AASLD The Liver Meeting®

APPLICATION OF ARTIFICIAL INTELLIGENCE ALGORITHM AS A VASCULAR EVALUATION TOOL FOR INTRA-STAGE ASSESSMENT IN THE CIRRHOTIC PATIENTS WITH METABOLIC DYSFUNCTION-ASSOCIATED STEATOTIC LIVER DISEASE

Zhengxin Li[1], Meng Li[2], Qiang Yang[3], Yayun Ren[3], Xiao Teng[4], Dean C. S. Tai[4], Ian R. Wanless[8], Jörn M. Schattenberg [6,7], Chenghai Liu[2,5]*.

1. Gongli Hospital of Shanghai Pudong New Area, Shanghai, China
2. Shuguang Hospital, Shanghai University of Traditional Chinese Medicine, Shanghai, China
3. Hangzhou Choutu Tech. Co., Ltd., Hangzhou, China
4. Histoindex Pte. Ltd., Singapore
5. Shanghai Key Laboratory of Traditional Chinese Clinical Medicine, Shanghai, China .
6. Department of Internal Medicine II, Saarland University Medical Center, Homburg, Germany
7. Saarland University, Saarbrücken, Germany
8. Department of Pathology, Queen Elizabeth II Health Sciences Centre and Dalhousie University, Halifax, Canada

UKS Universitätsklinikum des Saarlandes

INTRODUCTION

- Vascular changes in liver cirrhosis have been linked to fibrosis progression and potentially also prognosis. Research has shown that angiogenesis increases as liver fibrosis advances and diminishes when fibrosis regresses, highlighting its importance in the dynamic evaluation of fibrosis.
- This study was to explore a vascular evaluation for patients with metabolic dysfunction-associated steatotic liver disease (MASLD), which using second harmonic generation (SHG)/two-photon excited fluorescence (TPEF) microscopy imaging and artificial intelligence (AI)-based algorithm.

METHOD

- 160 needle biopsy samples with MASLD were collected: 41 from Shuguang Hospital and 119 from Medical Center of the Johannes Gutenberg-University.
- Fibrosis stages were assessed by the NASH-CRN staging system.
- The AI-based algorithm was developed based on the samples from Shuguang Hospital. The artery density(AD), portal vein density(PVD) and central vein density(CVD) were quantified by the AI-based algorithm.
- The correlations between vessels' density and fibrosis stages were analyzed using Spearman's correlation.

RESULTS

- The histological fibrosis stages were distributed as follows F1(26.25%), F2 (31.25%), F3 (24.38%) and F4 (18.12%).
- The AD showed the highest correlation with fibrosis stages than PVD and CVD, with r value of 0.54 (P<0.001).
- The PVD showed a mild correlation with fibrosis stages with r value of 0.41(P<0.001).
- These was a less correlation between CVD and fibrosis stages with r value of -0.19(P=0.548).
- PVD/CVD showed a similar rate to AD, with r value of 0.52(P<0.001).

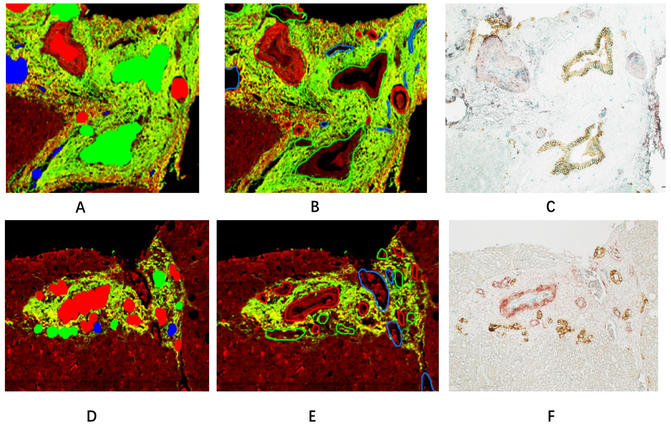

Figure 1: Training images of AI-based algorithm. A and D: AI marking image of qVessel, green lumens are bile ducts, red lumens are arteries, blue lumens are veins. B and E: Annotated SHG images, green lumens are bile ducts, red lumens are arteries, blue lumens are veins. C and F: Multi-IHC image, brown (DAB) lumens are bile ducts, red (AEC) lumens are arteries, blue (Emerald) without red stained lumens are veins.

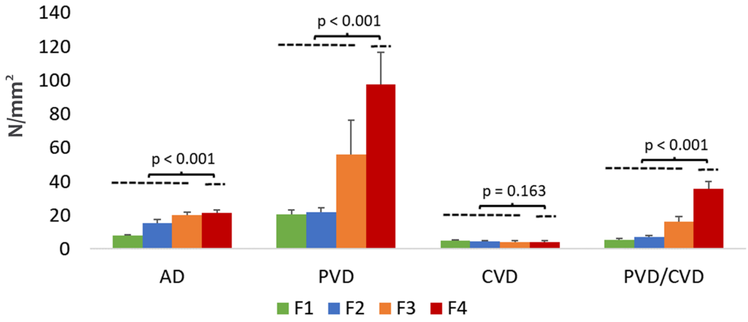

Figure 2: The mean (stand error) of the numbers of vessels for fibrosis stages were presented.

CONCLUSIONS

- The changing of AD is the most significant vascular lesions in the liver fibrosis progressing of MASLD.
- AI-based algorithm can serve as a method for evaluating vascular changes in MASLD, especially to track intra-stage change for cirrhotic patients.

REFERENCES

1）Wanless IR, et al.. Importance of tissue collapse and unmasking of reticulin on the assessment of fibrosis in acute and chronic liver disease. Hepatology 2016;63:214A.

2) Sun Y, et al. Artery density in human liver: A valuable measure for staging chronic liver disease. J Hepatol (suppl 1), 2019.

3) Feng Liu,et al. "qFIBS: A Novel Automated Technique for Quantitative Evaluation of Fibrosis, Inflammation, Ballooning, and Steatosis in Patients with Non-Alcoholic Steatohepatitis." Hepatology 2020

ACKNOWLEDGEMENTS

We thank the National Major Science and Technology Special Project of China for their financial support.

Thanks to Medical Center of the Johannes Gutenberg-University for providing cases in the study.

CONTACT INFORMATION

Cheng-hai Liu,

528 Zhangheng Road, Pudong New Area, Shanghai, 201203, China.

E-mail address: chenghai.liu@outlook.com