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Impact of Chronic Kidney Disease on Brain

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Recent research has highlighted the potential impact of CKD on the brain, including cognitive impairment, dementia, and stroke. Recent studies showed that the current understanding of this relationship suggested that inflammation, uremic toxins, metabolic acidosis, oxidative stress, vascular damage, and impaired glymphatic function may be contributing factors.
One of the key mechanisms by which CKD can affect the brain is through uremic toxins, which have been shown to promote neuronal damage and cognitive decline. Oxidative stress is another mechanism by which CKD can affect the brain. CKD can lead to an increase in reactive oxygen species, which can damage neurons and disrupt neurotransmitter signaling. Additionally, vascular damage is thought to play a role in CKD-induced cognitive impairment, with changes in blood flow and blood vessel function impairing brain function and increasing the risk of stroke or micro-bleeding. Metabolic acidosis may play a role in cognitive impairment in CKD patients. SPRINT-MIND study showed that decreases in serum bicarbonate were independently associated with lower performance on tests of executive functions. Recent studies suggest that the glymphatic system, which is responsible for the clearance of waste products from the brain, may also play a role in CKD-induced cognitive impairment. The glymphatic system is thought to be impaired in individuals with CKD, leading to the accumulation of toxic substances in the brain that can impair cognitive function. Beyond these mechanisms, CKD can also impact mental health and quality of life. Depression and anxiety are more common in individuals with CKD, and the disease can also lead to physical limitations that can affect daily activities and social interactions. Regular monitoring of cognitive function and mental health is also important for individuals with CKD. Overall, the complex relationship between CKD and cognitive impairment requires further research to better understand the mechanisms involved and to develop targeted interventions to improve outcomes for individuals with this condition.