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Dermal lymphatic capillaries do not obey Murray's Law

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Dermal lymphatic capillaries do not obey Murray's Law:

Understanding lymphatic development is clinically relevant in applications from embryonic viability, to chronic inflammation, to cancer metastasis. We specifically address the branching of developing lymphatic capillaries, and the flow of lymph through these vessels. Murray's Law is a general branching rule upheld in diverse circulatory systems including leaf venation, sponge canals, and various human organs. While branching in arterial development is understood to consistently follow Murray's Law, we have found that an optimization law for lymphatic vessels follows a different pattern. Here, the daughter vessels are smaller relative to the parent than would be predicted by the hypothesized radius-cubed law. By implementing a computational model using the immersed boundary method, we can examine the extent to which features other than transport cost are optimized in this geometry. This suggests an alternate hypothesis for optimization of a different feature of the lymphatic system, such as enhancing fluid mixing, fluid exchange, or immune cell transport, rather than minimizing fluid transport cost.