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ANTHROPOMETRIC PARAMETERS AFFECTING THE LINEAR DIMENSIONS OF THE RIGHT LIVER LOBE

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ABSTRACT — The anthropometric parameters and linear ultrasound diameters of right liver lobe were taken from 212 adult healthy volunteers (90 men and 122 women). In men anthropometric parameters correlate with linear dimensions of the right liver lobe much more than in women. The anteroposterior diameter of the right lobe is the most anthropometrically dependent liver's dimension in both men and women, and the craniocaudal diameter of the right lobe is the least anthropometrically dependent liver's dimension. The strongest correlations were found in both men and women between the anteroposterior diameter of the right lobe and weight, chest circumference and waist circumference.

KEYWORDS — Anthropometric parameters, ultrasound, linear dimensions of the liver, right liver lobe, gender differences.

INTRODUCTION

As it is known that the size of the liver can be influenced by many factors, such as weight, height, age, gender, size and shape of the body, presence of anatomical abnormalities of the liver, obesity, cirrhosis of the liver, alcohol abuse, as well as the respiratory phase during the measurement and the method of diagnostic visualization and position of patients throughout the examination [1; 2; 3; 4; 5; 6; 7; 8]. However, the influence's degree of factors on the liver's size varies according to point of view of different authors.

Some authors consider the size of the liver in men is larger than in women [3; 5; 6; 7], others that the difference has no clinical significance [2] or not at all [1].

Some authors [2; 7] consider the body mass index is determinative when measuring the oblique craniocaudal maximum diameter of right liver lobe but their parameters in relation to height and weight differ.

In the previous study we have already determined the difference in linear dimensions of the right liver lobe for men and women [8].

The purpose of this study was to determine the influence of anthropometric parameters on the linear dimensions of the right liver lobe in men and women.

MATERIALS AND METHODS

We have carried out measurements of anthropometric parameters and ultrasound examination of abdominal cavity's organs with determining of linear dimensions of the right liver lobe in 212 healthy volunteers (90 men и 122 women) aged 18 to 69 years.

Height, weight, infrasternal angle, chest circumference (CC) and waist circumference (WC) were measured. The posterior semicircle of CC matches with the line just below the inferior scapula's angle, the anterior semicircle of CC in men crosses the nipples and matches with the line just below mammary gland in women. WC was measured at the level of the navel. Thickness of subcutaneous adipose tissue of anterior abdominal wall (SAT of AAW) was measured at 3 cm to the right side from navel with ultrasound linear transducer. Body mass index (BMI) was calculated using standard formula.

Ultrasound examinations of liver were performed using following ultrasound systems: Aixplorer (Supersonic Imagine, France), SonoScapeS6 (China) and Mindray DC-8 (China) with convex transducers. All patients were investigated in the supine position with the both arms placed above the head, the stretched legs and with quiet breathing.

Right lobe was measured in the anterior axillary line with transducer orientated longitudinally through the VII–X intercostal spaces. We have measured oblique craniocaudal maximum diameter (OCC max, length), craniocaudal diameter (CC) and anteroposterior diameter (AP, depth) (Fig. 1).

All data were analyzed using the Statistical Package for the Social Sciences 23.0 (SPSS) software recommended for analysis of biomedical data. Correlation was assessed using Spearman's rank correlation coefficient. Chaddock`s scale was used for the assessment of correlation [9]. P-values of less than 0.05 were considered statistically significant.

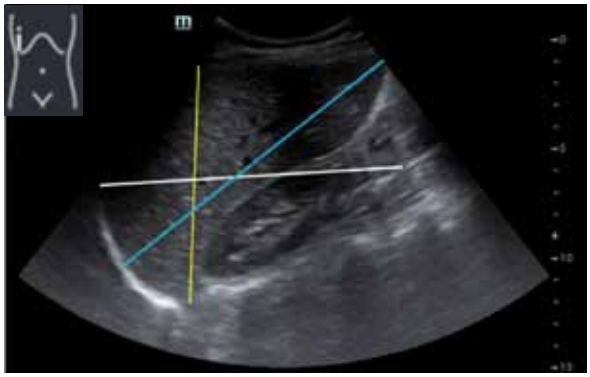

Fig. 1. Ultrasound measurements of the right liver lobe in volunteer M., 43 years old. Transducer orientated longitudinally in the VII-X intercostal spaces in the anterior axillary line. Blue color indicates the oblique maximum craniocaudal diameter, white — the craniocaudal diameter, yellow — the anteroposterior diameter

RESULTS

The correlation and its statistical significance between anthropometric parameters and linear dimensions of the right liver lobe in men and women are represented in the Table 1.

