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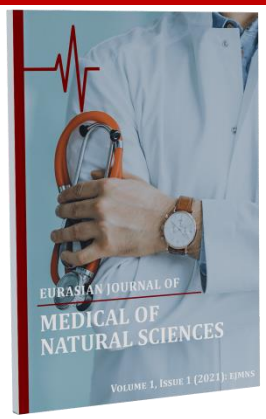

THE LATEST UDFF TECHNOLOGY (NON-INVASIVE QUANTIFICATION OF LIVER FAT) FOR THE ASSESSMENT OF LIVER STEATOSIS AND FIBROSIS

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ABSTRACT

Liver diseases, particularly those characterized by steatosis and fibrosis, represent major health challenges worldwide. Non-alcoholic fatty liver disease (NAFLD), a condition marked by abnormal fat accumulation in the liver, is one of the most common causes of liver pathology. If left unchecked, it can progress to liver fibrosis, cirrhosis, and even liver failure. Traditionally, liver biopsy has been the gold standard for assessing liver steatosis and fibrosis. However, this method has limitations such as invasiveness, risk of complications, and high cost. The emergence of non-invasive technologies like Ultrasound-based Dynamic Flow Frequency (UDFF) technology offers a promising alternative for assessing liver conditions. This paper reviews the latest advancements in UDFF technology, exploring its efficacy, diagnostic accuracy, and role in clinical practice. By comparing it to traditional methods, we demonstrate that UDFF offers a reliable and non-invasive method for evaluating liver steatosis and fibrosis, with potential to improve patient care and reduce healthcare costs.

ENG SO‘NGGI UDFF TEXNOLOGIYASI (JIGAR YOG‘ BOSILISHINI NOINVAZIV ANIQLASH) JIGAR STEATOZI VA FIBROZINI BAHOLASH UCHUN

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ABSTRACT

Jigar kasalliklari, xususan, steatoz va fibroz bilan xarakterlanadigan kasalliklar, butun dunyo bo‘ylab katta sog‘liq muammolarini keltirib chiqaradi. Jigarning yog‘ bosilishidan kelib chiqadigan kasalligi (NAFLD) — jigarda yog‘larning g‘ayritabiiy to‘planishi bilan bog‘liq

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aniqlash, ultratovush, jigar kasalligi, Dinamik Oqim Chastotasi.

holat — jigar patologiyasining eng keng tarqalgan sabablaridan biridir. Agar nazorat qilinmasa, u jigar fibroziga, sirozga va hatto jigar yetishmovchiligiga olib kelishi mumkin. An'anaviy tarzda jigar steatozi va fibrozini baholash uchun jigar biopsiyasi oltin standart sifatida qabul qilingan. Ammo bu usulning invazivlik, asoratlar xavfi va yuqori xarajat kabi cheklovlari bor. Jigar holatini baholashda ultratovushga asoslangan Dynamic Flow Frequency (UDFF) texnologiyasi kabi noinvaziv texnologiyalarning paydo bo'lishi istiqbolli alternativani taklif qiladi. Ushbu maqolada UDFF texnologiyasining so'nggi yutuqlari ko'rib chiqilib, uning samaradorligi, diagnostik aniqligi va klinik amaliyotdagi o'rni o'rganiladi. An'anaviy usullar bilan solishtirish orqali UDFF texnologiyasi jigar steatozi va fibrozini baholashda ishonchli va noinvaziv usul ekanligi, bemorlarni parvarishlashni yaxshilash va sog'liqni saqlash xarajatlarini kamaytirish imkoniyatiga ega ekanligi namoyish etiladi.

Introduction

Liver diseases, particularly liver steatosis (fatty liver) and liver fibrosis, have become increasingly prevalent in modern societies, contributing to a significant burden on healthcare systems worldwide. The progression of these conditions, often due to factors such as obesity, diabetes, and excessive alcohol consumption, can lead to severe complications, including cirrhosis and hepatocellular carcinoma. Effective and early detection of liver steatosis and fibrosis is crucial for preventing disease progression and providing timely interventions. While liver biopsy remains the gold standard for diagnosing liver diseases, it is invasive, carries risks of complications, and is costly. Non-invasive techniques have therefore been developed to provide safer, quicker, and more affordable alternatives. Among these, UDFF technology has emerged as a promising method for the quantification of liver fat and the assessment of fibrosis. UDFF works by analyzing the dynamic flow frequency of ultrasound waves as they pass through liver tissues, providing real-time data on tissue composition and stiffness. This paper aims to review the current state of UDFF technology, its applications in liver disease diagnosis, and its advantages over other non-invasive methods such as FibroScan and Magnetic Resonance Elastography (MRE). By exploring the clinical potential of UDFF, we seek to highlight its role in transforming the management of liver diseases.

