

## Increased Serum Level of Inhibin in Oligo-amenorrheic Women with Polycystic Ovaries

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## =Abstract=

Normal and abnormal follicular growth and steroidogenesis depend on gonadotropins as well as intraovarian peptides, which may mediate or potentiate gonadotropin action. Inhibin also affect follicular development and steroidogenesis and may play a role in dominant follicle selection and follicular atresia. Therefore, we studied the differences of serum inhibin, gonadotropin and androgen levels in the women with only the ultrasound findings and no disorder, and polycystic ovary (PCO) with ovulatory disturbance.

We prospectively analysed forty-three women with PCO. The diagnosis of PCO was based on typical appearance of the ovaries on TVS. Twelve women with regular menstrual cycle and normal ovarian morphology were selected as control. Basal levels of inhibin, luteinizing hormone(LH), follicle stimulating hormone(FSH), estradiol(E<sub>2</sub>), testosterone(T), androstenedione(ADD), dehydroepiandrosterone- sulfate(DS), prolactin and TSH in serum were determined.

There were significant differences in basal LH levels and LH/FSH ratio between the control and the women with PCO. The basal levels of inhibin and E<sub>2</sub> in the oligo-amenorrheic PCO (N=34) were significantly higher than those in the control. There was higher negative correlation between the inhibin and T levels in the oligo-amenorrheic PCO, but, not in the regular cycling PCO. Also, there was higher positive correlation between the LH and T levels in the oligo-amenorrheic PCO, but not in the regular

cycling PCO.

These data presume that the initial event of PCO is elevated pituitary LH secretion. Elevated levels of LH may down-regulate LH receptors on granulosa cells and also cause hypertrophy of the thecal layer. High levels of androgen secreted by the hypertrophied thecal layer may stimulate inhibin secretion from granulosa cells and can be converted to estrogen by extraovarian tissues and could serve to augment pituitary sensitivity to GnRH with a resultant secretion of more LH than FSH. Inhibin may inhibit FSH action on granulosa cell in the PCO follicle, impairing follicular development and dominant follicle selection resulted in ovulatory disturbance.

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Key words : Polycystic ovary, oligo-amenorrhea, inhibin

inhibin , luteinizing hormone ( , LH)  
 가  
 (Yen, 1996). , - follicle stimulating  
 hormone ( , FSH) . Tanabe  
 (1990) (polycystic ovarian syndrome) 가  
 inhibin FSH가  
 LH FSH . 가  
 LH LH/FSH 가 (Yen, 1991; Franks, 1995; Soulez et al., 1996),  
 inhibin .  
 ,  
 (Polson et al., 1988; Abdel et al., 1992; Clayton et al., 1992),  
 . Carmina (1997) 가  
 ,  
 ,  
 가  
 , polycystic  
 ovaries ( , PCO) 가 가 .  
 PCO inhibin LH, FSH androgen(ADD, T, DS)  
 PCO  
 , 가 PCO , PCO  
 가 .

1)

1996 3 1997 8 가 ( , , )  
 가 8mm 가 10  
 PCO 가 ( , )  
 43 가 가 12

2)

25 35 ( 3 ) ,  
 , 가 -20 °C . LH,  
 FSH, estradiol( , E<sub>2</sub>), prolactin, TSH, T, ADD, DS inhibin  
 , duplicate

LH, FSH, TSH prolactin commercial kits(Diagnostic Products Corporation, Los Angeles, CA)  
 immunoradiometric assay . sensitivity intra-assay coefficients of  
 variation ( CV) inter-assay CV LH가 0.15 IU/L, 1.2 % 3.3 % FSH 0.06 IU/L, 2.2 % ,  
 4.6%, TSH 0.03 uIU/mL, 3.0%, 6.0%, prolactin 0.05 ng/mL, 4.3 % , 6.5 % .

T E<sub>2</sub> commercial kits(Diagnostic Products Corporation, Los Angeles, CA)  
 radioimmunoassay sensitivity, intra-assay CV inter-assay CV T , 0.04  
 ng/mL, 6.4 % 10 % E<sub>2</sub> 8 pg/mL, 5.8 % , 7.4 % .

