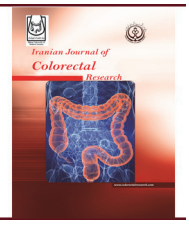
Original Article

Iran J Colorectal Res 2022;10(3):87-91.

Iranian Journal of Colorectal Research



Comparison of Serum Hormone Levels by Gender in Pilonidal Sinus Disease Patients

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Received: 29-08-2022
Revised: 12-09-2022
Accepted: 12-09-2022

Abstract

Background: Pilonidal sinus disease (PSD) describes an inflammation of the subcutaneous fatty tissue causing a pilonidal sinus, which can lead to pus collection and tenderness. We aimed to investigate the relationship between serum hormones, PSD, and the associated factors in patients referring to Khalij Fars Hospital, Bushehr, Iran, in 2017.
Methods: A cross-sectional study was conducted consisting of 50 patients with PSD who underwent surgery in Khalij Fars Hospital between February and May 2017. The patients with PSD who consented to participate were enrolled and subjected to a review of their physical signs and medical history. The serum levels of luteinizing hormone (LH), follicle-stimulating hormone (FSH), total testosterone, dehydroepiandrosterone (DHEA), and prolactin were measured.
Results: The level of sex hormones in female patients was significantly higher in comparison with males, except for testosterone (3.9±1.73 ng/ml in males vs. 0.35±0.17 ng/ml in females). The frequency of patients with normal serum levels of LH, testosterone, and prolactin was higher in females, whereas normal levels of FSH, DHEA, and prolactin were more common in males ($P<0.05$).
Conclusion: Elevated serum prolactin, LH, and testosterone levels in women might contribute to the development of PSD by triggering excessive hair growth/hirsutism.

Keywords: Pilonidal sinus disease, PILONIDAL sinus, GENDER, AGE, SEX hormones, BMI

Please cite this paper as:
Nazari F, Parsaiyan Z, Rezaei L, Mohammadpour M, Mirzaei K. Comparison of Serum Hormone Levels by Gender in Pilonidal Sinus Disease Patients . *Iran J Colorectal Res*. 2022;10(3):87-91. doi: 10.30476/ACRR.2022.96599.1152.

Introduction

Pilonidal sinus disease (PSD) describes an inflammation of the subcutaneous fatty tissue causing a pilonidal sinus, a small hole that involves the sacrococcygeal region and occurs in the cleft at the top of the buttocks and might be filled with fluid or pus, leading to the formation of a cyst (1, 2).

The precise cause of the disease is unknown. Still, aging-related hormonal changes are commonly associated with the condition (3). Generally, PSD develops between 16 and 20 years of age and affects the male gender more than females (4).

Risk factors such as poor hygiene, sitting for long periods of time, excessive hair, excess body fat around the waist, and irritation to the sacrococcygeal area influence the development of PSD (5). Furthermore, during adolescence, hair follicles in the natal cleft are initiated by sex hormones (6). Jones states that these follicles get filled with keratin, increase in size, extend to the subcutaneous fatty tissue, and become infected, leading to folliculitis. There may be a connection between PSD and hidradenitis suppurativa (HS). This painful, longstanding condition causes blisters and damage to the skin, occurring during puberty (7). Mortimer et al. found that most of the patients who were suffering from hidradenitis experienced a pilonidal sinus. They also reported higher testosterone levels and free androgen index values in these patients, which could be a significant cause of PSD (8). In a study by Rosenfield, the growth of sexual hair was associated with androgen hormones, so overproduction of androgens may cause thicker and more pigmented hair in erogenous areas (9). Accordingly, Seppala et al. stated that patients with higher-than-normal levels of prolactin may have hirsutism due to increased androgen levels (10). As there are few studies on the hormonal status of patients with PSD and a lack of information exists on the disease's etiology, we conducted this study to investigate the relationship between serum hormones, PSD, and the associated factors in patients referring to Khalij Fars Hospital, Bushehr, Iran, in 2017.

Materials and Methods

This study was approved by the local ethics committee under the code IR.BPUMS.REC.1396.132. This cross-sectional study included 50 patients with PSD who underwent surgery in Khalij Fars Hospital between February and May 2017. In fact, all patients with SPD who consented to participate in the study were enrolled in the research and subjected to a review of their physical signs and medical history. Patients who had previously received contraceptives, antidepressants, and antipsychotics were excluded from the study. Fasting blood samples of enrolled patients were analyzed, centrifuged, and frozen at -20 °C. Then, the serum levels of luteinizing hormone (LH), follicle-stimulating hormone (FSH), total testosterone, dehydroepiandrosterone (DHEA), progesterone, estradiol, cortisol, and prolactin were measured. Normal ranges were defined as the laboratory's reference values for age, and ovulation was also taken into account.

