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Morpho-functional alterations of colonic neuromuscular compartment in experimental Parkinson's disease

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Parkinson's disease (PD) is a degenerative neurological disorder, which is often associated with gastrointestinal symptoms. Among these disturbances, constipation has received considerable attention owing to its potential value as early marker of disease onset [1, 2]. Our study aims at evaluating motor dysfunctions and neurochemical coding of colonic neuromuscular compartment in a rat model of PD.

Experimental PD was induced in rats by unilateral injection of 6-idroxydopamine (6-OHDA) into two sites of the right medial forebrain bundle. Functional and morphological studies were carried out 28 and 56 days after treatment. Colonic circular muscle contractions were revorded in organ baths after electrical stimulation or in the presence of exogenous substance P (SP). Colonic samples were examined by immunohistochemistry for the following parameters: density of myenteric HuC/D$^+$ neurons and GFAP$^+$ glial cells; distribution pattern and quantitative expression of SP, tyrosine hidroxylase (TH) and choline acethyltransferase (ChAT).

Contractions elicited by electrically evoked tachykinin release as well as by exogenous SP were enhanced at both day 28 and 56, as compared to controls. Myenteric ganglia of PD animals displayed a significant increase in HuC/D$^+$ neuron density, but no alteration in GFAP$^+$ expression. SP$^+$ myenteric neurons progressively increased over time, while the expression of TH and ChAT were significantly reduced at both time points.

Experimental PD, elicited by nigrostriatal dopaminergic degeneration, is associated with functional and histopathological/neurochemical changes of the colonic neuromuscular compartment. The enhanced tachykinenergic motor control, associated with an upregulation of neuronal SP expression, together with reduced expression of TH and ChAT, may account for the colonic motor dysfunctions often associated to PD.

References

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Key words

Parkinson's disease, experimental model, colon motility dysfunction, enteric nervous system, neurochemical coding.