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## Letter to the Editor

# Letter regarding “Impacts of muscle mass dynamics on prognosis of outpatients with cirrhosis”

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**Keywords:** Sarcopenia; Cirrhosis; Prognosis

Dear Editor,

Sarcopenia refers to progressive decline in skeletal muscle, function, and strength with advancing age.<sup>1</sup> Sarcopenia is also highly prevalent in patients with cirrhosis,<sup>2,3</sup> and the development of sarcopenia in cirrhosis is considered to be associated with systemic inflammation.<sup>4,5</sup> In addition, sarcopenia has been reported to be associated with adverse clinical outcomes, such as cirrhotic complications, waitlist mortality, and post-transplantation mortality.<sup>3,6,7</sup> For these reasons, the importance of assessment of sarcopenia in patients with cirrhosis is being emphasized.<sup>8-10</sup> However, there are few studies on the association between changes in sarcopenia and the prognosis of cirrhosis. Thus, we read with great interest the article of Kim et al.,<sup>11</sup> which described that the change in muscle mass was a good predictor of the development of cirrhotic complications independent of liver function. However, it is still necessary to consider some of the issues that were not mentioned by Kim et al.<sup>11</sup>

Firstly, sarcopenia has sex-specific differences. Sex-specific cutoff values are used to define sarcopenia,<sup>8</sup> and the prevalence of sarcopenia is higher in male patients than in female

patients with cirrhosis.<sup>3</sup> In addition, some studies have reported that the impact of sarcopenia on clinical outcomes could differ between male and female.<sup>2,12</sup> The sex-specific differences of sarcopenia might be caused by sex hormones, such as testosterone.<sup>13</sup> The rate of muscle mass reduction and the impacts of muscle mass reduction on the prognosis could vary by gender. Kim et al.<sup>11</sup> described that male patients had higher prevalence of sarcopenia compared to female patients, and the changes in muscle mass significantly predicted the development of complication of cirrhosis in both sex groups. However, it should be considered that change in muscle mass may not be an independent prognostic factor after adjusting Child-Pugh and Model for End-stage Liver Disease scores, if stratified by sex.

Secondly, the lifestyle of cirrhotic patients should be considered. In the study of Kim et al.,<sup>11</sup> alcohol-related liver disease accounted for 21.0% of all patients, and was the second most common etiology. In addition, alcohol-related liver disease was an independent risk factor for the development of complication. However, there was no description of alcohol use after enrollment. With regard to alcohol-related liver disease, hepatic dysfunction may cause sarcopenia, and alcohol

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can also cause sarcopenia directly or by its metabolites.<sup>14</sup> Ongoing alcohol use after enrollment might be directly associated with the development of cirrhotic complications. The other lifestyle factors to consider are nutrition and physical activity. Malnutrition is frequently observed in patients with cirrhosis by multifactorial etiologies, such as inadequate dietary intake, ascites, gastroparesis, hormonal change, and altered metabolism.<sup>15</sup> In addition, reduced exercise capacity and impaired physical performance are commonly observed in patients with cirrhosis.<sup>16</sup> Physical inactivity might lead to sarcopenia in cirrhotic patients, as physical activity and exercise are anabolic stimuli that can improve the muscle protein balance, reducing the protein loss and increasing the muscle mass and contractile function.<sup>16</sup> Therefore, it is necessary to consider factors such as alcohol abuse, diets, and physical activity of enrolled patients during the follow-up period.

Thirdly, the quality of muscle is important, as well as muscle mass. Muscle quality is associated with myosteatorosis, which refers to ectopic fat infiltration in muscle. Myosteatorosis is defined by lower mean skeletal muscle radiodensity on computed tomography (CT), and it is common in cirrhotic patients with prevalence of 16–82%. Myosteatorosis is independently associated with mortality and complications in patients with cirrhosis.<sup>17</sup> Since CT was used for muscle mass evaluation, assessing myosteatorosis would also be possible in the patients enrolled in the study by Kim et al.<sup>11</sup> Moreover, further analysis of myosteatorosis would provide additional prognostic information in cirrhotic patients.

In conclusion, we genuinely appreciate the valuable work of Kim et al.,<sup>11</sup> which demonstrated that the change in muscle mass is an independent prognostic factor in predicting the development of cirrhotic complications. However, consideration of other issues that can affect muscle mass and quality in cirrhotic patients will be more helpful in identifying patients with a poor prognosis.

### Authors' contribution

Concept of the work: D.S.S. and J.M.Y.; drafting article: D.S.S. and U.I.C.; critical revision of the article: J.M.Y

### Conflicts of Interest

The authors have no conflicts to disclose.

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### Abbreviation:

CT, computed tomography

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