CNS 2018 ANNUAL MEETING
HOUSTON, TEXAS
OCTOBER 6-10, 2018

Primary Human Adipose-derived Mesenchymal Stem Cells Encapsulated in Fibrin Glue Suppressed Glioblastoma Recurrence and Improved Survival in Mouse Resection Model

Sara Ganaha MD; Paula Schiapparelli; Rawan Alkharboosh M.S; Sujan Mondal; Maarten Rotman MS, PhD; Alfredo Quinones-Hinojosa MD; Rachel Sarabia-Estrada DVM, PhD

Introduction

Despite aggressive regimens, glioblastoma (GBM) has a high recurrence after surgical removal due to the inability to eradicate residual cancer cells. Novel therapies are needed to overcome this problem. Previous work by our group has shown that human adipose-derived mesenchymal stem cells (hAMSCs) prolonged survival in mice with GBM. In this work, we used commercial fibrin glue (Tisseel) to encapsulate hAMSCs to locally treat mice after GBM resection.

Methods

Time-lapse microscopy was performed to evaluate migration in vitro of gel-encapsulated hAMSCs. We used primary infrared fluorescent protein (iRFP)-expressing hAMSCs for in vivo studies using immunocompromised mice. At 20 days after intracranial GBM implantation, tumor was confirmed with bioluminescence and surgically resected. Mice were randomly divided and received treatment as follows: 1. Tumor (no resection); 2. Tumor resection + Tisseel; 3. Tumor resection + hAMSCs_iRFP; 4. Tumor resection + hAMSCs_iRFP + Tisseel. Mice were evaluated for tumor recurrence and overall survival.

Learning Objectives

By the conclusion of this session, participants should be able to: 1) understand the therapeutic potential for using adipose-derived mesenchymal stem cells for the local therapy of brain tumors, and 2) understand that fibrin glue can potentially act as a matrix for the delivery of therapeutic stem cells.

[Default Poster]

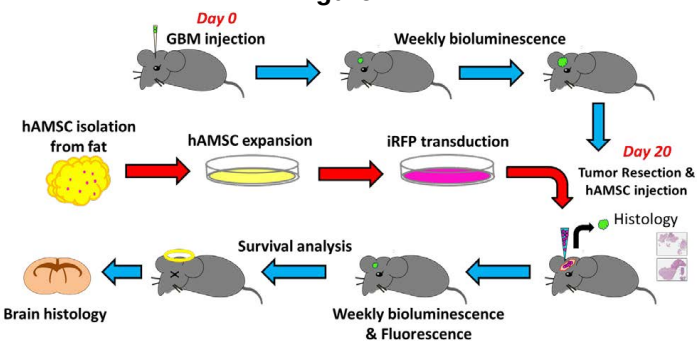
Results

Tisseel-encapsulated hAMSCs_iRFP were able to migrate and survive in vitro. At 72 days post-tumor implantation, mice treated with hAMSCs_iRFP with or without encapsulation in TISSEEL had significantly decreased tumor burden compared to the tumor group. There was a favorable trend for gel-encapsulated hAMSCs to suppress tumor recurrence compared to non-encapsulated hAMSCs. Also, mice treated with hAMSCs_iRFP with or without Tisseel had better survival compared to tumor group, with a tendency for better survival in gel-encapsulated hAMSCs.

Conclusions

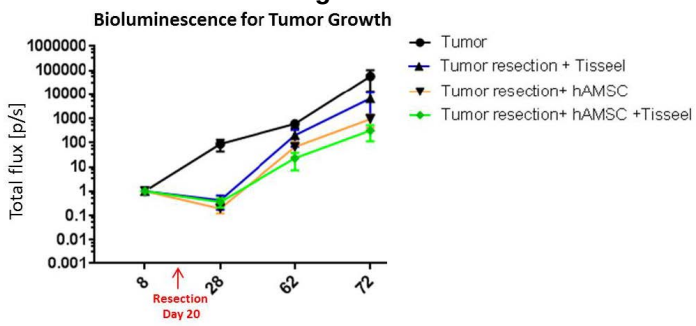
Our promising findings using an animal model suggest that hAMSCs encapsulated in fibrin glue have potentially significant clinical implications by decreasing tumor burden and improving survival. This approach represents a viable treatment to decrease tumor recurrence after GBM

Figure 1.



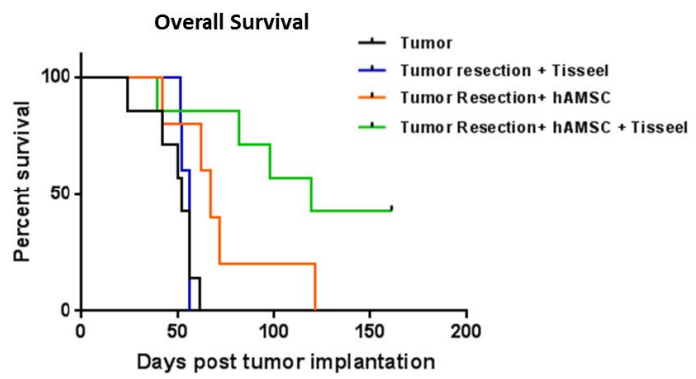
Schematic for mouse intracranial GBM implantation and resection.

Figure 2.



Bioluminescence for monitoring tumor growth and recurrence in immunocompromised mice.

Figure 3.



Overall mouse survival among different treatment groups.