

ROLE OF ULTRASOUND IN EVALUATING SARCOPENIA IN CIRRHOTIC PATIENTS

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Abstract

Background: Sarcopenia is a syndrome characterized by progressive and generalized loss of skeletal muscle mass and strength, common in liver cirrhosis. This study aimed to assess diaphragm muscle and quadriceps muscle thickness along with Quadriceps echogenicity in correlation with the nutritional status of the patients with cirrhosis as the literature reviewed is sparse regarding such an assessment. **Materials and Methods:** This prospective study was performed at the Institute of Hepatobiliary Sciences, Madras Medical College, Chennai over two months. 204 cirrhotic patients both in the male and female wards were subjected to ultrasound. The main Clinical criteria to assess the diagnostic accuracy were the RFH GA nutritional assessments score and the other ancillary one including hand-grip strength measurements. **Result:** We have observed a significant difference in diaphragm thickness (2.491 ± 0.38 Vs 1.653 ± 0.37 , p-value < 0.001) and quadriceps muscle thickness (4.559 ± 0.33 Vs 2.234 ± 0.59 , p-value < 0.001) between control and cases. When compared with Nutritional status, all parameters showed statistically significant differences, especially with the severely malnourished group in nutritional status, henceforth decrease diaphragm thickness and quadriceps muscle thickness and decreased echogenicity correlating significantly with nutritional status. **Conclusion:** Thus, we would like to postulate that measurement of diaphragm thickness, and quadriceps muscle thickness using ultrasound could serve as a definite tool to evaluate sarcopenia in cirrhotic patients without radiation effects.

INTRODUCTION

Sarcopenia was first proposed by Irwin Rosenberg in 1989. It is characterised by a steady decrease in muscle mass and is associated with chronic disease. Muscle performance and strength are decreased. Sarcopenia, which is generally understood as a major loss of muscle mass and function, is becoming recognised more and more as a significant independent risk factor for a variety of unfavorable consequences. Physical impairment, osteoporosis, fractures, extended hospital stays, and readmission are only a few of these undesirable effects. Operational definitions afterward include functional criteria (low muscle strength measured by hand grip strength). It has been observed in cirrhotic individuals that an imbalance between muscle protein production and protein breakdown led to a reduction of the rectus femoris muscle cross-sectional area. From a theoretical viewpoint, measuring the muscle mass of these patients may help identify at-risk patients and forecast the course of the patient's condition.^[1,2,3]

In clinical practice, measurement of the (quadriceps) rectus femoris (RF) cross-sectional area (CSA) is extensively utilized as a marker for muscle size. The justification behind these measurements can be attributed to their acceptability by participants, accessible location, a straightforward technique for reliably determining their placement, and strong correlation with functional strength. With ultrasound being used more and more as a reliable tool for detecting muscle atrophy in liver cirrhosis, ultrasound-based measurement cut-off points are becoming more and more important for both sexes to evaluate a person's muscle health as well as to identify sarcopenia early and accurately. This could help identify people who are more at risk and support individualized treatment plans.^[4,5]

This study aimed to assess diaphragm muscle and quadriceps muscle thickness along with Quadriceps echogenicity in correlation with the nutritional status of the patients with cirrhosis as the literature reviewed is sparse regarding such an assessment.

MATERIALS AND METHODS

This prospective study was performed at the Institute of Hepatobiliary Sciences, Madras Medical College, Chennai for two months. 204 cirrhotic patients both in the male and female wards were subjected to ultrasound. The ethics committee of our institution approved this study and written informed consent from each patient was obtained before their enrollment. The main clinical criteria to assess the diagnostic accuracy were the RFH GA nutritional assessments score and the other ancillary one including hand-grip strength measurements.

Statistical Analyses

Statistical analyses were performed using SPSS version 15.0. Pearson chi-square test was used to evaluate the distribution between variables. Correlation between the diaphragm thickness, quadriceps muscle thickness along with Quadriceps Echogenicity to the Nutritional status of the patient.

