Microembolism infarcts alter affective behaviors in rats

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Small cerebral infarcts (SCIs) are diffuse brain lesions caused by vascular occlusions. SCIs commonly occur in the aged brain and correlate with the presence of depressive disorders. Although underreported due to their asymptomatic nature, SCIs are estimated to affect 30% of the population over age 65, 60% of individuals with pre-senile onset depression and 94% of people with senile onset depression. In addition to being precursors for symptomatic stroke and dementia, SCI-induced “vascular depression” is highly resistant to antidepressant treatments. Links between ischemia and disrupted mood have long been suggested; however, neither a causal relationship nor an underlying mechanism has been established.

The present study uses a unique rodent model to address SCI-induced changes in affective behavior. To do this, adult Wistar rats (3 months) received either ischemia-inducing microspheres or SHAM treatment to the left or right hemisphere. Following a two-week recovery, behavioral tests were used to assess depressive-like and anxiety-like symptoms. The Cavalieri Principle was used as an unbiased stereological approach to quantify SCI damage in the affected hemisphere as compared to both the control side and SHAM animals.

The generation of SCIs result in both depressive and anxiety-like behaviors in treated versus SHAM animals without affecting baseline activity. As compared to SHAM animals, treated animals consume less sucrose over a two day period in the sucrose-preference test, indicating a decreased sensitivity to reward. Similarly, SCI animals spent less time in the center of the open field paradigm, suggesting an increase of anxiety-like behaviors. These findings support the hypothesis that diffuse ischemic damage can alter affective behavior in adult rats. Future work will focus on the mechanisms that underlie SCI-induced behavioral changes.