Editorial Commentary

Sarcopenia's increasingly vital role in liver cancer

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In recent years, a growing number of studies have reported on the application value of sarcopenia in the treatment and management of patients with liver cancer. Sarcopenia is a progressive and widespread skeletal muscle disorder characterized by a rapid decline in both muscle mass and function (1). Previous studies have predominantly focused on the issue of sarcopenia in patients awaiting liver transplantation and those with liver cirrhosis (2,3). Recent research has revealed that the pooled prevalence of sarcopenia in patients with hepatocellular carcinoma (HCC) is as high as 41.7%, and nearly half of the patients suffer from sarcopenia (4). The mechanisms underlying sarcopenia in liver cancer patients remain unclear, potentially due to the complex liver-muscle interplay. Sarcopenic patients show upregulation of CHI3L1 in skeletal muscle, which activates the TNF-α/TNF-R1 pathway for muscle protection but simultaneously promotes HCC progression through lipid peroxide (LPO) accumulation (5,6). Furthermore, sarcopenia serves as a powerful predictor for the prognosis of patients with HCC. For HCC patients with middle and advanced stage liver cancer who have undergone hepatectomy, sarcopenia is an independent prognostic factor in patients with advanced HCC, and it is associated with a lower survival rate (7). Compared to non-sarcopenic counterparts, these sarcopenic patients not only experience a higher incidence of complications but also demonstrate elevated 90-day mortality, increased readmission rates, and extended hospital stays (8). Furthermore, sarcopenia can also predict the drug response, systemic inflammation and median progression-free survival of HCC patients after receiving immunotherapy (9). However, in the realm of clinical practice, sarcopenia has received relatively scant attention. To date, it has not been incorporated into the nutritional management framework for patients. Moreover, there exists a paucity of research focusing on the predictive factors associated with sarcopenia as well as the accuracy of diverse diagnostic methods.

The principal indicators for diagnosing sarcopenia are the diminution of skeletal muscle quantity and quality. Presently, in the diagnosis of sarcopenia among HCC patients, computed tomography (CT) is predominantly employed to identify the skeletal muscles at the level of the third lumbar vertebra. CT is recognised by European and Asian working groups as the gold standard for non-invasive quantification of muscle mass. However, discrepancies exist in the demarcation of the standard range of skeletal muscles across different studies. Some studies adopt the psoas major index standardized by height, while more studies prefer to utilize the skeletal muscle mass index (SMI). It is noteworthy that varying approaches to defining the range of skeletal muscles are highly likely to affect the accuracy of sarcopenia diagnosis. Among these, the SMI is the index that is most frequently utilized. Regarding its cutoff values, variations are also observed among different studies. Currently, the criterion recommended SMI <42 cm^2/m^2 for men and <38 cm^2/m^2 for women by the Japanese Society of Hepatology is more prevalently adopted. This criterion eliminates the constraints imposed by age on the assessment and is capable of more effectively reflecting the characteristics of the disease. Nevertheless, certain studies prefer to adopt the optimal cut-off values derived from their respective datasets or use the body mass index

(BMI) to conduct further standardization and classification procedures on the SMI. Evidently, the determination of the optimal SMI cutoff values for accurately diagnosing sarcopenia still awaits further in-depth investigation. Multicenter prospective registries should be designed to establish the optimal cutoff values of sarcopenia in HCC patients.

Moreover, in light of the significant influence of sarcopenia on the prognosis of HCC patients, the accurate identification and prediction of its occurrence are of paramount importance. Nevertheless, at present, the majority of studies have centered on the incidence of sarcopenia among liver cancer patients and its correlation with prognosis, while the risk factors for sarcopenia in HCC patients remain ambiguous. Through the organic integration of artificial intelligence (AI) and imaging modalities, and by capitalizing on its potent data processing and image analysis capabilities, it becomes possible to conduct in-depth exploration of the characteristic information related to sarcopenia embedded within imaging data. Recently, some research is exploring the development of image-based automated deep learning platforms for sarcopenia assessment in head and neck cancer. Simultaneously, it is also exploring AI-assisted body composition evaluation through CT imaging to facilitate sarcopenia diagnosis. These studies have demonstrated the feasibility of AI applications in sarcopenia identification and assessment. However, prior to clinical translational application, strict guidelines and comparative studies are still needed to evaluate the effectiveness of AI segmentation models (10). This not only serves to compensate for the existing deficiencies in precise identification but also furnishes a reliable foundation for subsequent clinical interventions, enabling us to implement corresponding measures in the early stage of the disease, which holds positive implications for improving patients' prognosis. On the basis of successfully realizing early warning and precise identification, we can further explore the application value of integrating it with nutritional indicators. In the course of immunotherapy for liver cancer patients, nutritional management constitutes a crucial component. And sarcopenia is closely intertwined with the nutritional status of patients. By combining other nutritional indicators, the prediction of the prognosis of patients with HCC may be more accurate

Therefore, attaching importance to the role that sarcopenia plays in the treatment of patients with HCC, and precisely identifying and preventing it are not only conducive to the nutritional management of patients but also beneficial for improving the survival period and quality of life of HCC patients after undergoing surgeries, immunotherapies and other treatments, and ultimately improving the adverse health-related outcomes of patients and realize patient-centered precision management.

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References

1. Cruz-Jentoft AJ, Sayer AA. Sarcopenia. Lancet 2019;393:2636-46.
2. Wen Z, Tuo S, Liu Y, et al. Validating the prognostic value of muscle changes in patients with cirrhosis undergoing transjugular intrahepatic portosystemic shunt. Hepatobiliary Surg Nutr 2024;13:1010-4.

3. Ran S, Yao J, Liu B. The association between sarcopenia and cirrhosis: a Mendelian randomization analysis. Hepatobiliary Surg Nutr 2023;12:291-3.
4. Guo Y, Ren Y, Zhu L, et al. Association between sarcopenia and clinical outcomes in patients with hepatocellular carcinoma: an updated meta-analysis. Sci Rep 2023;13:934.
5. Lu D, Lin Z, Wang R, et al. Multi-omics profiling reveals Chitinase-3-like protein 1 as a key mediator in the crosstalk between sarcopenia and liver cancer. Redox Biol 2022;58:102538.
6. Hsu HC, Chow LH, Chen YL, et al. Effects of exercise and nutrition in improving sarcopenia in liver cirrhosis patients: a systematic review and meta-analysis. Hepatobiliary Surg Nutr 2025;14:33-48.
7. Utsumi M, Inagaki M, Kitada K, et al. Predictive values of sarcopenia and systemic inflammation-based markers in advanced hepatocellular carcinoma after hepatectomy. Asian J Surg 2024;47:3039-47.
8. Berardi G, Antonelli G, Colasanti M, et al. Association of Sarcopenia and Body Composition With Short-term Outcomes After Liver Resection for Malignant Tumors. JAMA Surg 2020;155:e203336.
9. Scheiner B, Lampichler K, Pomej K, et al. Transversal psoas muscle thickness measurement is associated with response and survival in patients with HCC undergoing immunotherapy. Hepatol Commun 2023;7:e0261.
10. Bedrikovetski S, Seow W, Kroon HM, et al. Artificial intelligence for body composition and sarcopenia evaluation on computed tomography: A systematic review and meta-analysis. Eur J Radiol 2022;149:110218.

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