Effect of microsecond pulse length and tip shape on explosive bubble formation of 2.78 µm Er,Cr;YSGG and 2.94 µm Er:YAG laser

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With new fiber systems available for 3 µm, Erbium lasers become more interesting for precise tissue ablation in a water environment. The dynamics of explosive bubble formation was investigated at 2.78 µm (Er,Cr;YSGG) and 2.94 µm (Er:YAG), in relation to energy (10-50 mJ), pulse length (20-150 µs) and fiber tip shape (flat or tapered). The dynamics of exploding bubbles were captured with high speed imaging (10 - 300 µs range. Increasing the pulse length and energy, the bubble became more was elongated. Tapered fibers produced spherical bubbles with an optically transparent surface expected to be more forceful for creating mechanical effects in both hard and soft tissues.