The Influence of Analgesic Medications on Adaptations of Paraspinal Muscle to Resistance Exercise in Patients with Chronic Low Back Pain

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INTRODUCTION: Low back pain (LBP) affects between 65-85% of the United States population throughout their lifetime. A common conservative treatment strategy is exercise-based rehabilitation coupled with pharmacological management. Analgesic medications, known to provide pain relief, are thought to improve exercise tolerance and force production during training. However, some medications may also influence muscle hypertrophy. The objective of this study is to investigate how analgesic medications commonly used during rehabilitation affect paraspinal muscle growth and compositional change in response to an exercise training program in patients with chronic LBP.

METHODS: Individuals with chronic LBP prescribed exercise rehabilitation treatment were consecutively recruited from clinics in San Diego. The study was approved by the UC San Diego IRB. All participants provided written informed consent. Prior to initiating rehabilitation, magnetic resonance images (MRI) of the lumbar spine and extensor isometric maximum voluntary contraction testing were performed, along with questionnaire-based assessments of medication use, sociodemographic characteristics, symptom severity, psychosocial factors, and physical activity. MRI and questionnaires were repeated post-intervention. The recommended treatment frequency was 2 sessions per week of a moderate-high intensity machine-based resistance exercise paradigm for 10-12 weeks. Patients were classified into medications groups if use exceeded 10% of the daily maximum and began at least 2 weeks prior to baseline MRI. Multifidus (M) and erector spinae (ES) lean muscle volume (LMV) and fat fraction (FF) were quantified from MRI using 3D IDEAL fat-water separation sequences. Disability (Oswestry Disability Index; ODI), pain (Visual Analogue Scale; VAS), and patient specific goal achievement (Patient Specific Functional Scale; PSFS), were collected pre- and post-intervention. Differences in muscle health measures and clinical outcomes between medication groups were analyzed using analysis of covariance (ANCOVA) and Tukey post-hoc corrections; sociodemographic covariates were included if correlation p-value with muscle health measures was < 0.10.

RESULTS SECTION: 44 patients (20 female, 24 male; Age = 52.5 ± 16.3; BMI = 26.6 ± 4.5; ODI = 23.52 ± 11.15) were included in the study across three medication groups (None = 28, NSAID = 9, SSRI = 7). Disability, pain, and patient specific goals improved significantly with treatment ($p = 0.003$; $p < 0.001$; $p = 0.003$). There were no significant changes in absolute or adjusted M or ES muscle hypertrophy or fatty infiltration in response to exercise-based rehabilitation across medication groups ($p > 0.166$, Figure 1). There was a significant main effect of medication on change in ODI ($p = 0.029$), with the no-medication group trending toward greater improvements compared to the NSAID and SSRI groups ($p<0.1$). M LMV change was positively correlated with ODI ($p = 0.032$, $R^2 = 0.107$) and PSFS ($p = 0.041$, $R^2 = 0.176$), and erector spinae LMV change was associated with VAS ($p = 0.036$, $R^2 = 0.111$). There was also a strong, positive correlation between greater SSRI dosage and increase in erector spinae fatty infiltration ($R^2 = 0.781$, $p = 0.008$, $n = 7$).

DISCUSSION: We found that the most used medications in this cohort were NSAIDs and SSRIs prescribed for pain, and these medications were not associated with muscle adaptation in response to resistance exercise, although they may indirectly impact disability. Limitations of this study include small sample size, limited breadth of medication classes evaluated, and inability to directly manipulate dose response.

SIGNIFICANCE/CLINICAL RELEVANCE: The study findings suggest that NSAID and SSRI use is not associated with paraspinal muscle adaptations to exercise but is related to attenuated improvements in disability.

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IMAGES AND TABLES:

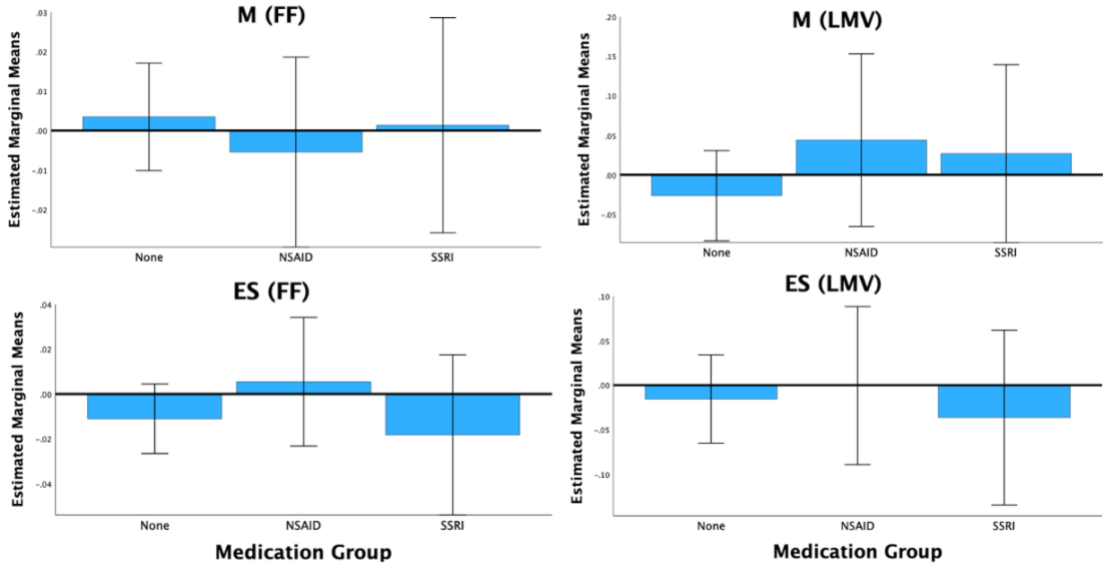

Figure 1. Adjusted bar plots for multifidus and erector spinae fat fraction (FF) and lean muscle volume (LMV) changes between medication groups