Prostate Specific Antigen as Predictive Factor for Androgenemia in Women

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Abstract

Background: Sex hormones of steroid origin - androgens, play an important role in the life of the body. They are involved in the regulation of bone maturation, gonadotropin secretion and the synthesis of high-density lipids, the production of β-endorphins. Along with the anabolic effect, androgens regulate libido and sexual potency, stimulate the function of the sebaceous glands and hair follicles. At physiological concentrations, androgens participate in the regression mechanism of the follicle in the ovaries and provide pubic hair and inguinal hair growth .The present study was conducted with the aim the possibility of using PSA for the diagnosis of hyper androgenic conditions in women. The study included 105 girls aged 17–26 were examined. The concentration in the peripheral blood of PSA and a androgens, testosterone and DHEA-S, were determined. In addition, the concentration of the transport proteins of androgens SHBG and albumin was investigated. The calculation of (FT) and (BT) was carried out according to special computer programs. The aim of this work was diagnostics of hyperandrogenic conditions in women. The result shows that the concentration of PSA increases with an increase in T peripheral blood, the concentration of PSA increases with an increase in DHEA-S in peripheral blood and the concentration of PSA increases with an decrease in SHBG in peripheral blood. In conclusion, we found that there is a relationship between androgen levels and PSA concentration in peripheral blood, and PSA is a valuable marker in the diagnosis of hyperandrogenism in women.

Keywords: *PSA, androgen, hyperandrogenism.*

Introduction

In a woman's body, androgen production is carried out by the ovaries, adrenal glands and in peripheral organs (liver, skin) and tissues (fatty, muscular) [1,2,3]. The substrate for the synthesis of androgens is cholesterol, which enters the adrenal glands and ovaries in the composition of LDL, or is formed locally from acetate. Androgens are formed from cholesterol under the influence of enzymes (17, 20-lyase, 17α-hydroxylase, 3β-hydroxysteroid dehydrogenase). The chain of transformations of prohormones into androgens is carried out in four stages with the formation of the following metabolites: dehydroepiandrosterone (DEA), androstenedione (An), testosterone (T) and dihydrotestosterone (DHT) (listed in order of increasing androgenic activity) [4,5]. It is shown that the adrenal glands are the main structure synthesizing DHEA (70%) and its less active metabolite, dehydroepiandrosterone sulfate (DHEA-S