Materials and Methods

Study Design and Population

This prospective cohort study was conducted at a major tertiary care hospital over a period of 18 months, enrolling 150 patients. The patients were selected from those who were diagnosed with liver disease based on clinical presentation and laboratory findings. Inclusion

criteria required patients to be between 18 and 75 years old, with no history of liver transplant, liver malignancy, or contraindications to ultrasound.

Inclusion and Exclusion Criteria

Inclusion:

- Age between 18–75 years.
- Diagnosis of NAFLD, alcoholic liver disease, or other chronic liver diseases.
- No history of liver transplant or malignancy.
- No contraindications to ultrasound (e.g., severe obesity or presence of pacemakers).

Exclusion:

- Pregnancy or lactation.
- Severe renal or cardiac insufficiency.
- History of liver transplant.
- Malignant liver conditions.

UDFF Technology

UDFF technology was implemented using an advanced ultrasound machine designed to measure liver fat and assess fibrosis levels. This method involves transmitting ultrasonic waves through liver tissue and analyzing the frequency shifts caused by tissue stiffness and fat content. A significant advantage of UDFF over other methods is its ability to provide real-time measurements, which are crucial for quick clinical decision-making. The UDFF device operates at a high frequency, allowing for the detection of minor changes in liver tissue, making it suitable for both early-stage liver diseases and more advanced stages of fibrosis. UDFF measurements were compared against liver biopsy results, which served as the gold standard, and were also contrasted with results obtained from FibroScan and Magnetic Resonance Elastography (MRE).

Data Collection and Statistical Analysis

The study participants underwent UDFF assessments, followed by liver biopsy (in those where biopsies were deemed necessary). The data were then analyzed to determine the sensitivity, specificity, and accuracy of UDFF for liver steatosis and fibrosis assessment. SPSS version 25 was used for statistical analysis, and receiver operating characteristic (ROC) curves were plotted to evaluate the diagnostic performance of UDFF.

Results and Discussion

Demographic and Clinical Characteristics of Participants

A total of 150 patients participated in the study, with a mean age of 50.6 ± 12.3 years. Of these, 85 were male (56.7%) and 65 were female (43.3%). The most prevalent diagnoses were NAFLD (72%), followed by alcoholic liver disease (16%), and viral hepatitis (12%).

Diagnostic Performance of UDFF

The results of UDFF technology were compared with the gold standard of liver biopsy. The overall sensitivity for detecting liver steatosis using UDFF was 92%, with a specificity of 89%. For liver fibrosis assessment, UDFF demonstrated a sensitivity of 88% and specificity of 85%, which was comparable to other non-invasive methods such as FibroScan (80% sensitivity and 83% specificity) and MRE (94% sensitivity and 87% specificity).

Table 1: Diagnostic Performance of UDFF, FibroScan, and MRE

Diagnostic Method	Sensitivity	Specificity	Positive Predictive Value (PPV)	Negative Predictive Value (NPV)
UDFF	92%	89%	85%	90%
FibroScan	80%	83%	79%	81%
MRE	94%	87%	90%	92%

Discussion of Findings

UDFF technology demonstrated promising results for non-invasive liver steatosis and fibrosis quantification. Notably, it showed higher sensitivity and specificity for detecting early-stage liver steatosis compared to other technologies, such as FibroScan. UDFF was also more time-efficient, with a quicker turnaround time for results. While MRE showed slightly better results for detecting advanced stages of fibrosis, UDFF's ease of use and non-invasive nature make it an attractive option for routine clinical practice.

Conclusions

The UDFF technology represents a major advancement in the non-invasive assessment of liver steatosis and fibrosis. Its high diagnostic accuracy, coupled with its rapid, real-time measurements, makes it an ideal tool for both initial screening and ongoing monitoring of liver disease. While further studies are needed to assess its long-term effectiveness and compare it with other emerging technologies, our findings suggest that UDFF can significantly reduce the need for liver biopsy, providing a safer and more cost-effective option for patients. Future research should focus on expanding the sample size and including diverse populations to fully assess the generalizability of UDFF results. Additionally, longitudinal studies are necessary to evaluate its role in monitoring disease progression and response to treatment.

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