



ORIGINAL ARTICLE

Pre-Transplant Aerobic Capacity and Prolonged Hospitalization After Liver Transplantation



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KEYWORDS

Exercise Tolerance;
End Stage Liver
Disease;
Exercise Test;
Liver Transplantation

Abstract

Introduction: Patients with end stage liver disease (ESLD) referred for liver transplantation (LT) are forwarded to pulmonary evaluation before being operated. ESLD is associated with muscle wasting, reduced exercise tolerance and aerobic capacity.

Objectives: We assessed the association between aerobic capacity (AC), liver disease severity and postoperative LT outcomes in a series of LT candidates in a university affiliated hospital in Brazil.

Methods: Pre-LT oxygen uptake at peak (pre-VO_{2peak}), liver disease severity, and early pos-LT outcomes such as length of intensive care unit (ICU) stay, <5 and ≥5 days and hospitalization, <20 and ≥20 days and postoperative mortality were compared. Pre-VO_{2peak} was measured through the cardiopulmonary exercise testing (CPET). Severity of liver disease was estimated by the Model for End-Stage Liver Disease (MELD) categorization into MELD < 18 and MELD ≥ 18 groups. Student's *t*-test was used to compare these groups. A logistic regression model was built to verify the effect of those variables on the length of ICU stay, length of hospitalization and postoperative mortality.

Results: A total of 47 patients were include in analysis. Pre-VO_{2peak} was similar to that of healthy sedentary individuals (75 ± 18%) and worse in the MELD ≥ 18 group as compared to the MELD < 18 group (19.51 ± 7.87 vs 25.21 ± 8.76 mL/kg/min, respectively; *p* = 0.048). According to the multivariate analysis, only a lower pre-VO_{2peak} (<20.09 ± 4.83 mL/kg/min) was associated to a greater length of hospitalization (*p* = 0.01).

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PALAVRAS-CHAVE

Doença Hepática Terminal;
Prova de Esforço;
Tolerância ao Exercício;
Transplante de Fígado

Conclusions: In LT candidates, a reduced pre- VO_{2peak} may predict a higher risk of greater pos-LT length of hospitalization. The length of ICU stay and postoperative mortality were not associated with variables studied. This finding should be evaluated in other studies before making specific recommendations about a routine use of CPET in LT candidates.

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Avaliação da tolerância ao exercício físico antes e após transplante hepático e influência do treinamento supervisionado

Resumo

Introdução: Pacientes com doença hepática em estágio final (DHEF), referenciados para transplante hepático (TH), são encaminhados para avaliação da função pulmonar antes de serem operados. DHEF está associada à fraqueza muscular, redução da tolerância ao exercício e capacidade aeróbica (CA).

Objetivos: Foi avaliada a associação entre capacidade aeróbica, a gravidade da doença hepática e os resultados pós-operatórios do TH em uma série de candidatos a TH em um hospital universitário no Brasil.

Métodos: O consumo de oxigênio num teste limitado por sintomas (VO_{2pico}) pré-TH, a gravidade da doença hepática, e os resultados precoces pós-TH como tempo de permanência na unidade de cuidados intensivos (UCI), <5 e ≥ 5 dias, tempo de permanência hospitalar, <20 e ≥ 20 dias e mortalidade foram comparados. O VO_{2pico} pré-TH foi medido através do teste de exercício cardiopulmonar (TECP). A gravidade da doença hepática foi estimada pelo Modelo para doença hepática em estágio final [Modelo de *End-Stage Liver Disease* (MELD)] e categorizada nos grupos MELD < 18 e MELD ≥ 18 . O teste *t de Student* foi utilizado para comparar esses grupos. Um modelo de regressão logística foi construído para verificar o efeito dessas variáveis sobre o tempo de permanência na UTI, tempo de internação e mortalidade pós-operatória. Resultados: um total de 47 pacientes foram incluídos nas análises. O VO_{2pico} pré-TH foi semelhante ao de indivíduos saudáveis sedentários ($75 \pm 18\%$) e pior no grupo MELD ≥ 18 em comparação com o MELD < 18 (19.51 ± 7.87 vs 25.21 ± 8.76 mL/kg/min, respectivamente; $p = 0.048$). De acordo com a análise multivariada, somente um menor VO_{2pico} ($<20.09 \pm 4.83$ mL/kg/min) pré-TH foi associado a um maior tempo de internação ($p = 0,01$).

Conclusão: Em candidatos a TH, uma redução do VO_{2pico} pré pode predizer um maior risco de maior permanência hospitalar pós-TH. Esta constatação deve ser avaliada em outros estudos antes de fazer recomendações específicas sobre o uso rotineiro do TECP para candidatos TH. O tempo de permanência na UTI e mortalidade pós-operatória não foram associados com as variáveis estudadas.

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1. Introduction

Liver transplantation (LT) is largely indicated for patients with end-stage liver diseases (ESLD).¹ The proportion of patients for whom this therapy has been indicated has increased worldwide, although the number of viable grafts has not in the same proportion.² Due to this discrepancy, several scores has been developed in order to better assess the severity of ESLD. Previous studies had shown that the Model for End-Stage Liver Disease (MELD) – the most used one – has a strong association with pre-transplant mortality rate.³ In spite of that, it does not accurately predict complications after LT.⁴

The amelioration of operative techniques and the recent advances in the immunosuppressive therapy has consistently contributed to the better rates of survival and

the prevention of graft dysfunction. Although LT success is traditionally measured using variables related to graft function along with patient survival, it may be accounted in terms of health-related quality of life scores or even through cardiopulmonary parameters such as aerobic capacity (AC), exercise capacity, skeletal muscle strength and body composition.⁵⁻⁷

An effective interaction of several physiologic mechanisms is necessary to sustain exercise and maintain gas exchange between the environment and the cells.⁸ The gold standard for AC analysis is the oxygen uptake at peak exercise (VO_{2peak}) during symptom-limited cardiopulmonary exercise testing (CPET). CPET provides an integrated evaluation of muscle and cardiorespiratory responses to effort.⁹ AC has been used as a prognostic factor in LT and is associated with liver disease severity as measured by MELD.^{5,6} AC

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