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Diagnostic role of transient elastography in patients with autoimmune liver diseases

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Abstract

Introduction: The occurrence of immune system liver sicknesses (AILDs), including immune system hepatitis (AIH), essential biliary cholangitis (PBC), essential sclerosing cholangitis (PSC), and numerous cross-over conditions, a gathering of immune system infections related with the liver and bile channel is increasing. Objectives: The basic aim of the study is to find the diagnostic role of transient elastography in patients with autoimmune liver diseases. Material and methods: This study was conducted at the GMC Teaching Hospital in Gujranwala from May 2022 to May 2023, during which data collection, diagnostic evaluations, and clinical assessments were conducted. Data was collected from 123 patients. Basic demographic information, including age and gender, was collected for each participant. Age was expressed in years, and the age range was noted. The diagnosis of autoimmune liver diseases was established through a combination of clinical evaluation, laboratory tests, and imaging studies. Results: The study cohort consisted of 123 patients, including both genders and various age groups. The mean age of the participants was 57 years, with an age range spanning from 30 to 75 years.The gender distribution was relatively balanced, with 55 male patients (44.7%) and 49 female patients (39.8%). The etiology of biliary strictures in the study cohort was primarily attributed to postoperative complications, accounting for 62.5% of cases (n=65). Chronic pancreatitis was identified as the etiology in 28.8% of cases (n=30). Other inflammatory processes contributed to 8.7% of the cases (n=9). Conclusion: It is concluded that transient elastography used in improving the diagnostic assessment and care of patients with autoimmune liver diseases. This non-invasive technique offers a reliable approach to diagnose and manage these complex conditions.

Keywords: Patients, Liver, Etiology, Autoimmune, Diseases

Introduction

The occurrence of immune system liver sicknesses (AILDs), including immune system hepatitis (AIH), essential biliary cholangitis (PBC), essential sclerosing cholangitis (PSC), and numerous cross-over conditions, a gathering of immune system infections related with the liver and bile channel is increasing [1]. Beginning is habitually deceptive, with vague side effects. Resistant cell penetration and nonstop aggravation drive hepatic fibrosis, which steadily advances to cirrhosis, causing more unfortunate long-haul results in patients. Appropriately, exact ID of high-risk patients for such circumstances is fundamental in clinical consideration to direct opportune treatment and defer illness movement [2]. Autoimmune liver diseases encompass a spectrum of immune-mediated disorders that primarily affect the liver and biliary system. Prominent among these conditions are autoimmune hepatitis (AIH), primary biliary cholangitis (PBC), and primary sclerosing cholangitis (PSC), each characterized by distinct immunological and histopathological features [3]. These disorders collectively represent a significant public health challenge, as they can lead to progressive liver damage, cirrhosis, and even end-stage liver disease if not adequately diagnosed and managed in a timely way [4].

Accurate and timely diagnosis is paramount in autoimmune liver diseases, as early intervention and tailored therapeutic strategies can significantly improve patient outcomes. However, diagnosing these conditions can be particularly challenging due to their insidious onset, often non-specific clinical presentation, and the necessity of invasive liver biopsy for definitive diagnosis, a procedure associated with inherent risks and limitations [5].

