Emphysema treatment could be optimized using network modelling

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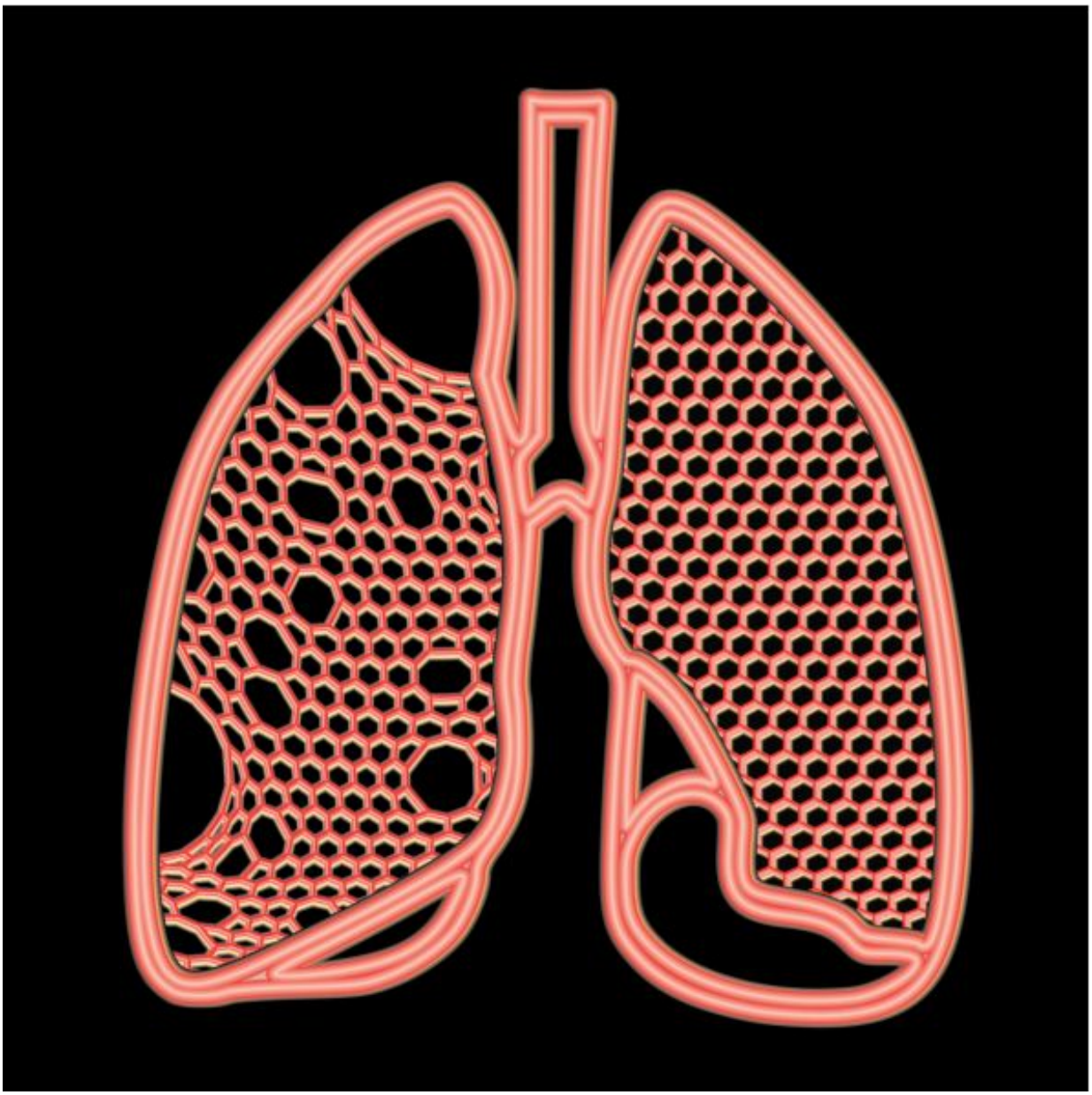

An artistic interpretation of the lung network model is shown. A healthy lung is shown on the right, while the enlarged regions on the left depict lung tissue destruction and reorganization characteristic of emphysema. Credit: Mondoñedo et al.

A unique engineering perspective of emphysema progression in the lung suggests how mechanisms operating at the micromechanical scale could help to predict patient survival and quality of life following treatment - according to new research published in *PLOS Computational Biology*.

Emphysema is a devastating lung disease commonly associated with Chronic Obstructive Pulmonary Disease (COPD), a condition which affects more than 65 million people worldwide. Lung volume reduction treatment can help to ameliorate advanced stages of disease by removing affected tissue and allowing healthier regions to restore lung function; however, it is not well understood how these therapies impact the microscopic mechanisms underlying disease progression.

The researchers, Jarred Mondoñedo and Béla Suki of Boston University, established a computational model of emphysema and showed that treatment responses were directly related to the specific redistribution of mechanical forces within the lung after intervention. Furthermore, this is the first study to directly compare newer, less invasive lung volume reduction techniques, such as novel biomaterial-based lung sealants and coils, with traditional surgical approaches, demonstrating comparable model predictions for immediate and long-term treatment efficacy.

The authors add that, "these findings highlight the critical role that mechanical forces might play in emphysema treatment, and suggest how newer and far less invasive lung volume reduction techniques can achieve comparable, if not better, outcomes than current surgical

approaches. This could potentially expand treatment options for many with emphysema, while lowering both costs and recovery time for patients."

With the growing interest and current clinical investigation of these more recent lung volume reduction techniques, this research has the potential to shape more individualized, patient-centered treatment strategies. Future work aims to link this model to routine lung imaging modalities, with the goal of determining the most effective intervention approach to optimize patient outcomes.

More information: Mondoñedo JR, Suki B (2017) Predicting Structure-Function Relations and Survival following Surgical and Bronchoscopic Lung Volume Reduction Treatment of Emphysema. *PLoS Comput Biol* 13(2): e1005282. DOI: 10.1371/journal.pcbi.1005282