

The Impact of Thyroid Disorders on Sonographic Appearance of the Ovaries

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Abstract:

Ovarian function, i.e. production of steroid hormones and ova, is under the regulation of endocrine factors derived from the brain. This brain–gonadal axis is the center for the maintenance of endocrine balance and fertility. The aim of this study is to investigate the impact of thyroid disorders on sonographic appearance of the ovaries. Sixty patients were enrolled in the study with thyroid disorders confirmed by thyroid function test. Transabdominal ultrasound was performed, utilizing a 3.5 MHz curved-array scanner of transabdominal transducer (Aloka SD 500) with a fully urinary bladder, the size of the ovary was measured. The highest possible magnification was used to examine the ovaries. After the longest medial axis of the ovary had been measured, the ovarian length and thickness were outlined and the area was calculated. Ultrasound findings of this study revealed that more than 50% of patients have PCOC and 30% with normal ovaries, while the remaining (20 %) distributed between simple cyst and multi-locular cyst. Ovarian size was normal and both ovaries showed hyperechogenicity. It will be helpful to assess thyroid function routinely in patients with abnormal ovarian appearance to avoid unnecessary surgery so as to not compromise fertility in younger women in the future.

Keywords: Ovaries, Thyroid, Ultrasounds, PCOC

Introduction:

Ovarian function, such as production of steroid hormones and ova, is under control of endocrine factors derived from the brain. This brain–gonadal axis is the core unit for the maintenance of endocrine balance and fertility ^[1]. Hypothyroidism may cause reproductive disorders as well. The association of multicystic ovarian disease with hypothyroidism has been described in the literature ^[2, 3].

Consistent regression of the ovarian cysts after thyroid hormone replacement therapy supports a causal relationship between hypothyroidism and ovarian stimulation. In addition, the presence of ovarian cyst has been considered a diagnostic marker for hypothyroidism. Although the etiopathogenesis of hypothyroidism and polycystic ovarian syndrome is completely different, these two entities have many features in common. A decrease in ovarian volume, resolution of ovarian cysts and reversal of the polycystic ovary syndrome-like appearance, together with improvement in serum hormone levels, has been shown to occur after the achievement of euthyroidism ^[4]. In addition an increase in ovarian volume and the appearance of bilateral multicystic ovaries, sometimes mimicking polycystic ovaries, have been reported in various cases with primary hypothyroidism.

The prevalence of subclinical thyroid dysfunction in the general population has been estimated around 10%, but in reproductive years this prevalence is considerably low at 4-6% ^[5]. In recent years, a number of publications have reported increased incidence of thyroid disorders in females with polycystic ovary syndrome.

Changes in ovarian morphology in hypothyroidism are well-known. In the presence of hypothyroidism, ovarian morphology becomes poly-cystic. Hence, thyroid disorders are one of the exclusion criteria before making a diagnosis of polycystic ovarian syndrome in any women. In fact thyroid disorders have been frequently associated with menstrual disturbances and impaired fertility. This disturbance might be associated with morphological changes; the aim of this article is to characterize these changes by ultrasound as noninvasive method to highlight the impact of the thyroid hormone action on the ovary.

Material and method:

This clinical study was conducted at Nuclear Medicine Department of Radiation and Isotope Center in Khartoum (RICK). Sixty female patients were enrolled in the study, their age ranged between 21-60 years old. Patients with thyroid disorders confirmed by thyroid function test were recruited in the study.

All ultrasonic examinations were performed by a single, experienced sonologist. Ethical approval was taken from the (RICK) ethical committee and a written informed consent was taken from all participants. Transabdominal ultrasound was performed, utilizing a 3.5 MHz curved-array scanner of transabdominal transducer (Aloka SD 500) with a fully urinary bladder.

Ultrasound measurements were taken in real time, according to a standardized protocol. Gain settings were optimized considering the size of the patient and the amount of pelvic fat. After identification of the ovaries, the size of the ovary was measured. The highest possible magnification was used to examine the ovaries. After the longest medial axis of the ovary had been measured, the ovarian length and thickness were outlined and the area was calculated.

Results:

Sixty female patients were enrolled in the study, their age ranged between 21-60 years old, as shown on figure 1, the majority of patients were in reproductive age.