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(85%)). DHEA-Sis subject to continuous hydrolysis, thereby maintaining a constant level of DHEA in the blood plasma. The contribution of the adrenal glands to the synthesis of An approaches 40-45%, the other part of which is synthesized by the ovaries [6,7]. It is also important to note that only 15-25% of the total T are synthesized by the adrenal glands. Excessive production of androgens is observed when there are tumor cells in the glands (Cushing's syndrome), or when certain enzyme systems are deficient, often 21-hydroxylase, this leads to a deficiency of cortisol and the accumulation of DHEA and An [8,9]. In the ovaries, androgens are secreted mainly by the theca cells of the inner maturation membrane of the follicles and interstitial stromal cells. About 25% of T is synthesized here. The main product of the biosynthesis of androgenic steroids in the ovaries is An (50%). DHEA is limited in the ovaries, only 15% of the total [10,11]. Aromatization of An and T occurs in the cells of the dominant follicle granulosa. The synthesis of androgenic steroids is under the regulatory influence of such tropic hormones of the pituitary gland, such as LH, the receptors for which are on the surface of both theca-cells and pre-antral and antral follicle granulosa cells, as well as FSH, to which only granulose cells have receptors. Tropic hormones act via membrane receptors through a classic mechanism involving cyclic adenosine monophosphate (C-AMP). In response to the action of LH, the tech-cells produce androgens, which in the dominant follicle are subject to FSH-stimulated aromatization into estrogens [12,13,14]. Androgens also begin to be secreted in significant quantities in the presence of androgen-producing ovarian tumors (epithelial, stromal tumors of the genital strand, lipid cell and germ cell tumors). Sometimes a hormonally inactive tumor can cause stromal proliferation and increase the production of androgens [15,16]. The T content in the blood may not display the actual level of androgenization since the bulk of androgens are in the bound state of the blood plasma, which makes them inactive. So, about 20% of them are associated with albumin and 80% - with globulins. The most stable connection is provided by sex steroid-binding globulins, which are synthesized in the liver. Only a small amount of testosterone remains free and active. In the idiopathic form of hyperandrogenism, when the content of free testosterone is elevated, and there are no other signs of virilization, the concentration of SHBG may be low. The main pathogenetic link in the development of this form is considered to be a violation of the processes of peripheral androgen transformation [17,18]. It is known that PSA in men is produced by the prostate gland and is present in the tissues of the prostate, seminal fluid and serum. A small amount of PSA can also produce paraurethral glands, and therefore, a certain amount of this fluid is also found in the urine. There is no doubt that the serum PSA concentration in men is an important marker for the diagnosis of prostate cancer [21,22,23]. It should be noted that in the laboratory diagnosis of the peripheral form of the hyperandrogenic status in women, there are several difficulties associated with the high cost of methods and the need to determine a large number of metabolites. In this regard, we are interested in the research of Canadian scientists Diamandis. Negri et al. (1998, 2000), who demonstrated the presence of PSA in some female tissues and biological fluids (mammary gland, ovaries, endometrial tissue, amniotic fluid, milk) [19,20]. The presence of PSA in them is closely related to the regulatory action of steroid hormones, especially androgens, glucocorticoids and progestins [24,25].

Result and Discussions

From the presented data, it follows that there is a relationship between certain androgens and the level of PSA in the peripheral blood.

In results are presented in (Figure 1) we see that the PSA concentration increases with an increase in T

blood.

