Conclusion

Parkinson’s disease is a chronic progressive neurodegenerative disorder characterized by the selective loss of dopaminergic neurons in the SNpc resulting in severe motor impairments. Serotonergic system plays an important regulatory role in the pathophysiology of PD in rats, the evaluation of which provides valuable insight on the underlying mechanisms of motor, cognitive and memory deficits in PD. We observed a decrease in 5-HT content in the brain regions of 6-OHDA infused rat compared to control. The decreased 5-HT content resulted in a decrease of total 5-HT, 5-HT2A receptors and 5-HTT function and an increase of 5-HT2C receptor function. 5-HT receptor subtypes - 5-HT2A and 5-HT2C receptors have differential regulatory role on the modulation of DA neurotransmission in different brain regions during PD. Our observation of impaired serotonergic neurotransmission in SNpc, corpus striatum, cerebral cortex, hippocampus, cerebellum and brain stem demonstrate that although PD primarily results from neurodegeneration in the SNpc, the associated neurochemical changes in other areas of the brain significantly contributes to the different motor and non motor symptoms of PD. The antioxidant enzymes – SOD, CAT and GPx showed significant down regulation which indicates increased oxidative damage resulting in neurodegeneration. We also observed an increase in the level of lipid peroxidation. Reduced expression of anti-apoptotic Akt and enhanced expression of NF-κB resulting from oxidative stress caused an activation of caspase-8 thus leading the cells to neurodegeneration by apoptosis. BMC administration in combination with 5-HT and GABA to PD rats showed reversal of the impaired serotonergic neurotransmission and oxidative stress mediated apoptosis. The transplanted BMC expressed NeuN confirming that 5-HT and GABA induced the differentiation and proliferation of BMC to neurons in the SNpc along with an increase in DA content and an enhanced expression of TH. Neurotrophic factors – BDNF and GDNF rendered neuroprotective effects accompanied by improvement in behavioural deficits indicating a significant reversal of altered dopaminergic and serotonergic neurotransmission in PD. The restorative and neuroprotective effects of BMC in combination with 5-HT and GABA are of immense therapeutic significance in the clinical management of PD.