

한국인 관상동맥질환의 위험 요인에 대한 환자-대조군 연구

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A Case-Control Study on the Risk Factors for Coronary Artery Disease among Korean

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ABSTRACT

Background : Coronary artery diseases (CAD) are increasing in recent years among Korean due to change of socioeconomic status. Even though death rates due to CAD has increased in Korea, few epidemiologic studies have been done about risk factors of CAD. We conducted a case-control study to analyze risk factors for CAD among Korean. **Methods :** The case series comprised 166 patients with angiographically confirmed CAD, who were admitted to Division of Cardiology in Asan Medical Center. The controls were 137 persons composed of patients with normal coronary arteriogram or patients with normal myocardial SPECT for chest pain. We surveyed life style habits, measured anthropometric variables, and analyzed biochemical markers among CAD patients and controls. **Results :** In univariate analysis adjusted for age and body mass index (BMI), age, obesity, abdominal obesity, hypertension, low HDL-cholesterol, low apolipoprotein A1, and high lipoprotein (a) were associated with CAD in men and women. Smoking, diabetes, and hypercholesterolemia were associated with in men only. Exercise and high HDL-cholesterol were inversely associated with CAD both in men and women. In multivariate logistic regression analysis, smoking, abdominal obesity, low apolipoprotein A1, and high lipoprotein (a) were found as independent risk factors of CAD among men. Abdominal obesity, low apolipoprotein A1, and high lipoprotein (a) were found as independent risk factors among women. **Conclusion :** These finding suggest cessation of smoking and weight control for abdominal obesity are important for prevention of CAD among Korean. The detection of low apolipoprotein A1 and high lipoprotein (a) could be useful for prevention of CAD. (**Korean Circulation J 1998;28(6):849-862**)

KEY WORDS : Coronary artery disease (CAD) · Risk factors · Case-control study.

서 론

10 200 1)
10 12.8 2)
가 1983 1993 10
6 가 2)
가
: (02) 224 - 3810 · : (02) 224 - 3815
E - mail : hyesoon@www.amc.seoul.kr , National Chol -

esterol Education Program(NCEP) Adult Treat -
ment Panel II 45

방 법

, 55
가
가 , , , HDL -
HDL -
가
3)
가
4)
apolipoproteins,⁵⁾ lip -
oprotein(a),⁶⁾ insulin,⁷⁾ fibrinogen,⁸⁾ homocystine⁹⁾
10)

, 가
가
.
(, , ,) (,
, 가 (가
, , , ,
(, ,)
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,¹¹⁾ 1 2
1980 1990
50% ,
70% .¹²⁾
가

,
(kg/m²) . Futrex
,¹³⁾ caliper
,
-
1
25 kg/m² ,
- 가 0.95

방 법

10

대 상
1997 1 1997 8
50%
가 40
SPECT(Single Photon Emi -
ssion Computed Tomography)
166 (123 , 43)
59) . 137 (78 ,

12
20
.
, HDL -
dextran sulfate MgCl₂
. LDL - 500 mg/
dl 500 mg/dl
Friedewald . Apolipop -
roteins A1 B immunonephelometry
, lipoprotein(a) enzyme - linked immunosorbent
assay , insulin radioimmunoassay

가 , 가 20
30% .
통계 분석
SAS 6.11 .
Student t - test , lipoprotein(a)
Wilcoxon rank sum test .
2_
test , Ma -
ntel - Haenszel 2 - test
95% .
logistic regression
analysis 95%
p 0.05 .
30 , 60 ,
가

가 , 가 20
30% .
통계 분석
SAS 6.11 .
Student t - test , lipoprotein(a)
Wilcoxon rank sum test .
2_
test , Ma -
ntel - Haenszel 2 - test
95% .
logistic regression
analysis 95%
p 0.05 .
30 , 60 ,
가

연구 대상자의 일반적 특성
60 70 가
가
가 50%

SPECT(Single Photon Emission Computed To -
mography)
가
SPECT 4
dipyridamole kg 0.14 mg 4
Dipyridamole
201Thallium - 201 74 - 111MBq(2 3 mCi)
5 10
4
45 45 180
3 60 SP -
ECT , , ,
12 27
가 , ,

가 , 가 60 80%
90%
가
(Table 1).
관상동맥질환군과 대조군 간의 위험 인자 평균치 비교
59.7 , 62.3
55.8 , 57.6
가 , 25.0 kg/m², 25.8 kg/m²

24.0 kg/m², 23.9 kg/m²

0.89, 0.87

0.96, 0.96

125.7 mg/dl, 135.0

97.6 mg/dl, 104.0 mg/dl

(Table 2).