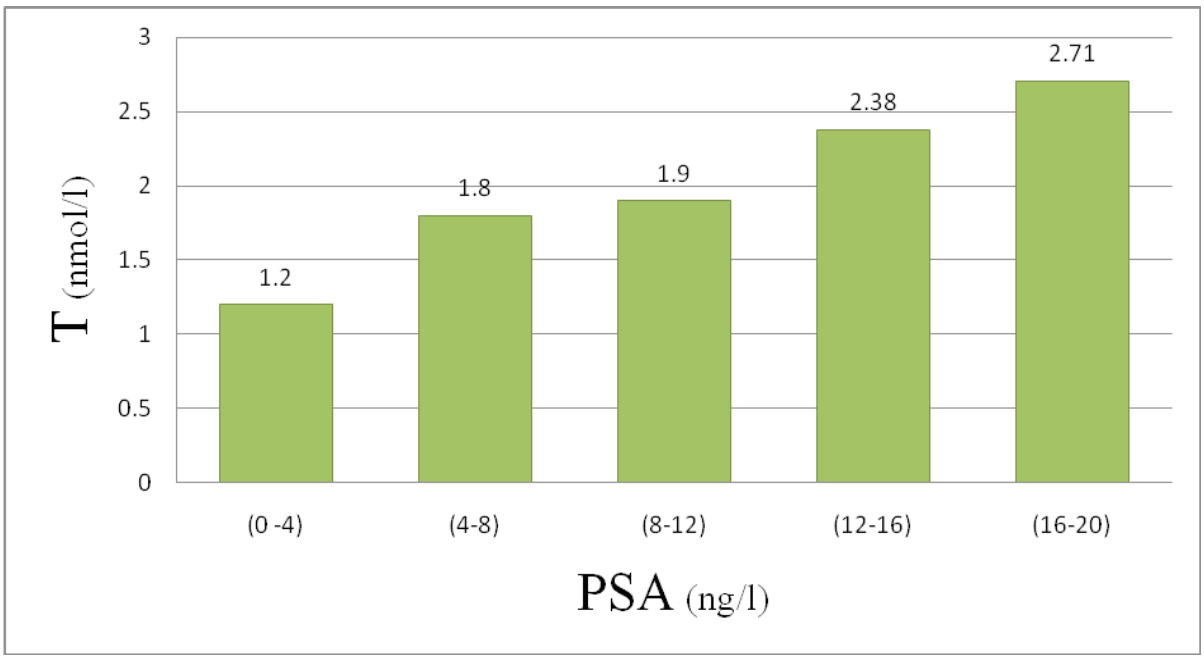

Figure 1. The content of T in the blood of women depending on the level of PSA.

The most obvious effect on PSA concentration is the effect of FT and BT: with increasing concentration of these androgens, the level of PSA in peripheral blood increases as in (Figure 2) and (Figure 3)

