Developing neural transplant cell sprays for traumatic neurological injuries

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Background

Clinical need: Traumatic neurological injuries drastically impact patients and their support networks, with high healthcare costs. Enhancing neuro-regeneration is a major clinical challenge. Neural cell transplantation therapies have significant translational potential to promote regeneration.

However, there are major drawbacks with current cell delivery methods (surgical microinjection & vascular delivery): (1) haemorrhage, needle induced tissue destruction or embolism, (2) high cell loss on injection through fine needles into dense neural tissue, (3) systemic clearance and loss of cells delivered intravascularly, (4) inhomogeneous cell distribution.

Hypothesis: Stem cell spray delivery can offer significant translational benefits for cell therapy over current delivery methods (summarised below).

Results

OPCs survive spray delivery:

Options to assess viability:

- OPCs viability at 48 hours
- OPCs viability at 7-10 days

Control

Spray

% Cell Viability

A. Control OPC viability at 48 hours
B. OPC viability 48 hour post spray
C. Control OPC viability at 10 days post spray
D. OPC viability 10 days post spray

OPCs retain proliferative capabilities and cellular marker expression:

A. Control OPCs after 48 hours
B. Sprayed OPCs after 48 hours
C. OPC proliferation at 48 hours
D. OPC NG2 expression at 48 hours

Sprayed OPCs can differentiate into oligodendrocyte lineage cells (OLCs):

A B C D

E. OPC viability at 48 hours
F. OPC viability at 7-10 days

OE. OPC viability at 10 days post spray

G. OPC proliferation at 48 hours
H. OPC NG2 expression at 48 hours

Conclusions

Spray technology could offer a novel clinical solution for neural cell delivery in transplantation therapies for traumatic neurological injuries.

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