Optimal transient disturbances in stenotic flows HUGH BLACK-
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ometries can have extended shear layers that are extremely sensitive to disturbance,
leading to very large disturbance energy growth, even if the flow is stable in the
large time limit. By adapting numerical methods for analysis of linear transient dis-
turbance growth to cope with arbitrary domain geometries, we have been able for
the first time to compute transient growth in comparatively simple (axisymmetric)
stenotic geometries, for both steady and pulsatile inflows. At Reynolds numbers well
below the stability limit, we find that extremely large (e.g. eight-to-ten magnitude)
energy growth is possible for optimal disturbances. For the flows examined, optimal
disturbances take the form of sinuous waves that grow on initially axisymmetric
shear layers, and exhibit characteristics of local convective instability. The practical
implication is that transient response to perturbation, rather than flow instability,
is likely to dominate observed features for physiological studies of many separated
flows.

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