

Nerve Regeneration, Inflammation and Effects of High Fat Diet and Alcohol Ablation on Pain Responses following Spared Nerve Injury

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Introduction

Between 7 and 10 percent of the general population suffers from chronic neuropathic pain, and about 30 percent of the general population is classified as obese. Obesity is a growing complication in treatment for chronic illness, and diets high in fat have been demonstrated to increase pain. Our lab has shown previously that neuropathic pain, in part, is driven by nerve regeneration following nerve injury in addition to macrophage infiltration of the dorsal root ganglion (DRG).

Hypotheses

High-fat diet (HFD) enhances neuropathic pain by interfering with nerve regeneration and by promoting inflammation. Alcohol ablation of neuroma will reduce neuropathic pain as compared to surgical resection by diminishing nerve regeneration.

Methods

16 Sprague-Dawley (SD) rats were subject to spared-nerve injury (SNI) and 16 SD rats were subject to a modified SNI. Half of those with modified SNI received HFD. Half of those with normal SNI received alcohol ablation and the other half resection of the neuroma at 14 days post-SNI. Static, dynamic, and cold allodynia and guarding behavior were measured for 28-35 days post-SNI. L4 DRGs and neuromas were collected from all rats at the end of the experiment and immunohistochemistry was performed to qualitatively examine Iba-1 and GAP43 expression.

Results

HFD resulted in slightly elevated pain behavior as compared to rats fed a normal diet, but no significance was found. GAP43 expression and macrophages were found to be slightly higher in DRGs and neuromas of HFD rats. Alcohol ablation demonstrated a significant shift towards pre-injury pain responses as compared to resection, with some pain recovery noted after 21 days in both groups. GAP43 expression was found to be slightly lower in the DRGs of rats who received ablation. Macrophage infiltration was increased and GAP43 expression decreased in ablated neuromas compared to resection.

Conclusions

HFD effects on pain response are limited in effect but trend towards increasing pain behavior, possibly by promoting macrophage infiltration and nerve regeneration. Alcohol ablation results in transient lowering of pain responses by diminishing nerve regeneration.

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