ADD, DS inhibin commercial kits(ADD; Diagnostic Systems Laboratories, Inc. Webster, Texas  
 / DS; ICN Biomedicals, Inc. Costa Mesa, CA / inhibin; Peninsula Laboratories, Inc. Belmont, CA)  
 radioimmunoassay sensitivity, intra-assay CV inter-assay CV ADD가 0.03 ng/mL,

4.3 % 7.6 % , DS 3.8 ng/mL, 9.0 % 9.5 % .

3)

PCO 가

SPSS package , spearman correlation ,

Unpaired student's t-test Wilcoxon rank sum test  $P < 0.05$

55 PCO 43 12 .

22 38 29.2 PCO 27.7 ( : 18 37 )

가 , 가 . body mass index ((kg/meter<sup>2</sup>), BMI)

18 23 PCO 17 33 25 4

. PCO 43 가 25 35 9 (21 %)

가 34 PCO 79 % 가 34

( 35 90 ) 26 6 8 .

가 PCO 28 , PCO 27.7 가

, BMI (Table 1).

Table 1. Clinical Profile of the Study groups (N= 55)

	PCO			<i>p</i> - value *
	Control (N= 12)	Eumenorrheic (N= 9)	Oligo- amenorrheic (N= 34)	
Age (yrs)	29.2 ± 2.0	28.0 ± 1.8	27.7 ± 0.8	NS
Menarche (yrs)	14.2 ± 0.3	15.0 ± 0.7	14.7 ± 0.2	NS
BMI	19.8 ± 0.4	20.2 ± 0.8	21.2 ± 0.6	NS
Parity	0.75 ± 0.2	0.3 ± 0.2	0.5 ± 0.1	NS
Infertility (No.)	0	4	6	NS**

Mean ± SE

NS, no significance

\*, Wilcoxon-rank sum test

\*\* , Chi-square test

가 PCO 가 PCO 가  
 가  
 가 PCO FSH, T ADD 가 , LH PCO 4.5  
 $\pm 0.9$  IU/L (2.2  $\pm$  0.5 IU/L) 가 (p= 0.02), inhibin  
 PCO 3.3  $\pm$  0.6 pg/tube (2.1  $\pm$  0.3 pg/tube) 가  
 가 PCO LH inhibin 가 가  
 (p=0.001, 0.005) FSH, T ADD 가 . , 가  
 PCO 가 PCO FSH, T, ADD inhibin 가  
 , LH가 11.1  $\pm$  1.5 IU/L 가 (p = 0.006)(Figure 1, 2, 3).

