

Abstract

Simvastatin and GSNO Augment Locomotor Recovery after Cauda Equina Compression in Rat Model of Spinal Stenosis

Brian R. Subach, MD, FACS, Spinal Research Foundation, Reston, VA; Thomas C. Schuler, MD, FACS, Reston, VA; Marcus M. Martin, PhD, Reston, VA; Shunmugavel Anandakumar, PhD, Charleston, SC; Anne G. Copay, PhD, Reston, VA; Peter Chou, PhD, Charleston, SC; John K. Orak, MD, Charleston, SC; Mushfiquddin Kahn, PhD, Charleston, SC; Inderjit Singh, PhD, Charleston, SC;

Introduction: Secondary spinal cord injury (SCI) can be caused by inflammation, cellular apoptosis, and demyelination following the primary contusion, leading to further damage and loss of function. Due to their neuroprotective and anti-inflammatory effects, HMG Co-A reductase inhibitors (statins) and GSNO (S-Nitrosoglutathione) could potentially be used to treat SCI and reduce secondary damage.

Methods: We surgically induced cauda equina compression in a rat model by inserting two silicon blocks into the epidural space under the L4 and L5 lamina. Following surgery, the animals were divided into three experimental treatment groups: untreated (n=8), simvastatin treated (n=8), and GSNO treated (n=11). All three groups were subjected to a locomotor test prior to surgery and at 2-day intervals following surgery.

Results: Both simvastatin- and GSNO-treated animals recovered motor function faster and to a greater degree than control animals. The histology of the compressed nerves between the groups also showed that animals treated with simvastatin and GSNO had a significantly decreased incidence of cellular apoptosis and an increased infiltration of nerve cells compared to untreated controls. There was more than a 2-fold decrease in the amount of cell death at both day 3 and day 14 in both simvastatin- and GSNO-treated animals compared to controls.

Conclusions: These results suggest that simvastatin and GSNO may be promising new treatments for SCI, although further studies are needed to confirm this.

Key Words: Spine/Peripheral Nerve, Simvastatin, Central Nervous System Injury, S-Nitrosoglutathione, Spinal Cord Injury