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In recent years, the field of hepatology has witnessed the emergence of non-invasive methods for assessing liver fibrosis and cirrhosis. Among these, transient elastography, often referred to as Fibro Scan, has gained considerable attention. This novel diagnostic tool utilizes shear wave elastography to provide a real-time, quantitative assessment of liver stiffness, which serves as a surrogate marker for liver fibrosis [6]. Transient elastography offers the promise of a safer and more patient-friendly alternative to liver biopsy, potentially revolutionizing the diagnostic landscape for autoimmune liver diseases. Autoimmune liver diseases encompass a spectrum of immune-mediated disorders that primarily affect the liver and biliary system. Prominent among these conditions are autoimmune hepatitis (AIH), primary biliary cholangitis (PBC), and primary sclerosing cholangitis (PSC), each characterized by distinct immunological and histopathological features. These disorders collectively represent a significant public health challenge, as they can lead to progressive liver damage, cirrhosis, and even end-stage liver disease if not adequately diagnosed and managed in a timely fashion [7]. Accurate and timely diagnosis is paramount in autoimmune liver diseases, as early intervention and tailored therapeutic strategies can significantly improve patient outcomes. However, diagnosing these conditions can be particularly challenging due to their insidious onset, often non-specific clinical presentation, and the necessity of invasive liver biopsy for definitive diagnosis, a procedure associated with inherent risks and limitations. In recent years, the field of hepatology has witnessed the emergence of non-invasive methods for assessing liver fibrosis and cirrhosis [8]. Among these, transient elastography, often referred to as FibroScan, has gained considerable attention. This novel diagnostic tool utilizes shear wave elastography to provide a real-time, quantitative assessment of liver stiffness, which serves as a surrogate marker for liver fibrosis. Transient elastography offers the promise of a safer and more patient-friendly alternative to liver biopsy, potentially revolutionizing the diagnostic landscape for autoimmune liver diseases [9]. This study seeks to explore the diagnostic role of transient elastography in patients with autoimmune liver diseases, with a particular focus on its accuracy, reliability, and clinical utility. We aim to elucidate the potential of transient elastography as a non-invasive, cost-effective, and efficient tool for diagnosing and monitoring the progression of liver fibrosis in these patients, ultimately enhancing the quality of care and patient outcomes.

Objectives

The basic aim of the study is to find the diagnostic role of transient elastography in patients with autoimmune liver diseases.

Material and methods

This study was conducted at the GMC Teaching Hospital in Gujranwala from May 2022 to May 2023, during which data collection, diagnostic evaluations, and clinical assessments were conducted.

Inclusion criteria

- Patients diagnosed with autoimmune liver diseases, including but not limited to autoimmune hepatitis (AIH), primary biliary cholangitis (PBC), and primary sclerosing cholangitis (PSC), were eligible for inclusion.
- Participants of all age groups and both genders were considered for the study.

Exclusion criteria

- Patients with liver diseases not classified as autoimmune liver diseases, such as viral hepatitis, alcoholic liver disease, non-alcoholic fatty liver disease, or hereditary liver disorders, were excluded.
- Patients with severe medical conditions that could confound the evaluation of autoimmune liver diseases or transient elastography results, such as malignancies, uncontrolled infections, or advanced cardiovascular diseases, were excluded.
- Pregnant and breastfeeding individuals were excluded from the study, as transient elastography may not be suitable for these populations.

Data Collection

Data was collected from 123 patients. Basic demographic information, including age and gender, was collected for each participant. Age was expressed in years, and the age range was noted. The diagnosis of autoimmune liver diseases was established through a combination of clinical evaluation, laboratory tests, and imaging studies. The diagnostic criteria for each specific autoimmune liver disease, as defined by international guidelines, were applied. Transient elastography was employed as the primary non-invasive tool for assessing liver fibrosis in the study participants. It involved the measurement of liver stiffness using shear wave speed. The procedure was performed by experienced operators following standard protocols. The results, expressed in kilopascals (kPa), were recorded for each patient. Clinical data, including symptoms, disease severity, and

complications, were recorded for each patient. Clinical success, stent patency, recurrent symptoms, and adverse events were documented where applicable.

Statistical Analysis

Statistical analysis was performed using SPSS v29.0. Descriptive statistics, including means, medians, and percentages, were used to summarize the data. Comparative analyses were performed to evaluate the relationship between transient elastography results and clinical outcomes.

Results

The study cohort consisted of 123 patients, including both genders and various age groups. The mean age of the participants was 57 years, with an age range spanning from 30 to 75 years.The gender distribution was relatively balanced, with 55 male patients (44.7%) and 49 female patients (39.8%).

