Name(s)

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Project Number

S1116

Project Title

Comparison between Alcoholic and Nonalcoholic Liver Using CT Phantom Calibration

Abstract

Objectives/Goals

The objective is to engineer a noninvasive methodology for precisely determining the volume, mass, and density of the liver. The secondary goal is to apply this method to obtain an accurate calculation of the average mass, volume, and density of nonalcoholic livers compared to alcoholic livers (patients who consume 1 to 3 drinks per day). Previous techniques for finding organ measurements relied on autopsy and blood tests were used to detect liver disease.

Methods/Materials

This study innovates a medical imaging method that focuses on the use of Computed Tomography (CT) and Phantom calibration, which creates a standard for evaluating the fluctuations on the scanner and electric current. Anonymous CT scans with full-body Phantom for 60 non-alcohol consuming patients and 35 alcohol consuming patients were obtained from CT database. Image results were analyzed using software program Reformat. Histographs and two sample t-tests were created for statistical analysis.

Results

The data collected from the patient population revealed that both consistency and accuracy were achieved using the Phantom calibration and differences in averages between normal and alcoholic measurements were successfully determined. Results indicate that alcoholic livers are larger in volume compared to nonalcoholic livers and the fat content is also higher in the alcoholic group. No significant difference in density was found. In regards to other measurements, alcohol consuming patients demonstrate a higher ratio for liver mass, volume index, and mass index.

Conclusions/Discussion

It was concluded that Phantom calibration in CT scans produced more accurate results than autopsy or CT alone. The liver measurements can be utilized as a guideline to detect abnormalities in volume, mass, and density of the liver, which can be the first signs of alcohol related disease such as cirrhosis and fatty liver. The contributions of this project may be utilized for future research in assisting doctors in making early liver disease diagnosis for patients.

Summary Statement

An innovative and noninvasive method for the early diagnosis of liver disease was engineered by using CT Phantom Calibration to compare volume, mass, fat content, and density measurements in alcoholic and nonalcoholic livers.

Help Received

Ap2/08