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Therapeutic potential of Mesenchymal Stem Cells for the treatment of type-1 Diabetes

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The transplantation of pancreatic islets is an innovative and intriguing therapeutic option for the long term treatment of type-1 diabetes (Remuzzi et al., 2009). Unfortunately, their clinical feasibility is limited by the great number of islets necessary to achieve glycaemic control and their short survival. A possible means to improve the performance of this technique can be represented by Mesenchymal Stem Cells (MSCs), adult stem cells alrady known to support the survival of different cellular populations (Scuteri et al., 2014). In this work the ability of Mesenchymal Stem Cells (MSCs) to improve the feasibility of this approach was verified into an in vivo model represented by Streptozotocin-induced diabetic rats.

We compared 5 different groups (8 rats/group): a) healthy controls; b) Diabetic rats; c) Diabetic rats transplanted with pancreatic islets (3000); d) Diabetic rats co-transplanted with pancreatic islets (2000) and MSCs (10^6); Diabetic rats treated with MSCs (10^6). Transplantations were performed after the assessment of neuropathic signs, represented by a decreased Nerve Conduction Velocity (NCV) and an impairment of nociceptive thermal and mechanical thresholds. The same parameters were evaluated two months after the transplantation.

Diabetic rats transplanted only with pancreatic islets, or co-transplanted with MSCs and a suboptimal number of pancreatic islets, showed a significant glycaemia value reduction, an improvement of thermal and mechanical sensitivity, and an improvement of NCV with respect to diabetic-untreated rats. No differences were observed between diabetic rats and diabetic rats treated with only MSCs.

In conclusion, we 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.

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References

[1] Remuzzi et al. 2009 Regression of diabetic complications by islet transplantation in the rat. Diabetologia 52: 2653-2661.
[2] Scuteri et al. 2014 A double mechanism for the Mesenchymal Stem Cells' positive effect on pancreatic islets. Plos One 9: e84309.

Keywords
Pancreatic Islet Transplantation, Mesenchymal Stem Cells, Type-1 Diabetes.