Brain remodeling refers to changes that occur in the structure and function of the brain over time. This can occur as a result of normal aging, as well as due to various experiences and events, such as learning, injury, and disease.

There are two main types of brain remodeling: neuroplasticity and neurogenesis.

Brain remodeling can have positive and negative effects on brain function, and it can be influenced by various factors, such as genetics, environmental factors, and lifestyle. Understanding the mechanisms of brain remodeling is an area of active research, and has important implications for the development of treatments for brain disorders and injury.

The brain remodeling patterns induced by alterations in peripheral nerve pathways with different nerve reconstructions are unknown.

Objective: To explore brain remodeling patterns related to alterations in peripheral neural pathways after different nerve reconstruction surgeries.

Methods: Twenty-four female Sprague-Dawley rats underwent complete left brachial plexus nerve transection, together with the following interventions: no nerve repair (n = 8), grafted nerve repair (n = 8), and phrenic nerve transfer (n = 8). Resting-state functional MR images of brain were acquired at the end of seventh month postsurgery. Amplitude of low-frequency fluctuation (ALFF), regional homogeneity (ReHo), and functional connectivity (FC) were compared among 3 groups. Behavioral observation and electromyography assessed nerve regeneration.

Results: Compared with brachial plexus injury group, ALFF and ReHo of left entorhinal cortex decreased in nerve repair and nerve transfer groups. The nerve transfer group showed increased ALFF and ReHo than nerve repair group in left caudate putamen, right accumbens nucleus shell (AcbSh), and right somatosensory cortex. The FC between right somatosensory cortex and bilateral piriform cortices and bilateral somatosensory cortices increased in nerve repair group than brachial plexus injury and nerve transfer groups. The nerve transfer group showed increased FC between right somatosensory cortex and areas including left corpus callosum, left retrosplenial cortex, right parietal association cortex, and right dorsolateral thalamus than nerve repair group.

Conclusion: Entorhinal cortex is a key brain area in recovery of limb function after nerve reconstruction. Nerve transfer related brain remodeling mainly involved contralateral sensorimotor areas, facilitating directional “shifting” of motor representation [1)]

1)
Xiang YT, Xing XX, Hua XY, Zhang YW, Xue X, Wu JJ, Zheng MX, Wang H, Xu JG. Altered Neural Pathways and Related Brain Remodeling: A Rat Study Using Different Nerve Reconstructions. Neurosurgery. 2023 Feb 2. doi: 10.1227/neu.0000000000002370. Epub ahead of print. PMID: 36735283.