

# Uncarboxylated osteocalcin is inversely correlated with total testosterone level in elderly man

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## Background:

Osteocalcin is the bone formation marker released by osteoblast. There is evidence on association of osteocalcin and testosterone synthesis. There were conflict studies of relationship with testosterone and uncarboxylated osteocalcin. They were small scale or studies of comorbidity male. This study aimed to investigate association of uncarboxylated osteocalcin and testosterone in male.

## Method:

This study was cross sectional and cohort study including 510 healthy male, aged 40~70 without comorbidity. Total testosterone, sex hormone binding globulin, total osteocalcin, uncarboxylated osteocalcin, BMD, other labs and life style characteristics were measured. Data was grouped by age and testosterone level under 3.5ng/ml or not. Uncarboxylated osteocalcin and testosterone was analyzed by ANCOVA model with adjusted by age, BMD and factors which affect testosterone level.

## Results:

Uncarboxylated osteocalcin in low testosterone with over age 61 was 3.7ng/ml, higher than general age(1.62ng/ml) and age 41~60 group(1.37ng/ml). In t-test, there was difference between uncarboxylated osteocalcin and low testosterone group in whole age(p=0.02), age 41~60(p=0.03), over age 61(p=0.04). In ANCOVA, there was association UCOC with testosterone in whole age (R square =0.17, p=0.03) and age 41~60(R square =0.19, p=0.03), over age 61(R square=0.70, p=0.04)

## Conclusion:

Uncarboxylated osteocalcin which active form of osteocalcin has inverse correlation with testosterone level in elderly Korean male. UCOC is the useful tool in hypogonadism study in male with BMD.

Table 1. Subjects baseline characters

Variable	40~70 age	40~60age	61~70age
	mean ± s.d(people) Percentage(people)	mean ± s.d(people) Percentage(people)	mean ± s.d(people) Percentage(people)
Age(year)	53.79 ± 7.66(510)	50.83 ± 5.46(404)	65.08 ± 2.73(106)
BUN(mg/dl)	11.86 ± 2.97(510)	11.63 ± 2.83(404)	12.75 ± 3.31(106)
Creatine(mg/dl)	1.13 ± 0.15(510)	1.12 ± 0.15(404)	1.13 ± 0.16(106)
Weight(kg)	72.65 ± 9.78(510)	73.01 ± 9.63(404)	71.26 ± 10.24(106)
BMI(kg/m <sup>2</sup> )	24.97 ± 2.85(510)	24.95 ± 2.81(404)	25.02 ± 2.98(106)
UCOC(ng/mL)	1.78 ± 1.54(510)	1.69 ± 1.43(404)	2.13 ± 1.85(106)
logUCOC	0.11 ± 0.35(510)	0.10 ± 0.34(404)	0.18 ± 0.37(106)
osteocalcin(ng/ml)	18.75 ± 6.25(510)	18.81 ± 6.09(404)	18.49 ± 6.86(106)
ALP(U/L)	66.56 ± 16.99(510)	66.04 ± 16.36(404)	68.51 ± 19.14(106)
SHBG(nmol/L)	57.01 ± 28.01(109)	50 ± 28.62(49)	59.55 ± 27.52(80)
T.T ng/ml)	5.14 ± 1.65(510)	5.07 ± 1.65(404)	5.38 ± 1.64(106)
T.cholesterol(mg/dL)	210.47 ± 35.71(510)	212.54 ± 36.31(404)	202.6 ± 32.29(106)
LDL(mg/dL)	131.43 ± 33.08(510)	132.69 ± 33.72(404)	126.63 ± 30.21(106)
TG(mg/dL)	141.14 ± 95.49(510)	143.86 ± 99.98(404)	130.77 ± 75.49(106)
HDL(mg/dL)	50.82 ± 12.58(510)	51.08 ± 12.56(404)	49.82 ± 12.68(106)
GOT(U/L)	31.98 ± 13.45(510)	32.18 ± 14.05(404)	31.24 ± 10.92(106)
GPT(U/L)	32.56 ± 19.58(510)	33.25 ± 20.46(404)	29.91 ± 15.59(106)
rGT(U/L)	51.76 ± 55.15(510)	54.08 ± 59.66(404)	42.94 ± 31.39(106)
Alcohol intake	2.83 ± 2.98	3.02 ± 3.02	2.08 ± 2.71
<170g(14glass)/wk	80.6%(411)	79.2%(320)	85.8%(91)
≥170g(14glass)/wk	19.4%(99)	20.8%(84)	14.2%(15)
smoking status			
yes	34.7%(117)	38.9%(157)	18.9%(20)
no	65.3%(333)	61.1%(247)	81.1%(80)
BMD result			
normal	76.4%(400)	82.7%(334)	62.3%(66)
osteopenia	14.3%(73)	9.9%(40)	31.1%(33)
osteoporosis	7.3%(37)	7.4%(30)	6.6%(7)

Table 2. Correlation coefficient between variables and testosterone after age adjusted

	40~70age		40~60age		61~70 age	
	c.c.	p value	c.c.	P value	c.c.	p value
Weight(kg)	-.348	.000	-.143	.004	-.379	.001
BMI(kg/m <sup>2</sup> )	-.348	.000	-.140	.005	-.416	.000
SHBG(nmol/L)	.591	.000	.404	.037	.657	.000
Alcohol intake	.207	.035	.484	.010	.115	.319
smoking status	.055	.582	-.257	.196	.137	.233
BMD result	-.09	0.03	-.012	0.01	-0.05	0.60

Table 3. Relationship of logUCOC and total testosterone in ANCOVA study

	40~70age		40~60age		61~70age	
	Adjusted R square	P value	Adjusted R square	P value	Adjusted R square	P value
Model 1-1	0.12	0.07	0.10	0.07	0.53	0.06
Model 1-2	0.17	0.03	0.19	0.03	0.70	0.04
Model 2-1	0.04	0.07	0.01	0.03	0.01	0.14
Model 2-2	0.03	0.07	0.04	0.05	0.02	0.14
Model 2-3	0.03	0.04	0.04	0.02	0.03	0.24

(model 1 : ANCOA in log UCOC and total testosterone, model 1-1 : age adjustment, model 1-2 age, :weight, BMI, BMD, alcohol drinking adjustment, Model2. ANCOVA in log UCOC and testosterone <3.5ng/ml or not, model 2-1 : no adjustment, Model 2-2 : age adjustment, model 2-3 :weight, BMI, BMD, alcohol drinking adjustment) ANCOVA : Analysis of Covariance

Fig 1. UCOC according to testosterone level (<3.5mg/ml or ≥3.5ng/ml) T.T: total testosterone

