

폐경전 여성과 폐경후 여성에서 혈전 형성 및 용해인자의 차이

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= Abstract =

The Difference of Thrombogenic and Fibrinolytic Factors in Premenopausal and Menopausal Women

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Background : Thrombotic and fibrinolytic factors which change in women following menopause, may be of pathogenetic importance in atherogenetic and thrombotic cardiovascular diseases by altering fibrinolysis on vascular surfaces. We investigated whether parameters of thrombosis and fibrinolysis were different before and after menopause.

Methods : Thrombotic factors such as plasma plasminogen activator inhibitor type 1 (PAI-1), fibrinogen, α_2 -antiplasmin, lipoprotein(a) were measured. In addition, fibrinolytic factors such as plasma tissue-type plasminogen activator (t-PA), plasminogen, antithrombin-III were also assessed in 41 premenopausal women, 174 menopausal women and 201 men.

Results : PAI-1 and fibrinogen and t-PA were significantly higher in menopausal women than in premenopausal women (13.1 ± 6.6 vs 16.9 ± 9.5 ng/ml, $p=0.046$, 293.6 ± 83.3 vs 347.5 ± 256.9 mg/dl, $p=0.001$, 10.1 ± 4.4 vs 12.5 ± 5.6 ng/ml, $p=0.003$). A positive significant correlation was found between PAI-1 and t-PA levels ($r=0.444$, $p=0.003$), but there were no significant relationship between PAI-1 and any other thrombogenic and fibrinolytic factors.

Conclusion : PAI-1, fibrinogen, t-PA were higher in menopausal women than in premenopausal women. The findings suggest that increase of atherosclerotic and thrombotic cardiovascular diseases after menopause may be influenced by these changes.

KEY WORDS : PAI-1 · Fibrinogen · t-PA · Menopause.

서 론

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t-PA가 (12.1 ± 4.9 vs 13.3 ± 5.6ng/ml, p=0.018),
 α 2-antiplasmin (337.4 ± 235.2 vs 303.2 ± 294.8ng/ml, p=0.011, 98.0 ± 10.1 vs 96.1 ± 13.4ug/ml, p=0.03), PAI-1, plasminogen, AT-III, Lp(a) (Table 1, Fig. 1).

2. 여성에서 폐경에 따른 혈전형성 촉진인자 및 용해인자 변화

PAI-1, 가 (13.1 ± 6.6 vs 16.9 ± 9.5ng/ml p value, 293.6 ± 83.3 vs 347.5 ± 256.9mg/dl p value) t-PA

Table 1. Thrombogenic and fibrinolytic parameter by SEX

	Female (n=215)		Male (n=215)		p-value (n=215)
PAI-1 (ng/ml)	16.2 ± 9.2		16.9 ± 9.9		0.569
t-PA (ng/ml)	12.1 ± 4.9		13.3 ± 5.6		0.018
Fibrinogen (mg/dl)	337.4 ± 235.2		303.2 ± 294.8		0.011
Plasminogen (mg/dl)	11.5 ± 2.3		11.1 ± 2.3		0.079
AT-III (ng/ml)	27.5 ± 5.7		27.3 ± 5.6		0.612
A ₂ AP (ug/ml)	98 ± 10.1		96.1 ± 13.4		0.03
Lp(a) (mg/dl)	24.9 ± 23.4		22.7 ± 21.6		0.570

A₂AP : alpha 2 antiplasmin

가 (10.1 ± 4.4 vs 12.5 ± 5.6ng/ml p value, Table 2, Fig. 2).

3. 같은 연령대 성별에 따른 혈전형성 촉진인자 및 용해인자 변화

49

49

가 (Table 3),

50

t-PA가

(Table 4).

4. PAI-1과 다른 혈전형성 촉진인자 및 용해인자간의 상관관계

PAI-1 t-PA

, α 2-antiplasmin, Lp(a), plasminogen, ant-

Table 2. Differences of thrombogenic and fibrinolytic parameters in premenopausal and menopausal women

	Premenopause (n=41)		Postmenopause (n=174)		p-value
PAI-1	13.1 ± 9.2		16.9 ± 9.5		0.046
t-PA	10.1 ± 4.4		12.5 ± 5.6		0.003
Fibrinogen	293.6 ± 83.3		347.5 ± 256.9		0.001
Plasminogen	11.6 ± 1.8		11.4 ± 2.4		0.704
AT-III	27.2 ± 3.8		27.6 ± 6		0.43
A ₂ AP	97.9 ± 11.1		98.1 ± 9.9		0.372
Lp(a)	19.7 ± 19.4		26.1 ± 24.2		0.227

