Lumbar Spinal Stenosis with or without Concomitant Degenerative Spondylolisthesis in Twins

Anders Joelson[1], Lilla Hajnalka Szigethy, Freyr Gauti Sigmundsson[2]
[1]Orebro University Hospital, [2]Skane University Hospital

INTRODUCTION:
There is growing evidence to suggest a potential genetic component underlying the development and progression of lumbar spinal stenosis (LSS). However, the genetic influences on the phenotypes requiring surgery are unknown. Twin studies can be used to distinguish genetic and environmental factors that underlie the development of a disease. If genetic factors are important, the concordance rate in monozygotic (MZ) twins, who share 100% of their genes, will be greater than in dizygotic (DZ) twins, who share on the average 50% of their genes. The aim of this study was to determine the concordance rates for LSS with or without concomitant degenerative spondylolisthesis (DS) requiring surgery by studying MZ and DZ twin pairs.
METHODS:
Patients between 18 and 85 years of age who underwent surgery for LSS with or without DS between 1996 and 2022 were identified in the national Swedish spine registry (LSS without DS: 45,110 patients; LSS with DS: 14,614 patients), and matched with the Swedish Twin Registry to identify MZ and DZ twins. The probandwise concordance rate and MZ/DZ concordance ratios and the limits of genetic determination were calculated.
RESULTS: We identified 414 twin pairs (92 MZ and 322 DZ pairs) of whom 1 or both twins underwent surgery for LSS without DS. We found 13 concordant MZ pairs and 6 concordant DZ pairs. The probandwise concordance rate for LSS without DS requiring surgery was 0.25 (95% confidence interval [CI], 0.14 to 0.34) for MZ twins and 0.04 (95% CI, 0.01 to 0.07) for DZ twins. For LSS with DS we identified 145 twin pairs (27 MZ and 118 DZ pairs) of whom 1 or both twins underwent surgery for LSS with DS. We found no concordant MZ pair and 2 concordant DZ pairs. When we evaluated pairs where at least one twin was operated for LSS with DS we found 2 concordant MZ pair and 4 concordant DZ pairs (the co-twins were operated for spinal stenosis without DS) resulting in the probandwise concordance rate 0.14 (95% CI, 0 to 0.31) for MZ twins and 0.07 (95% CI, 0.02 to 0.31) for DZ twins. The probandwise MZ/DZ concordance ratio was 6.8 (95% CI, 2.9 to 21.5) for LSS without DS and 2.1 (95% CI 0-11.9) for LSS with DS. The limits of genetic determination were 0.59 to 0.70 for LSS with DS and 0.27 to 0.36 for LSS without DS.
DISCUSSION AND CONCLUSION:
In this nationwide observational study, including 559 twin pairs, based on national Swedish registry data, we found a larger probandwise MZ/DZ concordance ratio for surgically treated LSS without DS compared with LSS with DS. Our findings suggest that genetic factors may play an important role in the development of LSS without DS requiring surgery. In contrast, the similarity in concordance rates in MZ and DZ twins for LSS with DS indicates that heredity is probably not of major etiologic importance in most cases of LSS with DS requiring surgery.