SPATIAL MEMORY FUNCTION AND HIPPOCAMPAL CHOLINERGIC ACTIVITY: RESTORATION BY INTRAHIPPOCAMPAL SEPTAL GRAFTS

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ABSTRACT

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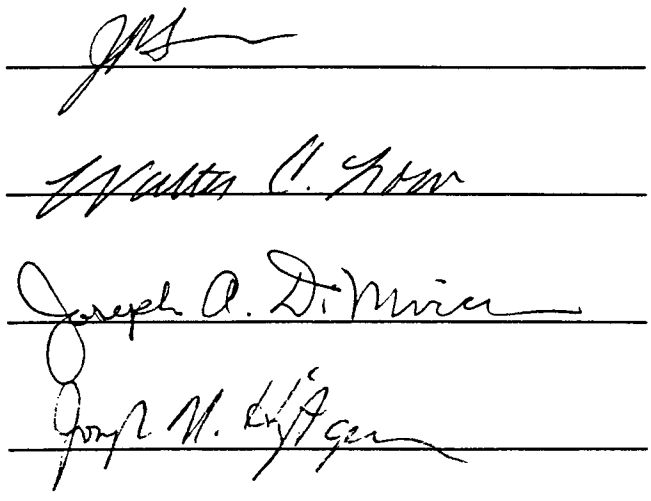
Spatial Memory Function and Hippocampal Cholinergic Activity: Restoration By Intrahippocampal Septal Grafts

The role of the cholinergic septohippocampal system in spatial learning and memory is supported by the results of numerous behavioral, neuroanatomical, electrophysiological, and neurochemical studies. Deficits in spatial learning and memory which result from interruption of the septohippocampal system are ameliorated by intrahippocampal septal grafts. The restoration of both hippocampal cholinergic activity and spatial memory function by intrahippocampal septal grafts was examined using lesion techniques, neurotransplantation, behavioral testing and neurochemical assays.

The present studies demonstrate that a lesion of the fimbria-fornix results in a loss of spatial memory function, and in a loss of hippocampal cholinergic activity and GABA uptake. Intrahippocampal septal grafts restore both spatial memory performance and hippocampal cholinergic activity. Regression analyses indicate that hippocampal cholinergic activity is significantly correlated with spatial memory performance. However, since some animals exhibited high levels of choline uptake, yet poor behavioral performance the restoration of cholinergic activity appears to be necessary but not sufficient for the complete restoration of spatial memory function.

Performance of a spatial memory task increases cholinergic activity in both the hippocampus and the retrosplenial cortex. These increases are abolished by a lesion of the fimbria-fornix. Intrahippocampal septal grafts partially restore the increase in hippocampal cholinergic activity suggesting that functional connections between the host hippocampus and the graft are formed.

Overall, the results of the present study indicate that intrahippocampal septal grafts partially restore both hippocampal cholinergic activity and spatial memory function and that functional host-to-graft connections are formed. The loss of septohippocampal GABAergic fibers and the loss of functional connections between the medial septal nucleus and the retrosplenial cortex may partially account for the observation that the restoration of hippocampal cholinergic activity is necessary but not sufficient for the complete restoration of spatial memory function.



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