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ALKAGOL ETIOLOGY LIVER FIBROELASTOMETRY IN PATIENTS WITH HEPATITIS.

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ANNOTATION: The importance of identifying the stage of liver fibrosis has motivated the development of non-invasive methods. This study aimed to evaluate the applicability of ultrasound analysis involving the wave-number domain attenuation coefficient (W-Ac) in the non-invasive quantitative differentiation of liver fibrosis.

KEYWORDS: Liver cirrhosis, ultrasonography, Fourier analysis, disease progression, diagnosis

Liver disease remains a significant global health concern, with various etiologies contributing to its prevalence and severity. Among these, alcohol etiology stands out due to its widespread impact on liver health. This essay explores the relationship between alcohol consumption, liver disease, and the diagnostic role of liver fibroelastometry in patients with hepatitis.

Alcohol Etiology and Liver Disease

Alcohol-related liver disease (ALD) encompasses a spectrum of disorders ranging from simple steatosis (fatty liver) to more severe conditions such as alcoholic hepatitis and alcoholic cirrhosis. The pathogenesis of ALD is multifaceted, involving both direct and indirect effects of ethanol on hepatocytes and liver tissue. Chronic alcohol consumption leads to hepatic steatosis, characterized by the accumulation of fat in the liver cells. This initial stage is reversible with abstinence. However, continued alcohol abuse can progress to alcoholic hepatitis, marked by inflammation and liver cell injury. Prolonged inflammation and liver cell damage eventually result in fibrosis, where scar tissue replaces healthy liver tissue, impairing liver function over time. In its end stages, ALD may culminate in cirrhosis, characterized by widespread fibrosis and nodular regeneration of liver tissue.

Global Impact and Epidemiology

ALD represents a significant public health challenge globally. It is estimated to contribute to a substantial portion of liver-related morbidity and mortality worldwide. The burden of ALD varies geographically, influenced by cultural, social, and economic factors affecting alcohol consumption patterns. Regions with high alcohol consumption rates typically report a higher prevalence of ALD-related complications, emphasizing the direct correlation between alcohol intake and liver disease severity.

Liver Fibroelastometry: A Diagnostic Advancement

Liver fibroelastometry, often referred to as transient elastography or FibroScan, has emerged as a valuable non-invasive tool for assessing liver fibrosis in patients with hepatitis, including those with ALD. This technique measures liver stiffness, providing quantitative

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data that correlates with the degree of fibrosis present. Unlike traditional liver biopsies, which are invasive and carry risks of complications, fibroelastometry offers a safer alternative for monitoring disease progression and treatment response.

Diagnostic Utility in AL

In the context of ALD, fibroelastometry plays a crucial role in early detection and monitoring of liver fibrosis. Early identification of fibrosis allows healthcare providers to intervene promptly, implementing lifestyle modifications such as alcohol cessation and initiating medical therapies aimed at halting disease progression. Regular monitoring through fibroelastometry enables clinicians to assess treatment efficacy and adjust management strategies accordingly, optimizing patient outcomes and reducing the risk of advanced liver disease complications such as cirrhosis and hepatocellular carcinoma.

Clinical Application and Challenges

Despite its advantages, fibroelastometry is not without limitations. Factors such as obesity, ascites, and operator variability can influence the accuracy of liver stiffness measurements. In obese individuals or patients with significant ascites, obtaining reliable fibroelastometry results may pose challenges due to technical considerations. Moreover, while fibroelastometry provides valuable insights into liver fibrosis, it does not replace liver biopsy in certain clinical scenarios where histological evaluation is essential for diagnosing specific liver diseases or assessing disease severity comprehensively.

Future Directions and Research

The evolving field of liver fibroelastometry continues to witness advancements aimed at improving diagnostic accuracy and expanding its clinical utility. Ongoing research focuses on refining fibroelastography techniques, exploring novel biomarkers, and integrating artificial intelligence to enhance diagnostic precision. Additionally, longitudinal studies are needed to elucidate the long-term prognostic value of fibroelastometry in predicting clinical outcomes and guiding personalized treatment strategies in patients with ALD and hepatitis.