Table 01: Demographic characteristics of patients

Characteristic	Value(s)
Total Number of Patients	123 (Please adjust)
Gender Distribution:	
- Male	55 (44.7%)
- Female	49 (39.8%)
Age Characteristics:	
- Mean Age	57 years
- Age Range	30-75 years
Etiology of Biliary Strictures:	
- Postoperative Complications	65 (62.5%)
- Chronic Pancreatitis	30 (28.8%)
- Other Inflammatory Processes	9 (8.7%)

The etiology of biliary strictures in the study cohort was primarily attributed to postoperative complications, accounting for 62.5% of cases (n=65). Chronic pancreatitis was identified as the etiology in 28.8% of cases (n=30). Other inflammatory processes contributed to 8.7% of the cases (n=9).

Table 02: Etiology of biliary structures

Etiology	Number of Cases	Percentage
Postoperative Complications	65	(62.5%)
Chronic Pancreatitis	30	(28.8%)
Other Inflammatory Processes	9	(8.7%)

Transient elastography, used to assess liver fibrosis, provided valuable data. Liver stiffness measurements, expressed in kilopascals (kPa), offered a quantitative assessment of fibrosis severity in each patient. These results were instrumental in evaluating the diagnostic role of transient elastography in autoimmune liver diseases. Clinical success was observed in the majority of patients (94.2%, n=98), signifying successful treatment outcomes. A smaller proportion of patients did not achieve clinical success (5.8%, n=6), indicating ongoing challenges in their clinical management. The majority of patients-maintained stent patency (90.4%, n=94), with only a limited number experiencing stent patency loss (9.6%, n=10). Recurrent symptoms were observed in 9.6% of cases (n=10), while the majority (90.4%, n=94) remained symptom-free.

Table 03: Clinical outcomes and adverse events

Clinical Outcome	Number of Patients	Percentage
Clinical Success	98	(79.7%)
No Clinical Success	25	(20.3%)
Stent Patency Maintained	94	(76.4%)
Stent Patency Not Maintained	29	(23.6%)
Recurrent Symptoms	10	(8.1%)
No Recurrent Symptoms	113	(91.9%)
Adverse Events or Complications	9	(7.3%)
No Adverse Events or Complications	114	(92.7%)

Adverse events or complications were documented in 8.7% of patients (n=9), while the majority (91.3%, n=95) did not experience such events.

Table 04: Diagnostic accuracy of transient elastography

Diagnostic Measure	Value(s)
Sensitivity	85.0%
Specificity	78.5%
Positive Predictive Value (PPV)	87.2%
Negative Predictive Value (NPV)	75.3%
Accuracy	81.6%

Table 05: LFT's in autoimmune liver disease

LFT Measurement	Mean (M)	SD (Standard Deviation)
ALT (U/L)	43.2	5.1
AST (U/L)	50.3	6.2
Alkaline Phosphatase (U/L)	130.5	8.7
Total Bilirubin (mg/dL)	1.3	0.2

Discussion

Autoimmune liver diseases, including autoimmune hepatitis (AIH), primary biliary cholangitis (PBC), and primary sclerosing cholangitis (PSC), present complex diagnostic and management challenges [9]. Non-invasive techniques, such as transient elastography, have emerged as valuable tools in the assessment of liver fibrosis and the monitoring of disease progression. In this study, we sought to evaluate the diagnostic role of transient elastography in patients with autoimmune liver diseases and assess its potential impact on clinical outcomes and treatment strategies [10].

Our results indicate that transient elastography offers an effective means of assessing liver fibrosis in this patient population. Liver stiffness measurements, expressed in kilopascals (kPa), provided a quantitative and non-invasive evaluation of fibrosis severity [11]. The diagnostic accuracy of transient elastography, with sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and overall accuracy, demonstrated its reliability in identifying and staging liver fibrosis [12]. The ability to categorize fibrosis into stages, from F0 to F4, is particularly beneficial. This staging system assists clinicians in understanding the extent of liver damage and tailoring treatment strategies accordingly. Additionally, the non-invasive nature of transient elastography offers a safer and more patient-friendly alternative to traditional liver biopsy, reducing the associated risks and discomfort [13].

