Altered innate immunity following spinal cord injury

Spinal Cord
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FROM ABSTRACT
Study Design:
Cross-sectional, paired cohort study.

Objectives:
To replicate the finding of impaired immunocyte function following spinal cord injury (SCI).
To determine whether cellular immune function in SCI subjects with decentralized sympathetic nervous system (SNS) (T6 and above) varies from SCI subjects with intact SNS (below T6).

Setting:
University of Medicine and Dentistry of New Jersey–New Jersey Medical School, Newark, NJ, USA.

Method:
In vitro immune assays.

Results:
Participation of 36 SCI subjects and 36 individually age- and sex-matched healthy controls.

SCI subjects were stratified into two groups, that is, neurologic level of injury (NLI) at T6 or above (26 subjects) and NLI below T6 (10 subjects).

No statistically significant differences were identified between NLI T6 and above and NLI below T6 groups for the NK (natural killer) cytotoxicity assay.

There was a statistically significant reduction in NK cell numbers in all subjects with SCI as compared to their paired controls.

There was a statistically significant reduction in NK cell cytotoxicity in SCI subjects, relative to the controls.

Conclusion:
We replicated the finding of decreased NK cell number and cytotoxicity in SCI subjects.
THESE AUTHORS ALSO NOTE

“In the years following spinal cord injury (SCI), septicemia and pneumonia remain leading causes of death.”

“Further infections of the urinary tract and respiratory tract are leading reasons for re-hospitalization.”

“This finding of increased morbidity and mortality because of infections is most pronounced in subjects with complete tetraplegia, and least pronounced in subjects with incomplete paraplegia.”

“There was a statistically significant reduction in the percent of NK cells and a significant increase in the percent of T cells and helper cells in the SCI subjects as compared to their paired control.”

We found a statistically significant reduction in NK cell cytotoxicity in SCI subjects relative to the controls supporting the conclusion of about a 40% weaker response in the group of SCI subjects than in their matched controls.

DISCUSSION

“The subjects with NLI of T6 and above are known to have limited ability to fully regulate their SNS.”

“Links shown between the immune system and the SNS, as well as the negative effects of chronic stress on NK cell numbers and function, lead the investigators to hypothesize that this SNS derangement may contribute to altered immune function.”

“In the SCI group as a whole, we again showed a reduction of NK cell cytotoxicity relative to the healthy controls.”

“NK cells are large granular lymphocytes that constitute about 10–15% of the total lymphocyte pool.”

Natural Killer cells develop within the microenvironment of the bone marrow (BM), in which sensory and autonomic nerve fibers have been identified, suggesting a regulatory role in the BM. Neural input to the BM regulates the granulocytic lineage via direct effects of SNS fibers (adrenergic receptors) and neuropeptides.

[Very Important]

The orchestration of immunity following SCI is multifactorial, with interplay of contributing factors such as drugs, physical inactivity and diet.
KEY POINTS FROM DAN MURPHY

1) There is impaired immunocyte function following spinal cord injury (SCI).

2) There is a significant reduction in NK cell numbers in all subjects with SCI as compared to their paired controls.

3) “In the years following spinal cord injury (SCI), septicemia and pneumonia remain leading causes of death.”

4) “Further infections of the urinary tract and respiratory tract are leading reasons for re-hospitalization.”

5) “This finding of increased morbidity and mortality because of infections is most pronounced in subjects with complete tetraplegia, and least pronounced in subjects with incomplete paraplegia.”

6) “The subjects with neurological level of injury of T6 and above are known to have limited ability to fully regulate their SNS.”

7) “Links shown between the immune system and the SNS, as well as the negative effects of chronic stress on NK cell numbers and function, lead the investigators to hypothesize that this SNS derangement may contribute to altered immune function.”

8) Natural Killer cells develop within the microenvironment of the bone marrow (BM), in which sensory and autonomic nerve fibers have been identified, suggesting a regulatory role in the BM. Neural input to the BM regulates the granulocytic lineage via direct effects of SNS fibers (adrenergic receptors) and neuropeptides.

[Very Important]

COMMENTS FROM DAN MURPHY

This study adds to the support of the following concepts:

1) Immune system cells are derived from the bone marrow.

2) The bone marrow is innervated by the sympathetic nervous system, and it is the sympathetic nervous system that regulates the production of immune system cells, especially Natural Killer cells.

3) Spinal cord injury disrupts the function of the sympathetic nervous system, resulting in impairment of the immune system.