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CLINICAL ARTICLE

Acne severity and the Global Acne Grading System in polycystic ovary syndrome



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ABSTRACT

Objective: To evaluate the association between acne, quantified by the Global Acne Grading System (GAGS), and abnormal clinical and laboratory markers of androgen excess in patients with polycystic ovary syndrome (PCOS). **Methods:** The retrospective study included 133 patients with PCOS. Acne severity was quantified with the GAGS score, alopecia was graded with the Ludwig classification, and hirsutism was quantified with a modified Ferriman–Gallwey (FG) score. **Results:** The mean GAGS score was significantly greater in younger women, those with a lower BMI, and those with a higher FG score. There was no relation between the mean GAGS score and waist circumference, waist/hip ratio, androgen hormone levels (free testosterone, total testosterone, or dehydroepiandrosterone sulfate), sex-hormone-binding globulin level, or menstrual irregularity. Alopecia was significantly associated with an increased waist/hip ratio; there was no relation between alopecia and age, waist circumference, body mass index, FG score, androgen hormone levels, or menstrual irregularity. A weak positive correlation was observed between the GAGS and FG scores. **Conclusion:** The GAGS may provide more precise and comprehensive information about acne severity in obese or hirsute patients with PCOS because this grading system includes evaluation of the type (comedones, papules, pustules, nodules) and location (anatomic area) of acne lesions.

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1. Introduction

In patients with polycystic ovary syndrome (PCOS), hyperandrogenism is a common finding and is diagnosed by clinical and laboratory tests [1]. A woman with excess androgen may present with acne, alopecia, and hirsutism. Grading systems may quantify the severity of these signs.

Acne is a disorder of the pilosebaceous unit and is mostly observed on the face, neck, upper back, and in pectoral regions. Androgens are important in the development of acne. In the sebaceous gland, the enzyme 5 α -reductase converts testosterone to a more potent androgen, dihydrotestosterone. In addition, androgens increase the formation of comedones by increasing sebum production from sebaceous glands and causing abnormal desquamation in follicular epithelial cells. After colonization of comedones with bacteria, papules and pustules may be observed [2].

The severity of acne is typically evaluated subjectively by the number, type, and distribution of the lesions. Many systems such as the Acne Severity Index, the Leeds technique, and the Global Acne

Grading System (GAGS) have been proposed for grading the severity of acne lesions [3,4]. However, in patients with PCOS, the severity of acne has not been well quantified, and the GAGS in particular is not commonly used in these patients.

Androgenic alopecia is characterized by hair loss primarily on the central area of the scalp. This sign has received limited study and may be a poor marker of androgen excess in patients with PCOS [5]. Alopecia is commonly graded with the Ludwig classification system, which classifies patterns of diffuse hair loss in the center of the scalp with preservation of the frontal hairline [6–8]. However, the relation between Ludwig grades and hyperandrogenemia or clinical patient characteristics has not been well established.

Hirsutism, another sign of hyperandrogenism, is defined as excessive growth of terminal hair in androgen-dependent areas. Hirsutism is commonly used in the diagnosis of PCOS and may be observed in 50–76% of patients [9].

The purpose of the present study was to evaluate the association between acne, quantified by the GAGS, and clinical and laboratory markers of androgen excess in patients with PCOS.

2. Materials and methods

The present retrospective study included 133 consecutive women (age 17–36 years) who received a diagnosis of PCOS, based on the

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Rotterdam criteria [10], between July 1, 2011, and July 31, 2012. The patients presented to the outpatient clinic at Onsekiz Mart University Hospital, Canakkale, Turkey, because of symptoms of PCOS, including clinical symptoms of hyperandrogenism such as acne and hirsutism. Inclusion criteria for the study included presence of PCOS according to the Rotterdam criteria; age more than 16 years and less than 37 years; absence of any hormonal therapy during the previous 3 months; and absence of therapy for acne or hirsutism during the previous 3 months. The institutional review board of Onsekiz Mart University approved the study. All women gave informed consent before the study began.

The patients were clinically evaluated for their age, waist circumference, waist/hip ratio, menstrual irregularity, acne and hirsutism scores, and alopecia grade. The physical examinations to assess acne, alopecia, and hirsutism were all conducted by the same physician. Weight and height of each patient were measured, and the body mass index (BMI) was calculated as weight in kilograms divided by the square of height in meters.

Acne lesions were scored using the GAGS [4]. This system divides the face, chest, and upper back into 6 areas: the forehead, right cheek, left cheek, nose, chin, and torso (chest and upper back combined). Each acne lesion is described and scored as a comedo (1 point), papule (2 points), pustule (3 points), or nodule (4 points); absence of an acne lesion in an area results in a score of 0 points. The local score for each anatomic area is determined by multiplying the score of the most severe lesion by an area factor (1 to 3), and the local scores of the 6 areas are then added together to obtain the total score. Acne severity is graded as none (total score, 0 points), mild (total score, 1–18 points), moderate (total score, 19–30 points), severe (total score, 31–38 points), and very severe (total score >38 points).

