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Correlation of Type 2 Diabetes Mellitus with Liver Fibrosis on Ultrasound Elastography: A Narrative Review

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Introduction:

Type 2 diabetes mellitus (DM) patients showed higher prevalence of developing non-alcoholic fatty liver disease which can further progress to liver fibrosis due to repetitive liver injury. This may lead to liver cirrhosis with increased risk for hepatocellular carcinoma. Liver fibrosis can also be quantified sonographically by using elastography which measures the degree of liver stiffness, from F0-F4 stages. F0-F2 stages are interpreted as insignificant, while F3-F4 are considered as significant liver fibrosis by using the METAVIR score. Furthermore, this ultrasound elastography is easy to be done as shown Figure 1.

Methods:

A systematic approach was performed using various search engines such as PubMed, Google Scholar and Elsevier between 2018 to 2022.

Results:

We reviewed 16 relevant studies out of 41 articles in our analysis. From these articles, all the studies showed that all type 2 DM patients are prone to develop significant liver fibrosis, hence increased liver-related mortality.

There are some cut-off points that are used to determined the degree of liver fibrosis as shown in Figure 2a and 2b. This cut off points are later use for the management of the patient (1).

5 studies showed the sensitivity and specificity of elastography around 80% in diagnosing different stages of liver fibrosis. Two of the studies (by Kwok et al. (2016) from Hong Kong and Lai et al. (2019) from Malaysia) showed correlation between DM and obesity with liver fibrosis on elastography, whereby 70-87% of these patients had histopathologically-proven liver fibrosis after biopsy.

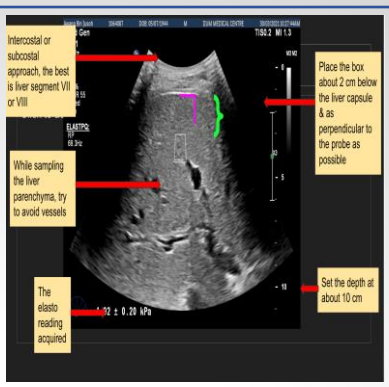

Fig. 1 shows how to perform Ultrasound Elastography using shearwave elastography technique by the Philips Ultrasound machine. 10 readings will be measured. The machine will calculate the average measurement for the final result.

a)

Pathologic Findings	METAVIR Score	Proposed Risk-based Group	Velocity Cutoff: Transient Elastography (FibroScan)	Velocity Cutoff: Point SWE (Siemens)	Velocity Cutoff: Point SWE (Philips)	Velocity Cutoff: 2D SWE (Aixplorer)	Velocity Cutoff: Point SWE (GE)*
No fibrosis Fibrous portal expansion Few bridges or septa	F0 F1 F2	Low risk (≤F2): unlikely to need follow-up	<7 kPa (<1.5 m/sec)	<5.6 kPa (<1.2 m/sec)	<5.7 kPa (<1.37 m/sec)	<7 kPa (<1.5 m/sec)	<8.29 kPa (<1.66 m/sec)
Numerous bridges or septa Cirrhosis	F3 F4	High risk (F3 or F4): clinically significant fibrosis	>15 kPa (>2.2 m/sec)	>15 kPa (>2.2 m/sec)	>15 kPa (>2.2 m/sec)	>15 kPa (>2.2 m/sec)	>9.40 kPa (>1.77 m/sec)

b)

Table 2: Recommendation for Interpretation of Liver Stiffness Values Obtained with ARFI Techniques in Patients with Viral Hepatitis and NAFLD

Liver Stiffness Value	Recommendation
≤5 kPa (1.3 m/sec)	High probability of being normal
<9 kPa (1.7 m/sec)	In the absence of other known clinical signs, rules out cACLD. If there are known clinical signs, may need further test for confirmation
9–13 kPa (1.7–2.1 m/sec)	Suggestive of cACLD but need further test for confirmation
>13 kPa (2.1 m/sec)	Rules in cACLD
>17 kPa (2.4 m/sec)	Suggestive of CSPH

Note.—ARFI = acoustic radiation force impulse, cACLD = compensated advanced chronic liver disease, CSPH = clinically significant portal hypertension, NAFLD = non-alcoholic fatty liver disease.

Fig. 2 (a) shows the METAVIR score and risk based group by different US machine. Fig. 2(b) tell us about the cut off point and interpretation of liver fibrosis for ultrasound elastography.

Courtesy image by (a) Lupsor-Platon, M. ed., 2020. Ultrasound Elastography. BoD–Books on Demand. (b) Barr, R.G., Wilson, S.R., Rubens, D., Garcia-Tsao, G. and Ferraioli, G., 2020. Update to the society of radiologists in ultrasound liver elastography consensus statement. Radiology, 296(2), pp.263-274.

Conclusion:

Type 2 DM patients are prone to develop significant liver fibrosis. Ultrasound elastography showed excellent diagnostic accuracy to assess the degree of liver fibrosis, potentially eliminating the need for invasive liver biopsy. Hence, liver should be considered as additional macrovascular target end-organ damage potentially affected by type 2 DM. However, future studies are recommended to explore further the effect of different disease control of type 2 DM on the severity of liver fibrosis

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