(Table 2).

Table 1. Basic characteristics of 166 CAD patients and 137 controls

	Men		Women	
	CAD (n = 123) No (%)	Control (n = 78) No (%)	CAD (n = 43) No (%)	Control (n = 59) No (%)
Age (yr)				
< 50	18 (14.6)	27 (34.6)**	3 (7.0)	9 (15.3)*
50 - 59	45 (36.6)	26 (3.3)	13 (30.2)	29 (49.1)
60 - 69	51 (41.5)	19 (24.4)	21 (48.8)	18 (30.5)
70	9 (7.3)	6 (7.7)	6 (14.0)	3 (5.1)
Postmenopause			42 (95.7)	54 (91.5)
Marriage				
Married	117 (95.1)	74 (94.9)	27 (62.8)	46 (78.0)
Divorced	2 (1.6)	3 (3.8)	2 (4.7)	2 (3.4)
Bereaved, others	4 (3.3)	1 (1.3)	14 (32.5)	11 (18.6)
Education (yr)				
< 9	16 (13.0)	8 (10.3)	24 (55.8)	10 (16.9)**
9 - 12	47 (38.2)	34 (42.6)	8 (18.6)	39 (66.1)
13 - 16	48 (39.0)	30 (38.5)	2 (4.7)	8 (13.6)
17	12 (9.8)	6 (7.7)	9 (20.9)	2 (3.4)
Job				
White-collar	64 (52.0)	45 (57.7)	8 (18.6)	4 (6.8)
Blue-collar	37 (30.1)	13 (16.7)	9 (20.9)	8 (13.6)
House wife, others	22 (17.9)	20 (25.6)	26 (60.5)	47 (79.7)
Income (million won/month)				
< 200	53 (43.1)	20 (32.1)	23 (53.5)	21 (35.6)
200 - 400	43 (35.0)	33 (42.3)	11 (25.6)	22 (37.3)
> 400	27 (24.4)	25 (25.6)	9 (20.9)	16 (27.1)
Physical activity				
Light	80 (73.4)	54 (74.0)	24 (60.0)	42 (77.8)
Moderate	16 (14.7)	12 (16.4)	13 (32.5)	11 (20.4)
Heavy	13 (11.9)	7 (9.6)	3 (7.5)	1 (1.9)
HRT				
None			32 (74.4)	35 (59.3)
Discontinue			2 (4.7)	5 (8.5)
Continue			0 (0.0)	2 (3.4)
Don't Know			8 (18.6)	12 (20.3)

CAD : Coronary artery disease ; HRT : Hormone replacement therapy

*p<0.05, **p<0.01

혈청 지질, 지단백, 아포지단백, Lp(a) 30.0 mg/dl, 39.2 mg/dl 17.7 mg/dl,
LDL - , 21.8 mg/dl (Table 2).

가 , 관상동맥질환군과 대조군 간의 위험 인자 빈도 비교

200.2 mg/dl 145.3 mg/dl 45

dl . HDL - , 가 , 55

39.4 mg/dl, 44.6 mg/dl 90.7% 66.1%

45.0 mg/dl, 51.5 mg/dl , TC/ . 가

HDL 5.05, 4.82 4.53, 4.37 가 가 ,

. Apolipoprotein A1 , 가

88.8 mg/dl, 102.7 mg/dl 가 가 .

142.4 mg/dl, 153.4 mg/dl , ap - 62.6%

olipoprotein B , 33.3% ,

, ApoB/Apo A1 , .

