馬偕紀念醫院
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Combined Effects of Obesity and Smoking on Subclinical Coronary Artery Disease

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Background

- Coronary artery disease (CAD):
  #atherosclerotic plaque accumulation and calcification.
- Coronary Artery Calcium Scoring (CAC):
  #non-invasive quantitation of coronary artery calcification using computed tomography (CT).
  #a marker of atherosclerotic plaque burden
  #an independent predictor of CAD
- Major risk factors for CAD, including older age, male, high BP, DM, hyperlipidemia**, obesity** and **smoking**.

Curr Opin Cardiol. 2021;36(6):769-775. doi:10.1097/HCO.0000000000000911
Arterioscler Thromb Vasc Biol. 2011;31(11):2715-2722. doi:10.1161/ATVBAHA.111.234062

- **Obesity (**BMI≧30) : **OR 1.47**
- **Smoker** : **OR=1.88**

- There is less evidence to compare obesity indicators and the combined effects of obesity and smoking.

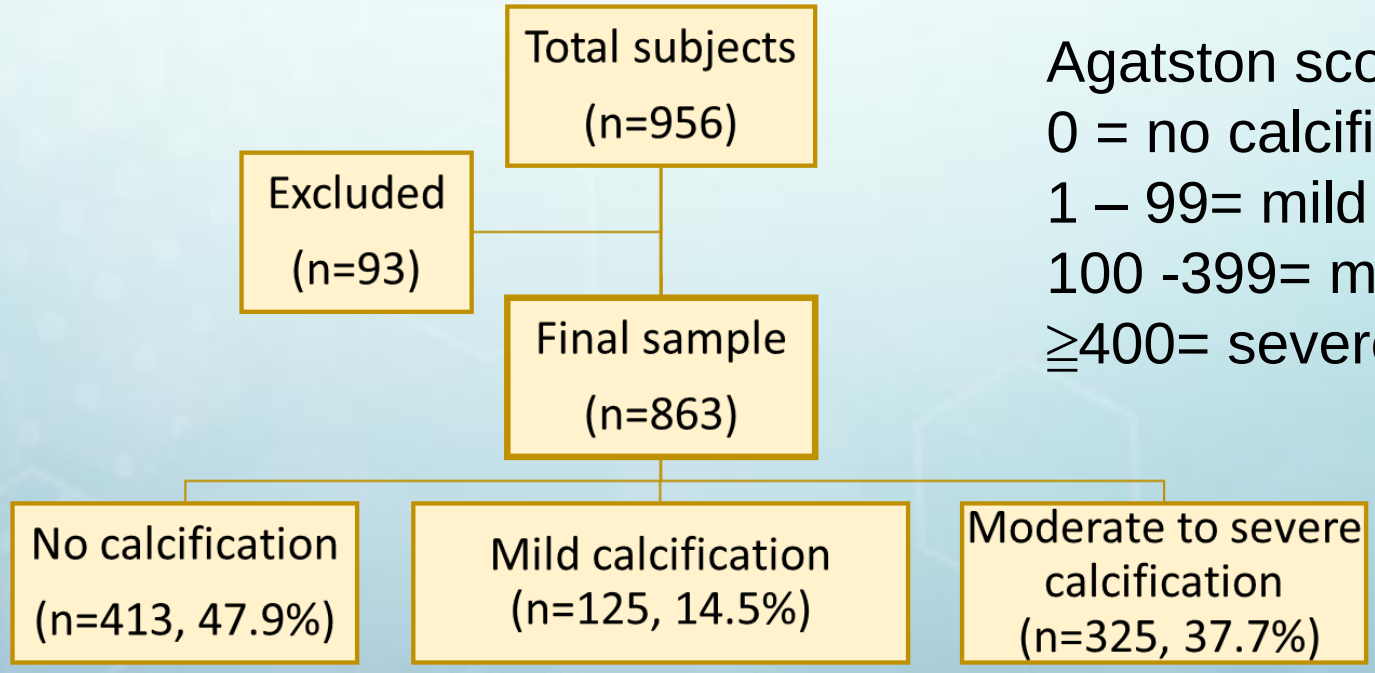
Atherosclerosis. 2022;362:1-10. doi:10.1016/j.atherosclerosis.2022.10.007
Front Endocrinol (Lausanne). 2021 Nov 3;12:750773. doi: 10.3389/fendo.2021.750773

Aim: [Relevance to Health Promotion in Hospitals and Health Services]

- Investigate the relationship between **different indicators of obesity (**body fat [BF], waist circumference [WC], body mass index [BMI]) and subclinical CAD
- **The combined effect of obesity and smoking**

