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Sarcopenia: a new predictor of postoperative complications for elderly gastric cancer patients who underwent radical gastrectomy

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ABSTRACT

Background: A geriatric assessment is needed to identify high-risk elderly patients with gastric cancer. However, the current geriatric assessment has been considered to be either time-consuming or subjective. The present study aimed to investigate the predictive effect of sarcopenia on the postoperative complications for elderly patients who underwent radical gastrectomy.

Materials and methods: We conducted a prospective study of patients who underwent radical gastrectomy from August 2014 to December 2015. Computed tomography–assessed lumbar skeletal muscle, handgrip strength, and gait speed were measured to define sarcopenia.

Results: Sarcopenia was present in 69 of 240 patients (28.8%) and was associated with lower body mass index, lower serum albumin, lower hemoglobin, and higher nutritional risk screening 2002 scores. Postoperative complications significantly increased in the sarcopenic patients (49.3% versus 24.6%, $P < 0.001$), compared with nonsarcopenic patients. The multivariate analysis demonstrated that sarcopenia (odds ratio: 2.959, 95% CI: 1.629–5.373, $P < 0.001$) and the Charlson comorbidity index ≥ 2 (odds ratio: 3.357, 95% CI: 1.144–9.848, $P = 0.027$) were independent risk factors for postoperative complications.

Conclusions: Sarcopenia, presented as a new geriatric assessment factor, was a strong and independent risk factor for postoperative complications of elderly patients with gastric cancer.

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Introduction

Gastric cancer is the fourth most common malignancy and the third leading cause of death worldwide.¹ As the world population ages and lifespans increase, the number of elderly patients with gastric cancer has been increasing significantly.² Surgical resection remains the most effective therapy for potentially curable gastric cancer.³ However, surgeons sometimes hesitate to perform surgery on elderly patients due to the high frequency of complications and poor survival rates associated with aging.^{4,5} Recently, some reviews confirmed that chronological age alone was not an independent predictor of postoperative complications and highlighted the importance of geriatric assessment to identify high-risk patients.^{6,7}

The American Geriatrics Society published a practice guideline for optimal preoperative assessment of geriatric surgical patients, including cognitive/behavioral disorders, cardiac evaluation, pulmonary evaluation, functional/performance status, frailty, nutritional status, medication management, patient counseling, and preoperative testing.⁸ However, this assessment seems time-consuming and may be infeasible in a busy surgical practice.⁶ Specific items such as deficiencies in activities of daily living, depression, decreased cognition, and frailty were believed to be the most robust predictors of postoperative complications among the surgical oncology population.⁶ Regrettably, these items were considered to be subjective and relatively cumbersome.^{9,10}

Sarcopenia, is an age-related syndrome, characterized by progressive and generalized loss of skeletal muscle mass and strength.¹¹ In recent years, sarcopenia has been gradually recognized to be associated with a negative prognosis after colorectal,¹² pancreatic,¹³ hepatic,¹⁴ and gastric surgery.¹⁵ However, most of these studies defined sarcopenia as reduced skeletal muscle mass alone, ignoring the importance of skeletal muscle function.¹⁶ Moreover, patients of all ages were included in these studies. It seems more meaningful to explore the predictive effect of sarcopenia among elderly patients undergoing oncological surgery, as sarcopenia is an age-related syndrome.

In this prospective study, we assessed both skeletal muscle mass and function to define sarcopenia, aiming to investigate the predictive effect of sarcopenia on the postoperative complications for elderly patients who underwent radical gastrectomy.

Materials and methods

Patients

From August 2014 to December 2015, all patients who underwent gastric cancer surgery at our department were included in this prospective study. The inclusion criteria included patients who were aged ≥ 65 y, had American society of anesthesiology (ASA) grade \leq III, planned to receive elective radical gastrectomy for gastric cancer, and had preoperative abdominal CT scans available for review. Exclusion criteria included those patients with a physical deformity, who were

unable to be tested for muscle strength or physical performance, and those who underwent palliative surgery. Radical gastrectomy was performed by specialized surgeons according to the Japanese gastric cancer treatment guidelines.¹⁷ All patients were given written informed consent for participation in this study, and the study was approved by the ethics committee of The First Affiliated Hospital of Wenzhou Medical University.

Data collection

All data were collected prospectively and maintained in a digital database. For each patient, the data were collected by trained surgeons (F.M.Z., F.Y.Z., and X.L.C.), and discrepancies were solved by referring to an adjudicator (C.L.Z.). Surgeons were trained by experienced surgeons until they were skilled and precise enough in data collection (judged by the experienced surgeons), and the original experienced surgeon was C.L.Z., who was the designer of this study. The following parameters were recorded: (1) clinicopathological features, including age, gender, body mass index (BMI), plasma albumin concentration (a plasma albumin concentration < 35 g/L was defined as hypoproteinemia), hemoglobin concentration (a hemoglobin concentration < 120 g/L for men and < 110 g/L for women were defined as anemia), comorbidity (assessed by the Charlson comorbidity index¹⁸), ASA grade, nutritional risk screening (NRS) 2002 scores, sarcopenia, previous abdominal surgery, histologic type, tumor location, tumor-node-metastasis (TNM) tumor stage, epidural use, laparoscopic-assisted surgery, type of resection, extent of node dissection, type of reconstruction, and combined resection and surgical durations; (2) postoperative outcomes, including postoperative mortality (within 30 d after the operation), hospital stays, complications (within 30 d after the operation), hospital costs, and readmissions within 30 d of discharge. Complications classified as grade II or above according to the Clavien-Dindo classification¹⁹ were analyzed in this study.

Diagnosis of sarcopenia

A cross-sectional CT image at the inferior aspect of the third lumbar vertebra (L3) was selected for estimating muscle mass, as described previously.¹⁵ To minimize measurement bias, one trained investigator (F.M.Z.) identified and measured muscle area using a dedicated processing system (version 3.0.11.3 BN17 32 bit; INFINITT Healthcare Co, Ltd). Muscle areas computed from each image were normalized for height (m^2) to obtain the third lumbar vertebra skeletal muscle index (L3 SMI, cm^2/m^2).

Handgrip strength was measured as reported previously.²⁰ Briefly, patients were asked to grip the electronic hand dynamometer (EH101; CAMRY, Guangdong Province, China) with their dominant hand with all their strength. Physical performance was evaluated using the 6-meter usual gait speed. Participants stood with their feet behind a starting line and started walking following the examiner's instructions. Timing started with the first foot fall and stopped when the patient's first foot completely crossed the 6-m end line.²¹ The two tests were conducted once patients were hospitalized,

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