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Therapeutic potential of mesenchymal stem cells co-transplanted with pancreatic islets for the treatment of type-1 diabetes

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Treatment of type-1 diabetes with pancreatic islet transplantation is an innovative therapeutic approach, but its clinical application is still very limited, mainly for the great number of islets necessary and for their short survival. An intriguing means to improve the performance of pancreatic islets transplantation may be represented by Mesenchymal Stem Cells (MSCs), adult stem cells already known to support the survival of different cellular populations. In this work, the ability of Mesenchymal Stem Cells (MSCs) to reduce the number of pancreatic islets necessary to achieve glycaemic control in Streptozotocin-induced diabetic rats, and their effect on a long term disease complication, the diabetic neuropathy was investigated. Diabetic rats showed high blood glucose level and important neuropathic signs, such as the decrease of Nerve Conduction Velocity (NCV) and the impairment of nociceptive (thermal and mechanical) thresholds. Two months after transplantation, diabetic rats co-transplanted with MSCs and a suboptimal number of pancreatic islets showed a marked and significant glycaemia value reduction, an improvement of thermal and mechanical sensitivity, and a nearly complete restoration of NCV with respect to diabetic-untreated rats. The in vitro analysis of the putative mechanisms of MSC positive action on pancreatic islets suggested the involvement of both trophic soluble factors released by MSCs, and their differentiation into insulin-releasing cells after the direct contact with pancreatic islets. In conclusion, it was demonstrated that co-transplantation with MSCs reduces the number of pancreatic islets needed to reach glycaemic control, and induces the regression of painful neuropathy signs, thus ameliorating diabetes complications management.

Biography

Arianna Scuteri has completed her PhD in Neuroscience from Milano-Bicocca University. She is the Principal Investigator and Scientific Coordinator of the project "Mechanisms of Mesenchymal Stem Cells positive action on the diseases of both central and peripheral nervous system". She is a Researcher at the Department of Surgery and Translational Medicine, Milano-Bicocca University. She has published more than 15 peer-reviewed papers and serving as an Editorial Board Member of several reputed journals.

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