Association between $VEGF$ and $eNOS$ gene polymorphisms and lumbar disc degeneration in a young Korean population

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ABSTRACT. Disturbances in blood flow to intervertebral discs (IVD) play an important role in IVD degeneration. Vascular endothelial growth factor (VEGF) and endothelial nitric oxide synthase (eNOS) are extremely important angiogenic factors for vasodilation and neovascularization. We investigated the relationship between single nucleotide polymorphisms (SNPs) of the $VEGF$ and $eNOS$ genes and genetic susceptibility to lumbar IVD degeneration in a young adult Korean population. Two hundred and forty-one participants (aged 18 to 30 years), with or without low back pain, were selected for the
study. Magnetic resonance imaging was made of the lumbar spine in all participants. The patient group (N = 102) had low back pain clinically and lumbar IVD degeneration radiographically. The control group (N = 139) included subjects with and without low back pain; all were negative radiographically for lumbar IVD degeneration. Using PCR-RFLP analysis, we analyzed VEGF (-2578C>A, -1154G>A, -634G>C, and 936C>T) and eNOS (-786T>C, 4a4b and 894G>T) SNPs. We made combined analyses of the genes and performed haplotype analyses. There were no significant differences in the genotype distribution of polymorphisms of VEGF and eNOS genes among patients and controls. However, the frequency of VEGF -2578CA +AA/-634CC combined genotypes was significantly higher in patients when compared with controls [odds ratio (OR) = 21.00; 95% confidence interval (CI) = 2.590-170.240]. The frequencies of the -2578A/-1154A/-634C/936C (OR = 3.831; 95%CI = 1.068-13.742), -2578A/-1154A/-634C (OR = 3.356; 95%CI = 1.198-9.400), and -2578A/-634C/936C (OR = 10.820; 95%CI = 2.811-41.656) haplotypes were also significantly higher in patients than in controls. We conclude that the combined genotype VEGF -2578CA+AA/-634CC is a possible risk factor for IVD degeneration and the VEGF -2578A/-1154A/-634C/936C haplotype may increase the risk for development of IVD degeneration. Furthermore, the VEGF -634C allele appears to be associated with susceptibility to IVD degeneration.

**Key words:** Endothelial nitric oxide synthase; Polymorphism; Intervertebral disc degeneration; Vascular endothelial growth factor