INTRODUCTION: The Thulium fiber laser has recently been tested as a potential alternative to the Holmium:YAG laser for lithotripsy. This study explores use of a short taper for expanding the Thulium fiber laser beam at the distal tip of a small-core fiber. METHODS: Thulium fiber laser radiation with a wavelength of 1,908 nm, 10 Hz pulse rate, 70 mJ pulse energy, and 1-millisecond pulse duration was delivered through a 2-m-length fiber with 150-microm-core-input-end, 300-microm-core-output-end, and 5-mm-length taper, in contact with human uric acid (UA) and calcium oxalate monohydrate (COM) stones, ex vivo (n = 10 each). Stone mass loss, stone crater depths, fiber transmission losses, fiber burn-back, irrigation rates, and deflection through a flexible ureteroscope were measured for the tapered fiber and compared with conventional fibers. RESULTS: After delivery of 1,800 pulses through the tapered fiber, mass loss measured 12.7±2.6 mg for UA and 7.2±0.8 mg COM stones, comparable to conventional 100-microm-core fibers (12.6±2.5 mg for UA and 6.8±1.7 mg for COM stones). No transmission losses or burn-back occurred for the tapered fiber after 36,000 pulses, while a conventional 150-microm fiber experienced significant tip degradation after only 1,800 pulses. High irrigation rates were measured with the tapered fiber inserted through the working port of a flexible ureteroscope without hindering its deflection, mimicking that of a conventional 150 microm fiber. CONCLUSIONS: The short tapered distal fiber tip allows expansion of the laser beam, resulting in decreased fiber tip damage compared to conventional small-core fibers, without compromising fiber bending, stone vaporization efficiency, or irrigation rates.

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