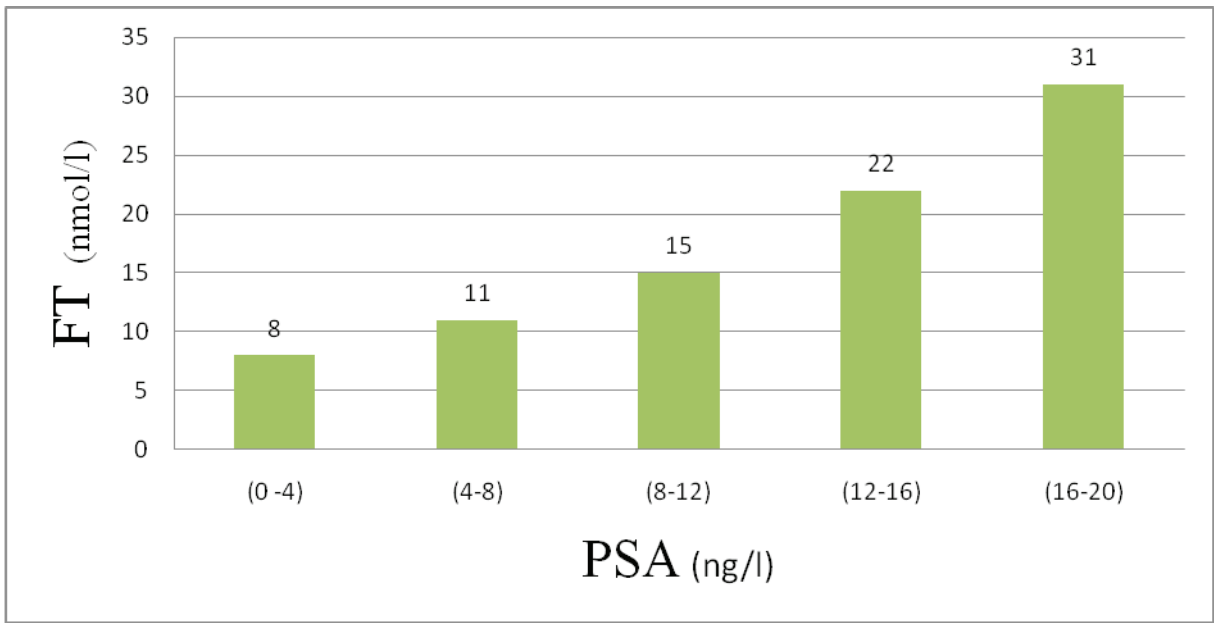

Figure 2. The content of FT in the blood of women depending on the level of PSA

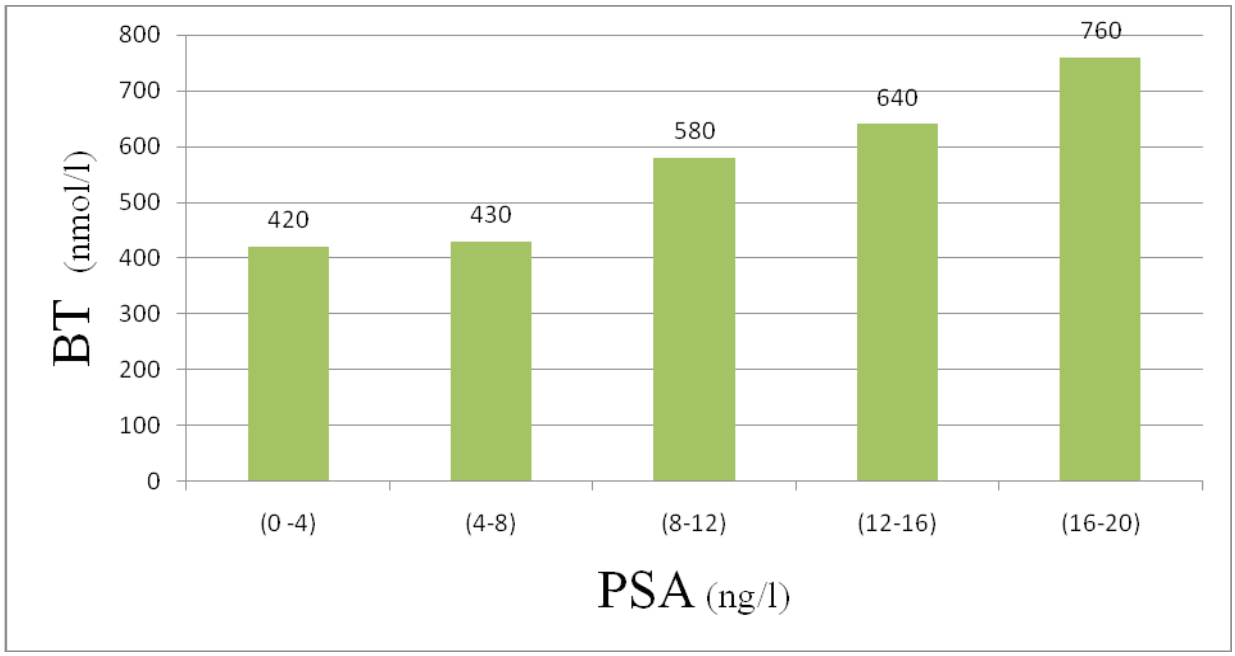

Figure 3. The content of BT in the blood of women, depending on the level of PSA

according to the results obtained in (Figure 4), we found that an increase in the value of PSA in women increases the concentration of DHEA-S in women.

