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Words of Wisdom

Re: Fragmentation of Stones by Burst Wave Lithotripsy in the First 19 Humans

Harper JD, JE Lingeman, Sweet RM, et al.

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Experts' summary:

Harper et al conducted a prospective feasibility study to evaluate the efficacy of burst wave lithotripsy (BWL) in patients with a stone. This technology was paired with ureteroscopy to allow visual assessment of the effects of lithotripsy on the stone and surrounding urothelial tissues. The primary purpose of the study was to assess the efficacy of stone fragmentation across various stone types, sizes, and locations while monitoring for adverse outcomes.

Nineteen subjects were recruited to this multi-institutional study. Treatment was delivered to stones <12 mm, the upper limit for effective treatment according to acoustic beam width. Most stones were in the kidney, except for two that were in the distal ureter. Stone density measured via computed tomography had a wide range (205–2000 Hounsfield units).

The primary study outcome was stone comminution, which was defined as the percentage of fragments <2 mm as measured via ureteroscopy. The majority of stones reached complete or partial comminution within 10 min of treatment. As expected, incomplete fragmentation was observed when the stone size or hardness was suboptimal. Mild tissue trauma was visualized, mostly limited to the urothelium and renal papilla.

Experts' comments:

Developed at the University of Washington, BWL is an emerging technology vying to be included in the repertoire for stone surgery in the near future [1]. This study provides a visual demonstration of the ability of BWL to fragment stones with minimal associated trauma to surrounding tissues, building on prior proof-of-concept studies [2–4].

The potential for use of BWL as a monotherapy should, for now, be interpreted with caution. Like conventional shockwave lithotripsy, the technology appears to be limited by stone size and hardness. Moreover, since all study subjects underwent concurrent ureteroscopy, stone clearance

outcomes from BWL alone could not be assessed. Reducing stones to <2 mm is a reasonable target, but the risk of steinstrasse, particularly when treating larger stones, remains pending a more thorough assessment of clinical outcomes.

While BWL may not challenge endoscopic and percutaneous techniques as the gold standard for treating kidney stones, this body of work underscores renewed interest in noninvasive treatment strategies to reduce morbidity for patients with stones. The favorable side-effect profile and tolerability without requiring anesthesia are key features of BWL. These early results thus promise a future in which treatment of small stones can be performed in emergency departments or outpatient clinics, allowing for faster resolution of symptomatic stone events while easing the burden on operating rooms.

Conflicts of interest: Marshall Stoller is co-founder of Applaud Medical. Heiko Yang has nothing to disclose.

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