Stem Cell Injection Induced Glioneuronal Lesion of the Cauda Equina (Poster ID: 42205)

Bryan S. Lee MD¹, Rebecca L. Achey BS², Gabrielle A. Yeaney MD³, David S. Bosler MD³, Zarmeneh Aly MD⁴, Daniel Ontaneda MD⁵, John Morren MD⁴, Edward C. Benzel MD¹

¹Department of Neurosurgery, Center for Spine Health, Cleveland Clinic
²Cleveland Clinic Lerner College of Medicine, Case Western Reserve University
³Department of Anatomic Pathology, Robert Tomsich Pathology & Laboratory Medicine Institute, Cleveland Clinic
⁴Neuromuscular Center, Neurological Institute, Cleveland Clinic
⁵Mellen Center for Multiple Sclerosis, Neurological Institute, Cleveland Clinic
Disclosures

• None
Introduction

• Commercial stem cell therapy and “stem cell tourism” refer to the for-profit industry that has recently experienced a rise in popularity due to the regenerative potential of pluripotent stem cells.

• Associated morbidities such as stem-cell induced lesions are often not given adequate consideration.

• We present a case illustrating the development of a tumor-like lesion after stem cell therapy with a unique morphologic pathology, illustrating this medical conundrum.
Methods

- A 58-year-old male with a history of left posterior cerebral and bilateral superior cerebellar artery territory infarcts secondary to complications from atrial fibrillation, initially presented with residual deficits of right-sided hemiparesis and thalamic pain syndrome.
- After the failure of conventional treatments, the patient underwent intravenous administration of autologous mesenchymal stem cells at a medical center in Phoenix, AZ, in, and intrathecal administration of fetal neuronal cells twice in Moscow, Russia.
Results

- During the subsequent two years, the patient’s right lower extremity weakness worsened, progressing to wheelchair-dependence.
- Magnetic resonance imaging (MRI) demonstrated diffuse enhancement and enlargement of nerve roots in the mid-thoracic to lumbar spine (Figures A-C).
- Lumbar decompression at L2-3 was performed with intradural biopsy of a dorsal nerve root.
Results

- The intradural biopsy revealed a low-grade fibrillary astrocytic mass encasing nerve roots (Figures D, E).
- Occasional clusters of mature neurons were noted (Figures F, G). Mitotic activity, necrosis, and microvascular proliferation were absent.
- Focally, the tumor showed pseudopapillary pattern (Figure H). Ki-67 proliferation index was 1% (Figure I).
Results

- DNA fingerprinting was performed using polymerase chain reaction (PCR) amplification of 16 highly polymorphic short tandem repeat (STR) loci, comparing the formalin fixed paraffin embedded nerve root biopsy tissue to a sample of the patient’s blood.
- At each of 12 informative loci, the biopsy tissue showed both peaks that matched the patient’s blood and additional peaks that did not match the blood, demonstrating that the tissue was of potentially of mixed origin including the patient and another unknown, exogenous source.
Discussion

• While the potential for therapeutic benefit using pluripotent embryonic stem cells in neurological disease has been demonstrated in preclinical trials using a murine model, the tumorigenic potential of injected stem cells are incompletely understood and warrant further investigation.

• There is a need for enhanced patient-physician communication, improved regulatory measures for stem cell clinics, and ethically designed clinical trials with longer follow-up periods.
Summary Points

• In our case, the prior use of mesenchymal stem cells in addition to fetal neuronal transplantation could have potentially attenuated the immune system of the patient due to known immunoregulator effects, having placed our patient at a higher risk for the development of the tumor-like lesion consisting of progenitor cells and cells differentiating along astrocytic and neuronal lineage.

• Use of experimental stem cell therapy outside clinical research, not sanctioned by the FDA, should be discouraged given possible risks including mass formation.