When measuring the right liver lobe the strongest correlations were revealed for the AP diameter both in men and in women.

In men there were noticeable direct correlations between the AP diameter of the right lobe with weight (r = 0.611), CC (r = 0.574), and WC (r = 0.562). Moderate direct correlations were found in men between the AP with height (r = 0.359), BMI (r = 0.469), infrasternal angle (r = 0.355), and thickness of SAT of AAW (r = 0.388). Moderate direct correlations in women were found between AP diameter and weight (r = 0.483), BMI (r = 0.404), infrasternal angle (r = 0.448), WC (r = 0.407), and thickness of SAT of AAW(r = 0.300).

There is the study showing that the AP diameter of the right lobe is the most correlated linear dimension with the volume of the liver [10]. Thus, it may be necessary to take this into account that AP diameter of right lobe when not only assessing linear diameters accordingly to anthropometric parameters but also for assessing the liver volume.

CONCLUSION

Anthropometric parameters correlate differently with right liver lobe linear dimensions. In men correlations are stronger than the same in women.

Table 1. *Correlation coefficients of anthropometric parameters and linear diameters of the right liver lobe in men and women*

Anthropo-metric parameters	OCC max		CC		AP	
	men (n=90)	women (n=122)	men (n=90)	women (n=122)	men (n=90)	women (n=122)
height	0,509 (p <0,001)	0,153 (p=0,092)	0,452 (p<0,001)	0,110 (p=0,226)	0,359 (p=0,001)	0,125 (p=0,169)
weight	0,427 (p< 0,001)	0,118 (p=0,197)	0,304 (p=0,004)	0,067 (p=0,462)	0,611 (p< 0,001)	0,483 (p<0,001)
BMI	0,153 (p=0,149)	0,018 (p=0,846)	0,040 (p=0,711)	-0,005 (p=0,957)	0,469 (p<0,001)	0,404 (p<0,001)
infrasternal angle	0,188 (p=0,076)	0,121 (p=0,183)	0,089 (p=0,404)	0,113 (p=0,217)	0,355 (p=0,001)	0,448 (p<0,001)
CC	0,223 (p=0,035)	0,081 (p=0,374)	0,112 (p=0,293)	0,031 (p=0,732)	0,574 (p=0,000)	0,456 (p=0,000)
WC	0,286 (p=0,006)	0,041 (p=0,655)	0,100 (p=0,350)	-0,009 (p=0,921)	0,562 (p<0,001)	0,407 (p<0,001)
thickness of SAT of AAW	0,018 (p=0,867)	-0,085 (p=0,354)	-0,136 (p=0,200)	-0,102 (p=0,264)	0,388 (p<0,001)	0,300 (p=0,001)

It's shown on the table that the anthropometric parameterswith the diameters of the right lobe correlate more in men than those in women.

Noteworthy statistically significant relationships for OCC max and CC diameters were found only in men with such parameters as height and weight (for OCC max r = 0.509 and r = 0.427, respectively, for CC r = 0.452 and r = 0.304, respectively).

Both height and weight affect on all the reviewed right liver lobe linear dimensions (oblique craniocaudal maximum diameter, craniocaudal diameter and anteroposterior diameter) in men. The craniocaudal diameter of the right lobe is the least anthropometric dependent linear dimension of the right liver lobe.

The dimension most closely correlated to anthropometric parameters (weight, BMI, infrasternal

angle, chest circumference, waist circumference and thickness of subcutaneous adipose tissue of anterior abdominal wall) for both men and women is the anteroposterior diameter of the right lobe.

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