The body mass index (BMI) for each patient was calculated based on their height and weight. A BMI of 18.5 to 24.9 kg/m^2 was considered normal weight, while BMI values of 25 to 29.9 and 30 or higher kg/m^2 were classified as overweight and obese, respectively. Regarding sex hormones, a normal serum testosterone level was considered to be 2.8–8.0 ng/ml for males and 0.06–0.82 ng/ml for females. Normal ranges of LH for men and women were 1.42 to 15.4 IU/L and 1.37 to 9 IU/L, respectively. The reference range of FSH during puberty was 0.3 to 10.0 mIU/mL (0.3 to 10.0 IU/L). Furthermore, DHEA normal values for adult men and women were 1.0 to 9.5 ng/mL and 0.4 to 3.7 ng/mL, respectively. Finally, prolactin levels less than 20 ng/mL (425 µg/L) for men and 25 ng/mL (25 µg/L) for non-pregnant women were mentioned as normal ranges (11-15).

Statistical Analysis

SPSS version 11.0 (SPSS Inc., Chicago, Illinois, USA) was used to analyze the data. Patients' characteristics were described as absolute and relative frequencies or means and standard deviations. For group comparisons, the student t-test was applied for parametric data, and the chi-squared test was used for comparing the proportions of women and men for each variable. $P<0.05$ was considered statistically significant.

Results

Of the 50 patients included in the study, 25 (50%) were female. The overall mean age was 24.76±6.18 years (range: 14–43), and the male-to-female ratio was 1. As shown in Table 1, the mean age was 24.68±7.04 years in males and 24.84±5.32 years in females (Table 1). The male sex was associated with a higher BMI of 26.18±3.61 kg/m^2. The level of sex hormones in female patients was significantly higher in comparison with males, except for testosterone (3.9±1.73 ng/ml in males vs. 0.35±0.17 ng/ml in females). Results also show no significant differences in age, weight, height, or BMI between female and male patients ($P>0.05$).

Then, the sex hormones of male and female patients were compared based on normal and abnormal serum ranges (Table 2).

The frequency of patients with normal serum levels of LH and testosterone was higher in females, whereas normal levels of FSH, DHEA, and prolactin were more common in males ($P<0.05$).

Discussion

The study findings revealed that the level of sex hormones in female patients was significantly higher in comparison with males, except for testosterone. Furthermore, the frequency of patients with normal serum levels of LH, testosterone, and prolactin was higher in females, whereas normal levels of FSH and DHEA were more common in males. In our research, the mean age of patients was 24.76 + 6.18 years, in

Table 1: Patients' characteristics and sex hormones by gender

Variable	Mean		Standard deviation		Minimum		Maximum		P value*
	Male	Female	Male	Female	Male	Female	Male	Female	
Age (years)	24.68	24.84	7.04	5.32	14	15	43	34	0.06
Weight (kg)	80.01	72	0.8	0.2	75	70	85	74	0.052
Height (cm)	175	170	1.2	0.84	170	165	180	175	0.06
BMI (kg/m^2)	26.18	24.81	3.61	4.39	18.29	18.26	34.38	33.3	0.05
LH (IU/L)	6.52	7.63	2.12	4.33	2.31	1.27	10.39	19.3	0.1
FSH (mIU/mL)	3.73	5.23	1.08	1.65	1.39	2.54	5.2	8.71	0.2
DHEA (ng/mL)	283.26	294.55	139.36	139.7	106	94.89	570.3	549.1	0.09
Testosterone (ng/ml)	3.9	0.35	1.73	0.17	0.18	0.11	6.98	0.91	0.05
Prolactin (ng/mL)	12.38	20.64	4.84	10.17	5.05	7.52	25.10	45.8	0.2

*P value was estimated by the student t-test. LH, Luteinizing Hormone; FSH, Follicle-Stimulating Hormone; DHEA, Dehydroepiandrosterone

Table 2: Gender-wise comparison of sex hormones based on serum range

Sex hormone		Males (Frequency, %)	Females (Frequency, %)	P-value*
Testosterone	Normal	21 (84)	23 (92)	<0.05
	Abnormal	4 (16)	2 (8)	
Prolactin	Normal	15 (60)	17 (68)	<0.05
	Abnormal	10 (40)	8 (32)	
LH	Normal	21 (84)	22 (88)	<0.05
	Abnormal	4 (16)	3 (12)	
FSH	Normal	25 (100)	21 (84)	>0.05
	Abnormal	-	4 (16)	
DHEA	Normal	17 (68)	14 (56)	<0.05
	Abnormal	8 (32)	11 (44)	

*P value was estimated by the chi-squared test. LH, Luteinizing Hormone; FSH, Follicle-Stimulating Hormone; DHEA, Dehydroepiandrosterone

line with other reports. Notably, Kaymakcioglu et al. reported the incidence rate of the disease at nearly 70% in the age range of 20–30 years (16).

