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PAT22

The Presence of Substance P in Forelimb Tendons in a Model of Upper Extremity Work-Related Musculoskeletal Disorder

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PURPOSE To determine the presence of substance P in forelimb tendons of rats that performed a high repetition-high force (HRHF) or low repetition-negligible force (LRNF) reaching and grasping task. The increased presence of substance P (SP) has been observed in patients with chronic tennis elbow, and may be associated with prolonged or abnormal pain states, e.g. hyperalgesia.

METHODS Forelimb tendons were collected from young adult Sprague-Dawley rats that had performed either a HRHF or a LRNF reaching and grasping task for 3, 6 or 12 weeks. Tendons were examined bilaterally using immunohistochemical techniques and compared to results from 0 week controls. SP immunoreactivity was measured using a bioquantification system interfaced with a microscope. For all statistical analyses, the factors exposure group, week and limb were used in a 3-way ANOVA ($p \leq 0.05$) to determine differences in SP immunoreactivity. Post-hoc analyses were carried out using Bonferroni method.

RESULTS SP immunoreactivity was significantly increased in epitenon and endotenon in HRHF forelimb tendons. The response was greatest in 12 week HRHF epitenon tissues of distal forelimbs, and greater in reach forelimb tendons than nonreach. We observed increased SP in the following amounts: HRHF 12 week > 6 week > 3 week, and epitenon > endotenon > paratenon. SP was also present in LRNF 12 week

epitenon, but at an attenuated level compared to HRHF. No SP immunoreactivity was observed in LRNF tendons at 3 or 6 weeks of task performance, or in the 0 week control tendons. The level of SP immunoreactivity was associated with motor behavior degradation.

CONCLUSIONS Our findings demonstrate that SP increases in tendon tissues as a consequence of performing highly repetitive and forceful tasks. The response is exposure dependent (HRHF > LRNF) and tissue dependent (epitenon > endotenon). The presence of increased SP in the HRHF nonreach limb, albeit less than the reach limb, is likely due to sustained postural loading during task performance. The tissue response is also dependent upon duration of task exposure.

RELEVANCE TO HAND THERAPY Despite increased awareness of ergonomic risk factors in the workplace, incidence and costs of WMSDs are high. Tendinopathies are associated with repetitive movement with and without force. The incidence of tendinopathies increases with age and the amount of exposure to forceful repetitive movement. Animal models provide an opportunity to examine tissue effects under controlled experimental conditions. The relationship of a neurochemical response with motor degradation supports the idea that peripheral neurochemical changes (i.e. SP) contributes to the signs and symptoms of tendinopathies.

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