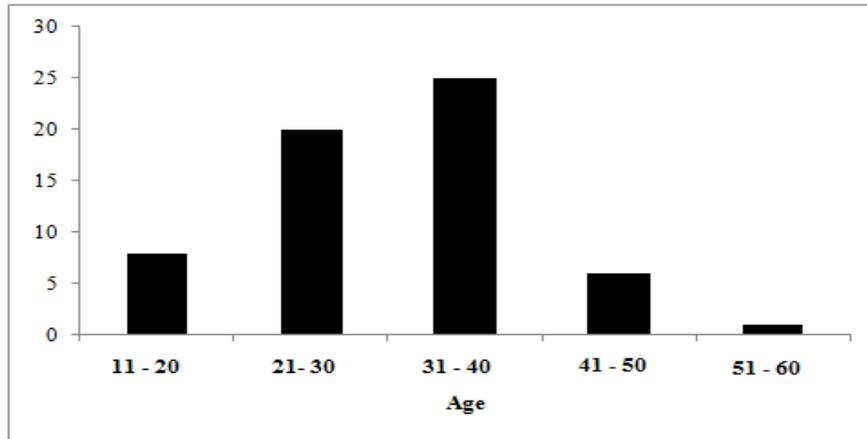


Figure 1: Age distribution, data represented as number of patients

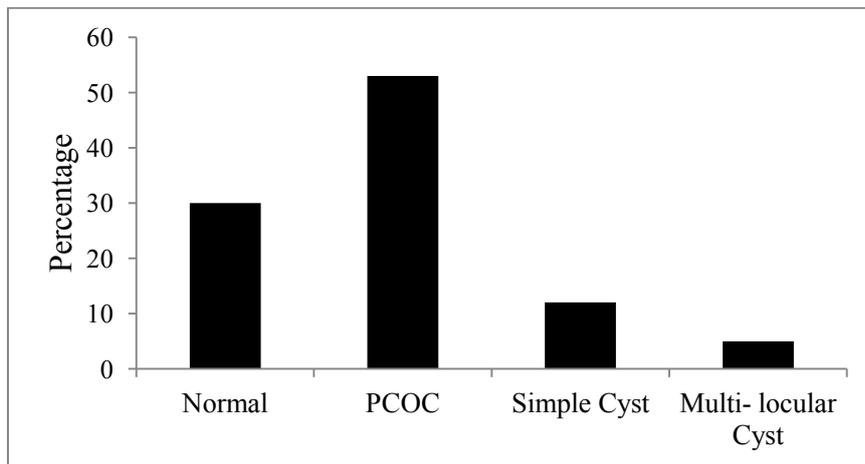


Figure 2: sonographic findings, data presented as percentage

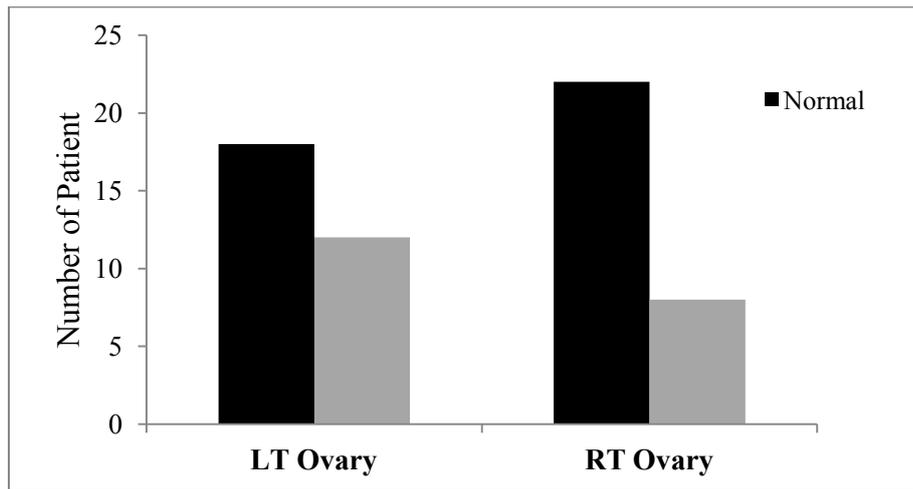


Figure 3: Ovaries' size

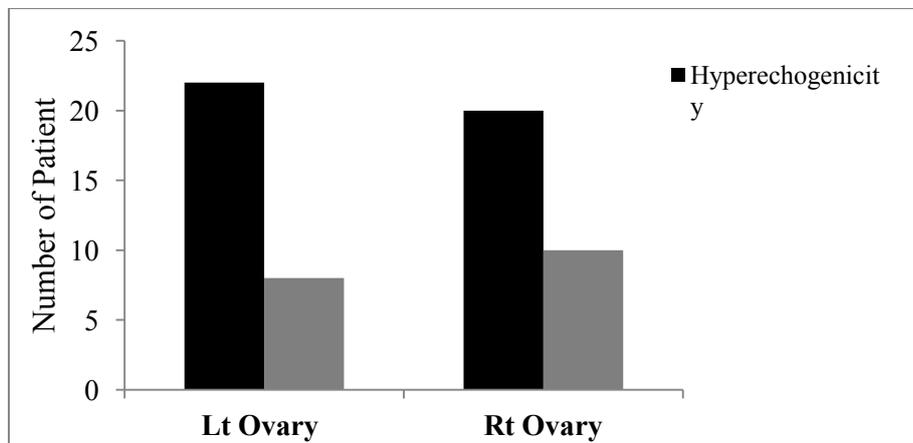


Figure 4: Echogenicity of the ovaries

Discussion:

Ovarian function, i.e. production of steroid hormones and ova, is under the regulation of endocrine factors derived from the brain. This brain–gonadal axis is the center for the maintenance of endocrine balance and fertility. The aim of this study was to investigate the impact of thyroid disorders on sonographic appearance of the ovaries. Sixty patients were enrolled in the study with thyroid disorders confirmed by thyroid function test.

Ultrasound findings of this study revealed that more than 50% of patients have PCOC and 30% with normal ovaries, while the remaining distributed between simple cyst and multi-locular cyst. This result consistent with the previous studies which confirmed that PCOC was common in patient with hypothyroidism ^[1, 3, 7]. Furthermore, a strong interaction between thyroid and ovary is implied by many

invitro researches, both in humans and animals. For example, thyroglobulin (TBG) and TSH receptor are detected in bovine luteal cells by immunohistochemistry^[8].

As human chorionic gonadotropin (HCG) has a thyroid stimulating hormone (TSH)-like effect^[9], thyroid activity affects the functionality of the reproductive axis^[10] and TSH has been reported highly elevated in ovarian hyperstimulation syndrome (OHSS)^[11] and PCOS patients.