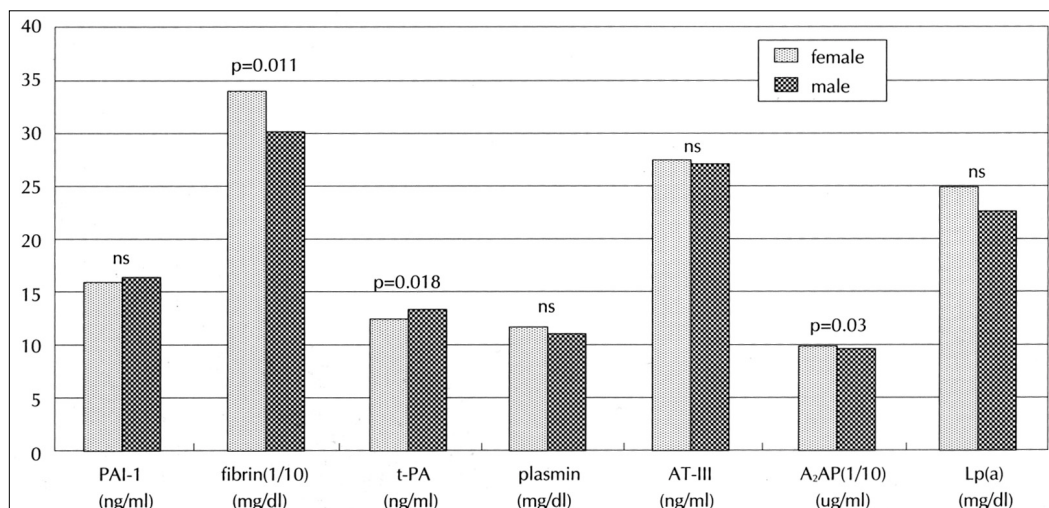


Fig. 1. Differences of thrombogenic and fibrinolytic parameters between female and male. Fibrin : fibrinogen, plasmin : plasminogen, AT-III : antithrombin III, A₂AP : alpha 2 antiplasmin, Lp(a) : lipoprotein(a), ns : not significant

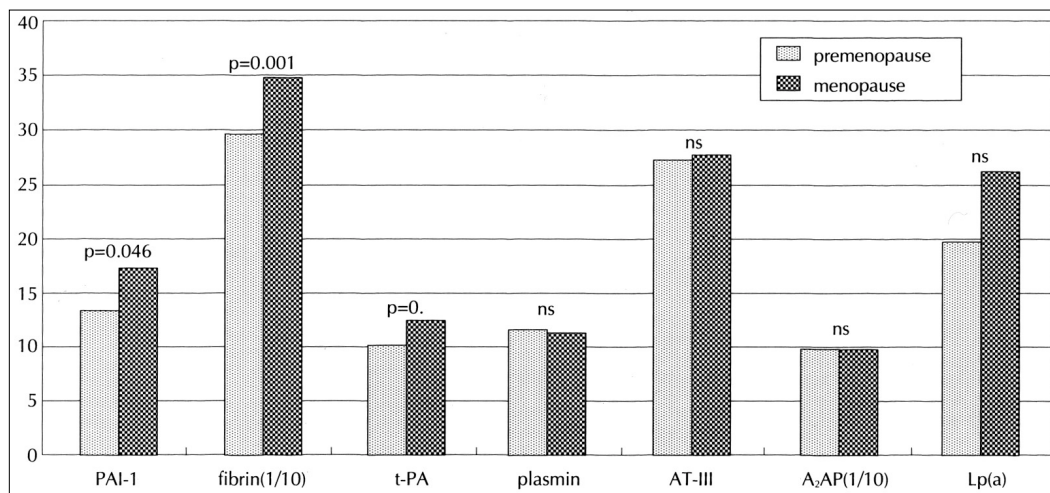


Fig. 2. Differences of thrombogenic and fibrinolytic parameters between premenopausal and menopausal women. Fibrin : fibrinogen, plasmin : plasminogen, AT-III : antithrombin IA₂AP : alpha 2 antiplasmin, Lp(a) : lipoprotein(a), ns : not significant