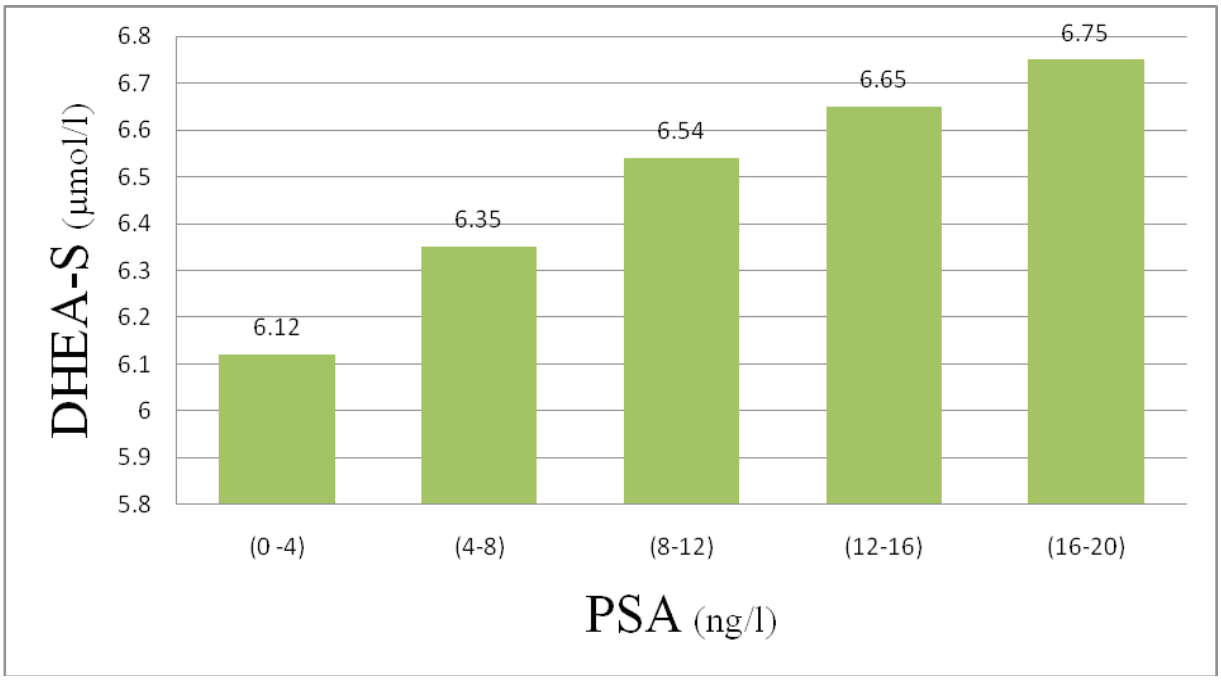

Figure 4. The content of DHEA-S in the blood of women, depending on the level of PSA .

while in results are presented in (Figure 5) that when the concentration of PSA increases, be decrease in SHBG in peripheral blood .

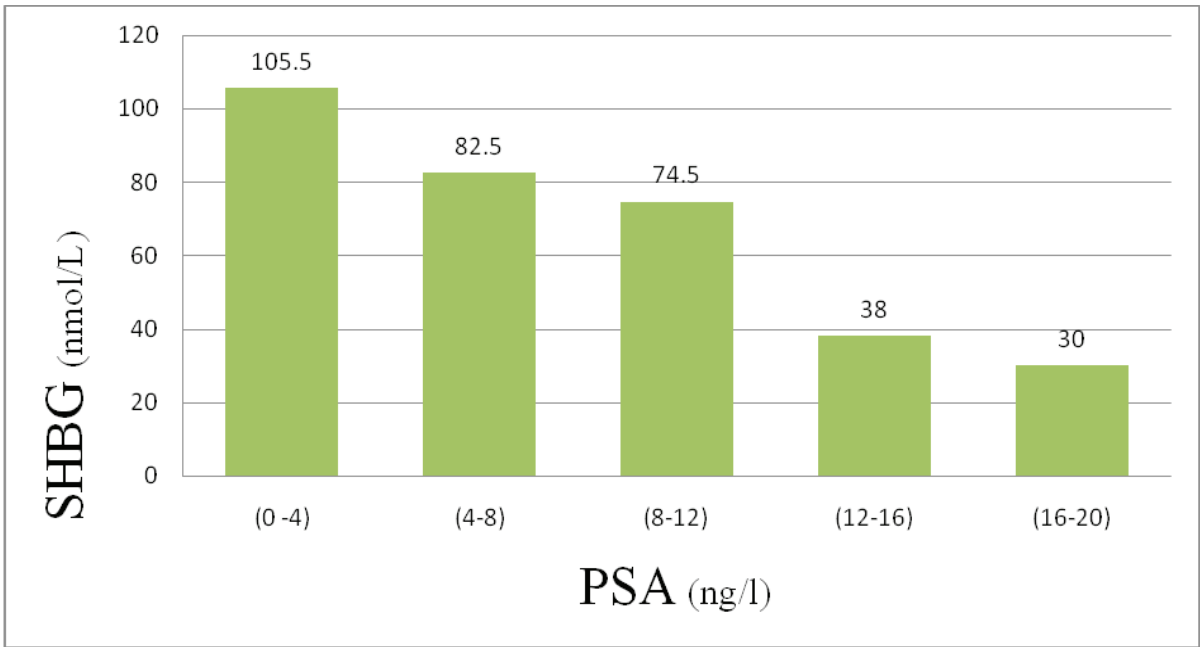

Figure 5. The content of SHBG in the blood of women depending on the PSA level

The research results are summarized in (Figure 6).

