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Methods for evaluating changes in cartilage stiffness following electromechanical reshaping

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One component of several otolaryngological surgeries is the reshaping of cartilage. Several previous studies have demonstrated the efficient achievement of this procedure through electromechanical reshaping (EMR), a technique that involves the direct application of voltage to cartilage mechanically deformed in a jig. Two main parameters, voltage and application time, may be varied to achieve varying degrees of shape change. Both maximized shape change and minimized intrinsic tissue damage determine the ideal parameters for EMR. In preceding research, EMR parameters were correlated with degree of shape change. However, it remains necessary to correlate the same parameters with the degree of change in the mechanical properties of tissue. This study satisfies this need by providing comprehensive data on the pre- and post-EMR stiffness of both septal and auricular cartilage over a range of voltages with constant application time (2-8V, 2min, and 2-8V, 3min, respectively). EMR was applied using flat platinum electrodes to one of two 15mm X 5mm samples obtained from the same cartilage specimen, while the second sample was maintained as a control. Following a 15 min rehydration period, the Young's modulus of the tissue was calculated for both the control and experimental sample from data obtained through a uniaxial tension test. A general reduction in stiffness was observed from beginning at 3V, with the magnitude of reduction increasing at 6V.

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