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Research paper

Is waist-to-height ratio better than body mass index as a predictive indicator of coronary atherosclerosis disease? A cohort study

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Being overweight and obese are strongly associated with cardiovascular disease.[1] Several different anthropometrical measurements are used in the clinical setting to predict disease risk in relation to overweight and obesity. Body mass index (BMI) is well known and frequently used, both in clinical practice and in the health and fitness industry.[2] However, BMI is a measure of general adiposity which does not distinguish between central and general obesity. Prospective epidemiological studies have revealed that central obesity was more relevant to CAD risk compared to general obesity.[3] Waist-to-height ratio (WHR) was suggested in the mid-1990s as an anthropometric measurement that may improve on BMI because it was used commonly to evaluate central obesity.[4] However, there was little data available about whether WHR was better than BMI as a predictive indicator of coronary artery disease (CAD) in large cohort.

We performed an analysis on prospectively collected data from a cohort of 8851 consecutive patients who were suspected of CAD and underwent coronary CT angiography (CCTA) at our hospital between March 2016 and November 2017. (Fig. 1A). Coronary atherosclerosis plaque and obstructive CAD was defined by CCTA. A structured interview and review of existing clinical data was conducted before CCTA to collect information on symptoms, demographic characteristics, and the presence of cardiovascular risk factors. WHR was calculated as waist circumference (cm) divided by height (cm) and was categorized as follows: < 0.5 (normal), 0.5 to 0.55 (over weight) and > 0.55 (obese).

Overall 8630 patients were finally analyzed, of whom 2582 (29.92%) were normal, 3531 (40.92%) were overweight, and 2517 (29.17%) were obese based on WHR. In this cohort, 4500 (52.14%) patients had any plaque and 1793 (20.78%) patients had obstructive CAD based on CCTA. For WHR, the prevalence of any plaque was increased significantly in three groups (44.77% for normal, 53.40% for overweight, 57.13% for obese, $p < 0.001$); and the prevalence of obstructive CAD was also increase significantly in three groups (17.35% for normal, 21.55% for overweight, 23.20% for obese, $p < 0.001$). For BMI, the prevalence of any plaque was not significantly different in three groups (51.11% for normal, 53.44% for overweight, 50.90% for obese, $p = 0.090$); and the prevalence of obstructive CAD was also not significantly different in three groups (20.60% for normal, 21.09% for overweight, 20.10% for obese, $p = 0.761$). WHR showed a reasonable predictive capacity for the presence of plaque and obstructive CAD for plaque (AUC = 0.561, 95% CI 0.548–0.573) and for obstructive CAD (AUC = 0.544, 95% CI 0.529–0.559), respectively (all $p < 0.001$). BMI showed a mild predictive capacity for the presence of plaque (AUC = 0.513, 95% CI 0.501–0.526, $p = 0.031$). The AUC value was significantly lower than WHR ($p < 0.001$). However, BMI did not show predictive capacity for the presence of obstructive CAD (AUC = 0.505, 95% CI 0.491–0.520), $p = 0.483$) (Fig. 1B).

In this cohort study, we compared the strength and utility WHR with BMI as a predictive indicator of coronary artery disease. The major finding of this study was WHR was associated with increased risk of coronary atherosclerosis and was better than BMI. We found the prevalence of any plaque and obstructive CAD was increase significantly in different WHR groups, but without significantly different between BMI groups. In a large cohort study of 1,346 middle-aged men followed for 10.6 years, WHR, waist circumference, and BMI were all directly associated with the risk of coronary events, with WHR providing additional information beyond BMI in predicting CAD, whereas BMI did not add to the predictive value of WHR.[5] The findings were consistent with our study.

WHR was associated with increased risk of coronary atherosclerosis and CAD and was a better predictor than BMI. These results reinforce the importance of using WHR as part of public health programs strategies.

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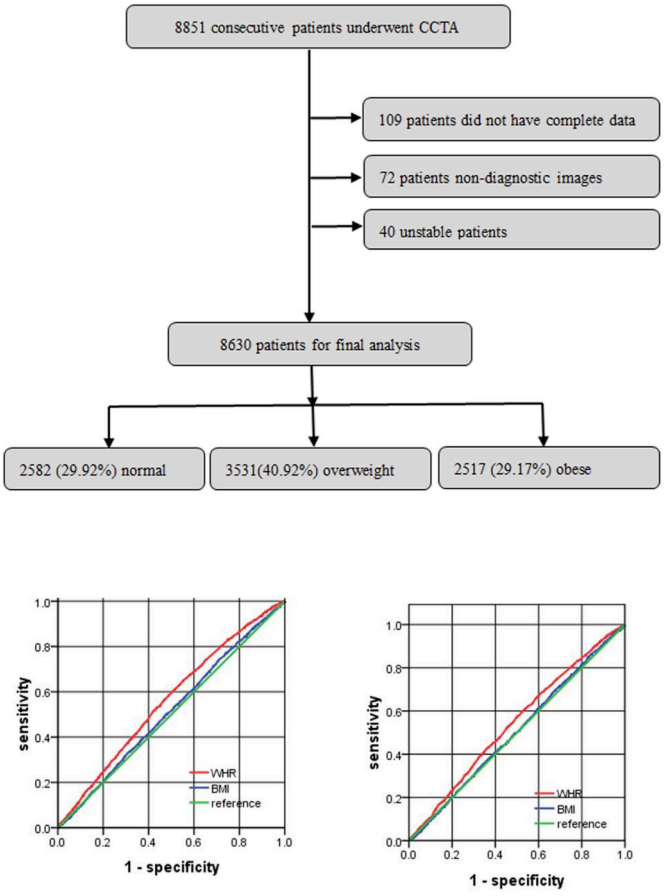

Fig. 1. A. Flow Chart of this Studied Patients. B. Receiver-Operator Characteristic Curves of WHR and BMI for the presence of plaque and obstructive CAD.

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