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Prevalence and Predictive Factors of Liver Steatosis Evaluated by CAP in Chronic Viral Hepatitis Infected Patients

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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Original Research Article

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ABSTRACT

Introduction: The CAP (Controlled Attenuation Parameter) function of FibroScan® is a new non-invasive diagnostic tool that allows the quantification of liver steatosis at the same time as elastometry. It is based on the attenuation of ultrasound waves. Its use is particularly validated in chronic viral hepatitis.
Objectives: evaluate the frequency and the predictive factors of liver steatosis diagnosed by CAP in a cohort of patients with chronic viral hepatitis submitted to transient elastography by Fibroscan ®.
Methods: This was a retrospective single center study conducted from May 2019 to May 2023. Were included all patients with chronic viral hepatitis B or C who had transient elastography performed with CAP by Fibroscan ®.
Results : Among 636 patients who had a Fibroscan ®, 305 had chronic viral hepatitis: 204 (32%) HVB and 131 (20,5%) HVC.

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Mean age was 55±9 years and 55,2% of patients were female. 30% of our patients were obese and 33.5% were overweight. 20,1% of our patients had diabetes, 25,8% had hypertension and 9,3% had dyslipidemia.
The mean CAP value (±SD) was 230,5 dB/m with a corresponding mean liver elasticity of 9.1 kPA. Liver steatosis was found in 38,8% of our patients.
49% of patients with chronic hepatitis C had steatosis on Fibroscan, 32% of those with chronic hepatitis B.
CAP values were significantly correlated with body mass index ($p < 0.001$), dyslipidemia ($p < 0.010$) and the presence of steatosis on ultrasound ($p < 0.012$). In contrast, there was no correlation between CAP values and age, sex, or the existence of diabetes or hypertension.
Conclusion: Fibroscan CAP function detected liver steatosis in 38,8% of patient with viral hepatitis, which was strongly associated with host metabolic factors, e.g., obesity and dyslipidemia. These cofactors may contribute to the progression of liver disease. Thus, they require serious management concomitantly with antiviral therapy.

Keywords: Viral hepatitis; liver steatosis; controlled attenuation parameter.

1. INTRODUCTION

"Liver steatosis is the excessive accumulation of fat in the liver. It is a major health problem and currently the most common cause of chronic liver disease worldwide" [1,2].

"Steatosis, oxidative stress, and insulin resistance have been recognized as important factors in hepatitis C virus infection (HCV) and are may be related to the progression of fibrosis" [3,4]. "In patients with chronic hepatitis C, the presence of hepatic steatosis affects response to treatment and may predict the development of hepatocellular carcinoma regardless of the stage of fibrosis" [3,5,6]. "In patients infected with hepatitis B virus (HBV), steatosis is a relatively common phenomenon, and its generally related to the host associated metabolic factors" [3].

Controlled attenuation parameter (CAP) is a non-invasive tool to quantify steatosis. It is realized simultaneously with liver transient elastography. This is an easy-to-perform and accurate method to quantify hepatic steatosis. Its performance has been well established in patients with chronic viral hepatitis and other chronic liver diseases.

1.1 Aim

The aim of this study was to evaluate the frequency and the predictive factors of liver steatosis diagnosed by CAP in a cohort of patients with chronic viral hepatitis submitted to transient elastography by Fibroscan ®.

2. PATIENTS AND METHODS

This was a retrospective single center study conducted from May 2019 to May 2023. Were included all patients with chronic viral hepatitis B or C who had transient elastography performed with CAP by Fibroscan ®. Patient's clinical characteristics, epidemiological data, and biochemical tests were registred. All the measures were made using de Fibroscan® compact 530 device (Echosens).

CAP measurement was performed with the M probe, or in case of failure or unreliable result, with the XL probe.

The CAP measurement was quantitative, measured in dB/m. The threshold values used for the diagnosis of steatosis were:

S0 (< 10%) = CAP < 222 dB/m;
S1 (11 -32%) = CAP ≥ 222 dB/m and < 233 dB/m;
S2 (33 -66%) = CAP ≥ 233 dB/m and < 290 dB/m and
S3 (>66%) = CAP ≥ 290 dB/m.

Moderate steatosis and severe steatosis were defined as a CAP value ≥ 233 and ≥ 290 respectively [1,7].

Statistical analyses were performed with SPSS software 21.0. Demographic characteristics of the study subjects were analyzed descriptively. Categorical data was analyzed using frequencies and percentages. Continuous data were analyzed using mean. A two-sided P value of <0.05 was considered statistically significant.

3. RESULTS

Among 636 patients who had a Fibroscan ®, 305 had chronic hepatitis: 204 (32%) HVB and 131 (20,5%) HVC.

Mean age was 55± 9 years and 55,2% of patients were female. 30% of our patients were obese (BMI ≥ 30 kg / m²) and 33.5% were overweight (BMI ≥ 25 kg / m²). 20,1% of our patients had diabetes, 25,8% had hypertension and 9,3% had dyslipidemia. 23,4% of patient had steatosis on ultrasound.

The use of the M probe provided results in 76.8% of cases. The use of the XL probe was necessary in 23.2% of patients.

The mean CAP value (±SD) was 230,5 dB/m with a corresponding mean liver elasticity measurement of 9.1 kPa. Liver steatosis was found in 38,8% of patients and was classified as S1 in 23.7% of cases, S2 in 35.1% and S3 in 41.2%. Liver elasticity was classified as F0-F1 in 64,9% of patients, F2 in 12,9%, F3 in 7,7% and F4 in 14,5%.

