

A DISCUSSION WITH:

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A TRANSCRIPTION OF THE VIDEO:

Peripheral Edema and Capillary Exchange

I think all medical students pass through a phase of their training where they have to learn about the Starling forces that theoretically govern what happens when the blood circulates through the capillaries. We know the whole purpose of the circulation and the heart is to circulate the blood in order for nutrients to come to the tissues, for things to be extracted from the tissues, for oxygen, of course, to be delivered. And all of that traditionally happens through a diffusion kind of interchange at the level of the capillary. Now Starling correctly recognized that this whole system operates through a balance of forces and there are pressures in the tissues, there are pressures in the circulation. And by those opposing forces theoretically, that will determine the direction of flow, either out of the circulation or back into the circulation. And when Starling originally did his work, he conceived of a model in which all of the flow would be outwards until about the midpoint of the capillary and then the flow would reverse as the pressures equilibrated and began to drive things in the opposite direction.

We've now learned that that's not true. It is true based on the forces that are operative, that the balance will generate a directionality, but that direction is all outward throughout the length of the capillary. And only a trivial amount of tissue fluid goes back to the circulation through the veins. It turns out that the lymphatics carry all the excess tissue fluid that comes out of the capillary and needs to get back to the heart. What that means is that even in venous disease, when there is clearly pathology in the vein to drive edema, the mechanism of the edema is through the lymphatics. It is the veins that overdrive and overstimulate the lymphatics to the point that they can no longer have capacity for the increased exit of fluid from the capillary into the tissue space. And so, that intimate relationship between veins and lymphatics occurs in health, of course, but it also governs what happens in disease. So even when we're treating what is clearly venous pathology, we have to be very sensitive to the role that the lymphatics play in the expression of that disease, which is edema and attacks of recurrent cellulitis and inflammation and breakdown of the skin.