Analysis on endocrine and metabolic features of different phenotypes of polycystic ovary syndrome patients

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Abstract: To discuss the manifestations of endocrine and metabolism for polycystic ovary syndrome patients with different phenotype. This study selected 226 cases of Rotterdam Standard diagnosed polycystic ovary syndrome patients in People's Hospital of Zhengzhou from October 2013 to February 2015. The control group was the 100 cases of non hyperandrogen menstrual women as the control group. Polycystic ovary syndrome included 4 phenotype: /or anovulatio (O) combined with hyperandrogenism (H) and polycystic ovary morphology (P), phenotype of O and P, phenotype of H and P, and phenotype of O and P. All patients were detected for the clinical endocrine and metabolism related parameters. The phenotype of O and P occupied 55.8%, it had significant difference on the comparison between control group and the luteinizing hormone (LH) and luteinizing hormone/follicle stimulating hormone (LH/FSH) of phenotype of O, H and P, phenotype of O and H and phenotype of O and P; the testosterone (T) of phenotype of O,H and P and phenotype of O and H was apparently higher than phenotype of O and P and control group; The total cholesterol (TC) and triglyceride (TG) in phenotype of O, H and P was greatly higher than phenotype of O and P and control group. The phenotype of O and P was the most common phenotype in PCOS patients. It was same for the clinical endocrine and metabolism of two classic characteristics in PCOS. Compared to other PCOS phenotype, the metabolism in phenotype of O and P was lower. The phenotype classification of PCOS patients could better guide clinical individualized treatment in patients with PCOS.

Keywords: Polycystic ovary syndrome, phenotype, endocrine, metabolism, crinosity.

INTRODUCTION

PCOS is a common endocrine disorder, affecting about 5%~10% of women of reproductive age, which is an important cause of female infertility (Ehrmamm, 2005). Its clinical manifestations of PCOS may include amenorrhea/oligohypomenorrhea, hyperandrogenism, obesity and insulin resistance. According to the standard diagnosis issued in Rotterdam conference (The Rotterdam ESHRE/ASRM-Sponsored PCOS consensus workshop group, 2004), PCOS was divided into 4 phenotype, like phenotype of anovulation, hyperandrogenism and polycystic ovary morphology, phenotype of anovulation and hyperandrogenism and phenotype of hyperandrogenism, polycystic ovary morphology and anovulation. Different phenotype had different manifestations on reproductive endocrine and metabolism injury. This study explored the difference of endocrine hormone and metabolic features between different phenotype PCOS patients.

MATERIALS AND METHODS

Study Objective

This study selected 226 cases of PCOS patients in People's Hospital of Zhengzhou from October 2013 to February 2015. According to PCOS diagnosis standard of Rotterdam in 2003 (The Rotterdam ESHRE/ASRM-Sponsored PCOS consensus workshop group,2004): ① oligo-and/or anovulatio (O); ② clinical/biochemical hyperandrogenism (H), clinical hyperandrogenism was the defined F-G evaluation ≥6 score, accompanied with baldhead and acne. Biochemical hyperandrogenism was total testosterone more than 2.81mmol/L; ③ polycystic ovary morphology (P), namely the quantity of one side ovarian follicles diameter with 2-9mm was at or more than 12 pcs or ovarian volume more than 10ml. As long as meet the above 2 conditions of above items, it was diagnosed to be PCOS. At thesame time, it shall excludehyperprolactinemia, atypical congenital adrenal hyperplasia, thyroid disease, cushing syndrome, androgen secretion tumor and other related disease which could cause endocrine disorders. 226 cases of PCOS patients were divided into 4 different phenotype: ① 56 cases of phenotype of O, H and P; ②17 cases of phenotype of O and H; ③ 27 cases of H and P; ④ 126 cases of phenotype of O and P. Control group was the 100cases of menstrual women of reproductive age women, without manifestation of clinical or biochemical hyperandrogenism and polycystic ovary. Objectives had took the medicine affecting glucolipid metabolism in nearly 3 months. The comparison difference of age and general condition between PCOS groups and control group (>0.05), with comparability.

