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# Decreased Serum Biotinidase Activity in Adult Patients With Decompensated Liver Cirrhosis

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**ABSTRACT**

*Decreased serum biotinidase activity in adult patients with decompensated liver cirrhosis*

**Objective:** The liver is the major source of serum biotinidase. Therefore liver cirrhosis can lead to decreased serum biotinidase activity and biotin deficiency. The aim of this study was to assess serum biotinidase activity in adult patients with liver cirrhosis and to investigate the relationship between serum biotinidase activity and the degree of compensation of liver cirrhosis.

**Material and Method:** A total 40 cirrhotic patients were included in the study (24 decompensated and 16 compensated) (mean age 53,5 yr, range 37-78 yr). 21 and 15 patients were associated with hepatitis B virus and hepatitis C virus, respectively, and 4 patients had cryptogenic cirrhosis. None of the patients exhibited clinical symptoms related to biotin deficiency. The control group consisted of 26 healthy persons (14 male and 12 female) (mean age 32 yr, range 20-50 yr). The statistical analyses were performed by student's t test.

**Results:** Serum biotinidase activities were found 5,7±1,6, 7,8±2 and 8,7±1,5 µmol/min/mL (mean±STD) (decompensated cirrhosis, compensated cirrhosis and the control group, respectively). Serum biotinidase activities in patients with decompensated cirrhosis were lower than both the patients with compensated cirrhosis and the control group's activities (p=0,005, p<0,001, respectively). However, there was no difference between patients with compensated cirrhosis and the control group (p>0,05).

**Conclusion:** Our findings suggested that serum biotinidase activity was significantly lower in patients with decompensated cirrhosis. However, the patients with compensated cirrhosis had similar biotinidase activity in comparison with the control group. These results indicated that the decreased serum biotinidase activity was associated with severe impaired hepatocellular function although there were no clinical symptoms regarding the biotin deficiency. Whether these patients can benefit from biotin supplementation needs further investigations.

**Key words:** Biotinidase, liver cirrhosis

**ÖZET**

*Dekompanse karaciğer sirozlu erişkin hastalarda düşük serum biyotinidaz aktivitesi*

**Amaç:** Karaciğer biyotinidaz enziminin başlıca kaynağıdır. Bu nedenle karaciğer sirozu, serum biyotinidaz aktivitesindeki azalmaya ve biyotin eksikliğine yol açabilmektedir. Çalışmanın amacı karaciğer sirozu olan erişkin hastalarda serum biyotinidaz aktivitesini değerlendirmek ve karaciğer sirozunun kompansasyonuyla olan ilişkisini araştırmaktadır.

**Gereç ve Yöntem:** 24 dekompanse ve 16 kompanse olmak üzere 40 karaciğer sirozlu hasta (25 erkek 15 kadın) çalışmaya alındı (ortalama yaş 53.5; yaş sınırları 37-78). Sırasıyla, 21 ve 15 hasta hepatit B ve C virüsü enfeksiyonu ile ilişkiliydi. Dört hasta kriptojenik siroz idi. Hastaların hiçbirinde biyotin eksikliğine ilişkin klinik bulgu gözlenmedi. Kontrol grup 26 (14 erkek, 12 kadın) sağlıklı bireyden oluştu (ortalama yaş 32; yaş sınırları 20-50) İstatistiksel analizler student t testi ile yapıldı.

**Bulgular:** Serum biyotinidaz aktiviteleri dekompanse kompanse ve kontrol gruplarında sırasıyla 5,7±1,6, 7,8±2 ve 8,7±1,5 µmol/min/mL (ortalama±STD) bulundu. Serum biyotinidaz aktivitesi dekompanse olgularda hem kompanse olgular hem de kontrol grubuna kıyasla düşüktü (p=0,005 ve p<0,001). Ancak kompanse sirozlu hastalar ile kontrol grubu arasında bir fark saptanmadı (p>0,05).

**Sonuç:** Bulgularımız serum biyotinidaz aktivitesinin dekompanse karaciğer sirozunda anlamlı olarak düşük olduğunu gösterdi. Buna karşın kompanse sirozlu olgulardaki seviyeler kontrol grubuna kıyasla farklı değildi. Dekompanse karaciğer sirozunda serum biyotinidaz aktivitesindeki azalma ciddi hepatoselüler fonksiyondaki bozuklukla ilişkilidir. Biyotin eksikliğine ilişkin bulguların olmamasına karşın hastaların biyotin tedavisinde fayda görüp görmeyeceği ayrıca araştırılması gereken bir husustur.

