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Rectification of pulsatile stress on soft tissues: a mechanism for normal-pressure hydrocephalus SHREYAS JALIKOP, SASCHA HILGENFELDT, The University of Illinois at Urbana-Champaign — Hydrocephalus is a pathological condition of the brain that occurs when cerebrospinal fluid (CSF) accumulates excessively in the brain cavities, resulting in compression of the brain parenchyma. Counter-intuitively, normal-pressure hydrocephalus (NPH) does not show elevated pressure differences across the compressed parenchyma. We investigate the effects of nonlinear tissue mechanics and periodic driving in this system. The latter is due to the cardiac cycle, which provides significant intracranial pressure and volume flow rate fluctuations. Nonlinear rectification of the periodic driving within a model of fluid flow in poroelastic material can lead to compression or expansion of the parenchyma, and this effect does not rely on changes in the mean intracranial pressure. The rectification effects can occur gradually over several days, in agreement with clinical studies of NPH.

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