Hormonal and biochemical detection

Fasting venous blood was taken in the 2nd to 4th day of menstruation or amenia. Chemiluminescence immunoassay was employed to detect luteinizing

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hormone (LH), follicle stimulating hormone (FSH), testosterone (T); the automatic biochemical analyzer from Olympus Corporation of Japan was adopted to check triglyceride (TG), total cholesterol (TC), high density lipoprotein (HDL) and low density lipoprotein (LDL).

STATISTICAL ANALYSIS

SPSS17.0 statistical software was used for data statistics. Measurement data was represented by. Comparison between groups adopted test and variance analysis. All comparison index was detected by homogeneity of variance. According to comparison index homogeneity of variance, SLD (check the name of test applied) statistics was utilized, <0.05 represented the difference with statistical significance.

RESULTS

Endocrine hormone comparison of PCOS different phenotype and control group

In all PCOS groups, the group of O and P phenotype was 126 cases, accounting for 55.8%, group of O and H and P phenotype was 56 cases, accounting for 24.8%, group of H and P phenotype was 27 cases, accounting for 11.9% and group of O and H phenotype was 17 cases, accounting for 7.5%. In PCOS groups, the BMI in group of O and H and P phenotype, group of O and H phenotype and Group of O and P phenotype were significantly higher than that in control group (=2.07, 2.21, 2.35,<0.05), among which group of O and H and P phenotype was significant higher than group of O and P phenotype (=2.31,<0.05). It has statistical significance on the comparison difference between the LH in group of O, H and P phenotype, group of O and H phenotype and group of O and P phenotype and control group (<0.05). It had statistical significance for the comparison difference between the LH/FSH in group of O, H and P phenotype, group of O and H phenotype and group of O and P phenotype and control group (=2.09, 2.16, 2.41, <0.05), among which the LH/FSH in group of O, H and P phenotype was significantly higher than group of O and P phenotype (=2.21,<0.05). The testosterone level in group of O, H and P phenotype and group of O and H phenotype were significantly higher than that in control group (=2.19、2.36, <0.05) and group of O and P phenotype (=2.17、2.25,<0.05), as seen in table 1.

Metabolic index comparison of different phenotype PCOS patients and control group

The data in table 2put that the fasting blood glucose level has no statistical significance between the 4 phenotype of PCOS groups and control group. The TC, TG and LDL in group of O, H and P phenotype, group of O and H phenotype were higher than that in control group and group of O and P phenotype, among which the TC in group of O, H and P phenotype was obviously higher than that in control group (=2.25, <0.05) and group of O and P phenotype (=2.32, <0.05). The TG in group of O, H and P phenotype was apparently higher than that in control group (=2.43, <0.05) and group of O and P phenotype (=2.42, <0.05). It had statistical significance for the LDL in group of O, H and P phenotype and group of O and H phenotype and group of H and P phenotype and control group (=2.19, 2.36, 2.51, <0.05).

DISCUSSION

According to Rotterdam criteria, PCOS could be divided into 4 different phenotype, and the incidence was different too. In this study, the group of O and P phenotype occupied 55.8%, which was the largest percentage. The study results was similar with China's large samples from Zhang (Zhang *et al*., 2009). While, in the study of Italian population from Guastella *et al* (Guastella *et al.*, 2010), the group of O, H and P occupied 53.9%. The difference might related to race. The reproductive endocrine and blood lipids in group of O, H and P phenotype and group of O and H phenotype were significantly higher than that in control group, and there was no significant difference between group of O, H and P phenotype and group of O and H phenotype. The 2 phenotype was most classical PCOS which was diagnosed by Rotterdam criteria and NIH standard (Zawadzki and Dunaif, 1992). LH and LH/FSH value in group of O and P phenotype was higher than that of group of H and P phenotype and control group, and LH/FSH was significantly than control group. This phenotype was a new phenotype from Rotterdam diagnosis standard, which was still a controversial phenotype, as the hyperandrogenism was still the typical feature of PCOS. And this phenotype was not hyperandrogenism. In this study, the reproductive endocrine and blood lipid was not serious. It required further large sample research to confirm its reproductive metabolic features.