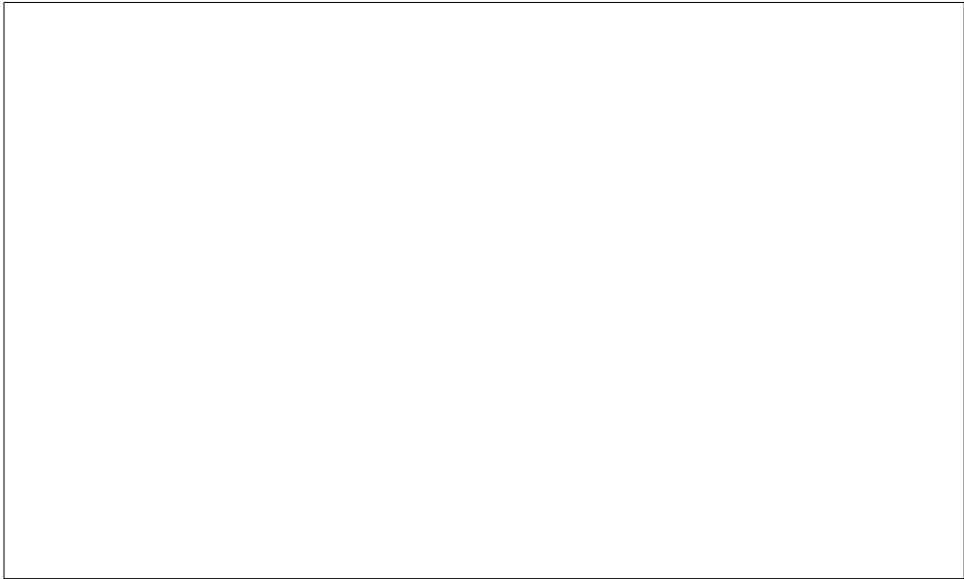


Figure 1. Comparison of the serum levels of gonadotropin in the three groups (N= 55). Control (group I), eumenorrheic PCO (group II), oligoamenorrheic PCO (group III)

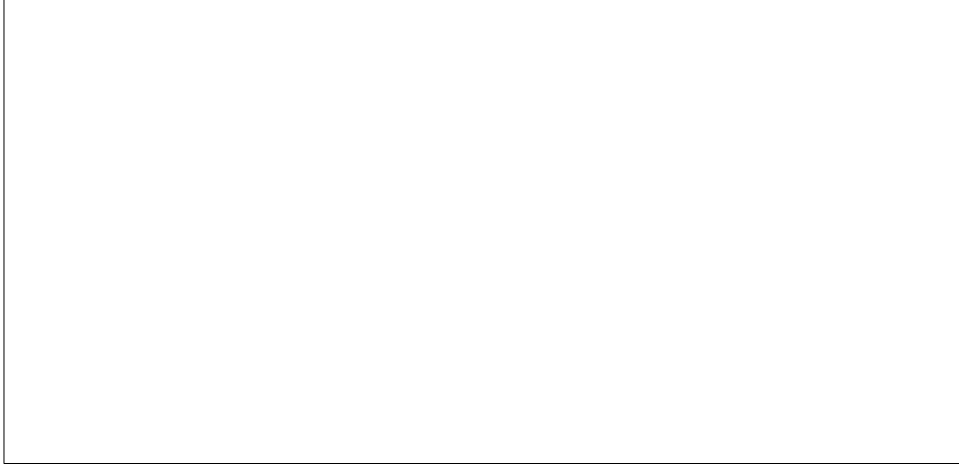


Figure 2. Comparison of the serum levels of androgen(T, ADD, DS) in the three groups (N= 55).



Figure 3. Comparison of the serum levels of inhibin & E<sub>2</sub> in the three groups (N= 55).



가 PCO 가 PCO inhibin  
T (Spearman  
correlation coefficient). , inhibin FSH LH  
, inhibin T , 가 PCO  
, 가 PCO negative correlation (Figure 4).