1.21, 0.96 0.71, 0.71 42.3% 57.5%

. Lipoprotein(a) , ,

Table 2. Mean values of anthropometric and metabolic variables among CAD patients

	Men		Women	
	CAD (n = 123) Mean ± S.D.	Control (n = 78) Mean ± S.D.	CAD (n = 43) Mean ± S.D.	Control (n = 59) Mean ± S.D.
Age (yr)	59.7 ± 8.9	55.8 ± 9.4***	62.3 ± 7.7	57.6 ± 7.5***
BMI (kg/m ²)	25.0 ± 2.3	24.0 ± 2.9**	25.8 ± 3.0	23.9 ± 3.0***
BF (%)	18.8 ± 5.1	16.7 ± 5.3*	30.8 ± 4.4	28.2 ± 6.2*
Triceps (mm)	17.0 ± 4.1	14.8 ± 4.8***	27.5 ± 6.4	26.9 ± 7.3
WHR	0.96 ± 0.04	0.89 ± 0.04***	0.96 ± 0.05	0.87 ± 0.06***
Waist/Height	0.55 ± 0.04	0.53 ± 0.04**	0.60 ± 0.06	0.54 ± 0.06***
SBP (mmHg)	130.7 ± 22.2	129.5 ± 20.2	132.2 ± 22.0	135.3 ± 22.2
DBP (mmHg)	81.7 ± 13.8	83.2 ± 13.6	82.0 ± 12.8	86.4 ± 13.8
Urate (mg/dl)	5.9 ± 1.4	5.9 ± 1.2	5.0 ± 1.6	4.6 ± 1.7
FBS (mg/dl)	125.7 ± 53.7	97.6 ± 23.9***	135.0 ± 61.4	104.0 ± 33.1***
Insulin (μIU/ml)	21.8 ± 28.4	22.0 ± 14.2	21.4 ± 12.6	22.1 ± 16.7
TC (mg/dl)	194.6 ± 32.7	192.6 ± 36.0	212.0 ± 40.2	217.0 ± 38.4
LDL (mg/dl)	118.7 ± 31.3	119.0 ± 34.6	125.1 ± 31.8	126.0 ± 31.9
TG (mg/dl)	174.0 ± 93.7	157.8 ± 93.2	200.2 ± 72.5	145.3 ± 71.3***
HDL (mg/dl)	39.4 ± 8.3	45.0 ± 11.3***	44.6 ± 8.7	51.5 ± 12.9***
TC/HDL	5.05 ± 1.13	4.53 ± 1.14***	4.82 ± 1.1	4.37 ± 1.0*
Apo A1 (mg/dl)	88.8 ± 17.9	142.4 ± 36.1***	102.7 ± 17.5	153.4 ± 40.7***
Apo B (mg/dl)	93.6 ± 23.2	94.2 ± 21.0	96.6 ± 28.2	101.8 ± 23.6
Apo B/Apo A1	1.21 ± 1.50	0.71 ± 0.27***	0.96 ± 0.28	0.71 ± 0.27***
Lp (a) (mg/dl)	30.0 ± 0.03	17.7 ± 0.20***	39.2 ± 0.05	21.8 ± 0.27***

CAD : Coronary artery disease ; BMI : Body mass index ; BF : Body fat ; WHR : Waist/hip ratio ; SBP : Systolic blood pressure ; DBP : Diastolic blood pressure ; FBS : Fasting blood sugar ; TC : Total cholesterol ; LDL : Low-density lipoprotein cholesterol ; TG : Triglyceride ; HDL : High-density lipoprotein cholesterol ; Apo A1 : Apolipoprotein A1 ; Apo B : Apolipoprotein B ; Lp (a) : Lipoprotein (a)

*p<0.05, **p<0.01, ***p<0.005

30 60 3 5 35 mg/dl 39.8%,
가 25.6% 19.2%, 8.5%
65.0% 82.0% , HDL - 60 mg/dl ,
, 0.8%, 2.3% 7.7%, 20.3%
, 52.0%, 55.8% Apolipoprotein A1 90 mg/dl
33.3%, 30.5% 55.3% 11.5%
, 56.1%, 65.1% 100 mg/dl
9.0%, 10.2% 51.2% 11.9%
, 41.5%, 47.5% Apolipoprotein B가 100 mg/d
25.7%, 24.1% , Lip -
, 14.9%, 27.9% oprotein(a) 30 mg/dl ,
5.1%, 10.2% 32.5%, 46.5% 19.2%, 22.0%
, 28.8%, 26.3% (Table 3).
11.8%, 11.8%
LDL - 160 mg/dl 각각의 위험 인자에 대한 관상동맥질환의 교차비
250 mg/dl 가
. HDL - 45

