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## Computerised Analysis of Liver Texture with Correlation to Needle Biopsy

Computergestützte Analyse der Leberstruktur in Korrelation mit der Feinnadelbiopsie

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Abstract

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# Zusammenfassung

**Ziel:** Verbesserung der Gewebecharakterisierung für die nichtinvasive Diagnose der diffusen Fettanreicherung in der Leber durch die Erstellung quantitativer Parameter für Ultraschall-Echos (US) in Korrelation mit der Histologie. **Methoden und Material:** Es wurden Ultraschall-Bilder von Patienten dokumentiert, die wegen anhaltend erhöhter Leberenzyme oder einer positiven Virushepatitis-Serologie zur Leberbiopsie (FNP) überwiesen wurden. Die histopathologischen Berichte wurden überprüft. Lebersteatose, Entzündung und Ausmaß der Fibrose wurden in Schweregrad 0 (normal) bis 3 (schwer) eingeteilt. Patienten mit einem Steatose-Grad von 3 ohne Zeichen der Entzündung oder Fibrose wurden ausgewählt. Ultraschall-Bilder von 24 Gesunden dienten als Kontrollen. Vier Gewebestruktur-Indices wurden für einen Zielbereich kalkuliert, der der Biopsie-Region entsprach. Sensitivität und Spezifität der Unterschiede zwischen den Gruppen wurden berechnet. **Ergebnisse:** Fettlebern und gesunde Lebern bildeten zwei klar unterscheidbare Gruppen. In allen Parameter-Unterbereichen gab es jedoch eine leichte Überschneidung zwischen den Gruppen, wobei einige Fälle jenseits der Dichotomie-Linie lagen. Es ergab sich eine hohe Sensitivität für alle Indices (90 - 100 %). **Schlussfolgerung:** Es ist möglich, eine höchst genaue „Ultraschall-Biopsie“ der Fettleber zu erhalten. Die beschriebenen Indices können als Hilfsmittel für die computergestützte Ultraschall-Diagnose der diffusen Leberparenchymerkrankung Anwendung finden, insbesondere für die schwere Lebersteatose.



## Abstract

**Aim:** To assist in tissue characterisation for the non-invasive diagnosis of diffuse fatty liver infiltration by providing quantitative indices of ultrasonic (US) backscatter with correlation to histology. **Methods and Materials:** US images from patients referred to US-guided liver needle biopsy (LNB) for persistently elevated liver enzymes or serologically positive markers for viral hepatitis were recorded. The histopathological reports were reviewed. Steatosis, inflammation and degree of fibrosis were scored from 0 (normal) to 3 (severe). Patients with level 3 steatosis without inflammation or fibrosis were selected. US images from twenty-four healthy subjects served as control. Four textural indices were calculated for a selected ROI corresponding to the biopsy site. Sensitivity and specificity of discrimination between the two groups were evaluated. **Results:** Fatty and healthy livers formed two distinct clusters. However, in all parametric subspaces there was a slight overlap between the groups with a few numbers of cases located across the dichotomy line. The sensitivity for all the indices was high (90 - 100 %). The specificity for each of the indices was moderate. The co-occurrence local homogeneity index yielded the highest specificity (88.5 %), with a sensitivity equivalent to two of the other indices (90 %). **Conclusions:** Highly accurate “ultrasonic biopsy” may be obtained for severe fatty liver. The described indices can serve as a tool in US computer- aided diagnosis (CAD) of diffuse parenchymal liver disease, in particular for severe steatosis of the liver.

## Schlüsselwörter

Ultraschall - Gewebestruktur - Steatose - diffuse Leberparenchymerkrankung - Feinnadelbiopsie

## Key words

Ultrasound - texture - steatosis - diffuse liver disease - needle biopsy

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