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Minocycline attenuates the development of diabetic neuropathic pain: possible anti-inflammatory and anti-oxidant mechanisms.

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Abstract

Painful neuropathy, a common complication of diabetes mellitus is characterized by allodynia and hyperalgesia. Recent studies emphasized on the role of non-neuronal cells, particularly microglia in the development of neuronal hypersensitivity. The purpose of the present study is to evaluate the effect of minocyline, a selective inhibitor of microglial activation to define the role of neuroimmune activation in experimental diabetic neuropathy. Cold allodynia and thermal and chemical hyperalgesia were assessed and the markers of inflammation and oxidative and nitrosative stress were estimated in streptozotocin-induced diabetic rats. Chronic administration of minocycline (40 and 80 mg/kg, i.p.) for 2 weeks started 2 weeks after diabetes induction attenuated the development of diabetic neuropathy as compared to diabetic control animals. In addition, minocyline treatment reduced the levels of interleukin-1β and tumor necrosis factor-α, lipid peroxidation, nitrite and also improved antioxidant defense in spinal cords of diabetic rats as compared to diabetic control animals. In contrast, minocycline (80 mg/kg, per se) had no effect on any of these behavioral and biochemical parameters assessed in age-matched control animals. The results of the present study strongly suggest that activated microglia are involved in the development of experimental diabetic neuropathy and minocycline exerted its effect probably by inhibition of neuroimmune activation of microglia. In addition, the beneficial effects of minocycline are partly mediated by its anti-inflammatory effect by reducing the levels of proinflammatory cytokines and in part by modulating oxidative and nitrosative stress in the spinal cord that might be involved in attenuating the development of behavioral hypersensitivity in diabetic rats.

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