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Beamwidth measurement of single lithotripter shock waves

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New lithotripters with narrower foci and higher peak pressures than the original Dornier HM3 electrohydraulic lithotripter have proven to be less effective and less safe. Hence, accurate measurements of the focal characteristics of lithotripter shock waves are important. The current technique for measuring beamwidth requires collection of single-point measurements over multiple shock waves, thereby introducing error as a result of any shock-to-shock variability. This work reports on the construction of a hydrophone array sensor and on array measurements of individual lithotripter shock waves. Beamwidths for an electrohydraulic lithotripter with a broad-focus, HM3-style reflector and a narrow-focus, modified reflector were measured using both new and worn electrodes as well as two different electrical charging potentials. The array measured the waveform, beamwidth, and focal location of individual shock waves. The HM3-style reflector produced repeatable focal waveforms and beam profiles at an 18-kV charging potential with both new and worn electrodes. Accordingly, these measurements agreed with averaged point measurements acquired under the same conditions. However, a lack of consistency in the measured focal locations and beam profiles at 23 kV underscores the value in obtaining beam profile measurements from individual shock waves. Work supported by Riverside Research Institute, NIH DK43881, and NSBRI SMS00402.