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A comparison between islet and stem cell transplantation for treatment of type 1 diabetes mellitus: A systematic review

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Introduction: The incidence of Type 1 Diabetes Mellitus (T1DM) has been increasing rapidly worldwide, while the current standard therapy-exogenous insulin supply is considered unsustainable and highly associated with poor glycemic control that may lead to a life-threatening condition. On the other hand, cellular-based therapy including either islet cell or stem cell transplantation has been recently developed, making it pertinent to compare the effectiveness between the two alternative treatments.

Aim: The aim of this systematic review is to compare the safety and effectiveness between islet cell transplantation and stem cell transplantation for future practice change.

Methods: Literature search using two databases, PubMed and Ovid Medline, was conducted for primary studies published from January 2000 to November 2015. A quality assessment of identified studies were conducted using ARRIVE, NOS, and MINORS assessment tools. The comparison between treatments was done based on the mean values of insulin independence period and blood glycemic level of the subjects in the studies.

Results: In 15 out of 17 included studies, the average insulin-independent period in T1DM patient post-islet cell transplantation was proven to be four years longer compared to post-stem cell transplantation that could only achieve one year at most. The studies found and supported that islet cell transplantation has better blood glycemic control, observed through random blood glucose level ranges from 140 mg/dL to 200 mg/dL and c-peptide levels ranges from 0.3 ng/ml to 4.5 ng/ml which marks the presence of insulin production. However, certain challenges such as donor shortage and poor engraftment hinder the widespread application. The studies also revealed that stem cell transplantation differentiated into β -cell-like cells that produce insulin, glucagon, and somatostatin, as well as acting in glucose-stimulated manner, imitating the physiologic mechanism of β -cells, this is in fact considered as a major potential for future development.

Conclusion: The current studies had proven a conclusive result in which islet transplantation has relatively higher effectiveness and better outcome compared to stem cell transplantation for treating T1DM patients.

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