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Thymoquinone modifies CD4+:CD8+ ratio without affecting tumor necrosis factor-α and interleukin-1β levels in Wallerian degeneration crush injury rat model

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Abstract
Wallerian degeneration following nerve injury not only suppresses CD4+ T-cell responses but also promotes pro-inflammatory immunological responses through TNF-α and IL-1β. Recent research suggests that thymoquinone might enhance nerve recovery by exerting anti-inflammatory effects on both the innate and adaptive immune systems. This study aims to evaluate the effect of thymoquinone on neuroinflammation in a sciatic nerve crush injury, as represented by TNF-α, IL-1β, and the CD4+:CD8+ ratio. In this study, 126 crush injury Wistar rats were divided into three main groups: placebo, thymoquinone 100 mg/kg, and thymoquinone 250 mg/kg administered daily. Rats were euthanized at six distinct time points: 12, 18, and 24 hours, as well as on day-5, day-6, and day-7. TNF-α and IL-1β levels were assessed using the Enzyme-Linked Immunosorbent Assay (ELISA). The CD4+:CD8+ ratio in peripheral blood was determined via flow cytometry. No significant TNF-α differences was found between treatment and placebo groups. However, on day 6, IL-1β was significantly lower in the TQ 250mg/kg group than in the placebo (p=0.008). A similar but non-significant trend existed on days 6 and 7. On day 5, both TQ groups showed a higher, statistically significant CD4+:CD8+ ratio compared to placebo (p=0.007), a trend that continued to day 7 but not statistically significant. Daily TQ administration did not consistently reduce TNF-α and IL-1ß levels. However, both doses elevated the CD4+:CD8+ ratio during the early stages of Wallerian degeneration, suggesting a potential benefit of TQ on nerve regeneration.

Keywords CD4+:CD8+ ratio · Nerve Injury · Interleukin-1β · Thymoquinone · Tumor Necrosis Factor-α · Wallerian degeneration

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