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Liver research

Stevenson-Lerner/Saldarriaga Lab -Research question

The team is involved in several translational research projects around chronic liver diseases, such as steatotic liver disease, chronic hepatitis C, autoimmune hepatitis, primary biliary cholangitis, and infectious diseases like Ebola. They investigate hepatic immunology, including macrophages and lymphocytes and how dysregulation of the immune response leads to fibrosis development as well as how the phenotype of a person's hepatic macrophages determines downstream immune activation and how they respond to liver injury.

Why Visiopharm software helps

The team chose Visiopharm's software for its ability to integrate complex biological data into a spatially resolved image analysis framework. Using custom-designed algorithms that include deep learning and artificial intelligence, the team combines clinical and histological information, architectural context, and molecular data to better understand the distribution of specific immune cell phenotypes in the different liver regions at different stages of disease.



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Liver biopsies were stained and multispectral images were segmented into portal tracts and lobules using Visiopharm.

Steatotic liver disease-related fibrosis

Research question

This study addresses the clinical challenge of understanding the heterogeneity of macrophage populations in the liver and their role in the progression of fibrosis in steatotic liver diseases. Macrophages, a critical component of the immune system, consist of diverse subtypes with varied and often opposing roles in disease progression and tissue repair. This complexity, coupled with a lack of understanding of how these cells vary between individuals and are spatially distributed in liver tissue, has hindered the development of effective therapies. The study aimed to overcome these limitations by leveraging advanced imaging and Al-driven analysis to characterize macrophage diversity and identify druggable targets, laying the groundwork for more personalized therapeutic strategies.

How Visiopharm software helped

Visiopharm software played a pivotal role in this research by enabling the detailed analysis of the distribution of different macrophage populations in liver tissue samples. The software identified and quantified diverse macrophage populations by detecting and analyzing specific cellular markers. By separating the tissue into different physiological regions, the analysis provided researchers with detailed data on the spatial distribution, density, and heterogeneity of macrophages within the liver regions, offering valuable insights into their roles in fibrosis progression.

Key insights

Using Visiopharm's software, the researchers discovered a significant variability in macrophage populations among patients with steatotic liver disease-related fibrosis. This heterogeneity sheds light on the immune system's role in fibrosis and suggests that a one-size-fits-all approach to treatment is insufficient. Instead, the findings highlight the potential for personalized therapies tailored to the unique macrophage profiles of individual patients.





Publications

Saldarriaga OA, Wanninger TG, Arroyave E, Gosnell J, Krishnan S, Oneka M, Bao D, Millian DE, Kueht ML, Moghe A, Jiao J, Sanchez JI, Spratt H, Beretta L, Rao A, Burks JK, Stevenson HL. Heterogeneity in intrahepatic macrophage populations and druggable target expression in patients with steatotic liver disease-related fibrosis. JHEP Rep. 2023 Nov 3;6(1):100958. doi: 10.1016/j.jhepr.2023.100958. PMID: 38162144; PMCID: PMC10757256.