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学位論文題目 Anthropometric obesity indices were stronger than CT-based indices in associations with carotid intima-media thickness in Japanese men

(日本人男性集団では肥満の体格測定指標の方が CT による指標よりも頸動脈中膜内膜肥厚とより強く関係していた)

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## 論文内容要旨

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学位論文題目	Anthropometric obesity indices were stronger than CT-based indices in associations with carotid intima-media thickness in Japanese men (日本人男性集団では肥満の体格測定指標の方がCTによる指標よりも頸動脈中膜内膜肥厚とより強く関係していた)		
<p><b>Background and purpose:</b> Computed tomography (CT) can directly provide information on body compositions and distributions, compared to anthropometric indices. It has been shown that various obesity indices are associated with carotid intima-media thickness (IMT). However, whether CT-based obesity indices are stronger than anthropometric indices in association with atherosclerosis remains to be determined in a general population. The aim of this study was to examine the associations of carotid IMT with various obesity indices (both CT-based and anthropometric), and then to compare strengths of association for each index among community-dwelling Japanese men.</p> <p><b>Methods:</b> We cross-sectionally assessed carotid IMT using ultrasound in 944 community-dwelling Japanese men free of stroke and myocardial infarction. CT image at the L4-5 level was obtained to compute areas of visceral adipose tissue (VAT) and subcutaneous adipose tissue (SAT). We defined adipose tissue within the inside edge of the abdominal wall as VAT, and defined that outside the area of the abdominal wall not including muscular fascia as SAT. Area of abdominal total adipose tissue (TAT) was calculated using the sum of areas of VAT and SAT. VAT-to-SAT ratio (VSR) and VAT-to-TAT ratio (VTR) were also calculated. Anthropometric measures assessed included body mass index (BMI), waist circumference (WC), waist-to-hip ratio (WHR), and waist-to-height ratio (WHtR). IMT of the common carotid artery, carotid bulb and internal carotid artery on both right and left sides was measured using the ultrasound device, and the average of the former IMT values was eventually used as carotid IMT in this study. In single-index analyses, we estimated the crude and adjusted slopes of carotid IMT per 20th to 80th percentile of each single obesity index using linear regression.</p>			

- (備考) 1. 論文内容要旨は、研究の目的・方法・結果・考察・結論の順に記載し、2千字程度でタイプ等を用いて印字すること。  
2. ※印の欄には記入しないこと。

In BMI-adjustment analyses, we constructed models including both BMI and one of the other 7 indices to test if the association of an index was independent of BMI. For the analysis of single adjustment and of BMI-adjustment, we constructed four models as follows: unadjusted model; Model 1, adjusted for age and CT type; Model 2, Model 1 with further adjustment for lifestyle risk factors of alcohol intake and smoking; and Model 3, Model 2 with further adjustment for metabolic risk factors of hypertension, diabetes, and dyslipidemia. A value of  $P < 0.05$  was considered statistically significant.

**Results:** In the single-index analyses, obesity indices other than VSR and VTR showed significant positive associations with carotid IMT after adjusting for age, CT-type, alcohol intake and smoking (Models 1, 2). Further adjustment for hypertension, diabetes and dyslipidemia (Model 3) attenuated the associations, but the slopes remained significant for all indices except VSR and VTR. Throughout the multivariable-adjusted models, associations of CT-based obesity indices were no stronger than those of anthropometric indices, and BMI showed the strongest association with carotid IMT. For example, adjusted slopes (in  $\mu\text{m}$ ) per 20th-80th percentiles of BMI, WC, WHR, WHtR, VAT area, and SAT area were 38.3, 33.6, 29.7, 35.5, 29.5, and 22.8, respectively, in Model 3. In BMI-adjustment analyses, none of the other 7 indices remained statistically significant in Models 2 and 3. In contrast, the association of BMI remained statistically significant even with simultaneous adjustment for any CT-based index in Models 2 and 3.

**Conclusions:** In community-dwelling Japanese men, anthropometric obesity indices, BMI in particular, were more strongly associated with carotid atherosclerosis than CT-based obesity indices. The association of general obesity with carotid atherosclerosis was strong and adding CT-based obesity measure did not influence much in the association.

## 学位論文審査の結果の要旨

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<p>(学位論文審査の結果の要旨) ※明朝体 11ポイント、600字以内で作成のこと</p> <p>動脈硬化と腹部内臓脂肪との関連が指摘され、頸部頸動脈の IMT が動脈硬化進展のマーカーとなることが報告されている。本論文では、Shiga Epidemiological Study of Subclinical Atherosclerosis (SESSA) のコホート (2006 年から 2008 年に集積した草津市在住の 40 歳～79 歳の一般男性で研究参加を承諾した心筋梗塞や脳卒中の既往のない集団) 944 名を用い、腹部 CT で計測される指標である内臓脂肪 (VAT)、皮下脂肪 (SAT)、腹部全脂肪 (TAT)、VAT to SAT 比 (VSR)、VAT to TAT 比 (VTR)、体格測定で算出される指標である BMI、Waist circumference (WC)、Waist to hip 比 (WHR)、Waist to height 比 (WHtR) と超音波検査で計測される頸部頸動脈の IMT との相関を横断的に解析し、以下の点を明らかにした。</p> <ol style="list-style-type: none"> <li>1) 本研究で使用した集団の年齢、BMI の中央値は 64.4 歳、23.3 kg/m<sup>2</sup> で、高血圧、糖尿病、脂質異常症の割合はそれぞれ 54.0%、18.1%、55.5%、頸動脈 IMT の中央値は 816 μm であった。</li> <li>2) 体格測定で算出される指標は VSR、VTR 以外では年齢、アルコール摂取歴、喫煙量、高血圧、糖尿病、脂質異常症などの多因子を調整しても頸動脈 IMT と相関し、特に BMI と IMT との相関が最も強く見られた。</li> <li>3) 年齢階層別では 65 歳未満において体格測定で算出される指標と頸部頸動脈 IMT との相関が強かったが有意ではなかった。</li> <li>4) CT で計測される指標では VAT、SAT と頸部頸動脈 IMT との相関が見られたが、体格測定で算出される指標ほど強くはなかった。</li> </ol> <p>本論文は、動脈硬化における肥満に関する体格測定指標の意義について新たな知見を与えたものであり、また最終試験として論文内容に関連した試問を実施したところ合格と判断されたので、博士 (医学) の学位論文に値するものと認められた。</p> <p style="text-align: right;">(総字数 597 字) (令和元年 8 月 27 日)</p>			