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Efficacy of Mesenchymal Stem Cell Therapy for Sepsis: A Meta-Analysis of Preclinical Studies

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Free article

Abstract

Background: Multiple studies have reported that mesenchymal stem cell (MSC) therapy has beneficial effects in experimental models of sepsis. However, this finding remains inconclusive. This study was performed to systematically determine the connection between MSC therapy and mortality in sepsis animal models by pooling and analyzing data from newly published studies.

Methods: A detailed search of related studies from 2009 to 2019 was conducted in four databases, including MEDLINE, EMBASE, Cochrane Library, and Web of Science. After browsing and filtering out articles that met the inclusion criteria for statistical analysis, the inverse variance method of the fixed effects model was used to calculate the pooled odds ratios (ORs) and their 95% confidence intervals (CIs).

Results: Twenty-nine animal studies, including 1266 animals, were identified. None of the studies was judged to have a low risk of bias. The meta-analysis demonstrated that MSC therapy was related to a significantly lower mortality rate (OR 0.29, 95% CI 0.22-0.38, P < 0.001). Subgroup analyses performed based on the MSC injection dose (< 1.0×10^6 cells, OR = 0.33, 95% CI 0.20-0.56, P < 0.001; 1.0×10^6 cells, OR = 0.24, 95% CI 0.16-0.35, P < 0.001) and injection time (< 1 h, OR = 0.24, 95% CI 0.13-0.45, P < 0.001; 1 h, OR = 0.28, 95% CI 0.17-0.46, P < 0.001) demonstrated that treatment with MSCs significantly reduced the mortality rate of animals with sepsis.

Conclusion: This up-to-date meta-analysis showed a connection between MSC therapy and lower mortality in sepsis animal models, supporting the potential therapeutic effect of MSC treatment in future clinical trials. The results in this study contradict a previous meta-analysis with regards to the ideal dose of MSC therapy. Thus, further research is required to support these findings.

Aging Dis

. 2020 May 9;11(3):465-469.
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Adipose Stem Cells (ASCs) and Stromal Vascular Fraction (SVF) as a Potential Therapy in Combating (COVID-19)-Disease

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- PMCID: PMC7220297
- DOI: 10.14336/AD.2020.0422

Free PMC article

Abstract

A recent and interesting study reported improved respiratory activity after intravenous administration of mesenchymal stem cells (MSCs) into patients affected by coronavirus disease 2019 (COVID-19). These outcomes displayed that intravenous infiltration of MSCs is a safe and efficacy treatment for COVID-19 pneumonia, a severe acute respiratory illness caused by the coronavirus 2 (SARS-CoV-2). Only 7 patients were treated, but with extraordinary results, opening a new strategy in COVID-19 therapy. Currently, no specific therapies against SARS-CoV-2 are available. The MSCs therapy outcomes reported, are striking, as these cells inhibit the over-activation of the immune system, promoting endogenous repair, by improving the lung microenvironment after the SARS-CoV-2

infection. The MSCs could represent an effective, autologous and safe therapy, and therefore, sharing these published results, here is reported the potential use possibilities in COVID-19 of the most common MSCs represented by Adipose Stem Cells (ASCs).

Bull Exp Biol Med

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Functional State of Mesenchymal Stem Cells Upon Exposure to Bioactive Coatings on Titanium Alloys

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- PMID: 32488788

- DOI: 10.1007/s10517-020-04841-6

Abstract

Bioactive coatings on implants affect osteogenic differentiation of mesenchymal stem cells (MSC). We studied the morphofunctional state of bone marrow MSC cultured on the surface of calcium phosphate coatings on titanium formed by plasma electrolytic oxidation (PEO). The biocompatible properties of the coatings manifested in the absence of the cytotoxic effect on cells. High expression of receptors (CD90, CD29, and CD106), enhanced synthesis of osteocalcin and osteopontin, and changes in surface architectonics of MSC adherent to the samples confirmed osteoinductive properties of the calcium phosphate PEO coating.

Anticancer Res

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The Role of MSCs in the Tumor Microenvironment and Tumor Progression

Sung Yong Ahn[1]
Affiliations expand

- PMID: 32487597

- DOI: 10.21873/anticanres.14284

Abstract

Over the past few decades, longevity without disease has become an important topic worldwide. However, as life expectancy increases, the number of patients with cancer is also increasing. Tumor progression is related to interactions between tumor cells and mesenchymal stem cells (MSCs) in the tumor microenvironment. MSCs are multipotent stromal cells known to be present in a variety of locations in the body, including bones, cartilage, fat, muscles, and dental pulp. MSCs migrate toward inflamed areas during pathological immune responses. MSCs also migrate toward tumor stroma and participate in tumor progression. MSCs can contribute to tumor progression by interacting with tumor cells via paracrine signaling and differentiate into diverse cell types. This also enables MSCs to make direct contact with tumor cells in tumor stroma. Interactions between tumor cells and MSCs enhance tumorigenic and metastatic potential, in addition to stimulating epithelial to mesenchymal transition. Herein, we reviewed the research associated with the tumor-enhancing role of MSCs in tumor progression, from primary tumor growth to distant tumor metastasis.

PLoS One

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A Comparative Study of the Capacity of Mesenchymal Stromal Cell Lines to Form Spheroids

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Free article

Abstract

Mesenchymal stem cells (MSC)-spheroid models favor maintenance of stemness, ex vivo expansion and transplantation efficacy. Spheroids may also be considered as useful surrogate models of the hematopoietic niche. However, accessibility to primary cells, from bone marrow (BM) or adipose tissues, may limit their experimental use and the lack of consistency in methods to form spheroids may affect data interpretation. In this study, we aimed to create a simple model by examining the ability of cell lines, from human (HS-27a and HS-5) and murine (MS-5) BM origins, to form spheroids, compared to primary human MSCs (hMSCs). Our protocol efficiently allowed the spheroid formation from all cell types within 24 hours. Whilst hMSC-spheroids began to shrink after 24 hours, the size of spheroids from cell lines remained constant during three weeks. The difference was partially explained by the balance between proliferation and cell death, which could be triggered by hypoxia and induced oxidative stress. Our results demonstrate that, like hMSCs, MSC cell lines make reproductible spheroids that are easily handled. Thus, this model could help in understanding mechanisms involved in MSC functions and may provide a simple model by which to study cell interactions in the BM niche

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