Methods

- **956 participants aged 50 to 75 years old** who underwent coronary CT in health checkups
- Three groups: **no** calcification**, mild** calcification and **moderate to severe** calcification groups



Agatston score
0 = no calcification
1 – 99= mild calcification;
100 -399= moderate calcification;
≧400= severe calcification

Table1. Characteristics of the study participants

Characteristics	No calcification [A] (n=413, 47.9%)	Mild calcification [B] (n=325, 37.7%)	Moderate to severe calcification [C] (n=125, 14.5%)	P value	Post-hoc analysis
Age (years)	58.5 ± 5.7	60.6 ± 6.2	62.4 ± 6.4	<.001*	C>B>A
Gender Men (n, %)	197 (47.7)	218 (67.1)	94 (75.2)	<.001*	
Women (n, %)	216 (52.3)	107 (32.9)	31 (24.8)		
SBP (mmHg)	126.9 ± 17.6	129.5 ± 17.2	130.6 ± 17.7	0.040*	C>A
DBP (mmHg)	78.2 ± 10.3	78.9 ± 10.1	78.1 ± 11.1	0.681	
HTN (n, %)	65 (15.7)	82 (25.2)	46 (36.8)	<.001*	
DM (n, %)	61 (14.8)	73 (22.5)	49 (39.2)	<.001*	
AC (mg/dL)	101.9 ± 20.3	106.6 ± 26.0	112.0 ± 32.3	0.001*	C>B>A
TG (mg/dL)	129.6 ± 73.3	138.7 ± 67	155.6 ± 93.6	0.002*	C>B, C>A
LDL-C (mg/dL)	133.4 ± 33.9	133.9 ± 34.3	135.5 ± 39.4	0.840	
HDL-C (mg/dL)	54.1 ± 15.8	51.6 ± 14.9	49.5 ± 15.5	0.006*	A>B, A>C
BF (n, %)	27.9 ± 6.7	27.3 ± 6.4	27.4 ± 6.8	0.439	
WC (cm)	85.1 ± 9.9	87.3 ± 8.5	89.7 ± 9.0	<.001*	C>B>A
BMI (kg/m^2)	24.5 ± 3.4	25.2 ± 3.1	25.5 ± 3.5	0.003*	C>A, B>A
Smoking (n, %)	82 (18.9)	78 (23.3)	50 (36.5)	0.001*	

Table2. Multiple logistic regression analysis of the presence of coronary artery calcification

	Moderate to severe calcification compared with no calcification	
	OR	95%CI
Total participants BF	1.052	(1.011-1.094)
WC	1.027	(1.002-1.053)
BMI	1.063	(0.996-1.135)
Men group BF	1.094	(1.035-1.155)
WC	1.038	(1.005-1.073)
BMI	1.109	(1.020-1.207)
Women group BF	1.001	(0.938-1.067)
WC	1.014	(0.974-1.055)
BMI	0.989	(0.880-1.111)
Age 50-65 yrs BF	1.066	(1.018-1.117)
WC	1.024	(0.995-1.055)
BMI	1.068	(0.992-1.151)
Age ≥ 65 yrs BF	1.013	(0.939-1.092)
WC	1.034	(0.981-1.091)
BMI	1.038	(0.892-1.208)

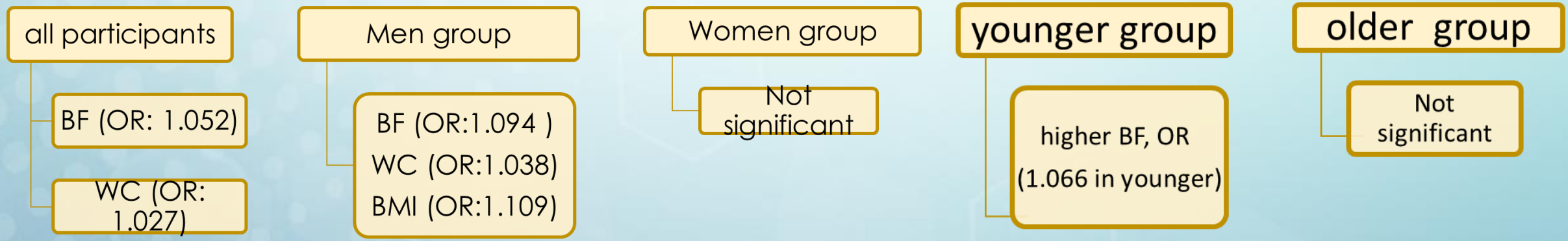
Adjusted for age, gender, smoking, fasting plasma glucose, low-density lipoprotein cholesterol and systolic blood pressure

