Comparative Analysis of Back Muscle Strength in Low Back Patients Taking Opioids, Serotonin-Reuptake Inhibitors, and Non-Steroidal Anti-Inflammatory Drugs

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INTRODUCTION: Low back pain (LBP) affects 65-85% of the US population at some point in their lifetime. The most common conservative treatment strategies for the management of chronic LBP are exercise-based rehabilitation and pharmacological management, and these strategies are often co-prescribed. However, certain analgesic medications are known to affect muscle performance and the adaptive response to exercise; non-steroidal anti-inflammatory drugs (NSAIDs) have been shown to attenuate exercise-induced muscle hypertrophy response, Opioids may reduce motor drive given their effects on the central nervous system, and no data exists on Selective Serotonin- or Serotonin-norepinephrine Reuptake Inhibitors (SSRI/SNRI's) which are becoming more widely prescribed for pain. The purpose of this investigation was to compare maximal voluntary back muscle force production across individuals with chronic LBP taking Opioids, Selective SSRI/SNRI's, NSAIDs or no medication.

METHODS: Consented individuals were included if they were initiating an exercise-based rehabilitation program, were between 18-85 years old, with LBP duration >3 months. Drug classes; no analgesic medications (NONE), OPIOIDs, SSRI/SNRI's, or NSAIDs were included based on the most prevalent analgesics observed in the recruited study population, and were classified according to a weekly medication use diary starting 2 weeks prior to initiation of the physical assessment and treatment program. Minimum medication dose for group classification was at least 10% of the maximum recommended daily dose for the drug, and individuals who had inconsistent medication use (<5% over the diary period, or less than 2 doses/week) or used medications in combination were excluded. The primary outcome of back muscle strength was measured as a maximal voluntary contraction into lumbar extension using an isokinetic dynamometer and normalized to age and sex matched pain-free normative data. Secondary demographic (age, sex, body mass index (BMI), radiographic diagnosis) and clinical (pain severity, disability, anxiety and depression) data were also collected and evaluated as potential confounders. Muscle performance was compared across medication classes using one-way analysis of variance (ANOVA) with Sidak corrected post-hoc comparisons. In cases where covariates were found to be significantly related to the outcome, an adjusted model (ANCOVA) was performed. Finally, individual correlational analyses were performed within each drug class to explore whether muscle performance or other patient characteristics varied according to dose.

RESULTS SECTION: 117 individuals consented to the IRB-approved protocol and were included in the analysis (53=NONE, 14=SSRI/SNRI, 32=OPIOIDs, 18=NSAIDs). On average, muscle strength values were 38.3(31.5)% lower than pain-free normative strength values matched to sex and age (by decade). OPIOIDs was older ($F=10.5$, $p<0.001$), had greater back pain severity($F=14.0$, $p<0.001$), disability ($F=24.7$, $p<0.001$), depression ($F=7.1$, $p<0.001$), and body mass index (BMI; $F=5.4$, $p=0.002$) vs the NONE and NSAIDS groups, and the SSRI/SNRI group also had higher depression scores vs NONE ($p=0.037$). There was a main effect of medication on muscle strength ($F=5.09$, $p=0.002$), with the OPIOID group (-54.8(16.4)%) having lower strength than the SSRI/SNRI (-22.0(46.2)%) group ($p=0.027$) and trending toward lower strength compared to NONE (-34.7(25.8)%); $p=0.09$). When adjusting for confounders (BMI, pain, and depression), the differences between OPIOID and SSRI/SNRI was retained ($p=0.007$), but differences between the OPIOID and NONE group lost significance ($p=0.593$). There was no relationship between drug dose and muscle strength for any drug class ($p>0.706$). Individuals who had a non-specific diagnosis tended to take higher doses of Opioids compared to those with a deformity diagnosis ($p=0.045$), and those who took higher doses of NSAIDs had lower anxiety scores ($r=-0.504$, $p=0.028$).

DISCUSSION: Individuals taking Opioids demonstrated substantially lower back extensor muscle performance compared to those taking SSRI/SNRI's when adjusting for pain, disability, BMI, and depression. These differences were not dose-dependent, although other patient characteristics were; Opioid dose was associated with diagnosis and NSAID dose was associated with anxiety. In individuals who are undergoing rehabilitation, measuring improvements in strength is often a key goal, and may be influenced by the analgesic medication prescribed. However, the efficacy of these drugs is highly variable across individuals and relationships between dosing and performance require further elucidation. Interestingly the seemingly protective effect of SSRI/SNRIs on muscle performance relative to the other groups has not been previously described and may suggest a faciliatory role of these drugs on muscle activation.

SIGNIFICANCE/CLINICAL RELEVANCE: Different classes of analgesic medications may have an impact on spine muscle strength and performance in individuals with LBP undergoing an exercise-based rehabilitation. Further research is necessary to understand the influence of medication use on treatment response.

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FIGURE: Normalized mean strength values adjusted for BMI, disability, pain, and depression