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Research Paper

# Assessment of Daily Physical Activity in Patients with Type C Liver Cirrhosis

Medicine

**KEYWORDS :** liver cirrhosis; daily physical activity; exercise; hepatitis C virus; liver function

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## ABSTRACT

*Background/Aims: The liver plays an important role in energy metabolism. In particular, protein-energy malnutrition is a common finding in patients with liver cirrhosis. Analysis of the level of daily physical activity is therefore important in patients with liver cirrhosis. The purpose of this study was to investigate the level of daily physical activity and associations between daily physical activity and liver functions in patients with liver cirrhosis type C. Methodology: Subjects comprised 11 patients with liver cirrhosis type C (mean age, 70.0±9.8 years; Child A, 6 patients; Child B, 5 patients). Patients with moderate or severe physical disease were excluded. A physical activity monitor was used by all patients for 2 weeks to monitor values such as metabolic equivalents (METs), exercise (Ex; METs x hours), mean daily number of steps, and mean level of daily physical activity. Results: Although serum data for the Child B group showed no significant differences compared with the Child A group, the Child B group showed significant decreases in the frequency of an Ex level >3 METs mean daily number of steps and mean level of daily physical activity. In addition, serum albumin level showed a significant positive relationship with mean daily number of steps (r=0.717, p<0.05) and serum AST level displayed a significant negative correlation to Ex level >4 METs (r=-0.634, p<0.05). Conclusion: A decrease in daily physical activity was associated with decreased liver function, in the form of decreased serum albumin level and increased of serum AST level.*

## INTRODUCTION

The major cause of liver cirrhosis in Japan is viral hepatitis due to hepatitis B virus (HBV) or hepatitis C virus (HCV)1). Liver cirrhosis is an end-stage chronic liver disease, and the decrease in liver function impairs energy metabolism. In particular, protein-energy malnutrition (PEM) is a common finding in patients with liver cirrhosis2,3). PEM may lead to skeletal muscle atrophy. On the other hand, in the diagnostic criteria for sarcopenia proposed by the European Working Group on Sarcopenia in Older People in 20104), sarcopenia was categorized by cause as primary (age-related) or secondary (related to activity level and disease and nutritional states). Sarcopenias such skeletal muscle atrophy and decreased muscle strength occur in patients with liver cirrhosis5,6), suggesting associations with mortality5). In addition, physical inactivity and insufficient dietary intake have been reported to be associated with compensated viral liver cirrhosis7). Analysis of levels of daily physical activity in patients with liver cirrhosis is therefore important. The purpose of this study was to investigate levels of daily physical activity and associations between daily physical activity and liver function in patients with liver cirrhosis type C.

## METHODOLOGY

Subjects comprised 11 patients with liver cirrhosis type C (mean age, 70.0±9.8 years; Child A, 6 patients; Child B, 5 patients). Patients with moderate or severe physical disease were excluded. A physical activity monitor (acthymarker; Matsushita Electric Works, Osaka, Japan) was used by all patients for 2 weeks to monitor metabolic equivalents (METs), exercise (Ex; METs x hours), mean daily number of steps, and mean level of daily physical activity. Before participating in this study, the purpose, method and possible side effects were explained and informed consent was obtained from each patient.

### Laboratory evaluations

All patients were examined and prothrombin time, platelet count and levels of albumin, total bilirubin, aspartate aminotransferase (AST), and alanine aminotransferase (ALT) were measured.

### Statistical analysis

All statistical procedures were performed using commercially available software (Statview for Macintosh version 5.0). Results are expressed as mean ± standard deviation. Non-parametric methods (Mann-Whitney U test) were used for non-pairwise comparisons between each group. All reported p-values were two-sided and values of $p<0.05$ were considered significant.

## RESULTS

As shown in Table 1, background data did not differ significantly between Child A and Child B groups.

