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Short Communication

An Comprehensive Overview of Cytotherapy as a Treatment Approach for Fibrotic Lung Diseases

Samuel Derozio*

Department of Pulmonary Medicine, University of Pretoria, Pretoria, South Africa

DESCRIPTION

The most frequent pneumoconiosis is fibrotic lung disease, particularly silicosis, which has a higher frequency and incidence in underdeveloped nations. There is currently no viable medication available to slow or reverse the course of silica-induced lung damage. To reduce silicosis-related morbidity and mortality, significant progress must be done.

Despite widespread indignation about silicosis' epidemiological persistence, little progress has been made in terms of therapy development. Silicosis research moves at a significantly slower pace than research for other chronic lung disorders. Only two registered clinical studies on silicosis therapies have been completed in the last ten years, creating a gap that must be filled, particularly by emerging nations such as Brazil, India, and China, where the incidence of silicosis makes subject availability for clinical tests easier. Evans and Kaufman characterized embryonic stem cells as pluripotent cells produced from the interior bulk of a mouse embryo in 1981, shifting the paradigm for stem cell potential [1]. Stem cells and stem-like cells have lately been discovered in practically all adult organs. Due to the ability of stem cells to develop and replace damaged cells in target tissues, cell transplantation began to be considered as a possible treatment for a variety of disorders. Furthermore, cell transplantation had positive effects in many illness models regardless of cell homing or differentiation, indicating that the cells had a paracrine/endocrine function.

Cell based therapies offer the benefit of simultaneously controlling inflammation and the remodeling process without causing toxicity or immunosuppression. These characteristics make cell therapy a particularly promising treatment option for fibrotic lung illnesses, such as silicosis. The bone marrow is the most well-studied adult cell source for cell therapy. A variety of cells in various stages of development can be found in the bone marrow. Hematopoietic stem cells are particularly important among these cells because of their ability to develop into immune cells and control immune cell proliferation and activity [2]. Nonetheless, increasing the growth and survival of other cells in the pool of cells present in bone marrow cells that play a fundamental role in the maintenance may have even greater therapeutic potential. These cells are known as the mesenchymal stromal cells, and they are multipotent in addition to having stromal features [3]. Both the pool of mononuclear cells in the bone marrow and the stromal cells alone have been found to help with a variety of inflammatory diseases. Furthermore, cell treatment has shown promise in models of lung fibrosis, including asthma, COPD, and bleomycin-induced lung fibrosis. Scientist studied the effects of a local infusion of adherent mononuclear cells over two time intervals. Thirty days after therapy, the inflammatory process was reduced, increasing lung function; however, these favourable benefits seemed to diminish after sixty days [4].

Inflammation (fractional area of granuloma and number of total and M1 macrophages), lung remodelling (TGF-level, collagen deposition, and elastic fibres), and apoptosis were all reduced after two infusions of bone marrow cells (caspase-3 level and number of apoptotic cells). Lung mechanics parameters improve as a result of all of these impacts. In the same silicosis model, a higher level of IL-1Ra appears to play a role in the cell treatment benefits lasting longer. A study in mice that used the entire pool of Bone Marrow Derived Mononuclear Cells (BMMC) found that they could prevent silica-induced lung injury. The mRNA expression of caspase-3, IL-1, and TGF-was decreased by systemic infusion of BMMC. Furthermore, in late stages of silicosis, therapeutic treatment with BMMC was effective to minimize lung fibrosis and enhance lung function, but not to reverse the inflammation. The decrease in macrophage numbers was followed by an increase in T regulatory cells, which kept the cellular infiltration going while transitioning to a new inflammatory profile. BMMC have the advantages of autologous transplantation, which reduces the risk of rejection and allows for harvesting and infusion on the same day without the need for *in vitro* culture growth. The invasiveness of the procedure-especially considering that many dosages may be required for sustained effects-as well as the diversity of the bone marrow's constitution-are both downsides of using bone marrow mononuclear cells.

The proportions of bone marrow cell populations can be altered by chronic inflammatory illnesses, making autologous transplantation potentially heterogenic across patients and stages of disease. The administration of Mesenchymal Cells (MSC) had no negative side effects, and oxyhemoglobin saturation in the

Correspondence to: Samuel Derozio, Department of Pulmonary Medicine, University of Pretoria, Pretoria, South Africa, E-mail: xxdero45369.edu.za

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blood of the patients after six months indicated that gas exchange in the lungs had improved. A decrease in the number of silica nodules was also seen in several of the patients.

CONCLUSION

This paper concludes that due to lack of viable therapeutic approaches for silicosis, cell-based therapy is a promising treatment option. The reduction of detrimental proinflammatory and profibrotic processes, the lowering of apoptosis, and the improvement of healing following lung damage are all essential outcomes of this therapy. In a model of silica-induced injury, cell treatment with embryonic cells was studied as a bioengineering strategy for the restoration of injured epithelium and was found to prevent fibrosis and reduce mortality.

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