MONITORING OF LATISSIMUS DORSI MUSCLE CONTRACTION BY INTRAMUSCULAR PRESSURE MEASUREMENT

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Non-invasive assessment of latissimus dorsi muscle (LD) contraction in cardiomyoplasty would be valuable for optimizing muscle stimulation parameters. Intramuscular pressure (IMP) measurement using an implanted sensor was performed in chronic studies to determine if LD contractile response could be reliably monitored.

Two pressure sensors (Model 4321, Medtronic, Inc.) were implanted in the left LD of five dogs. A 12-week training protocol was delivered to the in situ muscle using an implanted pulse generator (Model 7424) connected to epimysial electrodes placed in the vicinity of the thoracodorsal nerve. Biweekly monitors were performed to record IMP, force (F), and shortening (#L) during isometric and afterloaded contractions. Stimulation amplitudes, ranging from sub-threshold to supra-maximal settings, were applied. Pulse train frequency was varied between 15 and 50 Hz. The maximum recruitment amplitude (MRA) indicated by peak IMP agreed well with peak F during isometric (r² = 0.93) and afterloaded contractions (r² = 0.92). MRA indicated by IMP and #L during afterloaded contractions also had strong correlation (r² = 0.88). The rate of IMP development, dP/dt, decreased significantly from 2 to 12 weeks (p < 0.01). Pulse train frequency required for maximum increase in IMP also decreased over time, from 33 to 15 Hz. These changes reflect the reduction in contraction velocity and fusion frequency as the muscle converts to predominantly slow-twitch fibers.

In conclusion, IMP measurement for chronic monitoring of skeletal muscle contraction is feasible. LD response to varying stimulation parameters and changes in contractile properties as fiber-type transformation occurs are measurable.