MANIPULATION OF HYDROGEL SURFACE BY TAPERED STRUCTURE ACTUATED WITH ULTRASOUND

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A tapered structure can act as a geometric amplifier of ultrasound intensity. In this study we investigated the capability of a tapered structure to actuate hydrogel when ultrasonic waves are coupled into the tapered structure. Ballistic gelatin was used as a sample. The tapered structure (tip pointing down) was translated into the sample. This was done at different locations with different penetration depths with and without ultrasound. Subsequently, the tip of the tapered structure was introduced into intact sample without ultrasound to a pre-defined depth ($200\,\mu\mathrm{m}$). Following this, the tip was translated parallel to the sample surface (in two orthogonal directions) with or without ultrasound, while keeping the tip at the same depth. The lesions generated by the tapered structure were characterized with light microscopy. The differences and similarities in the generated lesions are reported. The investigated ultrasonic method could be used to carve and abrade soft materials such as hydrogels into pre-defined shapes with high spatial precision.