RESULTS

The mean difference between the Diaphragm thickness of the case and control was calculated and there is a significant difference between control vs case (2.491 ± 0.38 Vs 1.653 ± 0.37 , p-value < 0.001). Likewise, quadriceps muscle thickness also showed a significant difference between the control Vs case (4.559 ± 0.33 Vs 2.234 ± 0.59 , p-value < 0.001) [Table 1].

When compared with Nutritional status, all parameters showed statistically significant differences, especially with the severely malnourished group in nutritional status, henceforth decrease diaphragm thickness and quadriceps muscle thickness and decreased echogenicity correlating significantly with nutritional status [Table 2].

Table 1: Quadriceps muscle thickness and diaphragm thickness mean the difference between the control and case

Parameter	Mean \pm SD (n=204)		p-value
	Control	Case	
Quadriceps muscle thickness	4.559 \pm 0.33	2.234 \pm 0.59	<0.001
Diaphragm thickness	2.491 \pm 0.38	1.653 \pm 0.37	<0.001

Table 2: Diaphragm and quadriceps thickness vs nutritional status

Parameters	Nutritional status			p-value
	Moderate	Severely	Well	
Diaphragm Thickness 1 >2	2 (1.0%)	41 (20.1%)	3 (1.5%)	0.001
Diaphragm Thickness 2 < 2	1 (0.5%)	157 (77.0%)	0 (0%)	
Quadriceps Thickness 1 <4	3 (1.5%)	197 (96.1%)	1 (0.5%)	<0.0001
Quadriceps Thickness 2 > 4	0 (0%)	2 (1.0%)	2 (1.0%)	
Quadriceps Echo 1 Dec	3 (1.5%)	194 (94.6%)	1 (0.5%)	<0.0001
Quadriceps Echo 2 Inc	0 (0%)	5 (2.4%)	2 (1.0%)	

Among 204 patients nearly 97.1% (n=198) are identified as having severe malnutrition and among them, 77.0% of the patients have diaphragm thickness lesser than 2mm. Among 204 patients nearly 97.1% are identified as having severe malnutrition and among them, 96.1% of the patients have Quadriceps thickness lesser than 4mm. Among 204 patients nearly 97.1% are identified as having severe malnutrition and among them, 94.6% of the patients have decreased quadriceps echogenicity [Table 2].

