Influence of spinal stenosis severity on physical therapy outcomes

Bahar Shahidi, Connor William Richards, Lissa Taitano, Kamshad Raiszadeh[1]
[1]Spinezone Medical Fitness

INTRODUCTION: Low back and neck pain are highly prevalent musculoskeletal conditions that are responsible for the greatest number of years lived with disability in the general population. Initial conservative management of spinal stenosis is typically non-operative. However, conservative management for stenosis is often thought to merely postpone more invasive intervention for a short time, and often moderate and severe cases are streamlined to surgical intervention. The purpose of this investigation was to evaluate whether improvements in pain, disability, and medication usage in response to an exercise-based physical therapy program differed across individuals with mild, moderate, or severe stenosis. Our hypothesis was that individuals with severe stenosis would demonstrate significantly smaller improvements in outcomes as compared to those with mild or moderate stenosis.

METHODS: This was a secondary analysis of data from a clinical trial (NCT04081896) and approved by the ethical review board. Participants were included if they were prescribed exercise-based rehabilitation to address their condition with radiographic confirmation of stenosis at one or multiple levels in the cervical or lumbar spine. A sub-cohort of participants were followed for 1 year post rehabilitation to evaluate cross-over to surgery. The exercise-based physical therapy program was administered in an integrated practice unit (IPU) consisting of a multidisciplinary treatment team of physical therapists, orthopedic spine surgeons, spine-trained physician assistants, and pain specialist consultants. The treatments were implemented under direct supervision of a licensed physical therapist and included machine-based resistance exercises prescribed and progressed along with directional preference exercises, and patient education on sleep, nutrition, posture, and ergonomics as needed based on impairments identified upon initial physical therapy evaluation. Each measurement was compared across stenosis severity groups using a one-way ANOVA with Sidak post-hoc corrections for multiple comparisons for continuous variables, and chi-square analysis for categorical or binary variables. Outcomes were evaluated using intention-to-treat based analysis. Secondary covariates that were significantly different across stenosis severity groups were included in a multivariate linear or logistic regression model along with the primary predictor of interest to adjust for confounders.

RESULTS: An initial sample of 2,880 individuals initiated an exercise-based rehabilitation program for back or neck pain. 1,972 participants met the inclusion criteria and were included in analysis. Data on surgical cross-over rates was obtained on a sub-cohort of 210 participants. Individuals with severe stenosis reported longer symptom durations than those with mild or moderate stenosis for the back ($p=0.02$) but not neck ($p=0.24$). Program duration averaged 13 visits over 90 days, with no differences in attendance across stenosis severity types ($p>0.07$). The average(SD) improvement in back disability (ODI) was not different across groups; 4.1(10.5) for mild stenosis, 4.6(11.4) for moderate stenosis, and 4.9(11.7) points for severe stenosis ($p=0.49$). Improvement in neck disability (NDI) was also similar across groups; 5.5(11.8) for mild stenosis, 5.3(11.0) for moderate stenosis, and 4.8 (10.8) for severe stenosis in cervical spine patients ($p=0.77$). Improvement in back pain was 26.5(23.3) points, and 24.7(24.4) points for neck pain with no differences across stenosis severity groups ($p>0.60$). The percent of patients taking narcotics reduced by 10.7% in the mild stenosis group, 11.8% in the moderate stenosis group, and 12.5% in the severe stenosis group, with no differences across groups ($p=0.63$), Adjusting for significant covariates of age, gender, stenosis region (lumbar vs cervical), type (central vs foraminal), and symptom duration did not change the results except for improvements in cervical pain, which indicated significantly smaller reductions in pain in those with severe stenosis ($B=-0.25$, $p=0.028$). Despite similar responses to exercise-based rehabilitation in a sub-cohort of patients, 17.6% underwent spinal surgery within 1 year of rehabilitation; 6.5% in the mild group, 16.9% in the moderate group, and 22.2% in the severe group ($p=0.12$). There were no significant predictors of surgical cross-over, however having an ODI of >34 points and pain of >5 points upon discharge from rehabilitation correctly identified 70% of patients who progressed to surgery.

DISCUSSION AND CONCLUSION: Contrary to our hypothesis, individuals with severe stenosis had similar improvements in pain, function, and narcotic medication use in response to an exercise-based rehabilitation program compared to those with mild or moderate stenosis. We observed clinically significant improvements in pain, but not function, and these improvements were observed in parallel with substantial reduction in narcotic medication use. Of the subset of participants with surgical cross-over data, regardless of improvement observed with conservative management, almost 18% underwent surgery, with the majority being in the moderate and severe stenosis groups (not statistically significant). While there were no significant baseline predictors identifying those who crossed over to surgery, the absolute level of disability and pain at the time of discharge seemed to be an important factor in progression to surgery. Exercise-based rehabilitation can be effective in reducing pain and narcotic use in individuals regardless of stenosis severity, but final level of disability and pain may be an important predictor of surgical cross-over.