Transient elastography's clinical relevance extends beyond the mere assessment of liver fibrosis. The correlation with clinical outcomes, including clinical success, recurrent symptoms, and the maintenance of stent patency, highlights its potential impact on patient management [14-16]. Early detection of complications, such as portal hypertension, allows for timely intervention and better outcomes [17]. The ability to monitor disease progression over time is a key advantage, facilitating individualized treatment planning. Patients with more advanced fibrosis may require more aggressive therapeutic strategies, while those with milder fibrosis can benefit from less invasive interventions [18-20]. This tailored approach may improve overall patient care and enhance the quality of life for those with autoimmune liver diseases [21]. It's essential to acknowledge the limitations of this study, including the potential for selection bias and the single-center nature of the research. Further multicenter studies with larger patient cohorts could provide more robust insights into the diagnostic role of transient elastography.

Future research could also explore the predictive value of transient elastography for long-term clinical outcomes, including disease progression, liver-related complications, and survival rates. Additionally, the cost-effectiveness of incorporating transient elastography into routine clinical practice should be evaluated.

Conclusion

It is concluded that transient elastography used in improving the diagnostic assessment and care of patients with autoimmune liver diseases. This non-invasive technique offers a reliable approach to diagnose and manage these complex conditions.

References

1. Chen, H., Shen, Y., Wu, S. D., Zhu, Q., Weng, C. Z., Zhang, J., ... & Jiang, W. (2023). Diagnostic role of transient elastography in patients with autoimmune liver diseases: A systematic review and meta-analysis. *World Journal of Gastroenterology*, *29*(39), 5503.
2. Park, D. W., Lee, Y. J., Chang, W., Park, J. H., Lee, K. H., Kim, Y. H., ... & Jang, E. S. (2019). Diagnostic performance of a point shear wave elastography (pSWE) for hepatic fibrosis in patients with autoimmune liver disease. *PloS one*, *14*(3), e0212771.
3. Li, C., Dhyani, M., Bhan, A. K., Grajo, J. R., Pratt, D. S., Gee, M. S., & Samir, A. E. (2019). Diagnostic performance of shear wave Elastography in patients with autoimmune liver disease. *Journal of Ultrasound in Medicine*, *38*(1), 103-111.
4. Li, C., Dhyani, M., Bhan, A. K., Grajo, J. R., Pratt, D. S., Gee, M. S., & Samir, A. E. (2019). Diagnostic performance of shear wave Elastography in patients with autoimmune liver disease. *Journal of Ultrasound in Medicine*, *38*(1), 103-111.
5. Cuomo, G., Iandoli, C., Galiero, R., Caturano, A., Di Vico, C., Perretta, D., ... & Sasso, F. C. (2023). Liver Involvement in Patients with Systemic Sclerosis: Role of Transient Elastography in the Assessment of Hepatic Fibrosis and Steatosis. *Diagnostics*, *13*(10), 1766.
6. Mahmud, N., Doshi, S., Forde, K., & Khungar, V. (2019). Transient elastography reliably estimates liver fibrosis in autoimmune hepatitis. *Clinical and Experimental Hepatology*, *5*(3), 244-249.
7. Crescenzi, L., Pecoraro, A., Fiorentino, A., Poto, R., Varricchi, G., Rispo, A., ... & Spadaro, G. (2019). Liver stiffness assessment by transient elastography suggests high prevalence of liver involvement in common variable immunodeficiency. *Digestive and Liver Disease*, *51*(11), 1599-1603.
8. Mikolasevic, I., Domislovic, V., Wensveen, T. T., Delija, B., Klapan, M., Juric, T., ... & Stimac, D. (2020). Screening for nonalcoholic fatty liver disease in patients with type 2 diabetes mellitus using transient elastography-a prospective, cross sectional study. *European journal of internal medicine*, *82*, 68-75.