**Table 1.** Background data for patients with cirrhosis

| | Child A (n=6) | Child B (n=5) |
|---|---|---|
| Age (years) | 68.7 ± 13.0 | 71.6 ± 4.6 |
| Sex (M/F) | 4/2 | 2/3 |
| Weight (kg) | 62.0 ± 10.1 | 55.3 ± 14.4 |
| BMI (kg/m$^2$) | 23.8 ± 3.3 | 23.1 ± 4.6 |
| Alb (g/dl) | 3.9 ± 0.6 | 3.3 ± 0.3 |
| PT (%) | 75.8 ± 9.9 | 69.5 ± 5.0 |
| T-bil (mg/dl) | 1.0 ± 0.6 | 1.7 ± 0.7 |
| AST (IU/l) | 90.0 ± 59.3 | 67.8 ± 16.9 |
| ALT (IU/l) | 72.2 ± 46.3 | 39.4 ± 18.0 |
| PLT (×10$^4$/ul) | 11.5 ± 6.8 | 8.3 ± 2.5 |
| Basal energy expenditure (BEE) (kcal) | 1327.3 ± 160.7 | 1199.2 ± 221.0 |
| BEE/kg (kcal/kg) | 21.6 ± 1.3 | 22.2 ± 2.6 |
| Total energy expenditure (TEE) (kcal) | 1746.7 ± 214.5 | 1473.4 ± 273.5 |
| TEE/kg (kcal/kg) | 28.4 ± 2.5 | 27.4 ± 4.4 |

Although serum data for the Child B group showed no significant differences compared with those for the Child A group, the Child B group displayed significantly decreased Ex levels of >3 METs, 3-4 Mets (energy), 3-4 Mets/ kg body weight (BW), mean daily number of steps and mean level of daily physical activity.

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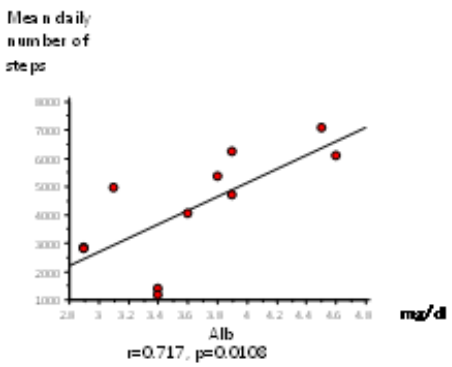
**Table 2. Comparison of physical activity between Child A and B**

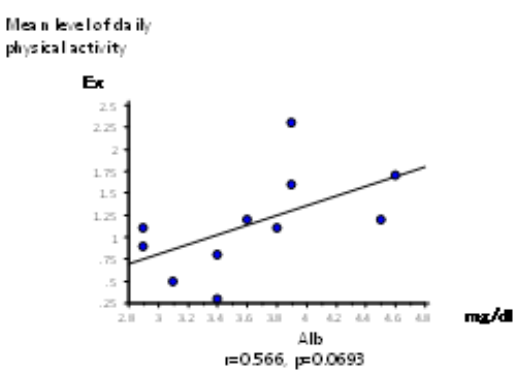
| | Child A | Child B |
|---|---|---|
| <3 Met/week (Ex) | 10.5±3.9 | 5.4±1.9* |
| >4 Met/week (Ex) | 0.7±0.5 | 1.2±0.4 |
| <3 Met (energy) | 352.0±79.8 | 244.2±87.6 |
| <3 Met/BW | 5.8±1.5 | 4.6±1.8 |
| 3-4 Met (energy) | 61.3±25.3 | 22.2±8.2* |

* p<0.05

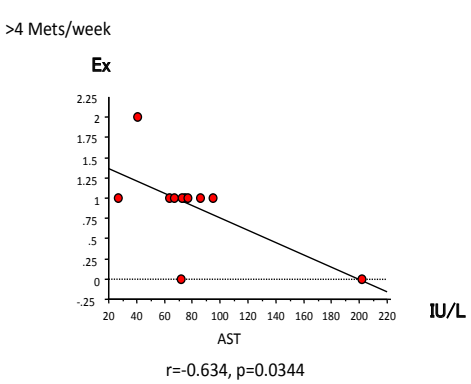
Abbreviations: BW, body weight; Ex, exercise

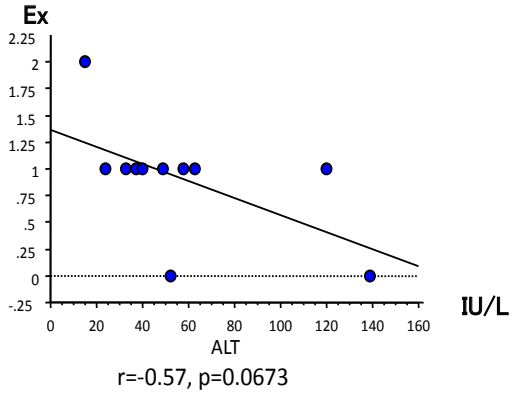
In addition, serum albumin level showed a significant positive correlation to mean daily number of steps (r=0.717, p<0.05) and a tendency toward a positive relation to mean level of daily physical activity (r=0.566, p=0.0693) (Fig. 1).