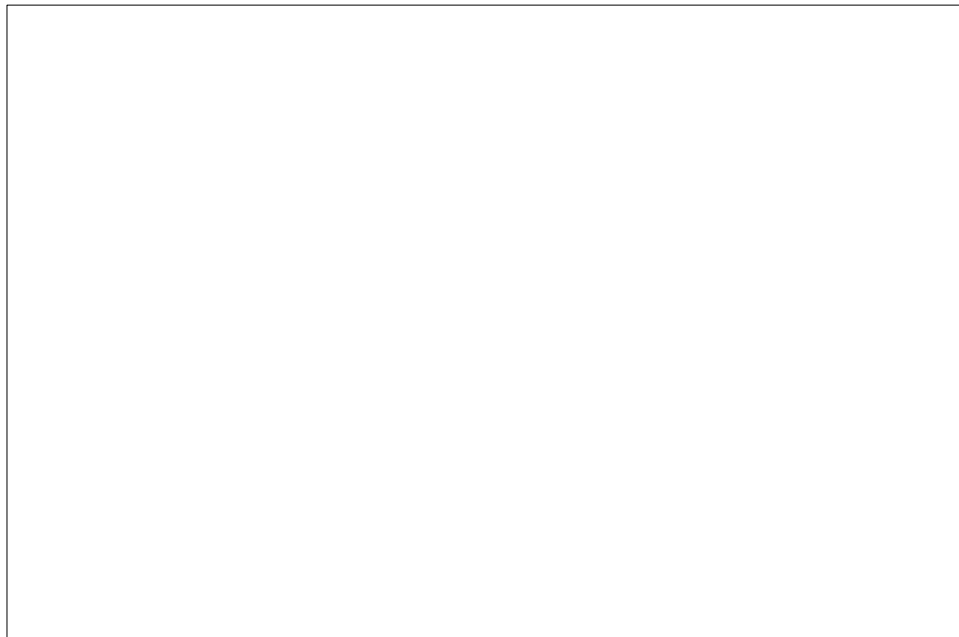


Figure 4. Correlation of serum inhibin and testosterone concentrations in oligo-amenorrheic(N= 34) (A) and eumenorrheic(N= 9) (B) PCO.

가 PCO 가 PCO LH T

(Spearman correlation coefficient).

가 PCO , 가 PCO LH

T positive correlation (Figure 5).

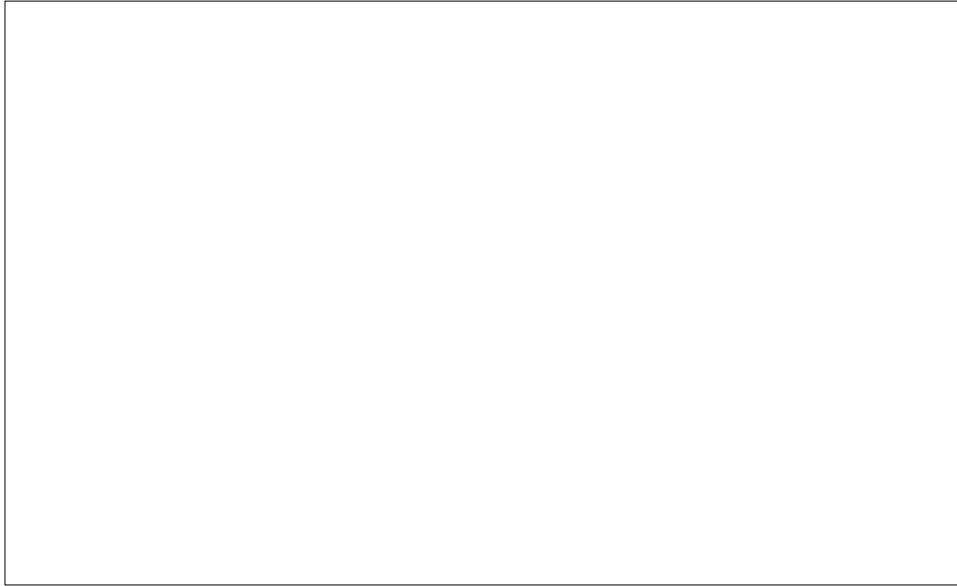


Figure 5. Correlation of serum LH and testosterone concentrations in oligo- amenorrheic(N=34) (A) and eumenorrheic(N= 9) (B) PCO.

PCO 가 , PCO

가 PCO

PCO 43 9 (20.3%)가 PCO 7 - 28%

(Goldzieher & Axelrod, 1963), 16-25% PCO

(Polson et al., 1988; Clayton et al., 1992). , PCO

가 ( , 1997),

(Ficicioglu et al., 1996). , 가 , PCO

가 . PCO ,

가

PCO

PCO .

PCO 가 inhibin FSH

가 (Tanabe et al., 1990; Mizunuma et al., 1994; Pigny et al., 1997),

inhibin , PCO inhibin 가

(Falcone et al., 1991; Yamoto et al., 1993). PCO ,

inhibin inhibin dimer , inhibin  $\alpha$ -subunit Pro  $\alpha$ -C

가

, inhibin  $\alpha$ -subunit가 FSH (Robertson et

al., 1995), Lambert-Messerilan (1994) 가 가 inhibin dimer .

