in sexual enjoyment, arousal, orgasm, and desire [50]. The other study randomized 115 women to traditional cycle vs. extended cycle 20 μg EE and 3 mg drosperinone, both groups demonstrated improvement in various sexual parameters by the sixth cycle [51].

One of the most recent studies randomized 97 women to either a 30 μg EE/150 μg LNG or 20 μg EE/100 μg LNG pill. There was a decrease in both total testosterone and the free androgen index with both pills, but this was only statistically significant for the higher dose pill. Interestingly, both groups demonstrated improvement in the desire subscale of the Female Sexual Function Index (FSFI), but this was only statistically significant for the lower dose group. The authors concluded that although there was a decrease in plasma androgen levels with the higher dose formulation, there was no impact on sexual desire. Furthermore, sexual desire increased among users of the lower dose formulation [52].

Another recent study by Fortenberry and Hensel assessed the association of sexual interest and sexual behaviors among adolescent women by means of daily diaries and interviews. The authors found no differences in average daily sexual interest based on hormonal contraceptive method and sexual interest was no different among COC users vs. nonusers [53].

There is also indirect support for the argument that COCs do not impact female sexual desire as demonstrated in another study by Davis et al. In a large community sample of 1,021 women, endogenous total and free testosterone were not correlated with sexual desire and arousal [54]. This implies that even though COCs decrease bioavailable androgens, this is not sufficient to cause a decrease in libido. It is not clear to what extent other psychosexual factors may have an impact. For example, McCall and Meston assessed cues for sexual desire in women with and without hypoactive sexual desire disorder (HSDD).They found that contraceptive use did not impact sexual desire in women with or without HSDD [55].

Negative Effects on Libido

As COC became more widely used, there were concerns about their potential negative effects on female sexuality. In 1969, Cullberg et al. prospectively studied 198 women and found that 5% had decreased libido [56]. Two years later, Herzberg et al. prospectively assessed side effects in 218 women on COC and also found a loss of libido in 5% [57]. Other retrospective trials from the late 1960s and early 1970s reported loss of libido in 14–32% of patients. None of these studies were randomized trials and they used older formulations which are very different from pills used today [58–60].

In a placebo-controlled trial, Graham and Sherwin assessed 45 women being treated for premenstrual symptoms. Mood was noted to improve in both the COC and placebo group; however, an overall decrease in sexual interest was seen in women on COC, and this did not correlate with mood. The authors concluded that mood and sexual desire are "dissociable," which suggests that COC can have a direct effect on women's sexuality [61].

It is likely that multiple factors, including psychosocial and cultural influences, have negative effects on female libido. In 1995, the first type of study recommended by the HRP, was completed by Graham et al. [62] This was a placebo-controlled, double-blind comparison of COC and

progestin-only pill users, carried out in two contrasting cultures (Scotland and the Philippines). All women had been sterilized or their partners had a vasectomy. The authors found that half the Scottish women on COC reported loss of sexual interest compared with baseline. While this effect was not observed in the Filipino women, this was attributed to the fact that they reported significantly lower sexual interest and generally more negative sexual relationships than the Scottish women at baseline, before starting COC.

In 2001, a study from the Kinsey Institute performed the second type of study recommended by the HRP. Sanders et al. assessed pre-COC use characteristics at baseline and regularly assessed subjects to see if they could predict the acceptability and continuation of the pill when used specifically for contraceptive purposes [63]. This was a randomized trial of a monophasic and a triphasic pill using validated instruments. Of the women who discontinued or switched pills, 8% did so because of sexual side effects. Specifically, subjects showed a statistically significant decrease in frequency of intercourse and psychosexual arousability.

In the study by Panzer et al., the authors studied 124 premenopausal women in a sexual health clinic who had already been diagnosed with female sexual dysfunction. These women had much lower total scores on the FSFI compared with non-COC users, and the subscale for desire was significantly lower as well [9].

In the trial by Sabatini and Cagiano both groups of COC users were more likely than women using the ring to report a decreased sexual desire; this effect was seen by cycle 3 and carried through to cycle 6, although by cycle 12, this effect had resolved in most subjects [30]. This study highlights the notion that desire in some women is variable, making it difficult to study the effects of COC.

More recent large scale community-based studies of sexual function have demonstrated a negative effect of COC on libido. In a cross-sectional study of 349 pre- and postmenopausal women, the authors found that COC use was associated with a significantly lower incidence of sexual thoughts and interest as well as days of sexual activity per month than nonusers [64].