Table 3. Prevalence of cardiovascular risk factors among CAD patients and controls

	Men		Women	
	CAD No (%)	Control No (%)	CAD No (%)	Control No (%)
Age M 45, F 55 yr	115 (83.5)	68 (81.2)	39 (90.7)	39 (66.1)***
Family history of MI	4 (3.4)	2 (2.6)	1 (2.5)	0 (0.0)
Family history of CVA	25 (21.2)	13 (17.1)	6 (15.0)	10 (17.2)
Smoking (+)	77 (62.6)	26 (33.3)***	5 (11.6)	5 (13.6)
Alcohol (+)	52 (42.3)	45 (57.7)*	2 (4.7)	8 (8.5)
Exercise (+)	80 (65.0)	64 (82.0)**	22 (51.2)	39 (66.1)
BMI 25 kg/m ²	64 (52.0)	26 (33.3)**	24 (55.8)	18 (30.5)**
WHR 0.95	69 (56.1)	7 (9.0)***	28 (65.1)	6 (10.2)***
Hypertension	49 (41.5)	19 (25.7)*	19 (47.5)	14 (24.1)*
Diabetes	30 (14.9)	4 (5.1)***	12 (27.9)	6 (10.2)*
Hypercholesterolemia	34 (28.8)	9 (11.8)***	10 (26.3)	9 (11.8)*
LDL 160 mg/dl	9 (7.3)	7 (9.0)	5 (11.6)	12 (20.3)
TG 250 mg/dl	14 (11.4)	7 (9.0)	8 (18.6)	6 (10.2)
HDL<35 mg/dl	49 (39.8)	15 (19.2)***	11 (25.6)	5 (8.5)*
HDL 60 mg/dl	1 (0.8)	6 (7.7)**	1 (2.3)	12 (20.3)**
ApoA1 M<90, F<100 mg/dl	68 (55.3)	9 (11.5)***	22 (51.2)	7 (11.9)***
Apo B 100 mg/dl	47 (38.2)	24 (30.8)	18 (41.9)	34 (57.6)
Lp (a) 30 mg/dl	40 (32.5)	15 (19.2)*	20 (46.5)	13 (22.0)**

CAD : Coronary artery disease ; MI : Myocardial infarction ; CVA : Cerebrovascular accident

; BMI : Body mass index ; WHR : Waist/hip ratio ; LDL : Low-density lipoprotein cholesterol

; TG : Triglyceride ; HDL : High-density lipoprotein cholesterol ; Apo A1 : Apolipoprotein

A1 ; Apo B : Apolipoprotein B ; Lp (a) : Lipoprotein (a)

*p<0.05, **p<0.01, ***p<0.005

45	2.0(95% CI : 1.1 3.6), 가 3.3	mg/dl	60 mg/dl	0.1(95% CI :
(95% CI : 1.9 6.0),	25 kg/m ²	0.0 0.6)	.	
25 kg/m ²	2.2(95% CI : 1.2 3.9),		가 2.2(95% CI : 1.2 4.0),	
- 가 0.95	0.95	13.0	가 3.1(95% CI : 1.7 5.6),	
(95% CI : 6.1 27.4),			가 2.3(95% CI : 1.3 4.2),	
가 2.1(95% CI : 1.1 3.8),			가 10.8(95% CI : 5.0 23.7),	
가 6.0(95% CI : 2.2 16.0),			가 1.9(95% CI : 1.0 3.7),	
가 2.9			가 5.8(95% CI : 2.1 16.2),	
(95% CI : 1.3 6.4), HDL -	35 mg/dl		가 3.1(95% CI : 1.4 7.0),	
35 mg/dl	2.8(95% CI : 1.4	HDL -	가 2.7(95% CI : 1.4	
5.4), apolipoprotein A1	90 mg/dl	90	5.4), apolipoprotein A1	가
mg/dl	9.5(95% CI : 4.7 19.3), lipoprotein	10.4(95% CI : 5.0 21.7),	lipoprotein(a)	
(a)가 30 mg/dl	30 mg/dl	2.0	가 2.3(95% CI : 1.2 4.6)	
(95% CI : 1.0 4.0)	,	,	가 0.5(95% CI :	
	가 0.6(95% CI : 0.3	0.3 0.9),	HDL -	가
0.9),		0.1(95% CI : 0.0 0.6)		.
가 0.5(95% CI : 0.3 0.9), HDL -	60		가	55