Hypothyroidism was found to produce ovarian cysts, and the polycystic appearance of the ovaries disappeared in all patients after thyroxin treatment. These findings further suggest that the PCOS-like appearance of the ovaries can be caused by primary hypothyroidism^[12]. In addition, a decrease in ovarian volume, resolution of ovarian cysts and reversal of the polycystic ovary syndrome-like appearance, together with improvement in serum hormone levels, occurred after euthyroidism was achieved^[12].

According to Anasti et al^[13], ovarian enlargement in severe hypothyroidism is probably due to the stimulation of FSHRs by unusually high TSH levels proven to have a weak FSH-like activity. It has been shown that TSH could interact directly with the FSHRs to elicit gonadal stimulation, because TSH has a small FSH- and luteinizing hormone (LH)-like effect. In this study the ovarian size tends to be normal with low percentage of abnormal size, this is may be due to uncontrolled study sample and variations of ages.

The degree of echogenicity of the ovarian stroma is usually assessed subjectively and this is open to observer bias. This study showed that both ovaries tend to have hyperechogenicity in most of the cases. Because there was a high percentage of PCO, the hyperechogenicity thought to relate to the increased volume of ovarian stroma due to the increased number of follicles. This result in line with previous studies of PCOS which concluded that echogenicity is significantly higher in women with PCOS^[14].

In conclusion, it will be helpful to assess thyroid function routinely in patients with abnormal ovarian appearance to avoid unnecessary surgery so as to not compromise fertility in younger women in the future.

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