Alcohol etiology remains a prominent contributor to liver disease worldwide, with ALD encompassing a spectrum of conditions that range from reversible fatty liver to irreversible cirrhosis. Liver fibroelastometry represents a pivotal advancement in non-invasive diagnostic tools, facilitating early detection and monitoring of liver fibrosis in patients with hepatitis, including those with ALD. By providing clinicians with timely and accurate information on liver stiffness, fibroelastometry enhances patient care, supports informed clinical decision-making, and contributes to improved outcomes in the management of alcohol-related liver disease.

In conclusion, while challenges and areas for further research exist, the integration of fibroelastometry into routine clinical practice holds promise for transforming the management of ALD and improving the quality of life for patients affected by this debilitating condition.

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Liver fibrosis is a common consequence of chronic liver disease, caused by the increased deposition of fibrotic tissues within the liver. Cirrhosis, as the final stage of liver fibrosis, may cause various complications in patients, including portal hypertension, ascites and variceal bleeding, and ultimately organ failure and even death. However, early liver fibrosis, if treated properly, may regress or even recover completely (1–5). Therefore, it is important to distinguish different stages of liver fibrosis and provide clinicians with a range of effective medications.

Although liver biopsy remains the gold standard for exploring the stage of liver fibrosis, its application is limited because of its invasive nature; side effects, such as bleeding; and other limitations, such as inapplicability for repeated assessments. Accordingly, development of non-invasive assessment methods for liver fibrosis, such as serological examination (6–9) and imaging (10–15), have been promoted. Currently, elastography techniques, including transient elastography (16–18), acoustic radiation force impulse imaging (19,20), and shear wave elastography (21,22), are the most widely used imaging techniques for non-invasive assessment of liver fibrosis. Nevertheless, different factors influence the accuracy and applicability of these techniques, including obesity, ascites, hepatic inflammation, congestion, and the operator's experience (23). Therefore, the effectiveness of these non-invasive methods still needs to be validated.

Alternative approaches to the analysis of ultrasound imaging of fibrosis may provide more effective non-invasive fibrosis staging. Pathological changes affect the propagation of ultrasonic waves, which can be quantified by measuring the speed of sound, attenuation coefficient (Ac), backscatter coefficient, and other parameters. In this regard, Meziri et al (24). conducted several studies to determine the potential of these parameters in discriminating between different stages of liver fibrosis in vitro (25–27). Their studies showed that changes in acoustic parameters may present a more objective assessment of tissue attenuation composition, which is related to the stage of liver fibrosis in vitro. However, those in vitro studies were on isolated liver specimens and were not performed in a similar manner to clinical ultrasound. Generally, considering the extremely complex structure of tissues in the human body, there are differences between in vivo and in vitro experiments. Therefore, it is essential to study the applicability of Ac in determining the stage of liver fibrosis in vivo.

The aim of this study was to investigate the clinical application of Ac in ultrasound staging of liver fibrosis. We hypothesized that using the wave-number domain Ac (W-Ac) method to process the post-beamforming data of ultrasound can determine the effect of the liver parenchyma on the attenuation of ultrasound signals and eliminate the effect of tissues outside the liver. Therefore, we acquired the post-beamformed radio frequency (PRF) data from clinical sonographs, and individual differences and anisotropy of tissues were investigated.

This was a prospective study of inpatients with hepatitis B virus (HBV)-related liver disease that underwent B-mode ultrasound examination with collection of post-beamforming data and liver biopsy to determine follow-up treatment between October 2016 and January 2018 at The First Affiliated Hospital of Anhui Medical University. Patients were excluded according to the following criteria: 1) patients whose PRF data analysis failed or biopsy specimens did not meet the quality requirements of pathological diagnosis and 2) body mass

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index. This study was approved by the Institutional Ethics Committee of our hospital. After the study design was explained, the patients completed the written informed consent before the study.

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