Alopecia was diagnosed and graded as Grade I, II, or III according to the Ludwig classification of androgenic alopecia [8]. Hirsutism was assessed using a modified Ferriman–Gallwey (FG) score [11], where the hair distribution in 11 androgen-sensitive areas is scored from 0 (none) to 4 (frank virilization). The scores from each area are summed to give the total score, indicating no (0 points), mild (1–7 points), moderate (8–15 points), or severe (more than 15 points) hair growth. Hirsutism was defined by a total FG score of ≥ 8 .

Measured hormonal levels included free testosterone, total testosterone, dehydroepiandrosterone sulfate (DHEA-S), and sex-hormone-binding globulin. The hormone levels were measured from serum samples drawn in the morning by venipuncture, during the early follicular phase (days 2–3) of the spontaneous or progesterone-induced menstrual cycle. All hormone levels were determined by radioimmunoassay (upper normal level: free testosterone, 3.1 pg/mL; total testosterone, 80 ng/mL; DHEA-S, 430 μ g/dL; and sex-hormone-binding globulin, 35 nmol/L). Ovarian morphology and follicular count according to the Rotterdam criteria were assessed by transvaginal ultrasonography on cycle days 2–3.

Data analysis was performed with SPSS version 20 (IBM, Armonk, NY, USA). The GAGS and FG scores were not normally distributed; the nonparametric Mann–Whitney test was used to compare GAGS and FG scores between normal and abnormal levels of clinical and hormonal parameters. The χ^2 test or the Fisher exact test was used to compare the frequency of alopecia grades in different groups. Pearson product moment correlation was performed for each logical pair of parameters. $P < 0.05$ was considered to be statistically significant.

3. Results

The presenting symptoms of the women with PCOS are shown in Table 1. Demographic and clinical characteristics of the patients (age, BMI, GAGS score and FG score) are given in Table 2.

Of the 133 patients with PCOS, the majority had mild acne, no alopecia, and mild to severe hirsutism (Table 3 and Fig. 1). The mean GAGS score was significantly greater in younger patients, patients

Table 1

Presenting symptoms and ultrasound findings of the ovaries in women with polycystic ovary syndrome (n = 133).

Symptom	Number (%) of patients
Menstrual irregularity	108 (81.2)
Hirsutism	56 (42.1)
Infertility	41 (30.8)
Acne	23 (17.3)
Alopecia	5 (3.8)
PCO morphology ^a (left)	120 (90.2)
PCO morphology ^a (right)	114 (85.7)

Abbreviation: PCO, polycystic ovary.

^a A polycystic ovary was defined by the presence of at least 12 follicles measuring 2–9 mm in diameter and/or an ovarian volume of more than 10 cm³ by ultrasonography.

with a lower BMI, and patients with a higher FG score, compared with those who were younger, had a lower BMI, or a lower FG score, respectively (Table 4). There was no relation between the mean GAGS score and waist circumference, waist/hip ratio, free testosterone level, total testosterone level, DHEA-S level, sex-hormone-binding globulin level, or menstrual irregularity (Table 4).

Alopecia was significantly associated with a waist/hip ratio of at least 0.8 (Table 4). There was no relation between alopecia and age, waist circumference, BMI, FG score, hormone levels, or menstrual irregularity (Table 4).

A weak positive correlation was observed between the GAGS and FG scores ($r = 0.30$; $P \leq 0.001$). No significant correlation was evident between the GAGS score and levels of free testosterone, total testosterone, or DHEA-S.

4. Discussion

The present retrospective study confirmed that the levels of free testosterone, total testosterone, and DHEA-S are not associated with

Table 2

Demographic and clinical characteristics of patients with polycystic ovary syndrome (n = 133).

Characteristic	Mean \pm SD	Median	Interquartile range
Age, y	23.8 \pm 4.6	23.0	20.0–27.0
Body mass index ^a	25.5 \pm 5.4	24.4	21.2–28.6
GAGS score	12.5 \pm 9.2	11.0	4.8–19.0
Ferriman–Gallwey score	11.6 \pm 8.3	9.5	5.0–17.0

Abbreviation: GAGS, Global Acne Grading System.

^a Calculated as weight in kilograms divided by the square of height in meters.

Table 3

Global Acne Grading System scores, Ludwig alopecia grades, and Ferriman–Gallwey scores in patients with polycystic ovary syndrome (n = 133).

Rating	Number (%) of patients
Acne rating (GAGS score)	
None (0 points)	13 (9.8)
Mild (1–18 points)	86 (64.6)
Moderate (19–30 points)	29 (21.8)
Severe (31–38 points)	4 (3.0)
Very severe (≥ 39 points)	1 (0.8)
Alopecia grade (Ludwig system)	
None	78 (58.7)
Grade I	52 (39.1)
Grade II	3 (2.2)
Grade III	0 (0.0)
Hirsutism rating (FG score)	
None (0 points)	5 (3.8)
Mild (1–7 points)	48 (36.1)
Moderate (8–15 points)	38 (28.6)
Severe (>15 points)	42 (31.5)

Abbreviations: FG, Ferriman–Gallwey; GAGS, Global Acne Grading System.

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