

Abstract

Objectives

Liver stiffness measurement (LSM) failure rate ranges between 2 and 10 % when using FibroScan and is generally due to obese patients. Indeed subcutaneous fat interferes with the spreading of ultrasound waves, making the examination much more difficult. The aim of this prospective study was to evaluate the feasibility and performances of a new FibroScan probe (XL probe).

Patients and methods

From January to september 2008, 99 patients with a BMI > 30 kg/m² were recruited (27 % male, mean age 52 (20-76), mean BMI 41 (30-64) kg/m²). For each patient liver stiffness measurement (LSM) was attempted with both standard M probe (ultrasound frequency = 5Mhz, diameter = 7mm, depth measurement = 25-65 mm) and XL probe (2.5 Mhz, 10 mm, 35-75 mm) by trained operators. Liver localization with an ultrasonic device and blood work up were carried out for each patient.

Results

On the 76 patients measured with the XL probe, (at least 10 valid measurements), LSM was significantly (median value 5.3 ± 1.8 kPa correlated to alkaline phosphatase (r = 0.31, p=0.006) and glycemia (r = 0.43, p<0.001). In addition stiffness value was significantly correlated to the following non-invasive fibrosis markers : APRI (r = 0.42), GUCI (r = 0.45), Forns (r = 0.39), Virahep-C (r = 0.43), and Lok (r=0.34)..

Conclusion

In patients with BMI > 30 kg/m², 60% of patients who cannot be measured with the M probe can be measured with the new XL probe choosing the optimized measurement point with an ultrasound imaging system. LSM obtained with the XL probe is well correlated to biological parameters and non invasive fibrosis markers. Its comparison with histology is currently going on to assess its diagnosis accuracy for significant fibrosis and cirrhosis especially in NAFLD.

Introduction

Transient elastography (FibroScan®, Echosens, Paris, France) is a non-invasive method for assessing liver stiffness, which is correlated to the fibrosis stage in numerous chronic liver diseases (1, 2).

This technique is easy to perform and provides immediate results with a good reproducibility.

However failure rate of liver stiffness measurement ranges between 2 and 10%, and is generally due to obese patients.

Objective

The aim of this prospective study was to assess the feasibility and performances of liver stiffness measurement (LSM) using the new XL probe on patients with BMI ≥ 30kg/m².

Patients and methods

➤ Patients with BMI ≥ 30 kg/m²

➤ For each patient, LSM was performed with the two different probes:

❑ M probe
(standard)

❑ XL probe
(overweight patients)



Characteristics	M probe	XL probe
US central frequency	3.5 MHz	2.5 MHz
Tip diameter	9 mm	12 mm
Measurement depths (below skin surface)	2.5-6.5 cm	3.5-7.5 cm
Amplitude des vibrations (peak to peak)	2 mm	3 mm

➤ Examinations performed by trained operators.

➤ Liver localization performed before each examination using an ultrasound scanner.

➤ Blood work up carried out to calculate different noninvasive fibrosis blood markers (FIB-4, GUCI, Virahep-C, Forns, APRI).

➤ Patient weight, height, waist circumference, hip circumference thoracic perimeter and skin capsula distance (SCD) were reported.

Results

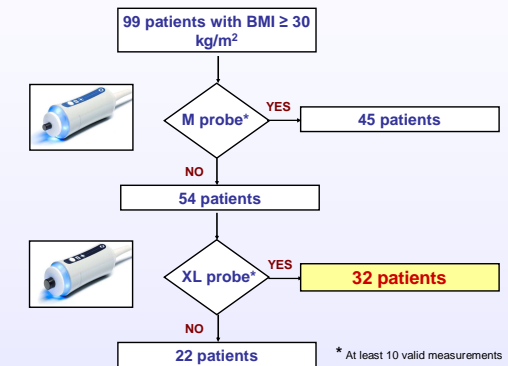
Characteristics of the 99 patients

Characteristics	Mean (Standard deviation)
Gender (% male)	27
Age (years)	52 (15.6)
Height (m)	1.64 (0.10)
Weight (kg)	109 (23)
BMI (kg/m ²)	40.5 (7.3)
Waist circumference (cm)	118 (14)
Hip circumference (cm)	128 (14)
Thoracic perimeter (cm)	112 (12)
Skin Capsula Distance (cm)	2.8 (0.8)
Platelets (10 ³ /mm ³)	271 (74)
INR	1.12 (0.44)
ASAT (UI/L)	28.0 (10.4)
ALAT (UI/L)	37.2 (24.0)
GGT (UI/L)	54.3 (105)
Alkaline phosphatase (UI/L)	80 (25)
Total cholesterol (mmol/L)	4.88 (1.20)
Triglycerids (mmol/L)	1.8 (1.0)
Fasting glucose (mmol/L)	6.9 (2.9)

Performances of the probes

Characteristics	M probe	XL probe	p	Statistical test
No valid measurements	27	0	< 0.001	Mac Nemar test
At least 5 valid measurements	53	85	< 0.001	Mac Nemar test
At least 10 valid measurements	45	76	< 0.001	Mac Nemar test
Success rate (%) *	75 ± 16	94 ± 9	< 0.001	Wilcoxon signed rank test
IQR/median (%) *	19 ± 11	19 ± 6	NS	Wilcoxon signed rank test
Median value (kPa) *	6.5 ± 4	5.3 ± 1.8	< 0.001	Wilcoxon signed rank test

* For the 44 patients measured successfully with the 2 different probes.



Correlations between non-invasive markers

Markers	Spearman (p)
FIB-4	0.38 (0.01)
GUCI	0.45 (0.002)
Virahep-C	0.43 (0.003)
Forns	0.39 (0.009)
APRI	0.42 (0.005)
Lok	0.34 (0.03)

Conclusion

➤ Using the new XL probe, LSM cannot be measured for only 22% of obese patients.

➤ 60% more patients were measurable with the XL probe.

➤ LSM obtained is well correlated with biology and fibrosis markers.

➤ A comparison study with histology is currently going on to assess the new probe performance compared to the liver biopsy.

(1) Talwalkar J.A, et al (2007). « Ultrasound based transient elastography for the detection of hepatic fibrosis : systematic review and meta-analysis. » *Clinical Gastroenterology and Hepatology*. 5 (10): 1214-20.
(2) Friedrich-Rust M, et al (2008). « Performance of transient elastography for the staging of liver fibrosis : a meta-Analysis. » *Gastroenterology*. 134 (4): 960-74
(3) Foucher J, et al (2005). « Prevalence and factors associated with failure of liver stiffness measurement using FibroScan in a prospective study of 2114 examinations. » 56th Annual meeting of the American Association for the study of Liver disease, San Francisco.