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ORIGINAL ARTICLE

Comparison of anthropometric measurements associated with the risk of endoscopic erosive esophagitis: A cross-sectional study

Jae Keun Park[a,1], Yaeji Lim[b,1], Hyuk Lee[a,*], Tae Jun Kim[a,c], Yoon-Ho Choi[a,c], Yang Won Min[a], Byung-Hoon Min[a], Jun Haeng Lee[a], Poong-Lyul Rhee[a], Jae J. Kim[a]

[a] *Department of Medicine, Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, Republic of Korea*
[b] *Department of Statistics, Pukyong National University, Pusan, Republic of Korea*
[c] *Center for Health Promotion, Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, Republic of Korea*

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KEYWORDS
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Summary
Background: In this cross-sectional study, we assessed five anthropometric measurements to determine the most reliable indicator of the erosive esophagitis (EE) risk: body mass index (BMI), waist circumference (WC), waist to height ratio (WHtR), a body shape index (ABSI), and body roundness index (BRI).
Methods: This study included 182,407 participants who underwent an esophagogastroduodenoscopy as part of a routine health check-up. We used the area under the receiver-operating characteristic curve (AUC) to assess the discriminatory power of each anthropometric measure as an indicator of EE risk.
Results: The prevalence of EE increased per quartile for all five anthropometric measurements in patients of both sexes (1 st quartile vs. 4th quartile, all $P < 0.05$). ABSI had the lowest AUCs for EE in both sexes (AUC: 0.524, 95% CI: 0.519–0.529 for male patients; AUC: 0.524, 95% CI: 0.513–0.535 for female patients). In contrast, BRI was the best predictor of EE in male patients (OR: 2.095, 95% CI: 1.982–2.215, $P < 0.0001$), and WC was the best predictor of EE in female patients (OR: 2.028, 95%

* Corresponding author at: Department of Medicine, Samsung Medical Center, Sungkyunkwan University School of Medicine, 81 Irwon-ro, Gangnam-gu, Seoul 06351, Republic of Korea. Fax: +822 3410 6983.
E-mail address: leehyuk@skku.edu (H. Lee).
[1] First two authors contributed equally to this study.

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CI: 1.785—2.307, $P < 0.0001$). WC showed the highest AUC values for EE in both male patients (AUC: 0.571, 95% CI: 0.566—0.576) and female patients (AUC: 0.596, 95% CI: 0.585—0.608).

Conclusions: BRI and WC were the most relevant indicators of EE risk in male and female patients, respectively. ABSI was the least reliable indicator of EE risk in patients of both sexes.

Introduction

Erosive esophagitis (EE), a condition that involves inflammation and ulceration of the esophagus, is one of the most common symptoms of gastroesophageal reflux disease (GERD). Previous epidemiological studies have revealed that the prevalence of reflux symptoms in patients with GERD is between 10% and 30% in Western countries, and less than 5% in Asian countries [1,2]. EE is associated with multifactorial etiologies such as esophageal mucosal resistance, gastroesophageal reflux, volume and composition of gastric contents, contact time with the refluxed material, the degree of incompetence of the intrinsic lower esophageal sphincter, and the presence of a sliding hiatus hernia [3]. Patients with EE have an increased risk of Barrett's esophagus and esophageal adenocarcinoma [4]. Therefore, it is important to identify individuals who are at high risk for EE, in order to develop effective preventive measures.

A recent study indicated the existence of a relationship between obesity and GERD [5—7]. One recent meta-analysis reported a strong association between body mass index (BMI) and EE in females [8]. The World Health Organization (WHO) has defined obesity as a body mass index (BMI) $\geq$30 [9]. The use of BMI as a surrogate marker for obesity remains controversial because it does not distinguish between fat and muscle. Moreover, it does not reflect an individual's fat distribution [10,11]. Therefore, waist circumference (WC) and waist-to-height ratio (WHtR) have been suggested as alternative obesity indices that can overcome the limitations of BMI, and numerous studies have confirmed that they are superior to BMI as indicators of risk for mortality, cardiovascular disease (CVD), and cardiometabolic diseases, including diabetes mellitus (DM) [12—20].

Recently, two new body indices have been developed: a body shape index (ABSI) and body roundness index (BRI) [21,22]. Studies have found that, compared with BMI, ABSI is a better of biochemical parameters that indicate disturbed metabolic processes in young and healthy sedentary men [23,24]. Other studies have also found that ABSI can prospectively predict morbidity and mortality [25,26]. However, compared with BMI, ABSI is a weaker predictor of CVD [27]. To date, no studies have investigated the relationship between these five anthropometric indices and EE induced by GERD, which is closely related to obesity.

Therefore, we conducted a cross-sectional study to determine which of these five anthropometric measurements (ABSI, BMI, BRI, WC, and WHtR) was the most relevant index for identification of individuals with EE.

Materials and methods

Ethical considerations

The informed consent requirement for this study was exempted by the institutional review board because researchers only accessed the database for analysis purpose, and personal information was not accessed. This study was approved by the institutional review board at the Samsung medical center.

Study sample and data collection

This cross-sectional study included 182,407 participants (103,172 male and 79,235 female patients) who underwent esophagogastroduodenoscopy as a part of a routine health check-up at the health promotion center at the Samsung medical center in Seoul, South Korea between January 2010 and December 2014. Of these 182,407 participants, 17,664 (13.4%) received a diagnosis of EE: 15,059 (85.3%) were male and 2605 (14.7%) were female. The mean age of the participants was 52.4 years [standard deviation (SD) $\pm$11.0 years; range 16—94 years]. All participants were requested to complete a structured questionnaire with questions regarding smoking history, drinking history, and physical activity.

Lifestyle factors

Information on covariates such as age, height, BMI, waist, sex, and lifestyle (alcohol intake, physical activity, smoking, and exercise) was collected by a gastroenterologist and trained nurses who administered a standard questionnaire in a face-to-face interview. Prior to conducting the survey, all eligible investigators were invited to attend a training session that covered topics such as the purpose of the study, how to administer the ques-

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