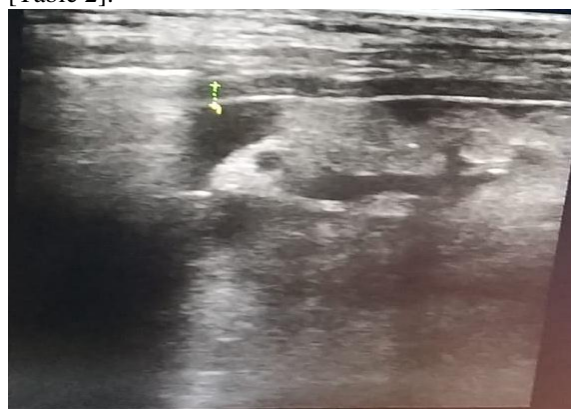


Figure 1: affected right hemidiaphragm in sarcopenic cirrhotic patient

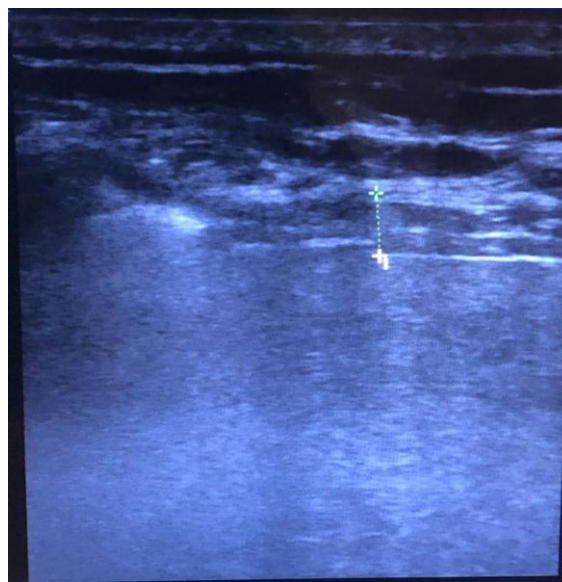


Figure 2: Unaffected Right Hemidiaphragm in Healthy Patient

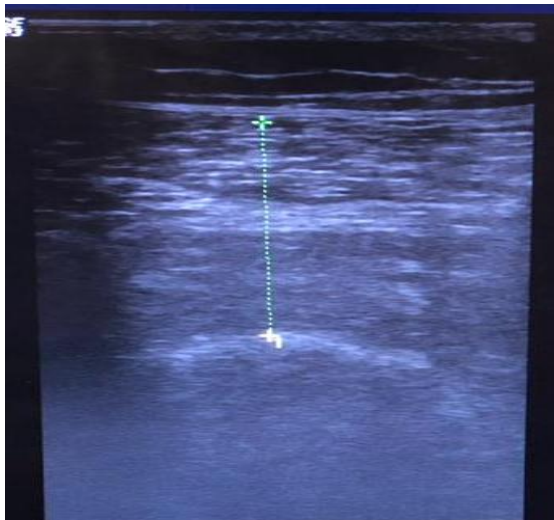


Figure 3: Reduced Quadriceps Muscle Size in Sarcopenic Cirrhotic Patient

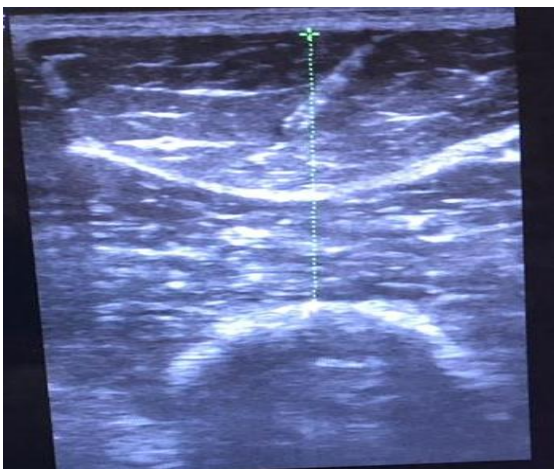


Figure 4 Unaffected Quadriceps Muscle in Healthy Patient

DISCUSSION

Sarcopenia is the most common and frequently hidden complication in liver cirrhosis patients, which have an undesirable impact on survival, quality of life, and response to the stressor, like infections and surgical procedure. Patients with sarcopenia and/or malnutrition require more time in the hospital and have higher mortality rates while there. Sarcopenia is a prevalent risk factor for frailty, falls, and fractures and is associated with significant morbidity and mortality in healthy older adults and patients with chronic illnesses.^[6] The patient is exposed to radiation when undergoing expensive, scarcely available examinations like CT and DEXA. Therefore, it is advised that fresh techniques be created to make sarcopenia diagnosis easier.^[7] Because of its link to higher mortality and complications in patients with early-stage cirrhosis, sarcopenia prevalence is of clinical significance.^[8] Our study demonstrated that ultrasound can be used as a reliable and valid method for the evaluation of diaphragm thickness and quadriceps muscle

thickness to evaluate sarcopenia in cirrhotic patients without radiation effects. As a result, it is hypothesised that sarcopenia can be diagnosed using a rapid imaging test that is simple to administer, simple to interpret, and accessible at the bedside. Ultrasound is evolving as a promising tool in measuring muscle at the bedside by quantifying the layer thickness of an interesting muscle or muscle group as an indicator of nutritional health. Recently, the use of ultrasound to measure quadriceps muscle thickness has been suggested as a superior bedside method for sarcopenia assessment.^[9,10]

CONCLUSION

Thus, we would like to postulate that measurement of diaphragm thickness, and quadriceps muscle thickness using ultrasound could serve as a definite tool to evaluate sarcopenia in cirrhotic patients without radiation effects.

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