Traumatic Brain Injury (TBI) and Steroids

Introduction

Traumatic Brain Injury (TBI) is a leading cause of disability and death worldwide. The role of steroids in TBI treatment has been debated, with some studies suggesting potential neuroprotection while others highlight adverse effects. This literature review examines the relationship between TBI and steroids, including their effects on neuroprotection, inflammation, and recovery outcomes.

Neuroprotective Effects of Steroids

Sex Steroids and Neuroprotection: Research suggests that sex steroids, including progesterone and estrogen, may aid in neuroprotection by reducing brain edema and inflammation. Studies show that progesterone treatment post-TBI reduces brain swelling and improves blood-brain barrier integrity (Herson et al., 2009).

Steroid Profiling in TBI: Studies in animals reveal that neurosteroids, such as progesterone and estradiol, increase following TBI, potentially aiding in brain recovery (Gray et al., 2022).

Corticosteroids in TBI Treatment

Ineffectiveness of Corticosteroids: Large-scale clinical trials indicate that corticosteroids, such as dexamethasone, do not provide significant benefits in TBI treatment. The Cochrane review found that corticosteroids increased mortality in TBI patients and should not be used routinely (Alderson & Roberts, 2005).

Delayed Cerebral Edema Treatment: Some evidence suggests that steroids may be effective in treating delayed cerebral edema in mild to moderate TBI cases, with improvements seen in neurological function (Prasad, 2021).

Anabolic Steroids and TBI

No Causative Role in Brain Injury: Research investigating anabolic steroids found no significant effect on axonal injury following TBI, suggesting that anabolic steroid use does not worsen TBI outcomes (Mills et al., 2012).
Neurodevelopmental Risks in Adolescents: Anabolic–androgenic steroids were found to negatively affect neurodevelopment and mental health in adolescent rats subjected to repetitive mild TBI (Tabor et al., 2020).

Mechanisms and Hormonal Influence

Endogenous Steroid Changes: Studies in animal models show that TBI alters endogenous steroid levels, influencing recovery. Increased neurosteroid levels, including pregnenolone and dihydroprogesterone, may contribute to neuroprotection (Meffre et al., 2007).
Estradiol and Adverse Outcomes: Higher systemic estradiol levels post-TBI have been linked to worse recovery outcomes, raising concerns about its role in TBI prognosis (Rakholia et al., 2018).

Conclusion

The role of steroids in TBI treatment is complex. While sex steroids like progesterone and estrogen may offer neuroprotection, corticosteroids have been largely ineffective and may even be harmful in acute TBI treatment. Anabolic steroids do not appear to worsen TBI but may impact neurodevelopment in younger individuals. Further research is needed to optimize steroid-based treatments for TBI recovery.

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Compilation by
Dr Santosh Kumar Bhaskar