Editorial

How does Surgical Apgar Score predict the short-term complications and long-term prognosis after esophagectomy?

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The incidence of esophageal cancer is increasing steadily, which is now the eighth most common malignancy, and its annual amounts have reached nearly half a million (1). Surgical treatment is the cornerstone of curative therapy for esophageal cancer, while this procedure is associated with significant severe complications, whose mortality rate would be the highest among all gastrointestinal surgeries (2). To better the treatment outcomes of esophageal malignancy, Akio Nakagawa and his colleagues provided evidence that the Surgical Apgar Score (SAS) predicts short-term complications and long-term prognosis after an esophagectomy (3). In this study, the sum of the scores of estimated blood loss, lowest mean arterial pressure, and lowest heart rate defined the SAS. A total of 400 patients received surgical treatment were taken into account. Complications achieved the grade-3 level according to the Clavien-Dindo classification, which had occurred in 145 of the cases (36%), which contained 8 cases of surgical mortality, 2 cases of pneumonia, 1 case of an anastomotic leak and 1 case of bronchial fistula. The occurrences of complications were significantly associated with hypertension, thoracotomy, a SAS of less than 5, age (older than 65 years), diabetes, and reconstruction route. Multivariate analysis showed that a SAS of ≤5 was significantly associated with pulmonary and gastrointestinal complication.

Moreover, the survival of patients with cStage 2, 3, or 4 diseases was substantially lower when the SAS was lower than 5 (43.0% *vs.* 59.7%, P=0.027). As more significant blood loss tended to cause higher heart rates and lower blood pressure, blood loss might be the essential part of determining SAS. Thus, the reason why SAS could predict the incidence of complications and survival after esophagectomy might be attributed mainly to intraoperative blood loss.

It has been reported that postoperative complications lead to a worse prognosis in esophageal cancers (4,5). As Booka *et al.* said (6), pulmonary infections had a significant negative impact on overall survival (P=0.035), which also had been revealed by multivariate analysis [hazard ratio (HR) 1.456; 95% CI, 1.020–2.079, P=0.039], while anastomotic leakage and recurrent laryngeal nerve paralysis did not affect the survival of patients. Moreover, Baba *et al.* (7) also reported that patients with pneumonia had a worse long-term prognosis than those without pulmonary infections (HR 1.60, 95% CI, 1.05–2.38, P=0.029). However, surgical site infection, recurrent nerve paralysis, cardiovascular complications, and anastomotic leakage were not in close connections with the long-term prognosis. In the research of Nakagawa *et al.* (3), thoracotomy (P=0.018), and SAS ≤5 (P=0.01) were in close connection with respiratory complications in the multivariate analysis. Compared with a minimally invasive esophagectomy, thoracotomy tended to gain a higher pain score and result in a more significant blood loss (8). Moreover, the serum C-reactive protein (CRP) level was significantly correlated with intraoperative

blood loss, and postoperative complications (9). The preoperative inflammatory response, evaluated by CRP, was reported to increase postoperative recurrence and lead to a reduced survival for various types of cancers (10,11). CRP as well as other serum cytokines or various growth factors, which were combined with systemic inflammation, could lead to proliferation, survival, and migration of cancer cells and even affect the long-term prognosis for the patients (12).

While it is more vulnerable when anastomotic leak might happen, a cervical anastomosis is often adopted for reconstruction after esophagectomy. Although several factors, such as preoperative nutritional status, reconstructed route, and technique of anastomosis, might lead to leakage, ischemia of gastric conduit could be the decisive one (13). Koyanagi *et al*. (14) used indocyanine green fluorescence to assess blood flow speed of the gastric tube, which showed that the blood flow speed was not associated with the connection of arterial arch but intraoperative blood loss. Once the intraoperative blood loss caused temporary lower blood pressure, ischemia or even leakage might occur. Nakagawa *et al*. (3) also reported that a SAS of ≤5 (P=0.035) was significantly correlated with gastrointestinal complication.

Improved perioperative management, skilled surgical techniques, and careful postoperative care have reduced the mortality and morbidity rates, especially in high volume centers (15). As treatment has evolved, the demand for proper meaningful prognostic tools is nonnegligible. A prognostic tool based on the accurate prediction of short-term complications and long-term prognosis in patients with esophageal carcinoma helps surgeon choose optimal treatment. However, the quality of a useful device should be examined by some model performance measures, including calibration, discrimination, and clinical usefulness (16). A calibration plot, which is summarized from the correspondence between outcomes and predictions, means calibration. And the ability how well a prediction model can distinguish those with the result from those without the result is defined as discrimination. Moreover, the usefulness of a prediction model is approved when better decisions are made with the model than without it. Although SAS has been proven to predict the complications and long-term survival rates after surgery, its calibration, discrimination, and clinical usefulness remain undefined.

The substantial benefit of this research revealed that SAS could predict short-term as well as long-term prognosis. However, if the calibration, discrimination, and clinical usefulness of the SAS could be further verified, this method could become more applicable.

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Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

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