Liver Surface Nodularity as an Estimate of Quantitative Liver Function and Portal Hypertension

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BACKGROUND

(1) Gradual accumulation of hepatic fibrosis is the hallmark of progressive CLD eventually causing cirrhosis with abnormal hepatic function and portal hypertension. **(2)** A nodular liver (NL) surface is produced by regeneration in cirrhosis and a marker for cirrhosis compared to a smooth liver surface (SS) . Shear Wave Elasticity (SWE) by ultrasound (US) is thought to be similar to Fibroscan in the ability to detect cirrhosis and predict Metavir Fibrosis stage (F0-F4) where F4 is cirrhosis (Rad 276:845). Neither method of detecting cirrhosis measures quantitative liver function. **(3)** 3. All non-invasive methods of measuring fibrosis are best at detection of cirrhosis. Perhaps a NL is good enough for clinical purposes and this would be enhanced if it correlates with portal hypertension and hepatic dysfunction. **(4)** 4. Physiologic staging with Hepatiq involves measuring quantitative function with PHM, functional spleen volume (fSV) and functional liver volume (fLV). A PHM < 95 or fSV >2.5 cc/lb IBW indicates cirrhosis and patients likely to have clinical outcomes. The PHM correlates with the functional mass of the liver (r2=.904) (AmJGastro;92:2054). Both PHM and fSV correlate closely with clinical outcomes (Hepat;55:1019).

METHODS

1. US and SWV: All patients had a fasting US (GE LOGIQ E9) with SWE per manufactures instructions: shear wave velocity (SWV) and Surface nodularity.
2. Clinical data was abstracted from the records.
3. Hepatiq automated quantitative liver spleen scan (QLSS) (Hepatiq_inc), meal 1-1 ½ hr before scan, injection 99Tc sulfur colloid, SPECT reconstruction and image processing by Hepatiq for perfused hepatic mass (PHM), functional spleen volume (fSV) and functional Liver volume (fLV).

PATIENTS

(1) 190 sequential patients with US for HCC screening and/or initial evaluation of CLD had Hepatiq and US with SWV. **(2)** 2. Liver Disease: see table **(3)** Cirrhosis was defined based on current biopsy (LBx), distant prior LBx with continuing active liver disease, evidence of portal hypertension or nodular liver surface by MRI/CT, present or past ascites/variceal bleeding/HE thought to be due to CLD and those on liver transplant list: 44 C and 146 NC **(4)** C categories based on clinical problems (ascites, VB, HE): C1: never had, C2 : had previously and Recovered, C3: present requiring treatment, and C4: on LT list. Most C patients had never had clinical problems or had recovered (early cirrhosis).

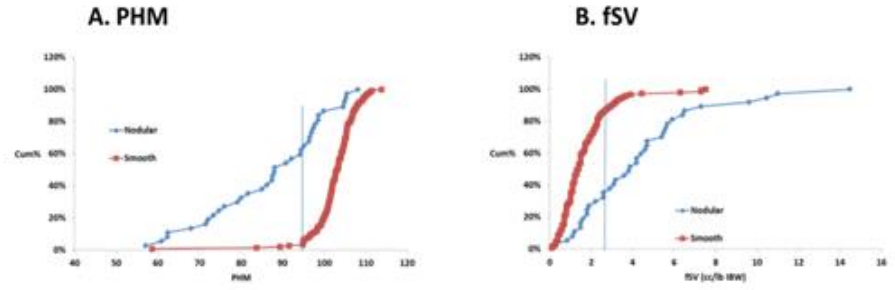
CLD		Cirrhosis	NC
HCV	Active	2	21
	SVR	9	27
HBV	Active	0	21
	Treat	1	9
ALD	Active	3	2
	abstinent	3	0
ACAH	Pre-Tx	0	0
	Tx	2	4
Crypt Cirrhosis		9	
PBC		1	6
NASH		8	28
LT			4
Acute LD			6
Normal			9
Miscellaneous		2	13
NC-Portal Hypertension			2
total		38	152

RESULTS

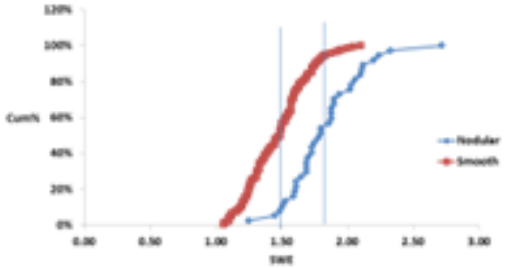
NS correlates with active or past clinical problems (C2-C4), decreased quantitative hepatic function and large spleen

	#	NC	Cir	C1	C2	C3	C4	PHM (<95)	fSV (>2.5)	SWV
NS	38	4	34	11	11	10	2	62%	79 %	1.8 (.3)
SS	152	142	10	7	1	1	1	4.7 %	16 %	1.5 (.2)
p								<.001	<.001	<.01

Cumulative percent of PHM (A) and fSV (B) in patients with NL vs SS



SWV curve was shifted to the right for NL compared to SS. Cumulative % of SWE: NL vs SS



CONCLUSIONS

- A nodular Liver surface by US often indicated cirrhosis, but some cirrhotic patients have a smooth surface.
- nodular surface and cirrhosis correlated with decreased quantitative hepatic function and increased fSV, but a nodular surface was not precise enough for clinical staging based on function
- Functional staging with Hepatiq that directly measures hepatic function, fSV and predicts clinical outcomes is superior to nodular surface
- A nodular liver surface can be useful in detecting early cirrhosis when PHM and fSV are normal