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Poster Presentation

Different Routes for Cellular Transplantation in Spinal Cord Injury

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Abstract

Cell therapy is known as one of the most promising curative interventions in the spinal cord injury (SCI). Selection of an appropriate route to transplant the stem cells is very important. Principally, four different injection routes have been used in animal experiments. 1. Intramedullary route: This route is known as a classic method for transplantation of stem cells. In this method, the stem cells are injected directly into the damaged tissue following the laminectomy. It is the most effective method for cell administration. The main disadvantage of this method is its invasiveness that leads to further damage to the tissue and post-operative complications. Moreover, the viability of injected cells is decreased because of immunologic condition of area. 2. Intrathecal route: In this minimally invasive method the cells are transplanted into the lumbar cistern by a needle after only a small incision on the skin. The expression of different chemotactic factors such as stromal cell-derived factor-1 (SDF-1α) and its CXCR4 receptor in damaged tissue mediates the large homing of injected cells in the site of injury. Since the amount of these signals is reduced as time passes, the efficiency of this method is mainly in the acute phase of SCI. However, this method, generally, is less effective than intramedullary injection route. Less invasiveness is the advantage of this method. 3. Intraventricular route: This method is not used anymore after developing safer and more efficient procedures. Here, the stem cells are injected into the lateral ventricles which migrate toward the injury site via a similar mechanism that mentioned in intrathecal injection. This method is as effective as intrathecal route but more invasive. 4. Intravascular route: This route has the least effectiveness among different methods of cell injection in the spinal cord injury, although it is the safest way. While cell administration through the artery is not that possible because the spinal cord has a multiple arterial supply, the intravenous injection is safe and easy. Like two previous methods, the homing of transplanted cells into damaged tissue is mediated by chemotactic substances such as SDF-1 and hepatocyte growth factor (HGF). The disadvantages of this method consist of trapping of the injected cells in other tissues than spinal cord such as lung and liver, not passing of the cells through an intact blood brain barrier, and their exposure in blood to immune cells for a long time. Efficiency and safety of routes for cellular transplantation and also the pathologic phase of SCI should be considered to choose an appropriate route for cell therapy.

Keywords: Spinal cord injury, Cell transplantation, Cell injection route.

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