Risk Factors for Surgical Crossover in Individuals with Spinal Stenosis Managed with an Integrated Practice Unit-Based Rehabilitation Program

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INTRODUCTION: The prevalence of spinal stenosis is approximately 11% in the adult population, and it is one of the most common reasons for symptomatic individuals to undergo surgical intervention. Although exercise-based rehabilitation is often recommended as the first-line of treatment for this population, there is conflicting data as to its efficacy, and it has been reported that up to 56% of individuals with symptomatic stenosis undergo surgery within 2 years of nonsurgical management. As a result, when stenosis is severe, physicians often bypass nonsurgical management with the thought that it is poorly tolerated and further delays necessary treatment. Recent evidence has supported the efficacy of a multidisciplinary integrated practice unit (IPU) model of exercise-based rehabilitation to address the multifactorial nature of spine pain. However, it is unknown whether individuals with varying levels of stenosis respond to this treatment modality. Further, it is unknown which characteristics of this population predict cross over to surgical intervention after undergoing an initial bout of rehabilitation within this treatment model. The purpose of this study was to evaluate whether improvements in pain, disability, and medication usage in response to an IPU exercise-based rehabilitation program differed across individuals with mild, moderate, or severe stenosis and if there were specific risk factors that predicted the need for surgical intervention.

METHODS: This was a secondary analysis of data from a clinical trials registry (NCT04081896). Consented participants were included if they participated in an exercise-based IPU rehabilitation program with radiographic confirmation of stenosis at one or multiple levels in the cervical or lumbar spine, and had post-rehabilitation follow up data for at least 1 year. Changes in pain (Numeric Pain Rating Scale), disability (Oswestry or Neck Disability Index), biopsychosocial risk (STarT Back tool), and analgesic use (narcotic or NSAID use frequency) were compared before and after rehabilitation using paired t-tests and were compared across stenosis severity groups (mild, moderate, severe) using a repeated measures ANOVA. Univariate logistic regression was used to identify risk factors for surgical crossover, and a receiver operating characteristic (ROC) analysis was used to identify thresholds for significant predictors of surgical crossover.

RESULTS: A sample of 357 individuals met the inclusion criteria and were included in the analysis. Most participants had stenosis of the lumbar region (78.2%) that was central (58.9%). In total, 13.2% had mild stenosis, 38.4% had moderate stenosis, and 45.9% had severe stenosis. Average follow-up duration was 2.1 years, and incidence of surgery within the follow-up period was 15.4%. Individuals with severe stenosis were older ($p<0.001$) and had more difficulty walking ($p=0.016$) upon initiation of rehabilitation compared to those with mild or moderate stenosis, with no other significant differences across stenosis severities. Participants experienced significant improvements in pain ($p<0.001$) and disability ($p<0.001$) and reduced analgesic medication use (16% narcotic cessation and 27% NSAID cessation) with rehabilitation. There were no differences in the number of visits (average 13 visits) completed or magnitude of pain or disability reduction across individuals with varying stenosis severities ($p>0.37$), and no significant difference in incidence of surgery across stenosis severities ($p=0.35$). Risk factors for surgical cross over included high disability scores upon discharge from rehabilitation ($p=0.002$), difficulty standing ($p=0.018$), high NSAID use upon discharge ($p=0.013$), high baseline biopsychosocial risk ($p=0.024$), presence of central stenosis ($p=0.002$), and male sex ($p<0.001$). Using ROC-based analyses to identify thresholds for continuous predictors, we found that the combination of central stenosis, a STarT score of above 4 points (high risk), disability score above 21 points (moderate disability), and the inability to stand for more than 30 minutes upon discharge from physical therapy accurately identified 72.8% of patients who progressed to surgery within 2 years of rehabilitation completion.

DISCUSSION AND CONCLUSION: Individuals with spinal stenosis of varying severities demonstrate similar magnitudes of improvement in pain, disability, and reduction in analgesic medication use in response to an exercise-based IPU rehabilitation program, and have similarly low rates of surgical cross-over within 2 years of completion. Predictors of surgical cross-over are not related to radiographic severity of stenosis, but are instead most related to type of stenosis (central vs. foraminal), having at least moderate levels of disability upon completion of rehabilitation- particularly with regard to standing tolerance, and high biopsychosocial risk.