Human mesenchymal stem cells impair the proliferation of monocytes through cell cycle interference

ABSTRACT

Introduction: Monocytes are essential phagocytic cells of the innate immune system as they are required for the maintenance of tissue homeostasis. However, accumulation of monocytes is implicated in various chronic inflammatory diseases like coronary heart disease, atherosclerosis and in autoimmune disorders. Therefore, the number of monocytes must be carefully regulated to avoid monocyte induced inflammatory disorders. Mesenchymal stem cells (MSCs) have shown to be effective against various inflammatory diseases due to their immunosuppressive properties. The present study was designed to evaluate the less understood immunomodulatory effect of MSCs on monocyte proliferation and survival. Method: Primary monocytes were isolated from peripheral human blood using CD14+ monocyte isolation kit. The in house produced umbilical cord MSCs were co-cultured with monocytes at different ratio and time; assessed for the monocyte viability, proliferation and cell cycle. Results: Mesenchymal stem cells suppressed monocyte proliferation in a dose-dependent manner. The antiproliferative effect of MSCs was mediated by cell cycle arrest, whereby monocytes were arrested in the G0/G1 phase of the cell cycle by preventing them from progress into S and G2/M phases. Although cell cycle arrest could potentially lead to apoptosis; however, MSCs significantly enhanced the monocytes survival and inhibited apoptosis. Conclusion: Human MSCs inhibit the stimulated monocyte proliferation without inducing cellular apoptosis at in vitro. These results reveal that MSCs can be utilised to control monocytes' quantity during an unwanted immune response to maintain homeostasis.

Keyword: Monocytes; Mesenchymal stem cells; Proliferation; Cell cycle; Immunomodulation