The TC, TG and LDL level in group of O, H and P phenotype were higher than that in group of H and P phenotype and group of O and P phenotype, namely the blood lipid level of PCOS patients with hyperandrogenism and anovulation phenotype was higher than that in patients with hyperandrogenism and vulation and patients of non hyperandrogenism and anovulation, which was similar to the research results of Gooren (Gooren, 2015). The dyslipidemia of patients with hyperandrogenism and anovulation might associate to the obesity incidence rate of the same group. In abdominal obesity, the anti-lipolysis effect of visceral fat on insulin was slow. The free fatty acid created by decomposed fat increase enter liver via the portal vein system and caused the increase of TG, TC and LDL synthesis.

CONCLUSION

PCOS was the most common female endocrine abnormalities and metabolic abnormalities caused

Table 1: endocrine index comparison of different phenotype PCOS patients and control group

Group	n	Age (years)	BMI (kg/m^2)	LH (U/L)	LH/FSH	T(nmol/L)
Control group	100	25±4	21.0±2.1	6.4±2.0	1.0±0.2	1.0±0.3
Group of O, H and P phenotype	56	24±5	25.0±3.2^{ab}	10.0±2.1^{a}	1.9±0.5^{ab}	6.5±1.0^{ab}
Group of O and H phenotype	17	24±5	24.0±3.1^{a}	9.9±2.8^{a}	1.5±0.3^{a}	2.2±0.5^{ab}
Group of H and P phenotype	27	25±5	24.0±3.3	7.5±2.2	1.1±0.3	1.8±0.4
Group of O and P phenotype	126	25±5	23.0±3.2^{a}	8.6±2.1	1.5±0.4^{a}	1.5±0.3
Value		2.0	17.6	11.0	16.0	4.8

Note: ^{a}for difference with statistical significance, compared to control group; ^{b}for difference with statistical significance, compared to group of O and P phenotype.

Table 2: Metabolic index comparison of different phenotype PCOS patients and control group

Group	n	FBG	TC	TG	HDL	LDL
Control group	100	5.0±0.6	4.3±0.7	0.9±0.2	1.3±0.2	2.4±0.5
Group of O, H and P phenotype	56	5.0±0.9	5.3±0.8^{ab}	1.6±0.3^{ab}	1.3±0.2	3.2±0.8^{a}
Group of O and H phenotype	17	5.4±1.4	4.9±0.9	1.4±0.2	1.2±0.3	2.9±0.6
Group of H and P phenotype	27	4.9±0.5	4.7±0.5	1.2±0.3	1.2±0.2	2.8±0.7^{a}
Group of O and P phenotype	126	4.8±0.5	4.7±0.5	1.1±0.2	1.2±0.2	2.8±0.4
Value		3.3	11.2	7.6	3.0	

Note: ^{a}for difference with statistical significance, compared to control group; ^{b}for difference with statistical significance, compared to group of O and P phenotype.

ovulation function disorder. The clinical manifestation was diversity and heterogeneity (Yang *et al.*, 2011). The common manifestation were clinical symptom of hyperandrogenism, high insulin hematic disease, change in IR and polycystic ovary and continuous anovulation or oligohypomenorrhea, infertility, etc. (Liu *et al.*, 2011). The risk greatly increased for PCOS patients to develop diabetes, hypertension, dyslipidemia, metabolic syndrome and cardiovascular disease. The clinical manifestation was different based on different regions, different nationalities and different ages. In the past, PCOS diagnosis only included classic phenotype, namely anovulation and hyperandrogenism (Zawadzki and Dunaif, 1992). Rotterdam criteria expanded the PCOS diagnosis, which included 4 totally different phenotype PCOS patients. If PCOS phenotype was different, the clinical endocrine features and insulin resistance could be different, along with metabolic syndrome and risk of cardiovascular disease (Yan *et al.*, 2011; Zhang *et al.*, 2014; Wang *et al.*, 2014; Tao *et al.*, 2013; Xu *et al.*, 2013; Huang *et al.*, 2015). In the 4 phenotype, the clinical endocrine features of phenotype of O, H and P was most common, the PCOS reproductive endocrine and metabolic profiling in phenotype of O and P were less. Therefore, in clinical work, it not only need to solve the problem of reproduction problem of PCOS patents, but also shall draw attention on endocrine metabolic features. Based on different clinical phenotype (Cui and Chen, 2014), it shallto pay different attention on treatment, and regularly follow up, in order to reduce the long-term complications of the harm on their health.

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