

Blood Nerve Barrier and Diabetic Peripheral Neuropathy: Anatomical and Biochemical Relations

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Abstract

Background: In the peripheral nerves; axons and surrounding Schwann cells are confined to a small microenvironment named endoneurial space which lacks lymphatic drainage. Homeostatic regulation of endoneurial microenvironment is to be maintained for precise functions of peripheral nerves. Diabetic peripheral neuropathy is one of the common complications affecting more than one third of diabetes following long term hyperglycemia.

Methods and materials: We have reviewed related articles from PubMed and Scopus websites from 2010 up to 2015.

Results: Endothelial cells and multi layers of ensheathing perineurium, endowed with their tight junctions create a selective and dynamic barrier to protect endoneurial space from external fluctuations. Reduction of tight junction proteins are the major cause of Blood Nerve Barrier (BNB) disruption and closely linked with peripheral nerve diseases especially in diabetes.

Advanced Glycation End-Products(AGEs) and Radical Oxygen Substrate(ROS) increment in blood flow cause to breakdown of BNB and basement membrane hypertrophy which progressively lead to capillary dysfunction and endoneurial hypoxia. Alterations of oxygen and glucose extraction from endoneurial vessels are two main reasons for observed endoneurial edema. Therefore, endoneurial hypoxia together with downstream metabolic cascade of polyol pathway imbalance endoneurial microenvironment homeostasis and result to demyelination, distal fiber degeneration and nerve conduction delay.

Conclusion: This review focuses on how BNB disruption relates to diabetic neuropathy. In addition, pathological mechanisms involved in BNB dysfunction and diabetic neuropathy are briefly discussed. Studies on variations of BNB will increase our understanding of diabetic neuropathy and

other peripheral disorders as well as stimulate the development of therapeutic strategies to treat these disorders.

Key words: Diabetes, neuropathy, BNB, Hypoxia