Table 3. Sexual difference of fibrinolytic parameters before fifty-year old age

	Female (n=42)	Male (n=55)	p-value
PAI-1	13.1 ± 7	17.9 ± 12.1	0.501
t-PA	10.1 ± 4.4	12.2 ± 6.2	0.11
Fibrinogen	279.3 ± 103	275.8 ± 68.4	0.501
Plasminogen	11.5 ± 2.3	11.1 ± 2.3	0.079
AT-III	27.5 ± 5.7	27.3 ± 5.6	0.612
A ₂ AP	97.9 ± 11.1	96.5 ± 14.8	0.177
Lp(a)	24.9 ± 23.4	22.7 ± 21.6	0.57

Table 4. Sexual difference of fibrinolytic parameters after fifty-year old age

	Female (n=173)	Male (n=146)	p-value
PAI-1	16.9 ± 9.5	16.5 ± 9.2	0.501
t-PA	12.5 ± 4.9	13.8 ± 5.2	0.033
Fibrinogen	347.5 ± 256.9	317.9 ± 92.9	0.155
Plasminogen	11.4 ± 2.4	11.1 ± 2.3	0.079
AT-III	27.6 ± 6	27.1 ± 5.8	0.612
A ₂ AP	98.1 ± 9.9	96.6 ± 9.8	0.069
Lp(a)	26.1 ± 24.2	23.1 ± 22.5	0.341

Table 5. Correlation coefficient between PAI-1 and throm-bosis-lysis profiles

	r-value	p-value
t-PA	0.444	0.00316
Fibrinogen	0.035	0.488
Plasminogen	-0.0072	0.889
AT	-0.086	0.0934
A ₂ -AP	-0.009	0.858
Lp(a)	-0.083	0.101

ithrombin III

(Table 5).

고 안

가

(HDL)
가 2) (LDL) 3)
가
, ,
14 - 16)
가 5,6).
(foam cell)
7,8,17).
nitric oxide(NO)
18),
(antioxidant) 가 19)

(thromboembolic diseases)
^{20,21)} .
가
. Gram 340 t - PA antigen 가
PA 가 t -
, t - PA 가
35) .
t - PA PAI - 1 가
tPA - PAI complex
가 . Jan -
, plasminogen activator inhibi -
tor - type(PAI - 1), 2 - antiplasmin sson ³⁶⁾ t - PA 가
, 4
tissue - type plasminogen activator(t - PA) , Ridker ³⁷⁾ Physicians' Health
plasminogen, antithrombin - III, Lp(a) Study cohort t - PA 가
, . Thompson ³⁸⁾ Ridker
. PAI - 1 t - PA antigen
^{22,23)} .
8 ~10 가
. PAI - 1가 t - PA
t - PA antigen 가
. 12 ,
9 - 9 30 . PAI - 1 t - PA 가
t - 가 가
PA , PAI - 1 가 가 .
1 ~4 trisodium 10
citrate EDTA
^{24,25)} ^{39,40)}
pH
5.9 PAI - 1/t - PA ^{41 - 43)}
fibrinolytic system component
가 pH가
citrate - based co -
llection tube(pH 4.5)(Stabilyte tubes Biopool™,
Sweden) .
PAI - 1 data ⁴⁴⁾
²⁶⁾ 가
PAI - 1 ^{27,28)} PAI - 1 ⁴⁵⁾
²⁹⁾ megakaryocyte ³⁰⁾ 가 .
- granule ³¹⁾ 가 가
PAI - 1 fibrin ^{46,47)}
t - PA t - PA . 50
^{32,33)} t - PA

가
PAI - 1 , t - PA ,
가
가
Lp(a)
19.7mg/dl
가
26.1mg/dl
2 - antiplasmin

, 2 - antiplasmin, lipoprotein(a)
t - PA, plasminogen, antithrombin
결 과 :
1) PAI - 1
t - PA 가 (13.1
± 6.6 vs 16.9 ± 9.5ng/ml, 293.6 ± 83.3 vs 347.5 ±
256.9mg/dl, 10.1 ± 4.4 vs 12.5 ± 5.6ng/ml).
2) PAI - 1 t - PA
(r=0.444, p=0.0316) parameter
(r=0.0072 0.086).

결 론 :
PAI - 1
t - PA 가 ,
가

References

가
PAI - 1, t - PA 가
가

요 약

연구배경 :

tissue - type plasminogen activator(t - PA)
plasminogen activator inhibitor type 1(PAI - 1)

PAI - 1 가 t - PA urokinase type - PA

연구방법 :

416 [: =201 : 215(41 ,
174), 55.7 ± 12.1 , 57.4 ± 10.1
] PAI - 1,

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