DOI: 10.5137/1019-5149.JTN.22639-18.1
Received: 19.01.2018 / Accepted: 12.03.2018
Published Online: 22.03.2018

Turk Neurosurg 28(6):1013-1014, 2018

Letter to Editor

How Can Mesenchymal Stem Cells Penetrate the Blood Brain Barrier?

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To the Editor;

We read with keen interest the article "Effects of two types of human cells on outgrowth of human glioma in rats" (1). In this paper, Abdi et al. reported that: Olfactory ensheathing cells (OECs) and bone marrow stem cells (BMSCs) can pass the blood brain barrier (BBB) and reach the glioma mass. Therefore, this approach can be a potentially powerful method for the delivery of therapeutic agents to malignant brain tumors. In addition, these cells can be genetically modified in order to specifically express tumor-inhibiting factors. In terms of how the transplanted cells penetrated the BBB, different groups have taken different views (2,3,5,6,8), but this strategy really provides a new insight into intracranial lesions and tumors in the future, especially intracranial tumors.

We would like to share our ideas on this topic. Methods to more effectively target agents or transplant cells to target tissues and organs are being developed and include the coating of cells with antibodies or peptides, modifying native cell surface molecules, genetic modification, etc. Because of the existence of the BBB, it is difficult to achieve therapeutic effects for intracranial lesions and/or intracranial tumors with conventional treatment (4,7,9). Menge et al. reported that mesenchymal stem cells (MSCs) may be useful for treating a variety of diseases associated with vascular instability and MSCs regulate BBB integrity through tissue inhibitor of matrix metalloproteinase-3 release after traumatic brain injury (7). Park et al. reported that MSCs could stabilize the BBB through regulation of astrocytes (8), and Tang et al. showed that MSCs maintain and regulate the BBB by inhibiting aquaporin-4 upregulation after cerebral ischemia (9).

We agree with the conclusion of Abdi et al., but we do not know how MSCs or OECs control migration and (or) homing the "Targeted location" and what the mechanisms of MSCs or OECs regarding glioma are. Careful attention to detail in "Trojan horses" would promote the promising therapeutic paradigm for MSC-based or OECs-based therapies for the treatment of intracranial lesions or tumors.

■ ACKNOWLEDGMENT

This work was supported by the National Natural Science Foundation of China (81401295), the Tianjin Research Program of Application Foundation and Advanced Technology (15JC-QNJC45200), the PUMC Youth Fund and the Fundamental Research Funds for the Central Universities (3332015126).

■ REFERENCES

1. Abdi Z, Eskandary H, Nematollahi-Mahani SN: Effects of two types of human cells on outgrowth of human glioma in rats. Turk Neurosurg 28:19-28, 2018
2. Bian P, Ye C, Zheng X, Yang J, Ye W, Wang Y, Zhou Y, Ma H, Han P, Zhang H, Zhang Y, Zhang F, Lei Y, Jia Z: Mesenchymal stem cells alleviate Japanese encephalitis virus-induced neuroinflammation and mortality. Stem Cell Res Ther 8(1):38, 2017

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3. Cerri S, Greco R, Levandis G, Ghezzi C, Mangione AS, Fuzzati-Armentero MT, Bonizzi A, Avanzini MA, Maccario R, Blandini F: Intracarotid infusion of mesenchymal stem cells in an animal model of Parkinson's Disease, focusing on cell distribution and neuroprotective and behavioral effects. Stem Cells Transl Med 4:1073-1085, 2015
4. Chen M, Li X, Zhang X, He X, Lai L, Liu Y, Zhu G, Li W, Li H, Fang Q, Wang Z, Duan C: The inhibitory effect of mesenchymal stem cell on blood-brain barrier disruption following intracerebral hemorrhage in rats: Contribution of TSG-6. J Neuroinflammation 12:61, 2015
5. Chung TN, Kim JH, Choi BY, Chung SP, Kwon SW, Suh SW: Adipose-derived mesenchymal stem cells reduce neuronal death after transient global cerebral ischemia through prevention of blood-brain barrier disruption and endothelial damage. Stem Cells Transl Med 4:178-185, 2015
6. Liu L, Eckert MA, Riazifar H, Kang DK, Agalliu D, Zhao W: From blood to the brain: Can systemically transplanted mesenchymal stem cells cross the blood-brain barrier? Stem Cells Int 2013:435093, 2013
7. Menge T, Zhao Y, Zhao J, Wataha K, Gerber M, Zhang J, Letourneau P, Redell J, Shen L, Wang J, Peng Z, Xue H, Kozar R, Cox CS Jr, Khakoo AY, Holcomb JB, Dash PK, Pati S: Mesenchymal stem cells regulate blood-brain barrier integrity through TIMP3 release after traumatic brain injury. Sci Transl Med 4:161ra150, 2012
8. Park HJ, Shin JY, Kim HN, Oh SH, Song SK, Lee PH: Mesenchymal stem cells stabilize the blood-brain barrier through regulation of astrocytes. Stem Cell Res Ther 6:187, 2015
9. Tang G, Liu Y, Zhang Z, Lu Y, Wang Y, Huang J, Li Y, Chen X, Gu X, Wang Y, Yang GY: Mesenchymal stem cells maintain blood-brain barrier integrity by inhibiting aquaporin-4 upregulation after cerebral ischemia. Stem Cells 32:3150-3162, 2014