Table 4. Odds ratios and 95% confidence interval for CAD according to cardiovascular risk factors

	Men		Women	
	OR (95% CI)		OR (95% CI)	
	Univariate	Adjust for age, BMI	Univariate	Adjust for age, BMI
Age M 45, F 55 yr	2.0 (1.1 - 3.6)*	2.2 (1.2 - 4.0)*	3.1 (1.4 - 6.9)**	2.9 (1.3 - 6.7)*
Family history of MI	1.3 (0.2 - 7.1)	1.4 (0.2 - 8.9)	1.0 (0.9 - 1.0)	1.0 (0.9 - 1.0)
Family history of CVA	1.2 (0.6 - 2.7)	1.2 (0.6 - 2.7)	0.8 (0.3 - 2.4)	1.1 (0.3 - 3.5)
Smoking (+)	3.3 (1.9 - 6.0)***	3.1 (1.7 - 5.6)***	1.4 (0.4 - 5.3)	1.7 (0.4 - 6.5)
Alcohol (+)	0.6 (0.3 - 0.9)*	0.6 (0.3 - 1.1)	0.3 (0.1 - 1.5)	0.3 (0.1 - 1.2)
Exercise (+)	0.5 (0.3 - 0.9)*	0.5 (0.3 - 0.9)*	0.2 (0.1 - 0.6)**	0.2 (0.1 - 0.7)***
BMI 25 kg/m ²	2.2 (1.2 - 3.9)**	2.3 (1.3 - 4.2)**	2.9 (1.3 - 6.5)*	2.7 (1.2 - 6.3)*
WHR 0.95	13.0 (6.1 - 27.4)***	10.8 (5.0 - 23.7)***	16.5 (6.4 - 42.6)***	11.4 (4.1 - 31.6)***
Hypertension	2.1 (1.1 - 3.8)**	1.9 (1.0 - 3.7)*	2.5 (1.1 - 5.9)*	3.4 (1.3 - 8.8)**
Diabetes	6.0 (2.2 - 16.0)***	5.8 (2.1 - 16.2)***	3.4 (1.2 - 9.7)*	2.3 (0.8 - 6.9)
Hypercholesterolemia	2.9 (1.3 - 6.4)**	3.1 (1.4 - 7.0)**	1.2 (0.4 - 3.1)	1.1 (0.4 - 3.3)
LDL 160 mg/dl	0.8 (0.4 - 1.5)	0.9 (0.5 - 1.6)	0.5 (0.2 - 1.1)	0.4 (0.2 - 1.1)
TG 250 mg/dl	1.3 (0.5 - 3.4)	1.5 (0.6 - 3.8)	2.0 (0.7 - 6.3)	1.8 (0.6 - 5.4)
HDL <35 mg/dl	2.8 (1.4 - 5.4)***	2.7 (1.4 - 5.4)***	3.7 (1.2 - 11.7)*	3.5 (1.2 - 10.0)*
HDL 60 mg/dl	0.1 (0.0 - 0.6)**	0.1 (0.0 - 0.6)**	0.1 (0.0 - 0.5)**	0.1 (0.0 - 0.7)*
ApoA1 M <90, F <100 mg/dl	9.5 (4.7 - 19.3)***	10.4 (5.0 - 21.7)***	7.8 (3.1 - 19.7)***	6.3 (2.5 - 15.8)***
Apo B 100 mg/dl	1.4 (0.8 - 2.5)	1.4 (0.7 - 2.6)	0.5 (0.2 - 1.2)	0.4 (0.2 - 1.1)
Lp (a) 30 mg/dl	2.0 (1.0 - 4.0)*	2.3 (1.2 - 4.6)*	3.1 (1.3 - 7.2)**	3.8 (1.5 - 9.8)**

