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Comment on "Prognostic value of preoperative enhanced computed tomography as a quantitative imaging biomarker in pancreatic cancer"

Yang J *et al*. Quantitative imaging predicts PC prognosis

Abstract

Pancreatic ductal adenocarcinoma (PDAC) is one of the most lethal malignancies because of its high invasiveness and metastatic potential. Computed tomography (CT) is often used as a preliminary diagnostic tool for pancreatic cancer, and it is increasingly used to predict treatment response and staging. Recently, a study reported in *World Journal of Gastroenterology* that quantitative analysis of preoperative enhanced CT data can be used to predict postoperative overall survival in patients with PDAC. A tumor relative enhancement ratio of ≤ 0.7 indicates a higher tumor stage and poor prognosis.

Key Words: Pancreatic ductal adenocarcinoma; Computed tomography; Tumor relative enhancement ratio; Diagnostic imaging; Quantitative analysis; Prognosis

Yang J, Liu Y, Liu S. Comment on "Prognostic value of preoperative enhanced computed tomography as a quantitative imaging biomarker in pancreatic cancer". *World J Gastroenterol* 2022; In press

Core Tip: Pancreatic ductal adenocarcinoma (PDAC) is among the most lethal malignancies because of its high invasiveness and metastatic potential. The purpose of this letter is to highlight that a quantitative parameter based on enhanced computed tomography, namely the tumor relative enhancement ratio, can reveal the correlation between high malignant potential because of hypervascularity and poor prognosis in PDAC.

TO THE EDITOR

The stroma of pancreatic ductal adenocarcinoma (PDAC) is a fibroproliferative microenvironment mainly composed of fibroblasts, and its low vascular supply severely limits the tumor utilization of oxygen and nutrients[1,2]. In such a situation, invasion into fertile tissue becomes an acquired behavior of the tumor in response to severe metabolic stress[3,4]. We were extremely interested in a retrospective study by

Gao *et al*[5] published in the June 2022 issue of *World Journal of Gastroenterology*. This was a moderate-quality observational study with a Newcastle-Ottawa Quality Assessment Scale score of 6 (3, 1, 2)[6] that was assessed independently by two of our authors. The importance of this study was that it revealed the ability to predict the overall survival of patients with resectable pancreatic cancer (PC) from an imaging perspective, providing assistance in developing early treatment plans and improving patient prognosis. Gao *et al*[5] initially found that enhanced computed tomography (CT) characterizing vascular perfusion could be used as a quantitative imaging biomarker (QIB) of the malignant potential of PC. Based on this innovative idea and combined with data analysis, the authors demonstrated the value of QIB for predicting the prognosis of patients with PC. In addition, the authors proposed some new concepts to calculate the difference between the region of the overall tumor of the portal venous (PV) phase and that of the non-enhancement phase as the tumor enhancement amplitude (TEA), and the difference between the pancreatic tissue outside the tumor of the PV phase and that of the non-enhancement phase was used as the pancreatic enhancement amplitude outside the tumor (PEA)[5]. The tumor relative enhancement ratio (TRER) was then derived as TEA/PEA. Based on a retrospective analysis of 67 patients with resectable PC, the conclusions drawn by the authors properly summarize the data in the study. Furthermore, this study provides the unique insight that preoperative enhanced CT is a simple and effective predictive tool for overall survival in patients with PDAC and highlighted the need for close monitoring of patients with TRER ≤ 0.7 because their prognosis is likely to be poor. We would like to thank Gao *et al*[5] for this study, which helped to advance clinical diagnosis and treatment.

In recent years, QIB has become more widely used in clinical practice because the objective features obtained from *in vivo* images measured on a scale of proportions or intervals can serve as indicators of normal biological processes, pathogenic processes, or responses to therapeutic interventions[7]. We therefore use an open multidisciplinary citation analysis database based on artificial intelligence techniques termed *Reference Citation Analysis*. We used "quantitative imaging biomarker" and "pancreatic cancer" as

search terms to find the most recent (last 5 years) and relevant cutting-edge research. Overall, the application of QIB is mainly combined with a clinical perspective, and it plays an important role in characterizing tissue, detecting disease, identifying phenotypes, defining longitudinal changes, or predicting outcomes[7]. As previously mentioned, the highly invasive and metastatic nature of PC makes the search for prognostic biomarkers with high accuracy challenging. Numerous studies developed different QIB models that, in addition to characterizing microvascular density[8], significantly compensate for the survival prediction rate of clinical models[9] and contribute to clinical decision making. Next, we provide a brief analysis of PC survival prediction based on the study by Gao *et al*[5] and in the context of the current state of research.

At present, radiomics research concerning the prediction of the prognosis of resectable PC mainly focuses on the analysis of tumor texture features on CT images[10,11]. Low-attenuation radiomic features of tumors are associated with poorer survival[12,13]. In addition, current radiomics data suggest that first-order entropy is associated with overall survival in PDAC patients and can significantly improve prediction accuracy[14]. Gao *et al*[5] revealed that PDAC hypervascularity was positively associated with poorer survival based on a quantitative analysis of vascular perfusion imaging, which is consistent with the aforementioned low blood supply of highly invasive PDAC[1,2]. In addition, TRER is calculated using CT, which is simple and more easily accepted by clinicians and supports its strong practicability.

We are extremely concerned about the study of PDAC invasion and metastasis because high invasion and metastasis are the characteristics of PDAC itself[15]. Several current radiomics studies identified several predictors of survival following treatment in patients with unresectable or advanced PDAC, including the mean value of positive pixels and kurtosis[16], age and homogeneity on unenhanced CT[17], skewness[18], and cluster tendency with a square root filter[19]. Gao *et al*[5] cited several limitations, including the absence of patients with metastasis. We anticipate future research by Gao *et al*[5] on the use of TRER based on enhanced CT to predict the treatment response and

survival of patients with metastatic PDAC after treatment, which will bring great benefits concerning the diagnosis and treatment of patients. In conclusion, quantitative analysis based on enhanced CT imaging (TRER) has good acceptability and utility for predicting the prognosis and survival of patients with PDAC.

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