The mean BMI values in male and female patients were 26.18 and 24.81 kg/m2, respectively, signaling a tendency toward an overweight/obese status. There are a number of papers that discuss the impacts of obesity in patients with PSD. In a study by Arda et al., high BMI in adolescents was considered a significant risk factor in developing new signs, symptoms or pathological changes of PSD after surgical treatment (17). Similarly, Cubukcu et al. indicated that obesity might increase the possibility of pilonidal sinus recurrence (18). Other studies by Akinci et al. and Bolandparvaz et al. also affirmed the role of obesity in the increased risk of PSD (19, 20). Arda et al. explained that the pilonidal sinus is associated with visible pits in the midline of the natal cleft with a minuscular appearance of enlarged hair follicles. In overweight people, the enlargement is commonly caused by stretching of the follicular openings due to the buttocks' weight getting pulled by the earth's gravitational force (17). Once the force reaches a critical level, the base of the hair follicle ruptures. Moreover, due to butt chafing, hair follicles become distended with keratin leading to infection and swelling of the follicle. In fact, a foreign-body reaction around an ingrown hair causes an inflammatory reaction and results in the development of chronic PSD (21-23).

Until the middle of the 20th century, many researchers mentioned PSD as a congenital disease; however, in 1946, Patey and Scarff suggested that the disease was acquired. They also added that the pilonidal sinus is caused by hair penetration into the epidermis with subsequent long-lasting, low-grade infection (24). Similar studies focusing on puberty as a major factor in PSD found that the insertion of hair occurs during puberty (25, 26). Accordingly, Yildiz et al. mentioned PSD as a relatively common perianal disorder among young adults aged 17–25 years (27). Likewise, Kaymakcioglu found that about 70% of patients suffering from PSD were in the age group of 20–30 years (16).

Study findings also mentioned prolonged sitting as a key driver of developing PSD (28). Sitting for more than 6 hours a day is considered to significantly affect disease recurrence (29). Secondary school students, soldiers, and drivers are the most frequently reported jobs among the cases of PSD (20, 30, 31). In a study by Bolandparvaz et al., sitting for more than four hours increased the risk of PSD, and jobs requiring long-term sitting were mentioned as important risk factors affecting the disease (20).

Sex hormones represent another factor known to influence the pilosebaceous glands, which mainly

correspond to the early onset of PSD (32). Our findings revealed that the level of testosterone, dehydroepiandrosterone (DHEA), and prolactin differed significantly in patients with PSD. Similar findings affirmed the role of sex hormones and stated that progesterone levels were considerably higher in patients with excessive hair growth. Furthermore, steroid hormones revealed a mild effect on hypertrichosis, indirectly associated with PSD hair growth (33-35).

Serour et al. added that the reason for the higher frequency of PSD in young adults could be due to the effect of more active sex hormones on pilosebaceous glands during puberty (21). Androgens stimulate these glands, and once the circulating hormone level grows, it induces the secretion of pilosebaceous glands, leading to excessive sweating in the buttock area (36). In a study by Lunniss et al., PSD was more common in female patients who had high estrogen and low progesterone levels (37). The effect of androgenic hormones was also assessed in hidradenitis suppurativa, depicting that endocrinal abnormalities could be a significant reason for the disease (8).

Different methods were used to avoid possible biases in BMI measurement, investigation of the participants' medical history and physical symptoms, and, most importantly, examination of the sex hormone levels. For example, two of the authors reviewed medical records and physical symptoms independently. The BMI was checked with a special device. On the other hand, the sex hormone levels were compared with the latest version of the available references.

Conclusion

Raised serum prolactin, LH, and testosterone levels in women might contribute to the development of PSD by triggering excessive hair growth/hirsutism.

Author' Contribution

FN Conception and design of study. ZP Acquisition of data and Approval of the version of the manuscript to be published. *LR* Analysis and/or interpretation of data and Drafting the manuscript. *MM and* KM Revising the manuscript critically for important intellectual content.

Acknowledgments: Not applicable.

Funding: Not applicable.

Availability of Data and Materials: Not applicable

Ethics Approval and Consent to Participate: Not applicable.

Consent for Publication: Not applicable.

Competing Interests: The authors declare that they have no competing interests.

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