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❖ 临床研究 ❖

# 多囊卵巢综合征患者血清和肽素与胰岛素抵抗的相关性分析

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**【摘要】目的:** 分析多囊卵巢综合征(PCOS)患者血清和肽素与胰岛素抵抗(IR)的关系。**方法:** 100例PCOS作为病例组, 选取80名同期体检的育龄期女性作为对照组, 均于卵泡早期采集空腹静脉血, 检测空腹胰岛素(FINS)、空腹血糖(FPG)和肽素及性激素[促卵泡刺激素(FSH)、睾酮(T)、黄体生成素(LH)]水平, 计算胰岛素抵抗指数(HOMA-IR); 并常规体格检查, 测定身高、体重、腰围、臀围, 计算身体质量指数(BMI)及腰臀比(WHR)。按IR情况分为IR组(HOMA-IR $\geq$ 2.69)与非IR组(HOMA-IR $<$ 2.69), 分析PCOS血清各参数与HOMA-IR的关系。**结果:** 病例组WHR、BMI、T、LH、FPG、FINS、HOMA-IR、和肽素均高于对照组( $P < 0.05$ ); PCOS中的IR组WHR、T、LH、FPG、FINS及和肽素水平均高于非IR组( $P < 0.05$ ); PCOS患者WHR、BMI、FPG、FINS、HOMA-IR与血和肽素水平呈正相关( $P < 0.05$ ); 多因素Logistic回归分析结果显示, 高和肽素、BMI和WHR是PCOS患者发生HOMA-IR的影响因素( $P < 0.05$ )。**结论:** PCOS患者血清和肽素呈高水平, 合并IR的PCOS患者和肽素异常表达更明显; 和肽素可能为参与PCOS人群发生IR的关键因子。

**【关键词】** 多囊卵巢综合征; 和肽素; 性激素; 胰岛素抵抗; 肥胖

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## Correlation between serum, copeptin levels and insulin resistance in PCOS patients

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**【Abstract】Objective:** To analyze relationship between serum, copeptin levels and insulin resistance (IR) in patients with polycystic ovary syndrome (PCOS). **Methods:** 100 patients with PCOS were enrolled as case group. 80 women during childbearing age who underwent physical examination in the same period were enrolled as control group. Fasting venous blood was collected in early follicles. The levels of fasting insulin (FINS), fasting blood glucose (FPG), copeptin and sex hormones [follicle stimulating hormone (FSH), testosterone (T), luteinizing hormone (LH)] were detected. The homeostasis model assessment-insulin resistance index (HOMA-IR) was calculated. Routine physical examination was conducted to determine height, weight, waist circumference and hip circumference. Body mass index (BMI) and waist-hip ratio (WHR) were calculated. According to different IR, they were divided into IR group (HOMA-IR not less than 2.69) and non-IR group (HOMA-IR less than 2.69). The relationship between PCOS serum parameters and HOMA-IR was analyzed. **Results:** WHR, BMI, T, LH, FPG, FINS, HOMA-IR and copeptin in case group were higher than those in control group ( $P < 0.05$ ). The levels of WHR, T, LH, FPG, FINS and copeptin in IR group were higher than those in non-IR group ( $P < 0.05$ ). WHR, BMI, FPG, FINS and HOMA-IR were positively correlated with levels of serum and copeptin ( $P < 0.05$ ). Multivariate Logistic regression analysis showed that high copeptin, obesity and WHR were the influencing factor of HOMA-IR in PCOS patients ( $P < 0.05$ ). **Conclusion:** The levels of serum and copeptin are abnormally high in PCOS patients. The abnormal expression of copeptin is more significant in PCOS patients with HOMA-IR. Copeptin may be a key factor involved in occurrence of PCOS IR.

**【Key words】** Polycystic ovary syndrome; Copeptin; Sex hormone; Insulin resistance; Obesity

多囊卵巢综合征(polycystic ovarian syndrome, PCOS)系多因性内分泌疾病, 以高雄激素血症、卵巢多囊样改变、持续稀发排卵或无排卵及闭经为特点,

易并发高血压、代谢综合征、动脉粥样硬化及糖尿病等, 严重影响预后<sup>[1]</sup>。最新统计数据<sup>[2]</sup>表明, PCOS罹患糖尿病风险较正常人高约2.5倍。但目前P-



## 2.2 IR组与非IR组患者WHR、T、LH、FPG、FINS及和肽素水平比较

PCOS患者均按是否出现IR分为IR组( $n=83$ )与非IR组( $n=17$ ),IR组WHR、T、LH、FPG、FINS及和肽素水平均高于非IR组( $P <$

0.05)。见表2。

## 2.3 PCOS患者和肽素水平与各参数相关性分析

PCOS患者WHR、BMI、FPG、FINS、HOMA-IR与血和肽素水平呈正相关( $P < 0.05$ )。见表3。

表2 IR与非IR患者WHR、T、LH、FPG、FINS及和肽素水平比较( $\bar{x} \pm s$ )

组别	WHR	FSH(mIU/mL)	T(nmol/L)	LH(mIU/mL)	FPG(mmol/L)	FINS(IU/L)	和肽素(pmol/L)
IR组( $n=83$ )	0.97 ± 0.25	6.75 ± 1.53	2.01 ± 0.51	13.78 ± 4.41	5.97 ± 0.49	16.23 ± 2.74	13.74 ± 4.52
非IR组( $n=17$ )	0.82 ± 0.17	6.69 ± 1.73	1.45 ± 0.42	8.23 ± 2.17	5.06 ± 0.41	11.35 ± 2.36	8.78 ± 1.23
$t$ 值	2.359	0.144	4.237	5.050	7.153	6.836	4.474
$P$ 值	0.020	0.886	<0.001	<0.001	<0.001	<0.001	<0.001

