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Numerical simulation of shock wave generation and focusing in shock wave lithotripsy[1] JEFF KRIMMEL, TIM COLONIUS, California Institute of Technology — Shock wave lithotripsy is a procedure where focused shock waves are fired at kidney stones in order to pulverize them. Many lithotripters with different source mechanisms and reflector shapes (or lenses) are in clinical use, but accurate prediction of focal region pressure is made difficult by nonlinearity and cavitation. We report on development of a numerical simulation framework aimed at accurate prediction of focal region flow physics. Shock wave generation and beam focusing are simulated via the Euler equations with MUSCL-type shock capturing scheme and adaptive mesh-refinement (Berger and Oliger, 1984). In future work, a bubbly cavitating flow model will be added. Electrohydraulic, electromagnetic, and piezoelectric lithotripters are modeled with axisymmetric and three-dimensional geometries. In the electrohydraulic case, a simple expanding bubble model simulates spark firing. In the piezoelectric case, a boundary condition prescribing the motion of individual elements is used. Amplitudes and durations of calculated focal region waveforms are in reasonable agreement with experimental data.

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