From the presented data, it follows that there is a relationship between androgens and the level of PSA in the peripheral blood.

The most pronounced effect on the concentration of PSA is exhibited by FT and BT: with an increase in the concentration of these androgens, the PSA level in peripheral blood increases.

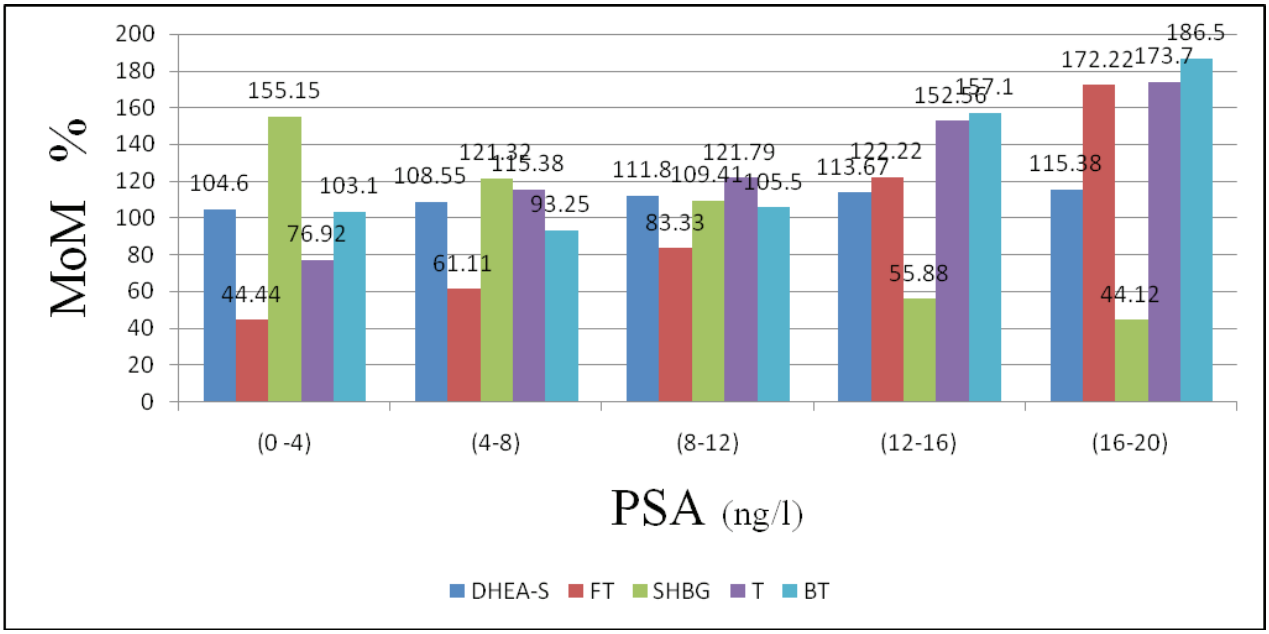

Figure 6. Androgen content in women's blood (in MoM) depending on PSA level

Androgen level DHEA-S and T affect the level of PSA in peripheral blood.

We also noted an inverse relationship between the level of SHBG and PSA: with an increase in the

concentration of PSA, there is a decrease in the level of SHBG. Such dependence, apparently, is determined by the modulating effect of estrogens and androgens on the level of SHBG.

Conclusion:

There is a relationship between the levels of androgens and the concentration of PSA in peripheral blood, The concentration of PSA increases with an increase in T, FT and BT in peripheral blood and the concentration of PSA increases with decrease in SHBG in peripheral blood, therefore PSA is a valuable marker in the diagnosis of hyperandrogenism women.

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Ethical Clearance: Not required

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