表3 PCOS患者和肽素水平与各参数相关性分析

指标	和肽素	
	$r$ 值	$P$ 值
WHR	0.407	0.001
BMI	0.582	<0.001
FSH	0.083	0.528
T	0.028	0.829
LH	-0.119	0.364
FPG	0.630	<0.001
FINS	0.692	<0.001
HOMA-IR	0.706	<0.001

## 2.4 PCOS患者IR的多因素Logistic回归分析

以PCOS患者是否出现IR作为因变量,纳入BMI、T、LH、FPG、FINS、和肽素等作为自变量进行多因素Logistic回归分析,结果显示高和肽素水平、BMI、WHR是PCOS患者出现IR的危险因素( $P < 0.05$ )。见表4。

表4 PCOS患者出现IR的多因素Logistic回归分析

指标	$B$ 值	$P$ 值	$OR$ 值	95% CI
WHR	1.560	0.009	4.758	1.475 ~ 15.350
BMI	1.813	0.001	6.128	2.168 ~ 17.321
T	1.213	0.102	3.362	0.787 ~ 14.370
LH	0.824	0.081	2.279	0.905 ~ 5.741
FPG	2.008	0.190	7.450	0.369 ~ 15.589
FINS	1.257	0.435	3.516	0.150 ~ 8.252
和肽素	2.726	0.001	12.847	4.508 ~ 44.461

## 3 讨论

伴随着人们生活方式及饮食习惯的改变,肥胖、超重的女性逐渐增加,PCOS患者的发病率也呈现升高的趋势。目前关于PCOS的病因及具体发病机制尚不明确,但肥胖、IR和高雄激素血症在PCOS中互为因果,互相作用形成恶性循环。其中,IR及高胰岛素血症被认为是PCOS患者发生生殖功能障碍和代谢异常的关键因素,约50%~70%的PCOS患者合并IR<sup>[12]</sup>。

Qi等<sup>[13]</sup>表示,AVP可通过多途径、多机制刺激胰高血糖素分泌,影响糖原分解。AVP系由下丘脑

释放的生物活性肽,属体内关键应激激素,具备维持血流动力学稳定、调节中枢神经系统、调控渗透压等生物学功能<sup>[14]</sup>;但AVP以脉冲方式释放进入血液,体内稳定性差,半衰期短,检测较困难<sup>[15]</sup>。和肽素系前精氨酸加压素原C末端成分,由下丘脑神经垂体分泌,在体内与AVP等摩尔量释放,在AVP细胞内转运、成熟方面有关键作用,且稳定性好,故可通过检测和肽素反映AVP的表达<sup>[16]</sup>。应激刺激下和肽素释放增多<sup>[17-18]</sup>。马艳等<sup>[19]</sup>发现,急性心力衰竭、心血管疾病患者血清和肽素过表达。近年来,和肽素与代谢综合征、糖尿病之间的关系日益引起研究者关注。应激介导的下丘脑-垂体-肾上腺轴激活在IR发生中有重要作用<sup>[20]</sup>。但对和肽素与PCOS胰岛素抵抗的关系鲜少有报道。

本研究对PCOS患者及正常育龄期女性血清和肽素及代谢相关指标进行检测发现,PCOS患者血清和肽素和BMI较正常对照组高,且PCOS中的胰岛素抵抗组较非胰岛素抵抗组有更高的和肽素水平,推测和肽素可能参与PCOS发病及进展过程,且合并胰岛素抵抗、肥胖群体的血清和肽素分泌异常状态更显著<sup>[21]</sup>。肥胖PCOS患者血清和肽素表达过高的原因可能与患者BMI、WHR过高,腰部及内脏脂肪含量高,肠胃运动少,调节激素分泌功能减弱有关,干扰甾体类激素代谢,影响卵巢及肾上腺轴功能,更易出现内环境紊乱,而肾上腺皮质激素进一步刺激机体释放和肽素,导致其浓度上调<sup>[22]</sup>;且肥胖PCOS患者肌肉及脂肪组织摄取葡萄糖功能降低,外周组织对胰岛素敏感性降低,导致胰岛素抵抗,故罹患糖尿病的风险更高,因此推测肥胖放大了PCOS胰岛素抵抗,影响外周组织对胰岛素的敏感性,降低胰岛素与受体结合能力,导致胰岛 $\beta$ 细胞亢进,增加IR程度<sup>[23]</sup>。本研究进一步检测性激素及血糖、胰岛素水平发现,PCOS患者FPG、LH、T、FINS及HOMA-IR较正常育龄期女性高,且伴IR的PCOS患者FPG、FINS、WHR、T、LH均较非IR患者

高,推测和肽素水平改变可能与 PCOS 血糖异常改变及胰岛素抵抗的发生存在紧密联系。

本研究还发现, WHR、BMI、WHR、FPG、FINS、HOMA-IR 均与和肽素水平呈正相关,同时 Logistic 回归分析结果显示高和肽素水平、肥胖、WHR 是 PCOS 患者出现 IR 的危险因素,提示和肽素可能通过影响血糖、脂肪及胰岛素分泌等途径诱发胰岛素抵抗,增加 PCOS 出现胰岛素抵抗、肥胖等代谢综合征的发生风险。

综上所述,PCOS 患者多伴胰岛素抵抗、肥胖等现象,其血和肽素水平较正常育龄期女性高,且和肽素水平与 PCOS 患者 BMI、WHR、FPG、FINS、HOMA-IR 呈正相关,其与 PCOS 胰岛素抵抗发生存在紧密联系,或可能成为预测 PCOS 代谢性疾病发生的重要依据。

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