INTRODUCTION

The neural differentiation of mesenchymal stem cells (MSCs) is a promising cell-based therapeutic intervention of neurodegenerative diseases, such as Alzheimer’s disease. The cultivation of MSCs isolated from various sources has demonstrated differentiation into cells of neural lineage, under exposure to neural differential media. MSCs can express characteristic neural markers including neuroectodermal stem cell marker (Nestin) and microtubule associated protein 2 (MAP2) when cultured in specific culture condition. Nestin is essential for the survival, self-renewal and proliferation of stem cells, and is also a regulator of cell differentiation and migration. MAP2 is expressed in mature neurons and involved in the formation and growth of microtubules and is required for the formation of neurites in neurons. The purpose of this study is to determine if MSCs can successfully transdifferentiate into neuron-like cells, evidenced by the expression of neural markers and changes in cell morphology towards a neuronal phenotype.

METHODOLOGY

Bone-marrow-derived MSCs were cultured in a 5% CO2 incubator at 37°C in growth media, and the cell morphology of undifferentiated MSCS was observed. In addition, a proliferation assay was performed, and a trypan-blue dye-exclusion assay determined cell viability. MSCs were later induced with neurogenic differentiation media and incubated in a 5% CO2 incubator at 37°C over 24-, 48-, 72- and 96-hours. Quantitative and qualitative immunophenotyping of cells for specific neural markers was achieved using immunofluorescent staining of Nestin and MAP2 sandwich ELISA, respectively.

RESULTS

MSCs demonstrated a high proliferative capacity and high degree of cell viability in culture, with a doubling time of 35.08 hours. MSCs adhered to plastic culture vessels in vitro as a monolayer, and adopted a elongated, fibroblast-like cell morphology predominantly elongated. Under exposure to neurogenic differentiation media, cells demonstrated positive expression for Nestin and MAP2 and cells adopted a neuronal phenotype with significantly higher at 72 hours.

CONCLUSION

BM-MSCs harness neurogenic potential, evidenced by altered cell morphology and expression of neural markers over 72 hours. Previous studies have documented that MSCs are an effective source of neuron-like cells in neurological disease or neuronal injury cases. Further research is required to validate these findings and the potential to treat neurological diseases, and investigate if BM-MSCs transdifferentiate to functional neurons with signaling capacity.

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References