49% of patients with chronic hepatitis C had steatosis on Fibroscan, 32% of those with chronic hepatitis B.

CAP values were significantly correlated with body mass index ($p < 0.001$), dyslipidemia ($p< 0.010$) and the presence of steatosis on ultrasound ($p < 0.012$). In contrast, there was no correlation between CAP values and age, sex, or with the existence of diabetes or hypertension.

4. DISCUSSION

“Non-invasive methods for assessing liver fibrosis are becoming widely used” [8,9].

The most commonly used imaging technique for the liver is ultrasonography [1,10]. “Although widely used, ultrasonography remains machine and operator dependent and may underdiagnose mild steatosis due to the low sensitivity of the method” [11].

In fact, in our study, some patients with steatosis on Fibroscan® didn’t have steatosis on ultrasonography.

CAP is frequently used to both diagnose and quantify liver steatosis, helping identify the patients who may require additional follow-up on metabolic optimization and help prevent the progression of liver disease.

“It also has the advantage of being measured at the same time as liver stiffness and it is not influenced by fibrosis” [8,12]. With our results, we cannot conclusively state that fat accumulation had an effect on fibrosis stage assessment because patients didn’t have a liver biopsy.

In this study, 49% of patients with HCV had steatosis and 32% of those with HBV. In clinical practice, hepatic steatosis is frequently found in HBV patients with a reported incidence of 18%-27% [13,14]. In HCV patients, steatosis is more frequent as showed Cardoso’s and Hwang’s studies in which half of patients with HVC had steatosis [1,15].

“Additional research has noted that steatosis in HCV patients is more frequent than in HBV patients, possibly because of the HCV viral influence on metabolic routes leading to insulin resistance and metabolic syndrome. That isn’t described in HBV patients” [16].

Several studies have noticed a significant correlation between HCV genotype 3 infection and the presence of steatosis [3,17], the severity of which may be related to levels of HCV RNA in patients infected with genotype 3 [3]; however, our study could not confirm this relationship as we didn’t have the patients genotype [3].

On the other hand, in HBV infection, genotype or HBeAg status, did not seem to have any influence on the hepatocyte fat accumulation [18].

As our study also showed, Machado’s meta analysis demonstrated that the most significant correlations with steatosis were metabolic. There was a real increased risk of steatosis associated with diabetes and obesity, respectively. Furthermore, there was a definite positive correlation found between the presence of steatosis and elevated BMI, dyslipidemia, hypertriglyceridemia, and hypercholesterolemia [18]. This was also the case in our study.

“Once more, the risk factors in the general population are similar to these data, and metabolic factors are so significant in general population that nonalcoholic fatty liver disease has been proposed as a result of the metabolic syndrome” [18,19].

“Obesity is associated with insulin resistance and can also cause type 2 diabetes and contribute to steatosis” [3,20]. “Previous studies reported high BMI as one factor associated with fatty liver” [2,3,21].

In multiple studies, diabetes also appears to be closely related to steatosis whether or not there is a pre-existing liver disease [22].

In patients with HBV, the prevalence of diabetes is similar to that of the general population.

“In contrast, diabetes is prevalent in individuals with HCV. A recent meta-analysis to determine the incidence of extrahepatic symptoms in patients infected with HCV revealed that diabetes is one of the most common manifestations, occurring in 15% of patients” [3,23]. Similar to this, the prevalence of diabetes was nearly twice as high in patients with chronic hepatitis C in a countrywide population-based register study carried out in Sweden (10.6 versus 5.5%, $P < 0.05$) [24].

Regarding fibrosis, 14,5% of patients in our study had severe liver fibrosis.

Studies by Seto and Mak LY have demonstrated a correlation between severe liver fibrosis and severe liver steatosis [25,26]. They affirmed the detrimental effect of chronic severe hepatic steatosis on the development of fibrosis, highlighting the therapeutic utility of regular CAP assessments in patients with chronic viral hepatitis. On the other hand, fibrosis regression was related to the resolution of severe steatosis.

This concomitant condition in HCV patients can accelerate liver fibrosis progression [3], and it is also associated with a lower virological response to antiviral therapy [3,19,27].

Therefore, it is important to closely monitor the BMI, blood pressure, blood glucose and lipid and to treat hypertriglyceridemia in patients with viral hepatitis, as it may prevent the occurrence of hepatic steatosis [13,28].

“Also, CAP can be widely applied to both diagnose and quantify liver steatosis in HCV infected patients helping to identify those that might need further follow up regarding metabolic optimization to help preclude liver disease progression” [1,29,28].

5. CONCLUSION

Fibroscan’s CAP function is a very useful and easy way to diagnose liver steatosis, especially in the actual context of the expanding obesity and nonalcoholic fatty liver disease (NAFLD).

Our study concluded that a considerable percentage of patients with chronic viral hepatitis had liver steatosis, which was significantly correlated with host metabolic variables, such as obesity (BMI > 25) and dyslipidemia.

Therefore, it is vital to raise the awareness of doctors to this important cofactor that contributes to the progression of liver disease to cirrhosis and to offer treatment aimed at metabolic diseases along with antiviral therapy in these patients.

CONSENT

As per international standards or university standards, patient(s) written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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