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Oral Contraceptives and Thyroid Results: Navigating the Complex Interactions and Clinical Implications

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Abstract

This review explores the complex interactions between birth control pills and thyroid function, emphasizing the potential for misinterpreted thyroid test results and the risks associated with inappropriate treatment. Birth control pills, widely used for contraception, influence thyroid hormone binding proteins, leading to altered thyroid function test results that may mimic thyroid dysfunction. This can result in unnecessary levothyroxine prescriptions, with significant health implications. Additionally, the paper examines historical and recent perspectives on the relationship between hormonal contraceptives and hypothyroidism, highlighting a shift from a perceived risk to evidence of protective effects. Practical recommendations for healthcare providers, including the prioritization of TSH and FT3 measurements, aim to improve diagnostic accuracy and patient outcomes. This synthesis of evidence underscores the importance of informed clinical decision-making in managing thyroid health for individuals using oral contraceptives.

Introduction

Birth control pills have revolutionized the way people approach family planning and personal health. For many, they represent a reliable, convenient, and effective method of contraception. However, despite their widespread use, misunderstandings and mistakes in their usage remain common, leading to unintended consequences such as reduced effectiveness or adverse health effects.

This review aims to provide an evidence-based perspective on the challenges associated with the use of birth control pills. By examining common mistakes, practical recommendations, and insights derived from scientific literature, this publication seeks to support both individuals using birth control pills and healthcare providers prescribing them. The goal is to enhance understanding, improve adherence, and foster better communication between patients and medical professionals, ultimately ensuring safer and more effective use of this vital contraceptive method.

Materials and Methods

This review was conducted through a systematic search of peer-reviewed literature published in the last two decades. Databases such as PubMed, Scopus, and Web of Science were used to identify relevant studies. Keywords included "oral contraceptives," "thyroid function tests," "thyroxine-binding globulin," "hypothyroidism," and "levothyroxine misuse." Only articles in English, with full-text availability, and published in indexed journals were included.

The methodology followed PRISMA guidelines to ensure comprehensive inclusion and exclusion criteria. Primary research articles, systematic reviews, and meta-analyses were prioritized to provide a robust evidence base.

Data were extracted to address the influence of birth control pills on thyroid function tests, misdiagnosis of thyroid conditions, inappropriate levothyroxine prescriptions, and evolving perspectives on the relationship between oral contraceptives and hypothyroidism. Findings

were synthesized to highlight clinical implications and provide actionable recommendations for healthcare professionals.

Conclusion

Healthcare providers must stay informed about the evolving evidence base and consider individual patient factors when evaluating the risks and benefits of hormonal contraceptive use, especially concerning thyroid health. Current data highlights the protective role of contraceptive pills in reducing the risk of hypothyroidism. Continued research is crucial to better understand the mechanisms behind these associations and to offer more definitive guidance for clinical practice.

Keywords: oral contraceptives, thyroid, TSH, T3, T4, hypothyroidism

Analysis of the Literature

Impact of Birth Control Pills on Thyroid Function Tests

The use of oral contraceptives (OCs) has been found to influence thyroid function test results, potentially leading to misinterpretation of thyroid health. In many scientific papers it is stated that thyroxine-binding globulin (TBG) concentration can be increased on birth control pills [1, 2]. Furthermore, originally it was suggested that estrogen itself can induce hepatic TBG protein synthesis or that it induces sialylation of TBG which prolongs TBG half-life. [3, 4]. The elevated concentration of TBG raises the levels of total thyroxine (T4) and triiodothyronine (T3) without affecting the free (active) hormone levels significantly [5, 6]. Studies report that total T3 and T4 levels may rise by 20-40%, while free T4 (FT4) remains stable, and free T3 (FT3) may experience a transient reduction [7].

This physiological change can also result in elevated thyroid-stimulating hormone (TSH) levels as the body works to maintain hormonal balance. Such alterations may mimic subclinical hypothyroidism in laboratory results, despite the absence of intrinsic thyroid dysfunction [8]. It is therefore crucial for healthcare providers to account for OC usage when evaluating thyroid function, as this can help avoid unnecessary misdiagnoses and treatments.

While these changes are typically harmless and reflect the body's adaptation to increased TBG, they underscore the importance of careful interpretation of thyroid function tests in patients using oral contraceptives [9]. Understanding the mechanism and implications of these interactions can enhance diagnostic accuracy and improve overall patient care.

The Importance of TSH and FT3 in Thyroid Assessment

When evaluating thyroid function, reliance on thyroid-stimulating hormone (TSH) levels and free triiodothyronine (FT3) may provide a more reliable diagnostic perspective compared to FT4 alone [10]. Free T3 is the biologically active form of thyroid hormone and more directly reflects the body’s thyroid hormone status and metabolic activity. While FT4 serves as a precursor to FT3, its levels can be influenced by factors such as TBG changes, rendering it less reflective of true thyroid activity in some contexts, particularly for individuals on oral contraceptives [11].

