

Original Article

Comparison of Elasticity Values of the Right Lobe of the Liver of Normal Weight and Morbidly Obese Turkish Patients

S Aksoy, C Colak, M O Nalbant, R Turkey, I Erdil, E Hocaoglu, E Inci, H Alis¹

Departments of Radiology and ¹General Surgery, Bakirkoy, Dr. Sadi Konuk Research and Training Hospital, Istanbul, Turkey

Date of Acceptance:

11-Jul-2016

INTRODUCTION

Tissue stiffness is related to tissue composition which is changed by diseases. Elastography is a method used for the measurement of stiffness in some organs. There are two main types of elastography: strain and shear wave elastography studies.^[1] We preferred to use shear wave elastography. Because this type is better than the other types for diffuse organ diseases. Another advantage of shear wave elastography is that it is independent from the user.

Morbid obesity is a lethal condition for the people. At our hospital, sleeve gastrectomy operations are made for this. Before operation, the general surgery department of our hospital sends the patients to our department for abdominal ultrasonography for the detection of any abdominal pat before operation. We accepted the people who have more than a value of 40 for the body mass index (BMI) as morbid obese. We calculated this value using patient's weight in kilogram (kg) divided by the square of the patient's height in meters (m²).

Morbid obesity makes some changes in the liver. The most common one is fatty liver. In one study in Japan, the proportion of patients with nonalcoholic fatty liver disease was detected to be 82.4% in morbid obese patients.^[2] Because fatty liver can progress to liver fibrosis and can

ABSTRACT

Introduction: Shear wave elastography is a method for the measurement of tissue stiffness. The advantage of this method is that its outcome is not operator dependent. Our aim was to compare the elasticity values of the right lobe of the liver of normal weighted and morbidly obese patients. **Materials and Methods:** The mean elastiscity values of the right lobe of the liver were calculated for 38 normal weighted and 37 morbidly obese patients. All the patients had no history of liver disease. **Results:** The mean elastiscity value was significantly higher in morbidly obese patients than (25,7 +3,30 kPascal) in normal weighted patients for the right lobe of liver (10,55 +2,20 kPascal). **Conclusion:** Morbidly obese patients have a potential risk for liver fibrosis even in the absence of hepatosteatosis.

KEYWORDS: *Ultrasonography, morbid obesity, shear wave elastography*

shorten patients' life; our aim is to detect microstructural changes in the liver before fatty changes. We hypothesized that microstructural fatty changes in morbid obese patients can make differences in elastographic values of the liver.

PATIENTS AND METHODS

There were two groups of patients. All the patients are Turkish people from Bakirkoy Dr. Sadi Konuk Research and Training Hospital, Istanbul, Turkey. Both groups were chosen from the patients between January and October 2015. First group are normal weight people. They were sent to our department for the abdominal ultrasonography for other reasons. They had no history of liver disease. There were 38 normal weight patients: 21 females and 17 males. Their age ranged from 17 to 45. Their BMI was lesser than 25 kg/m² [Table 1].

The second group consisted of obese patients. Their BMI was greater than 40. The research protocol was approved by the ethics committee.

Address for correspondence: Dr. Sema Aksoy, Department of Radiology, Bakirkoy Dr. Sadi Konuk Research and Training Hospital, Bakirkoy Istanbul, Turkey. E-mail: semaaksoy2000@yahoo.com

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

For reprints contact: reprints@medknow.com

How to cite this article: Aksoy S, Colak C, Nalbant MO, Turkey R, Erdil I, Hocaoglu E, *et al.* Comparison of elasticity values of the right lobe of the liver of normal weight and morbidly obese Turkish patients. *Niger J Clin Pract* 2017;20:542-4.

Access this article online

Quick Response Code:



Website: www.njconline.com

DOI: 10.4103/1119-3077.206362

The general surgery department sent these patients to us for abdominal screening before sleeve gastrectomy. Their liver tests (aspartate transaminase and alanine transaminase) were normal and they had no history of liver disease. The patients who had fatty liver and abnormalities of liver function tests excluded from the study. There were 37 morbidly obese patients, 32 females and 5 males. Their age ranged from 18 to 48 years. [Table 2]

Measurements were performed with Applio. 500 Platinum (Toshiba, America, Medical Systems). We used a convex probe.

The region of interest (10 × 16 mm) was put in the right lobe of the liver.

The patient was examined in the dorsal decubitus position with the right arm elevated in a resting respiratory position. Measurements are performed at least 1.5–2.0 cm far away the Glisson capsule in the right lobe. The area is far from the main vessels due to artefacts [Figure 1].