In two of the most recent and largest studies assessing female sexual function and contraception, Wallwiener et al. assessed the prevalence of sexual dysfunction and impact of contraception in over one thousand female German medical students. Study participants were administered the FSFI as well as other questions about contraception. The authors found COC users had statistically significant lower total FSFI scores as well as lower scores on desire and arousal than nonhormonal contraception [65]. In the other study, which sought to assess a potential correlation between specific types of COC on female sexual function, they again concluded that FSFI scores were negatively affected by COC, but no correlation was found between specific types of COC and negative effect on libido [66].

In the prospective study of 30 women taking 30 mg EE and 3 mg drospirenone referenced earlier, the women had a significant decrease in the McCoy Female Sexuality Questionnaire score, a reduction in the number of intercourse/week, and a reduction in the frequency of orgasm during intercourse [41].

Lastly, there is some indirect support for the idea that COC negatively impact desire. A few studies had found that the delivery of higher doses of testosterone may impact sexual desire, response, and behavior in both sexually functional and low desire women, particularly those who are postmenopausal [67–69]. In summary, there are several recent large, non-industry funded trials that have demonstrated a significant negative impact of COC on female sexuality.

Other Hormonal Forms of Contraception

Since the introduction of COC, other forms of hormonal contraception have been introduced, although none of them have been studied extensively as the pill, especially with regard to female sexual function. As with COC, there are conflicting results.

Estrogen and Progesterone Combinations

The Contraceptive Ring and Contraceptive Patch

Mohamed et al. compared the contraceptive ring vs. COC (30 μg ethinylestradiol and 3 mg drospirenone) and found that a decreased libido was more common with the NuvaRing [70]. In a study of 500 women, Gracia et al. found that among recent COC users, slight decrements in sexual function scores were noted with contraceptive ring use overall and in several domains of sexual functioning, whereas slight increases were noted with patch use [71]. However, they concluded that for both products, these changes are not likely to be clinically significant. Guida et al. randomly

assigned three groups of women to the contraceptive ring, COC, or a control group for six consecutive cycles [72]. They found that compared with women not using hormonal contraception, women in both the ring and the COC group reported a global improvement of sexual function after 3 months and this was sustained until the 6-month assessment.

Progesterone Only

Depot Medroxyprogesterone Acetate (DMPA)

DMPA is an injectable progestin which provides a highly reliable form of contraception. Nelson found that 5.8% of women using DMPA reported either lost or decreased libido [73]. Alternatively, Ott et al. report no differences in sexual interest when comparing various forms of hormonal contraception, including COC and DMPA [74]. Lastly, Schaffir et al. found that COC users had lower levels of free testosterone compared with DMPA users; however, scores of desire, arousal, and total scores on the FSFI were no different. The authors concluded that while users of COC and DMPA have significantly different sex hormone levels, they are not different in sexual function [75].

A recent article assessed the influence of oral contraceptives (the specific formulations were not assessed; however, most participants were using a combined estrogen–progestin pill) and DMPA on sexual interest in 328 adolescents followed longitudinally for 41 months [74]. They found that sexual interest did not change significantly in either group during the study period. Interestingly, the authors found that sexual interest was higher when taking oral contraceptives compared to the weeks off of them.

In one of the most recent studies on DMPA, the authors found no difference in sexual interest compared with nonusers of any hormonal method of contraception in an adolescent population [53].

Etonorgestrel Implant

The etonorgestrel implant (Implanon) is a rod that is inserted into the upper arm. Although in general there is a low side effect profile, a decreased libido has been noted. Gezginc et al. found that 2.5% of women had the implant removed due to decreased libido [76].

The LNG IUD (Mirena)

In a study of women who used the LNG IUD, Skrzypulec and Drosdzol showed that women using the LNG IUD had greater sexual desire, greater arousal, and less sexual dysfunction as compared with a control group of women [77].

Conclusion

When counseling a woman on contraceptive options, it is important to present potential positive and negative implications. Studies have shown that women who discontinue COC often choose a less effective method or no method of contraception, increasing their risk of pregnancy and COC are known to have many health benefits [78]. While side effects such as breast tenderness and weight gain are well documented, sexual side effects are not as well studied, particularly with regard to impact on libido. This is likely due to the fact that female libido is complex, and it is therefore difficult to reliably predict how it may be affected by COC, or any other hormonal contraceptive. Based on current literature, the majority of which pertains to COC, it seems there are mixed effects on libido, with a small percentage of women experiencing an increase or a decrease, with the majority being unaffected. Nevertheless, for the individual woman who is negatively affected, this can have substantial impact on her quality of life and relationship. Healthcare providers must be aware that hormonal contraceptives can have negative effects on female sexuality so they may counsel and care for their patients appropriately.

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Statement of Authorship

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