**Title:**

Vitamin D promotes neurologic recovery from intracerebral haemorrhage by enhancing hematoma resolution in rodents

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**Abstract:**

***Objective*:**

Intracerebral haemorrhage (ICH) causes significant mortality and morbidities due to hematoma mass effect. Novel therapies aimed at promoting hematoma clearance are essential. Peroxisome proliferator-activated receptors gamma (PPAR γ), a member of the type II nuclear hormone receptor superfamily, can promote microglia polarization and therefore hematoma resorption. Vitamin D (VD) has neuroprotective effects and can activate PPAR γ. We hypothesized that VD treatment could improve functional outcome of ICH through PPAR γ activation.

***Method:***

Male C57/6 mice received an intra-striatum injection of collagenase to induce ICH. VD was administered orally everyday till end points. Experimental outcomes were: (i) neurologic functions on cylinder test and rotarod test; (ii) hematoma volume on MRI and digital quantitative analyses; (iii) mechanistic studies by western blot and immunofluorescence staining of brain specimens.

***Result:***

VD-treated animals had better neurologic recovery in terms of usage of the affected limb and motor coordination on day 7 and 10. VD treatment reduced hematoma volume by 32.2% and 59.6% on day 3 (P<0.05) and day 5 (P<0.01) based on digital analyses, and by 13.2% and 20.1% on day 5 (P<0.01) and day 7 (P<0.001) on MRI, when compared with control. VD upregulated the expression of PPAR γ, and the latter’s downstream targets CD206 and CD36, markers of M2 microglia and enhanced phagocytosis.

***Conclusion:***

VD promotes hematoma clearance and neurologic recovery in ICH possibly by activating PPAR γ and erythrophagocytosis. This study provides novel preclinical evidence to support future clinical studies on the use of VD in the treatment of ICH.