On the other hand, serum AST level displayed a significant negative correlation to Ex level >4 METs (r=-0.634, p<0.05), while serum ALT level tended to show a negative correlation to Ex level >4 METs (r=-0.57, p=0.0673)




**DISCUSSION**

In this study, daily physical activity of patients with liver cirrhosis type C was investigated using an acthymarker, so-called, a daily physical activity monitor. Although no significant differences were seen between Child A and Child B in serum parameters, daily physical activity decreased significantly as disease stage advanced. In particular, the mean daily number of steps and mean level of daily physical activity (Ex) was significantly decreased in patients with Child B liver cirrhosis compared with patients with Child A liver cirrhosis. Decreased physical activity has been reported to cause a loss of skeletal muscle by decreasing muscle protein synthesis8). As the stage of liver cirrhosis advances, patients with liver cirrhosis may decrease daily physical activity and, as a result, lose skeletal muscle. Indeed, Hayashi et al. reported decreased daily number of steps as a factor independently associated with sarcopenia in patients with cirrhosis5). In addition, sarcopenia as a result of loss of skeletal muscle and decrease in muscle strength have been reported to increase mortality rates in patients with liver cirrhosis9). The present study showed a significant positive relationship between serum albumin level and mean daily number of steps and a tendency toward a positive relationship with mean level of daily physical activity. Serum albumin level is a strong and independent predictor of mortality in liver cirrhosis10). This relationship in our study appears reasonable. Estimating daily physical activity in patients with liver cirrhosis is thus important.

On the other hand, we showed that serum AST level was significantly negatively correlated with Ex level >4 METs and serum ALT level tended to show a negative relationship to Ex level >4 METs. Strong daily physical activity thus does not appear feasible in patients with increased levels of transaminases such as AST and ALT. Conversely, Luiz et al. reported an association between physical activity and liver enzyme level in European adolescents. They showed that strong physical activity was significantly associated with higher serum levels of AST and ALT11). Symptoms of general fatigue due to increased levels of transaminases such as AST and ALT may contribute to decreased daily physical activity.

In conclusion, a decrease in daily physical activity was shown to correlate with decreased liver functions. Decreased daily physical activity was suggested to be associated with decreased serum albumin levels and increased serum AST levels. We think that estimating daily physical activity in patients with liver cirrhosis type C is clinically important.

## REFERENCE

1) Michitaka K, Nishiguchi S, Aoyagi Y, et al. Etiology of liver cirrhosis in Japan: a nationwide survey. J Gastroenterol 2010; 45: 86-94 | 2) Kondrup J, Muller MJ. Energy and protein requirements of patients with chronic liver disease. J Hepatol 1997; 27: 239-247 | 3) Medenhall CL, Anderson S, Weesner RE, et al. Protein-calorie malnutrition associated with alcoholic hepatitis. Veterans Administration Cooperative Study Group on Alcoholic Hepatitis. Am J Med 1984; 76: 211-222 | 4) Cruz-Jentoft AJ, Baeyens JP, Bauer JM, et al. Sarcopenia: European consensus on definition and diagnosis: report of the European Working Group on Sarcopenia in Older People. Age Ageing 2010; 39: 412-423 | 5) Montano-Loza AJ, Meza-Junco J, Prado CM, et al. Muscle wasting is associated with mortality in patients with cirrhosis. Clin Gastroenteral Hepatol 2012; 10: 166-173, 173.e1 | 6) Hayashi F, Habu D, Yuikawa M, et al. Frequency of sarcopenia in relation to various nourishment evaluation methods in patients with compensated viral cirrhosis. J Metab Clin Nutr 2012; 15: 259-270 (In Japanese) | 7) Hayashi F, Momoki C, Yuikawa M, et al. Physical inactivity and insufficient dietary intake are associated with the frequency of sarcopenia in patients with compensated viral liver cirrhosis. Hep Res 2013; 43: 1264-1275 | 8) Ferrando AA, Lane HW, Stuart CA, et al. Prolonged bed rest decreases skeletal muscle and whole body protein synthesis. Am J Physiol 1996; 270: E627-633 | 9) Montano-Loza AJ, Meza-Junco J, Prado CM, et al. Muscle wasting is associated with mortality in patients with cirrhosis. Clin Gastroenterol Hepatol 2012; 10: 166-173 | 10) Longheval G, Vereerstraeten P, Thiry P, et al. Predictive models of short- and long-term survival in patients with nonbiliary cirrhosis. Liver Transpl 2003; 9: 260-267 | 11) Ruiz JR, Labayen I, Ortega FB, et al. Physical activity, sedentary time, and liver enzymes in adolescents: the HELENA study. Pediatr Res 2014; 75: 798-802 |