

Meeting Abstract

Whole Slide Image Analysis System for Quantification of Liver Fibrosis

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Background and Aims

Histological evaluation of fibrosis after a liver biopsy is crucial for evaluating the pathology of patients with chronic liver disease. We have reported image analysis allowing quantification of liver fibrosis using Elastica van Gieson (EVG) stained whole slide images (WSIs) of liver biopsy specimens [1]. In this paper, a whole slide image analysis system for quantification of liver fibrosis was developed to apply a large number of cases in routine practice.

Method

Our system was composed of 2 steps: color correction and tissue classification. Firstly, the color correction was performed by transforming the color distribution from a target WSI into a reference WSI, where the distribution was estimated by two triangle pyramids. Next, the tissue classification was performed by using quadratic discriminant function generated from RGB signal data sets in reference WSIs. After 2 steps, the WSI pixels were classified into five classes

corresponding to four tissue areas: collagen fibers, elastic fibers, nucleus, and cytoplasm and one nontissue area (i.e., glass slide). Finally, the area ratios of collagen and elastic fibers were automatically quantified.

Results

WSIs of liver biopsy specimens collected from 102 patients with hepatitis C were analyzed by our system [2]. The system successfully corrected the color of any WSI to that of the reference WSI and precisely extracted fine collagen and elastic fibers from portal and periportal areas (Figure 1). The averaged calculation time for WSIs with hundred-millions of pixels solution was about four minutes.

Conclusions

The whole slide image analysis system could provide quantification of liver fibrosis in biopsy specimens with different color distributions, which can display continuous value, and represent a progression of liver disease.

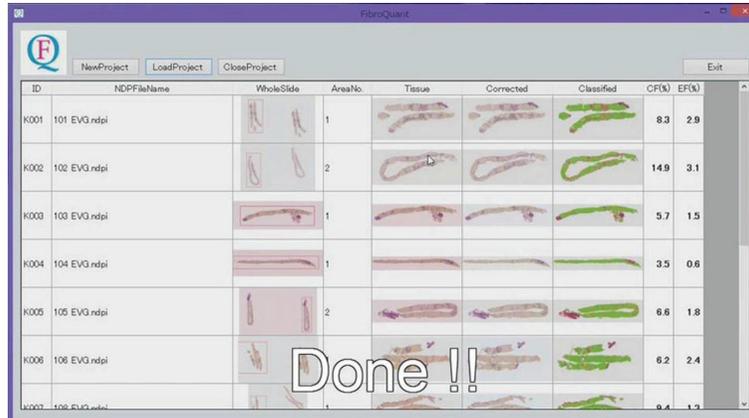


FIGURE 1: Whole slide image analysis system for quantification of liver fibrosis. The figure shows the color corrected and classified WSI and the area ratios of collagen and elastic fibers obtained by the system.

Acknowledgment

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References

- [1] Y. Murakami, T. Abe, A. Hashiguchi et al., "Color correction for automatic fibrosis quantification in liver biopsy specimens," *Journal of Pathology Informatics*, vol. 4, p. 36, 2013.
- [2] Y. Yasui, T. Abe, H. Takada et al., "Elastic fiber accumulation as a significant factor in predicting the development of hepatocellular carcinoma," in *Proceedings of the International Liver Congress 49th Annual Meeting of the European Association for the Study of the Liver (EASL '14)*, London, UK, April 2014.