Take AIM

Smith institute

Using Mathematics to Exterminate Varicose Veins!

TakeAIM 2019 Runner-Up:

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Did you know that 17% of men and 33% of women have varicose veins? (Vascular Disease Foundation Newsletter, Spring 2005) Varicose veins are thick and swollen veins which arise due to the reduction in blood flow caused by damaged valves, where the increased pressure within the vein causes pain and discomfort.

The most well known treatment consists of removing the veins by surgical stripping...it's as painful as it sounds. But what if I tell you that each vein can be treated with a microfoam? The least invasive method of treating these veins consists of the injection of a foam directly into the affected vein.

The foam front displaces the blood and the following foam treats the walls of the channel, causing the vein to collapse and eventually dissolve. But what does Maths have to do with the treatment? Our research looks at the fundamental mathematics behind the treatment of such painful veins - developing simulations that provide quick and accurate predictions.

We model the treatment by solving the governing Stokes equations, looking at the displacement of blood by foam in vein like geometries. Our findings allow us estimate optimal parameters for the foam in order to provide an effective displacement of the blood and treatment of the vein walls. Additionally, we use the theory to validate the accuracy of our simulation as well as supporting our conclusions.