Research highlights that TSH and FT3 measurements offer a clearer picture of thyroid function, particularly when TBG levels are elevated. This approach minimizes the risk of diagnostic errors and unnecessary treatments, ensuring a more tailored and accurate assessment of thyroid health [12].

Clinicians should be aware of the changes occurring under the influence of contraceptive pills and their impact on thyroid hormones and keep it in mind when ordering tests and its focus on fT4 and fT3 rather than T3 and T4 as these are not affected by COC use [13].

The studies show no difference in TSH levels, except usage of ethinyl estradiol EE, estradiol valerate (E2V) and dienogest (DNG) that may increase TSH levels [14].

Encouraging laboratories and clinicians to prioritize TSH and FT3 assessments could enhance the overall reliability of thyroid testing in patients using hormonal contraceptives.

Additional Factors Contributing to Misinterpretation

Beyond the general influence of OCs on thyroid function tests, several additional factors can exacerbate the potential for falsely positive results:

1. Individual Variations in TBG Response: Genetic predispositions or pre-existing conditions, such as liver disease, can amplify the effects of OCs on TBG production. In such cases, the increase in total thyroid hormone levels may be more pronounced, leading to greater diagnostic challenges [15].
2. Additional Medications: The use of other medications, such as hormone replacement therapy or selective estrogen receptor modulators, can further increase TBG levels or interact with thyroid function tests. These interactions may complicate the accurate assessment of thyroid health [16].
3. Assay Sensitivity and Specificity Issues: Variability in laboratory assay methodologies for measuring free T4 and T3 can contribute to inconsistent or misleading results. Differences in assay performance may particularly affect individuals on OCs, where the hormonal level is already altered [17].

Recognizing these factors is critical for healthcare providers to improve the accuracy of thyroid function test interpretation in patients using oral contraceptives. Employing alternative diagnostic tools, such as free hormone indices or TBG-adjusted reference ranges, may help mitigate these challenges. In case of inconsistent results, it can be recommended to discontinue OCs for a period of 4 weeks and repeat the tests [18].

Risks of Inappropriate Levothyroxine Prescription

A potential consequence of misinterpreting thyroid function tests in individuals using oral contraceptives is the inappropriate prescription of levothyroxine. This medication, commonly used to treat hypothyroidism, can have significant side effects if prescribed unnecessarily or in incorrect dosages. Overuse of levothyroxine may lead to symptoms of hyperthyroidism, including palpitations, anxiety, insomnia, and bone density loss [19]. Prolonged misuse can also increase the risk of cardiovascular complications such as atrial fibrillation and arrhythmias [20].

Healthcare providers must consider the impact of oral contraceptives on thyroid hormone levels and TSH results to avoid such errors [21]. A thorough understanding of the interplay between OCs and thyroid function tests can prevent misdiagnosis and ensure levothyroxine is prescribed only when genuinely indicated. This highlights the critical need for a

comprehensive approach to interpreting lab results in the context of a patient's overall health and medication profile.

Evolution of Perspectives on Oral Contraceptives and Hypothyroidism

Historically, the relationship between oral contraceptives (OCs) and thyroid function has been a subject of extensive research and debate. Early studies suggested a potential link between prolonged OC use and an increased risk of hypothyroidism. For instance, a cross-sectional analysis of data from the National Health and Nutrition Examination Survey (NHANES) 2007–2012 indicated that long-term use of birth control pills was associated with a higher incidence of hypothyroidism. Participants with a history of OC use spanning more than 10 years exhibited a significantly elevated risk (odds ratio [OR], 1.555; 95% confidence interval [CI], 1.167 to 2.072) of developing hypothyroidism [22].

In contrast, more recent research has presented findings that challenge this earlier perspective. A 2023 study utilizing data from the TriNetX database examined over 18,000 women aged 18 to 45 and found that hormonal contraceptive use was associated with a decreased incidence of hypothyroidism. The study reported that all forms of hormonal contraception, including estrogen-progestin combinations, progestin-only contraceptives, and progestin-containing intrauterine devices, had a protective effect against the development of hypothyroidism. Notably, progestin-only contraceptives and intrauterine devices demonstrated the most substantial protective effects, with ORs of 0.14 and 0.12, respectively, while estrogen-progestin contraceptives had an OR of 0.30 [23].

This shift from earlier findings suggesting a potential risk to more recent data indicating a protective effect underscores the complexity of the relationship between hormonal contraceptive use and thyroid function. The discrepancies between studies may be attributed to various factors, including differences in study design, population demographics, duration of contraceptive use, and advancements in contraceptive formulations over time.

Conclusion

It is essential for healthcare providers to remain cognizant of the evolving evidence base and to consider individual patient factors when assessing the potential risks and benefits of hormonal contraceptive use, particularly in relation to thyroid health. Current data confirms the protective function of contraceptive pills against hypothyroidism. Ongoing research is necessary to further elucidate the mechanisms underlying these associations and to provide clearer guidance for clinical practice.

Disclosures

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