When blood vessels are overly permeable

In Germany alone there are around 400,000 patients who suffer from chronic inflammatory bowel diseases. For the first time, researchers at Universitätsklinikum Erlangen have discovered that dysfunctions in blood vessels play a significant role in the development of such diseases. In experimental model systems, the progression of the disease slowed down significantly by eliminating these dysfunctions. The researchers have now published their results in the Journal of Clinical Investigation.

Diseases in humans are often caused by malfunctioning cells. Epithelium cells, which form the barrier between the bowel and surrounding tissue, and inflammatory cells have been the focus of investigations of the mechanisms of chronic inflammatory diseases of the bowel up to now. While it is well known that inflammatory cells can only reach the relevant tissue via blood vessels, the role of blood vessels in chronic inflammatory bowel diseases has not been very well researched. In conjunction with groups at the Department of Medicine 1– Gastroenterology, Pneumology and Endocrinology at Universitätsklinikum Erlangen and the Optical Imaging Centre Erlangen (OICE) at FAU, a group of researchers in molecular and experimental surgery at the Department of Surgery has now conducted an in-depth investigation of the role of blood vessels.

Highly permeable blood vessels

The interdisciplinary cooperation project, which was primarily implemented by Victoria Langer as part of her doctoral thesis, discovered that the blood vessels of patients with chronic inflammatory bowel disease are especially permeable. In molecular analyses, the researchers identified the cause as a malfunction in the cell to cell interaction in endothelial cells. Endothelial cells form the lining of blood vessels and are responsible for maintaining vessel wall impermeability. The dysfunction is caused by a specific cytokine known as interferon-γ, which is present in higher concentrations in chronically inflamed intestinal tissue. The increased permeability of blood vessels was proven in various experimental models and in patients with chronic inflammatory bowel diseases.

The significance of blood vessel permeability was demonstrated using genetic methods in experiments in animal models as the ability of endothelial cells to react to interferon-γ was inhibited, which significantly slowed down the progression of the disease. A significant clinical finding is that the drug Imatinib (Glivec®), also inhibits vessel permeability, which also significantly suppressed disease progression. Imatinib (Glivec®) is currently mainly used to treat cancer.

The study conducted by the researchers in Erlangen proves for the first time the great significance of the cardiovascular system in chronic inflammatory bowel diseases and opens up new approaches for treatments. Prof. Michael Stürzl started researching chronic inflammatory diseases only a few years ago. He emphasises the excellent knowledge of inflammatory processes and optical imaging available at Universitätsklinikum Erlangen and FAU that enabled him to quickly and successfully start research in a new field. Michael Stürzl now has a clear overview of the newly-discovered disease mechanisms and new treatment options. ‘We really hope, of course, that our results will benefit patients with chronic inflammatory bowel diseases in the long term. This is also being supported by the fact that the medication we
successfully used in the animal model has already been approved for clinical applications,’ he says.

wissenschaftliche Ansprechpartner:

Further information
Prof. Dr. Michael Stürzl
Phone: +49 9131 85 39522
michael.stuerzl@uk-erlangen.de

Originalpublikation:
https://www.jci.org/articles/view/124884
doi: 10.1172/JCI124884