

# LIVER ECHOTEXTURE - A METHOD TO IMPROVE INTERPRETATION

ACR ANNUAL MEETING 2018

BRAHEE D,  
KLEPCHICK P,  
THOMPSON D



THE AUTHORS HAVE NO DISCLOSURES

# LIVER ECHOTEXTURE

- INTRODUCTION
- Ultrasound (US) is a commonly used diagnostic tool in the evaluation of the liver and is the most highly recommended imaging modality used in evaluation of suspected liver disease [1].
- However, as it is largely subjective, characterizing liver echotexture is often difficult for radiologists with limited experience [2].
- There have been few studies in the literature demonstrating techniques for evaluating liver parenchyma echotexture characteristics and a consistent measurement method has not been established [3,4,5,6].

# LIVER ECHOTEXTURE

- OBJECTIVE
- To determine if specific training in interpretation of liver US utilizing comparison to the spleen and a practice tutorial will improve interpretation agreement and diagnostic confidence in new radiology residents.



# LIVER ECHOTEXTURE

- METHODS
- A retrospective review was performed of 64 abdominal US examinations in adults (with representative cases of both normal and abnormal liver echotexture) imaged between 07/01/2014 and 07/01/2015.

# LIVER ECHOTEXTURE

- METHODS
- Eighteen physicians (Reviewers) were grouped by level of Radiology training: Novices (1<sup>st</sup> year Residents), Intermediate (3<sup>rd</sup> – 4<sup>th</sup> year Residents), and Expert (Attending Radiologists who routinely interpret US).

# LIVER ECHOTEXTURE

- METHODS
- Each Reviewer was asked to review 64 randomized abdominal US images to rate the echotexture characteristics of the liver as homogeneous or heterogeneous and record their diagnostic confidence level using a 5-point Likert scale.

# LIVER ECHOTEXTURE

- METHODS
- Six weeks later, Reviewers participated in a liver echotexture tutorial which demonstrated use of the spleen as an internal reference, and after approximately 4 additional weeks, the same 64 scans were newly re-randomized and re-reviewed.

# LIVER ECHOTEXTURE

- RESULTS
- A total of 2304 abdominal US case reviews were performed. A consensus of the Experts in this study, with an intra-rater reliability  $ICC > 0.8$ , formed the basis for an accuracy standard.

# LIVER ECHOTEXTURE

- RESULTS
- Using a quadratically weighted kappa, there was significantly greater agreement between the Novice group and Expert consensus after the tutorial ( $p = .004$ ) than before.



# LIVER ECHOTEXTURE

- RESULTS
- Using a weighted kappa to measure agreement; all of the 9 Novice Reviewers were in “fair” to “poor” agreement ( $\kappa < .40$ ) with Expert Consensus before the liver echotexture tutorial.
- After the tutorial, 5 of the 9 in the Novice group improved to “moderate” agreement ( $\kappa > .40$ ) with Expert Consensus.

# LIVER ECHOTEXTURE

- RESULTS
- By intraclass correlation coefficient (ICC) analysis, before the tutorial, none of the Novice Reviewers had “good” agreement with a consensus of Expert Reviewers (ICC for all Novices <.60).
- After the tutorial, 3 of the 9 in the Novice group were in “good” agreement ( $ICC \geq .60$ ) with Expert Consensus.

# LIVER ECHOTEXTURE

## CONCLUSION

- When characterizing liver echotexture on US, the use of the spleen as an internal comparison improves interpretation consensus and confidence in Novice and Intermediate level radiology residents as demonstrated in this preliminary study.
- Also, a tutorial to demonstrate how to apply this principle is useful.
- This technique should be considered as a training tool for inexperienced US readers.

# LIVER ECHOTEXTURE

- IN SUMMARY
- When evaluating the echotexture of the liver parenchyma, comparing to that of the spleen improves resident interpretation and confidence as well as leads to more consistent agreement with attending (Expert) interpretations.

# REFERENCES

- 1) [Tchelepi H<sup>1</sup>, Ralls PW, Radin R, et al. Sonography of diffuse liver disease.](#) *J Ultrasound Med.* 2002 Sep;21(9):1023-32; quiz 1033-4. PMID: 12216750
- 2) [Lee CH, Choi JW, Kim KA, et al. Usefulness of standard deviation on the histogram of ultrasound as a quantitative value for hepatic parenchymal echo texture: preliminary study.](#) *Ultrasound Med Biol.* 2006 Dec;32(12):1817-26. PMID: 17169693
- 3) [Soresi M, Giannitrapani L, Cervello M, et al. Non invasive tools for the diagnosis of liver cirrhosis.](#) *World J Gastroenterol.* 2014 Dec 28;20(48):18131-50. doi: 10.3748/wjg.v20.i48.18131. PMID: 25561782
- 4) Taylor KJ, Riely CA, Hammers L, et al. Quantitative US attenuation in normal Liver and in patients with diffuse liver disease: importance of fat. *Radiology* 1986; 160:65-71.
- 5) Yao W, Zhao B, Zhao Y, et al. [Ultrasonographic texture analysis of parenchymatous organs by the four-neighborhood-pixels algorithm: clinical experiment.](#) *J Ultrasound Med.* 2001 May;20(5):465-71. PMID: 11345103
- 6) Nishiura T, Watanabe H, Ito M, et al. [Ultrasound evaluation of the fibrosis stage in chronic liver disease by the simultaneous use of low and high frequency probes.](#) *Br J Radiol.* 2005 Mar;78(927):189-97. PMID: 15730982
- 7) Altman DG. Practical statistics for medical research. London: Chapman and Hall; 1991.
- 8) Cicchetti, DV. Guidelines, criteria and rules of thumb for evaluating normed and standardized assessment instruments in psychology. *Psychological Assessment.* 1994; 6(4): 284-90.
- 9) Cohen J. A coefficient of agreement for nominal scales. *Educational and Psychological Measurement.* 1960; 20:37-46.
- 10) Barr RG, Ferraioli G, Palmeri ML, et al. [Elastography Assessment of Liver Fibrosis: Society of Radiologists in Ultrasound Consensus Conference Statement.](#) *Ultrasound Q.* 2016 Jun;32(2):94-107. PMID: 27233069