Quantitative Digital Pathology and AI Method Characterizes the Histologic Phenotypes of Fibrosis Severity in Bleomycin-Induced Lung Fibrosis Mouse Model

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RATIONAL

Idiopathic pulmonary fibrosis (IPF) is illustrated by scarring of the lungs, difficulty in breathing, persistent dry cough, and a shortened life span. Thus, it is important to develop drugs to treat this illness. Integrin has been shown to participate in activation of transforming growth factor-β, a profibrotic mediator that is pivotal in developing IPF. In this study, we used bleomycin-induced lung fibrosis mouse model to study the anti-fibrotic effect of integrin and we utilized FibroNestTM, an advanced digital Pathology AI quantification tool, to describe the diseased-state histologic phenotypes of fibrosis.

METHOD

Mice (n=5/group) were treated without or with bleomycin intratracheally. After bleomycin administration (day 7), mice were treated for another 21 days with vehicle or a small molecule αvβ6 integrin inhibitor.

Liver histology stained with picrosirus red (PSR) for collagens I/III (insets) and image analyzed with PharmaNest’s digital pathology platform. Integrin Inhibition (Treatment) markedly reduced the Fibrosis Architectural phenotypes (color map). Red signifies more severe fibrosis with complex dense collagen fibers as compared to the yellow/green color cloud.

The Fibrosis Phenotypic Score (Ph-FCS) is continuous and incorporates the expression of trio complementary sub phenotypes: the collagen quantity, Single fiber Morphometry, and Fibrosis Architecture and their related changes (remodeling).

*p<0.05,  **p<0.01

CONCLUSION

FibroNestTM phenotypic fibrosis analysis demonstrated integrin inhibition significantly ameliorates bleomycin-induced lung fibrosis.

This digital pathology image analysis tool can greatly contribute to the histological evaluation of therapeutic IPF drug efficacy.