Chest Wall Muscle EMG Activity and Arm Force during Functional Tasks: Implications After Open Heart Surgery

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PURPOSE: Patients often need to use their arms to assist with functional activities but after open heart surgery pushing with the arms is limited to minimize force across the healing sternum. The main purposes of this study were to determine: 1) how accurately patients can estimate arm weight bearing with 10 lb of force or less and 2) if feedback training is effective for improving their ability to estimate arm force and reduce pectoralis muscle contraction during functional activities. PROCEDURE: An instrumented walker was designed to measure arm force during functional tasks including ambulation with a walker and sit-stand transfers. Pectoralis muscle electromyography (EMG) was also measured in study participants. After baseline testing, study participants underwent a brief session of visual and auditory concurrent feedback training. Data analysis included t-tests and ANOVA ($P<0.05$). DATA: Results showed that self-selected arm force was over 10 lb for all tasks (11.7-19.0 lb) but after feedback training it was significantly lower (8.3-9.8 lb). During most trials (67%), study participants over-estimated arm force. Pectoralis muscle EMG values were less than 10% of maximal voluntary contractions and were reduced (3.3-5.6%) after feedback training. CONCLUSIONS: Results indicate that patients may not be good at estimating extremity force during weight bearing activities and that visual and auditory feedback improves accuracy. Activation of the pectoralis muscle during arm weight bearing is minimal suggesting minor force occurs across the sternum. An instrumented walker and feedback training could significantly improve outcomes for patients recovering from surgery or trauma.

Awards Won:
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