CAD : Coronary artery disease ; OR : Odds ratio ; CI : Confidence interval ; MI : Myocardial infarction ; CVA : Cerebrovascular accident ; BMI : Body mass index ; WHR : Waist/hip ratio ; LDL : Low-density lipoprotein cholesterol ; TG : Triglyceride ; HDL : High-density lipoprotein cholesterol ; Apo A1 : Apolipoprotein A1 ; Apo B : Apolipoprotein B ; Lp (a) : Lipoprotein (a)

*p<0.05, **p<0.01, ***p<0.005

가²⁾ 가

40 2 가¹⁷⁾
가 3.1

4 3)
123 43
가 2.9 : 1

40

가¹⁸⁾¹⁹⁾ HDL -

가³⁾

가 45 , 55
가 , 2.2, 2.9 가 0.6

0.4 0.6²⁰⁾

가

가²¹⁾ 2
가 가

가¹⁴⁾
가¹⁵⁾ 0.5 , 0.2
가

가

가¹⁶⁾ NCEP II 가 50%
가 55²²⁾²³⁾ Framingham Heart Study

가 65³⁾ 가²⁴⁾ Honolulu Heart Program
가²⁵⁾

가

가²⁶⁾ NCEP II

³⁾ 가
³³⁾ 가
³⁴⁾ 가
 2.3, 2.7 Nurse's Health Study 2 -
²⁷⁾ 3 가 3.1 3.5 ³⁵⁾³⁶⁾ 2.4 , ³⁵⁾ 가
 가 ²⁸⁾²⁹⁾ 5.8
 2.3
 가
 0.95
³⁷⁾ 11.4 가 , 10.8, 가 140 mg/dl
³⁰⁾ 가 100 mg/dl ,
 125 135 mg/dl
³⁸⁾ 가
 가
 / ⁷⁾ meta - analysis
 / 가 ³⁹⁾
³¹⁾ LDL -
⁴⁰⁾⁴¹⁾ HDL -
⁴²⁾ NCEP II
 HDL - 60 mg/dl
 53% ³²⁾ 가 , ³⁾ LDL - 190 220 mg/dl, 120
 1.9, 130 mg/dl ,
 3.4 가
 가 LDL -

가 , HDL - Apolipoprotein A1

가 3.1

3) Lipoprotein(a)

43) 6)

48) Lp(a)

가 2.2, 2.6

VII Lp(a)

PAI - 1 가

44) Lp(a)가

가 HDL - Lipid Research Clinics Prev - alence Study

가 49)

45) TC/HDL - C

가

46) HDL - TC/HDL , 40

HDL - 2.7, 3.5

LDL - HDL - 가

45) HDL - 0.1, 0.1 요 약

연구배경 :

Apolipoproteins

5)46) apolipoprotein 1980

B apolipoprotein 1990 6 가

A1 Apo B/Apo A1 ,

apolipoprotein A1

가 10.4, 6.3

apolipop -

rotein A1 HDL - , apolipoprotein B

LDL - 47) LDL -

방 법 :

1997 1 1997 8

50%
가 40
SPECT (Single Photon Emission Computed Tomography)
166 (123 ,
43) 137 (78 ,
59) , 가 , , /
 , , , , HDL -
 , LDL - , apolipoprotein A1, apolipoprotein B, lipoprotein(a)

결 과 :

45 45 2.2,
가 3.1, 25
kg/m² 25 kg/m² 2.3, -
가 0.95 0.95 10.8,
가 1.9,
가 5.8,
가 3.1, HDL -
35 mg/dl 35 mg/dl 2.7,
apolipoprotein A1 90 mg/dl 90 mg/dl
10.4, lipoprotein(a)가 30 mg/dl
30 mg/dl 2.3 ,
가 0.5, HDL -
60 mg/dl 60 mg/dl 0.1
 , 55 55
2.9, 25 kg/m²
25 kg/m² 2.7, - 가 0.95
0.95 11.4,
가 3.4, HDL - 35 mg/dl
35 mg/dl 3.5, apolipoprotein A1
100 mg/dl 100 mg/dl 6.3,
lipoprotein(a)가 30 mg/dl 30 mg/dl
3.8 ,
가 0.2, HDL - 60 mg

/dl 60 mg/dl 0.1 .

apolipoprotein A1,
lipoprotein(a)가, apo -
lipoprotein A1, lipoprotein(a)가

결 론 :

apolipoprotein A1 lipoprotein(a) 가가

중심 단어 :

1997

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