Table3. Comparison of obese smokers, non-smokers and normal-weight individuals

Obesity indicators	BMI		WC	
	OR	(95% CI)	OR	(95% CI)
Normal-weight + non-smoking	1.000		1.000	
Obesity + smoking	3.028	(1.547-5.926)	3.629	(1.850-7.118)
Obesity + non-smoking	1.090	(0.633-1.876)	1.513	(0.871-2.628)
Normal-weight + smoking	1.303	(0.537-3.159)	1.723	(0.798-3.721)

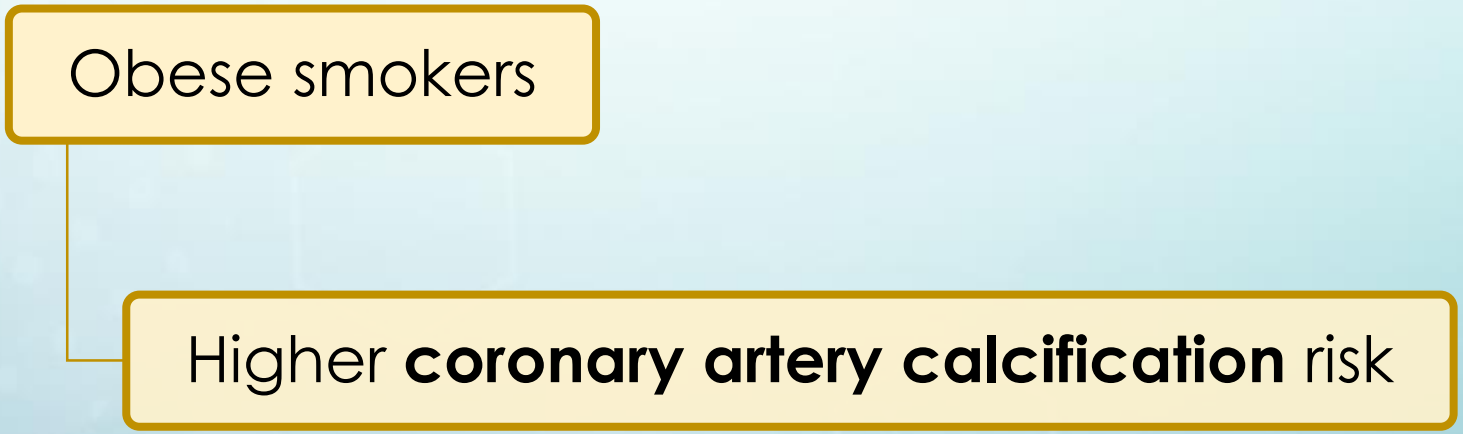
Major results-1

- In univariate analysis, higher WC, BMI, and smoking rates were seen in the moderate to severe calcification group.
- **Higher BF and WC** were significantly associated with moderate to severe coronary artery calcification in all participants.
- The odds ratio of all obesity indicators in men was increased. However, this association was not seen in women or elderly.



Major results-2

- Obese smokers have significantly increased risk of coronary artery stenosis compared with non-smokers and normal-weight individuals.



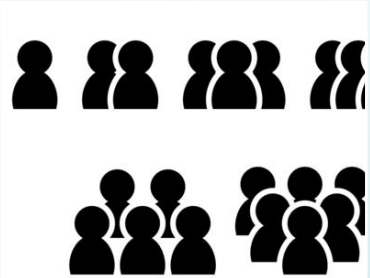
Discussion

- The relationship between the indicators of obesity (e.g., BMI) and the presence of CAD is still uncertain and debatable.
- Our study showed WC and BF, as obesity indicators, were more significant predictors than BMI, leading to the trend of coronary artery calcification grade.
- The OR is higher in men and younger people.
- Obese smokers have a significantly increased risk of coronary artery stenosis compared with non-smokers and normal-weight people

Study limitation

- Selection bias may exist, and the results may not generalize to common populations.
- Due to the small number of participants, we need to combine the participants with obesity and overweight (BMI ≧ 24).
- There are many risk factors in CAD, such as unhealthy dietary habits, and it isn't easy to consider them in one model.

selection bias



small number of participants

lots of risk factor in CAD

Conclusion

- BF and WC can be used as a regular monitoring index for the prediction of CAD in adults in Taiwan, especially in men and young people.
- For obese smokers, the risk of CAD may remarkably increase.
- Obese smokers can take notice of this and take action to quit smoking and start controlling their weight for prevention of CAD.

Thank for your attention !