The promise of precision medicine for rheumatoid arthritis

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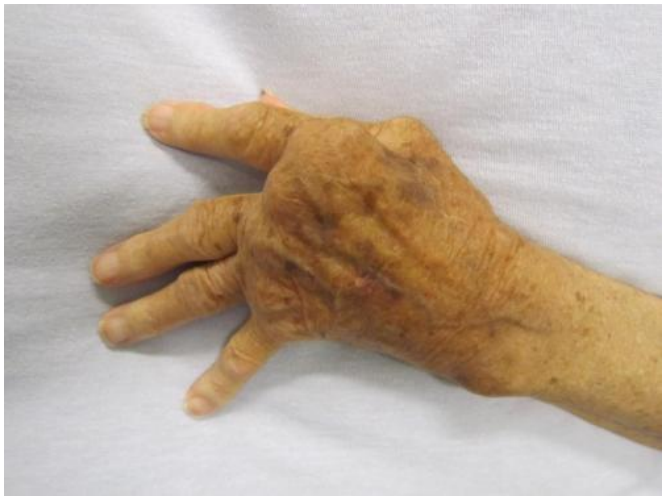

A hand affected by rheumatoid arthritis. Credit: James Heilman, MD/Wikipedia

In a new study, a Yale-led research team identified the mechanism of a gene that raises the risk of severe rheumatoid arthritis in susceptible individuals. The finding may lead to the development of treatment based on the genetic profiles of arthritis patients, the researchers said.

The study was published on Nov. 21 by *Proceedings of the National Academy of Sciences* (*PNAS*).

Rheumatoid arthritis is a common autoimmune disease that affects an estimated 3 million people and is most prevalent in women. The disease, which destroys cartilage in joints, can lead to severe disability. In its most severe form, vascular inflammation and internal organ damage occur, leading to premature death.

To understand the disease mechanism, Yale professor of medicine Richard Bucala, M.D., and his team focused on the disease-causing variants of the gene, MIF, which his lab had found to be associated with severe rheumatoid arthritis.

The research team conducted experiments with cells derived from the rheumatoid joint of patients who either had a disease-causing, high- expression variant of the MIF gene or a disease-protective, low-expression variant of the MIF gene. They found that high-expression MIF variants correlated with increased expression of the MIF receptor protein (CD44) and induced structural changes in the protein that occur in cancerous tissues. These cancerous properties in turn led to the destructive changes in the rheumatoid joint.

"We showed that the presence of the high-expression risk variant led to more MIF production and to structural alterations in a cell surface protein that had long been associated with invasive cancers," said Bucala. "The high-expression MIF risk gene helps explain the cancer-like properties of the rheumatoid joint."

This finding could lead to the application of MIF inhibitors, which the laboratory has developed for clinical testing in cancer and in autoimmunity, for severe rheumatoid arthritis in genetically susceptible patients. In the published study, the researchers used these drugs as well as new inhibitors to suppress the invasive effect of MIF on rheumatoid joint cells.

"It's a precision-medicine approach to treating autoimmune disease," Bucala noted. "Patients with a risk MIF genotype would be most effectively treated by such drugs."

More information: MIF allele-dependent regulation of the MIF coreceptor CD44 and role in rheumatoid arthritis, *PNAS*, www.pnas.org/cgi/doi/10.1073/pnas.1612717113

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