9. MESENCHYMAL STEM CELL-DERIVED EXOSOMES AND THEIR ANTINEOPLASTIC POTENTIAL

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Introduction. Mesenchymal stem cells (MSC) are pluripotent cell types derived from mesenchyme able to differentiate and proliferate into a variety of tissues. Exosomes derived from MSC exhibit a round morphology (40-160 nm) beneficial in ferrying various materials like metabolites, proteins, lipids, and nucleic acids (DNA, mRNA, miRNA and ncRNA). Their function is believed to be involved in numerous physiological and pathological states. Exosomes can act as both therapeutic targets and biomarkers for certain diseases, however they may also possess positive and negative influences on cancer. Their efficacy and therapeutic potential are still developing and may provide significant benefit once fine-tuned.

Aim of study. Review of the application potential of mesenchymal stem cell-derived exosomes in cancer therapy.

Methods and materials. Methods include literature review of research/clinical trials published in PubMed and NIH. Keywords include “MSC-derived exosomes”, “cancer”, “stem cells”.

Results. Clinical and preclinical studies highlighted both beneficial and detrimental effects of MSC-derived exosomes on different types of neoplastic diseases. In patients with chronic myelogenous leukemia, exosomes loaded with tyrosine kinase inhibitors and proteasome inhibitors showed higher efficacy compared to traditional chemotherapy. Additionally, they employ positive modulatory effects in apoptosis related proteins, by delivering critical proteins and RNAs which decrease the avoidance of apoptosis in cancer cells. Simultaneously they promote entrance of cancer cells in the G0 phase evoking tumor dormancy. Further involvement of MSC-derived exosomes is important in immunoregulatory function on different immune cells, as T-, B-lymphocytes, and NK cells, by stimulating or inhibiting their function in the microenvironment of the cancer cells which is important in tumor destruction or tumor escape. Other effects of MSC-derived exosomes are their potential for tissue regeneration after radiotherapy, involving cellular proliferation, reducing the pathogenesis of fibrosis, suppressing inflammation and oxidative stress. Negative effects of exosome therapy may be attributed to their subsequent stimulatory effects of angiogenesis which may feed tumors and worsen the prognosis.

Conclusion. Preliminary research demonstrated that MSC-derived exosomes used as transporters for chemotherapeutic agents improve the treatment outcomes of some neoplastic diseases. Despite this, there are some specific negative effects of exosomes that limit their broad use and underscore the need for further research in this area.