, inhibin 가 PCO 가 ,

가 PCO . PCO inhibin 가

가 (Erickson et al., 1992; Pigny et al., 1997) , 가 PCO 가 inhibin 가 (Richards, 1994) . , 가 PCO 가 PCO LH LH/FSH 가 가 , LH , inhibin 가 가 inhibin (Yamamoto et al., 1993), PCO inhibin , (Guidice et al., 1993; Yamamoto et al., 1993), Roberts (1994) inhibin PCO . , 가 PCO 가 PCO 가 가 , 가 LH 가 LH FSH IGF-I inhibin 가 (Findlay, 1993), inhibin 가가 LH , inhibin LH inhibin LH 가 (Hillier, 1991). , PCO 가 LH inhibin 가 가 inhibin LH 가 , LH 가 가 PCO T, ADD DS 가 PCO 가 . Carmina (1997) 가 PCO 가 , 가 PCO 가 PCO 가 , Ficicioglu (1996) 44 PCO T, DS, ADD

가 가 . 가

가 가 . 43 4

( , ) 가 , Carmina (1997) 15 PCO 4

, Ficicioglu (1996) 44 8 8

Pigny (1997) 72 PCO ADD 가 LH inhibin  $\alpha$ -subunit positive correlation

, ADD inhibin LH . ADD LH

inhibin , T 가 PCO LH positive correlation , inhibin negative correlation . Pigny (1997) PCO

LH T positive correlation 가 PCO 가 LH가

T 가 , 가 PCO

LH , LH

, 가 PCO

가 PCO

가 . inhibin LH 가

(Hillier, 1991) 가 FSH 가 inhibin 가

가 PCO

inhibin T negative correlation 가 LH가 inhibin T

가 가 ,

가 PCO

PCO LH LH/FSH 가 (Yen, 1991; Franks, 1995;

Soulez et al., 1996), PCO LH LH/FSH

가 LH/FSH 가 PCO 가  
 가 PCO 2 가가 . Carmina (1997) PCO  
 15 가 PCO 25 가  
 PCO LH 가가 . GnRH  
 가 LH LH/FSH 가 가 (Yen, 1991), 가  
 가 . , PCO ,  
 PCO 가 FSH E<sub>2</sub>  
 (Hillier et al., 1991), 가 PCO E<sub>2</sub> 가  
 , 가 E<sub>2</sub> LH 가 가 (Lobo et al., 1981)  
 . , 가 PCO E<sub>2</sub> 가 LH  
 LH/FSH 가 가 PCO  
 가가 E<sub>2</sub> 가 , - (Rebar  
 et al., 1976) 가 E<sub>2</sub> .  
 , PCO LH 가(Tanabe et al.,  
 1997) , 가 LH LH (Rajaniemi, 1980)  
 inhibin (Franchimont,  
 1981) inhibin FSH LH/FSH 가  
 . , PCO LH 가 , 가  
 가 E<sub>2</sub> inhibin FSH ,  
 LH, FSH .

1996 3 1997 8 가 ( , , )  
가 8mm 가 10  
( , ) 43  
가 가 12 inhibin LH, FSH  
androgen(ADD, T, DS) , .  
가 PCO (N= 9) FSH, T ADD 가 ,  
LH PCO  $4.5 \pm 0.9$  IU/L ( $2.2 \pm 0.5$  IU/L) 가 ,  
inhibin PCO  $3.3 \pm 0.6$  pg/tube ( $2.1 \pm 0.3$  pg/tube)  
가 . 가 PCO (N= 34) LH inhibin 가  
가 FSH, T ADD 가 . , 가  
PCO 가 PCO FSH, T, ADD inhibin 가  
, LH  $11.1 \pm 1.5$  IU/L 가 (p = 0.016).  
inhibin FSH LH , 가  
PCO inhibin T negative correlation, LH T positive  
correlation .  
, PCO LH 가 ,  
LH 가 , 가 가 E<sub>2</sub> inhibin  
FSH , LH, FSH

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