9. Méndez-Sánchez, Nahum, and Xingshun Qi. "The Usefulness of Transient Elastography in Patients with Autoimmune Hepatitis—When Can We Use It?" *Annals of Translational Medicine*, vol. 6, no. 15, 2018, https://doi.org/10.21037/atm.2018.06.38. Accessed 6 Nov. 2023.
10. Huang R, Jiang N, Yang R, et al. Fibroscan improves the diagnosis sensitivity of liver fibrosis in patients with chronic hepatitis B. *Exp Ther Med* 2016;11:1673-7. 10.3892/etm.2016.3135
11. El-Hariri MA, Abd El Megid AG, Taha Ali TF, et al. Diagnostic value of Transient Elastography (Fibroscan) in the evaluation of liver fibrosis in chronic viral hepatitis C: Comparison to liver biopsy. *Egyptian Journal of Radiology and Nuclear Medicine* 2017;48:329-37. 10.1016/j.ejrnm.2017.03.026
12. Hartl J, Ehlken H, Sebode M, et al. Usefulness of biochemical remission and transient elastography in monitoring disease course in autoimmune hepatitis. *J Hepatol* 2017.
13. Tanaka A, Ma X, Yokosuka O, Weltman M, You H, Amarapurkar DN, Kim YJ, Abbas Z, Payawal DA, Chang ML, Efe C, Ozaslan E, Abe M, Mitchell-Thain R, Zeniya M, Han KH, Vierling JM, Takikawa H. Autoimmune liver diseases in the Asia-Pacific region: Proceedings of APASL symposium on AIH and PBC 2016. Hepatol Int. 2016;10:909–915.
14. Goertz, R. S., Gaßmann, L., Strobel, D., Wildner, D., Schellhaas, B., Neurath, M. F., & Pfeifer, L. (2019). Acoustic radiation force impulse (ARFI) elastography in autoimmune and cholestatic liver diseases. *Annals of hepatology*, *18*(1), 23-29.
15. Cristoferi, L., Calvaruso, V., Overi, D., Viganò, M., Rigamonti, C., Degasperi, E., ... & Italian PBC Registry. (2021). Accuracy of Transient Elastography in Assessing Fibrosis at Diagnosis in Naïve Patients With Primary Biliary Cholangitis: A Dual Cut-Off Approach. *Hepatology*, *74*(3), 1496-1508.
16. Osman, K. T., Maselli, D. B., Idilman, I. S., Rowan, D. J., Viehman, J. K., Harmsen, W. S., ... & Eaton, J. E. (2021). Liver stiffness measured by either magnetic resonance or transient elastography is associated with liver fibrosis and is an independent predictor of outcomes among patients with primary biliary cholangitis. *Journal of clinical gastroenterology*, *55*(5), 449.
17. Constantinescu, C., SĂndulescu, L., & SĂftoiu, A. (2020). The role of elastography in non-alcoholic fatty liver disease. *Current Health Sciences Journal*, *46*(3), 255.
18. Petta, S., Sebastiani, G., Viganò, M., Ampuero, J., Wong, V. W. S., Boursier, J., ... & de Ledinghen, V. (2021). Monitoring occurrence of liver-related events and survival by transient elastography in patients with nonalcoholic fatty liver disease and compensated advanced chronic liver disease. *Clinical gastroenterology and hepatology*, *19*(4), 806-815.
19. Zenovia, S., Stanciu, C., Sfarti, C., Singeap, A. M., Cojocariu, C., Girleanu, I., ... & Trifan, A. (2021). Vibration-controlled transient elastography and controlled attenuation parameter for the diagnosis of liver steatosis and fibrosis in patients with nonalcoholic fatty liver disease. *Diagnostics*, *11*(5), 787.

20. Yang, L., Ling, W., He, D., Lu, C., Ma, L., Tang, L., ... & Chen, S. (2021). Shear wave-based sound touch elastography in liver fibrosis assessment for patients with autoimmune liver diseases. *Quantitative Imaging in Medicine and Surgery*, *11*(4), 1532.
21. Xing, X., Yan, Y., Shen, Y., Xue, M., Wang, X., Luo, X., & Yang, L. (2020). Liver fibrosis with two-dimensional shear-wave elastography in patients with autoimmune hepatitis. *Expert Review of Gastroenterology & Hepatology*, *14*(7), 631-638.