

# The Role of Ultrasound in the Diagnosis of Hepatic Steatosis in Morbidly Obese Patients

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**Background:** Hepatic steatosis is prevalent in obese patients. Although it requires histology for diagnosis, ultrasound may indicate its presence. We evaluated the importance of ultrasound in the diagnosis of steatosis in morbidly obese patients, and considered its clinical relevance for patients with BMI of 35-40 kg/m<sup>2</sup> without co-morbidities.

**Methods:** 187 morbidly obese patients submitted to bariatric surgery were prospectively studied. All patients had ultrasound before the operation, and hepatic biopsies during the operation, which were compared.

**Results:** The prevalence of steatosis histologically was 91.4%. The sensitivity and specificity of ultrasound in diagnosing steatosis was 49.1% and 75%, respectively, with a positive predictive value of 95.4%.

**Conclusion:** The biopsies found a very high prevalence of steatosis in the studied population. The ultrasound results yielded a high positive predictive value (95.4%), suggesting its use as a diagnostic tool for this co-morbidity in morbidly obese patients. The low sensitivity of the method could be related to the lack of objective criteria for the ultrasound diagnosis of steatosis, and probably, technical problems in performing ultrasound in such patients. We believe that in patients with a BMI of 35-40 kg/m<sup>2</sup> without other co-morbidities, the ultrasound finding of steatosis could be of value as an indication for bariatric surgery.

*Key words:* Hepatic steatosis, diagnostic ultrasound, morbid obesity, bariatric surgery

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## Introduction

Steatosis is the accumulation of fat in the hepatic parenchyma, and may be caused by obesity.<sup>1</sup> It is frequently seen in obese patients submitted to surgical procedures. The gold standard for diagnosis is tissue examination; however, it can be identified with good accuracy by abdominal ultrasound.<sup>2</sup> The importance of diagnosing hepatic steatosis resides in the fact that it can evolve to more advanced stages of hepatic damage such as steatohepatitis and cirrhosis, and also because its prevalence is related to obesity.<sup>1-8</sup>

A positive ultrasound test for steatosis could be important for patients with body mass index (BMI) in the range of 35 to 40 kg/m<sup>2</sup>, in the absence of other co-morbidities, because surgical treatment may be considered. The purpose of this study was to evaluate the precision of ultrasound in the diagnosis of steatosis in the morbidly obese patient.

## Materials and Methods

This was a prospective study, from July 2001 to July 2003, in which 187 patients were submitted to surgery for morbid obesity at the Centro da Obesidade Mórbida (COM) do Hospital São Lucas da PUCRS, Brazil. The abdominal ultrasound is considered as a routine preoperative examination. Ultrasounds were performed in different clinics, due to the patients'

convenience or their health insurance plan. Hepatic biopsies were obtained during the bariatric surgery, and all specimens were processed by the same pathologist. The first 105 biopsies (July 2001 to August 2002) were wedge liver biopsies, and the remaining 82 (August 2002 to July 2003) were needle liver biopsies, with no difference between results ( $P=0.185$ , Yates corrected). The ultrasound finding of steatosis was compared with the hepatic biopsies, which are considered as the gold standard.

Informed consents were obtained preoperatively. Patients who refused to participate by unwillingness to sign the consent or who had the findings of cirrhosis at the biopsy, were excluded from the study.

## Results

A total of 187 patients were available for study, with an average age of 36 years (range 18-67), an average BMI of 47.5 kg/m<sup>2</sup> (range 35.0-82.2), and 130 female patients (69.5%). The histologic prevalence of steatosis in this entire population was 91.4%. The sensitivity and specificity of ultrasound in the diagnosis of steatosis was 49.1% and 75%, respectively, with a positive predictive value of 95.4% (Table 1).

Table 2 depicts the results from the patients who had a BMI between 35 and 40 kg/m<sup>2</sup>. The prevalence in this subgroup was 95.8%, with a sensitivity of 39% and a specificity of 100%, and a positive predictive value of 100%.

## Discussion

A published prospective study to evaluate steatosis and hepatic fibrosis in non-obese patients found a sensitivity of 94% and a specificity of 84% of the

**Table 1.** Steatosis in ultrasound versus biopsy (187 patients with BMI 35.0-82.2)

	Biopsy +	Biopsy -
Ultrasound with steatosis	84	4
Ultrasound without steatosis	87	12

**Table 2.** Ultrasound versus biopsy in the diagnosis of steatosis in the 24 patients with BMI 35-40

	Biopsy +	Biopsy -
Ultrasound with steatosis	9	0
Ultrasound without steatosis	14	1

ultrasound in the diagnosis of steatosis.<sup>9</sup> The sensitivity of the test was 100% for patients with moderate to severe steatosis. They reported six false positive findings, five for patients with cirrhosis and one in a patient with a normal biopsy.<sup>9</sup>

Debongnie et al<sup>10</sup> in another prospective study, also with non-obese patients, found a sensitivity of 80% and specificity of 100% while searching for findings of steatosis, fibrosis and hepatic cancer.

Joy et al<sup>2</sup> also stressed that ultrasound presents a high positive predictive value when suggestive of steatosis, besides being cost-effective, safe and patient-friendly. Moreover, the ultrasound can be considered as an alternative to the hepatic biopsy in selected patients.

Our results found a very high prevalence of steatosis in the entire group of patients undergoing bariatric surgery (91.4%). The ultrasound results yielded a positive predictive value of 95.4%, indicating the validity of this test as a diagnostic tool for this co-morbidity in morbidly obese patients. In the patients with BMI 35 to 40 kg/m<sup>2</sup>, we found a higher prevalence (95.8%). The sensitivity was lower (39%), when compared with the entire studied population (49.1%). However, the specificity and positive predictive value were 100%.

We believe that the low sensitivity values obtained for the test might be related to the lack of clear standards for the diagnosis and reporting of steatosis on ultrasound. It could also be related to the possible technical difficulties found while performing ultrasound in such patients. Another possible explanation for the low sensitivity found, could be the small number of patients in the lower range of BMI.

The present study has shown the clinical importance of an ultrasound suggestive of steatosis, when considering morbidly obese patients with a BMI between 35 and 40 in the absence of other co-morbidities. In such patients, the ultrasound finding of steatosis could indicate a surgical option for the treatment.

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*(Received September 4, 2003; accepted March 15, 2004)*