**Anahtar kelimeler:** Biotinidaz, karaciğer sirozu

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## INTRODUCTION

Biotinidase (EC 3.5.1.12) is the enzyme responsible for cleaving the vitamin biotin from biocytin and biotinyl-peptides derived from the proteolytic degradation of holocarboxylases (1). It is also required for conversion of dietary protein-bind biotin to its free form (2). Because the liver is the major source of serum biotinidase, liver cirrhosis can lead to decreased serum biotinidase activity and biotin deficiency (1). The aim of this study was to assess serum biotinidase activity in adult patients with liver cirrhosis and to investigate the relationship between serum biotinidase activity and the degree of compensation of liver cirrhosis.

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## MATERIALS AND METHODS

A total of 40 (25 male and 15 female) cirrhotic patients (24 decompensated and 16 compensated) were included in the study (mean age 53.5 yr; range 37-78 yr). Twenty-one and 15 patients were associated with hepatitis B virus and hepatitis C virus, respectively, and 4 patients were cryptogenic cirrhosis. A histological diagnosis was made in the patients of compensated cirrhosis. Decompensation of cirrhosis was considered when a patient first developed one of the major complications of the disease (3). None of the patients exhibited clinical symptoms related to biotin deficiency. The control group consisted of 26 healthy persons (14 male and 12 female) (mean age 32 yr; range 20-50 yr).

The sera from groups were frozen at −20°C and assayed within 6 months. Serum biotinidase activity was quantitated using the artificial substrate, biotinyl-p-aminobenzoate (4,5).

The statistical analyses were performed by student's t test.

## RESULTS

Serum biotinidase activities were found 5,7±1,6; 7,8±2 and 8,7±1,5 μmol/min/mL (mean ± STD) in decompensated cirrhosis, compensated cirrhosis and the control group, respectively. Serum biotinidase activities in patients with decompensated cirrhosis were lower than both the patients with compensated cirrhosis and the control group's activities ($p=0,005$, $p<0,001$, respectively). However, there was no difference between patients with compensated cirrhosis and the control group ($p>0,05$).

## DISCUSSION

Biotinidase catalyzes the cleavage of biotin from biocytin or biotinyl peptides (1). The enzyme also appears to play an integral role in the processing of dietary, protein-bound biotin (2). Biotinidase activity in sera of patients developed biotin deficiency while receiving parenteral hyperalimentation was normal (6). Besides, biotin-deficient rats had biotinidase activities similar to those of rats receiving adequate dietary biotin (7). The secondary biotinidase deficiency is rarely found except in late-onset multiple carboxylase deficiency (5). However, liver injury may influence on biotinidase activity because it is mainly synthesized by the liver.

Our study showed that serum biotinidase activities were 5,7±1,6; 7,8±2 and 8,7±1,5 μmol/min/mL (mean±STD) in decompensated cirrhosis, compensated cirrhosis and the control group, respectively. Serum biotinidase activities in patients with decompensated cirrhosis were lower than both the patients with compensated cirrhosis and the control group's activities ($p=0,005$, $p<0,001$, respectively). Yet, there was no difference between patients with compensated cirrhosis and the control group ($p>0,05$).

A study by Weiner et al. reported biotinidase deficiency in patients with chronic liver disease (8). A report by Nagamine et al. showed that the mean biotinidase activity in the liver patients was significantly lower than in control group (9). According to this study, in chronic liver diseases caused by hepatic viral infections the mean biotinidase activity in decompensated liver cirrhosis was lower than in compensated liver cirrhosis. Their data indicated that the decrease of biotinidase activity tended to parallel the degree of liver disease (9). Similarly, Grier et al. found low serum biotinidase activities in patients with chronic liver disease (10). A recent study by Pabuçcuoğlu et al. from Turkey showed that there was significant difference between the mean enzyme activity of the patients with chronic liver disease and the control subjects and concluded that the decreased serum biotinidase activity in chronic liver diseases was associated with severe impairment of hepatocellular function (11). Meanwhile, Faith et al. in their preliminary report suggested that serum biotinidase might be a sensitive and specific diagnostic marker of hepatic biosynthetic function in both acute and chronic liver disease (12). Our results showed a correlation with these previous studies. Besides, it can be postulated that the biotinidase activity in serum is a potentially useful diagnostic index of synthetic function of the liver because the measurement of serum biotinidase activity is simple and inexpensive, and it can be automated (13).

In conclusion, our study suggested that serum biotinidase activity was significantly lower in patients with decompensated cirrhosis; however, the compensated cirrhotic cases had no different serum biotinidase activity in comparison with the control group. These results indicated that the decreased serum biotinidase activity was associated with severe impaired

hepatocellular function although there were no clinical symptoms regarding the biotin deficiency. Whether these patients can benefit biotin supplementation needs to be established.

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