Tissue stiffness was measured by using color-coded sample box. The dark blue areas were chosen. The measurements of quantitative value of sample box are defined as kilopascal. The formula is $E = 3\rho c^2$ E means tissue stiffness, ρ means density of the tissue (kg/m^3), c means shear wave velocity as m/s).

RESULTS

This study was done between the dates of January and October 2015.

The mean elasticity value was 10.55 ± 2.20 kPascal (kPa) for the right lobe of the liver for the normal weighted of the patients.

The mean elasticity value was 25.7 ± 3.30 kPa for the right lobe of the morbidly obese patients. This value is significantly higher than normal weighted people ($P < 0.01$). Number Cruncher Statistical System 2007 (Kaysville, Utah, USA) program was used for the statistical analysis. Student's *t* test was used for the comparison of parameters of two groups. $P < 0.01$ was accepted as statistically significant.

DISCUSSION

The tissues in the human body are generally viscoelastic. The tissues both contain the tissue characteristics of both elastic and viscous materials. Elastic tissues mean more solid and viscous means more fluid.^[2] Elasticity could be used almost every organ for the detection of the masses and for the diffuse involvement of the liver, such as cirrhosis elasticity is also useful.^[3] Elasticity values changes in the masses according to the surrounding tissue. So, we can detect masses.

Hepatosteatosis is very common in the morbid obese patients. This hepatosteatosis could generate liver cirrhosis which is a very mortal condition.^[4] Our idea is the elasticity of the liver can be changed in the morbid obese patients before hepatosteatosis. So, we compared the elasticity values of normal weighted people to values of morbidly obese patients.

The mean elasticity value was measured 10.55 ± 0.30 kPa for the right lobe of the liver for the normal weighted of the patients. The mean elasticity value was measured 25.7 ± 3.30 kPa for the right lobe of the morbidly obese

Table 1: Age and gender distribution for the normal weight people

		Min-Max	Average ± SD
Age (years)		17-45	31 ± 4.40
		n	%
Gender	Male	17	44.7
	Female	21	55.3

Table 2: Age and gender Distribution for the morbidly obese people

		Min-Max	Average ± SD
Age (years)		18-48	33 ± 4.40
		n	%
Gender	Male	5	13.5
	Female	32	86.5



Figure 1: The measurement of ultrasonographic shear wave measurement of an 18-year-old morbidly obese female patient. The dark blue area represents normal liver tissue

patients. This difference is statistically different from the normal weighted people. Liver stiffness values greater than 12.5 kPa are suggestive of cirrhosis in one study.^[5] There are also a few studies about liver fibrosis and elasticity values.^[6,7] In these studies, as liver fibrosis increases the mean elasticity value of the liver also increases.

This means microstructural liver fibrosis could begin before ultrasonographically apparent hepatosteatosis.

CONCLUSION

Morbid obesity could lead to liver fibrosis even in the absence of hepatosteatosis. Shear wave ultrasonography could detect these abnormalities before visible changes occur in the ultrasonography. It will be useful as a noninvasive method for the follow-up of morbidly obese patients.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Garra BS. Elastography: history, principles and technique comparison: *Abdom Imag.* 2015;40:680-97.
2. Yan-Ping Huang, Yong-Ping Zheng. Measurement of soft tissue elasticity *in vivo*: techniques and applications. USA: CRC Press; 2015. pp 127-9.
3. Garra BS. Imaging and estimation of tissue elasticity by ultrasound. *Ultrasound Q* 2007;23:255-68.
4. Matteoni CA, Younossi ZM, Gramlich T, Boparai N, Liu YC, McCullough AJ, *et al.* Nonalcoholic fatty liver disease: a spectrum of clinical and pathological severity. *Gastroenterology* 1999;116:1413-9.
5. Zeng J, Liu GJ, Huang ZP, Zheng J, Wu T, Zheng RQ, Lu MD, *et al.* Diagnostic accuracy of two-dimensional shear wave elastography for the non-invasive staging of hepatic fibrosis in chronic hepatitis B: a cohort study with internal validation. *Eur Radiol* 2014;24:2572-81.
6. Obara N, Ueno Y, Fukushima K, Nakagome Y, Kakazu E, Kimura O, *et al.* Transient elastography for measurement of liver stiffness measurement can detect early significant hepatic fibrosis in Japanese patients with viral and nonviral liver disease. *J Gastroenterol* 2008;43:720-8.
7. Tutar O, Beşer ÖF, Adaletli I, Tunc N, Gulcu D, Kantarci F, *et al.* Shear wave elastography in the evaluation of liver fibrosis in children. *J Pediatr Gastroenterol Nutr* 2014;58:750-5.

