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Mesenchymal Stem Cells Localize to Developing Saccular Aneurysms

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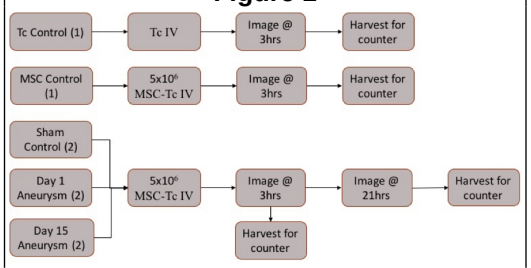
Introduction

- Mesenchymal stem cells (MSCs) are multipotent immunomodulatory cells
- MSCs promote healing of formed aneurysms (1-3)
- Our lab has previously shown that IV MSC adminstration during saccular aneurysm formation inhibits tunica intima hyperplasia
- MSCs also altered serum cytokines
- **Objective:** to determine whether or not MSCs localize to the developing aneurysm

Methods

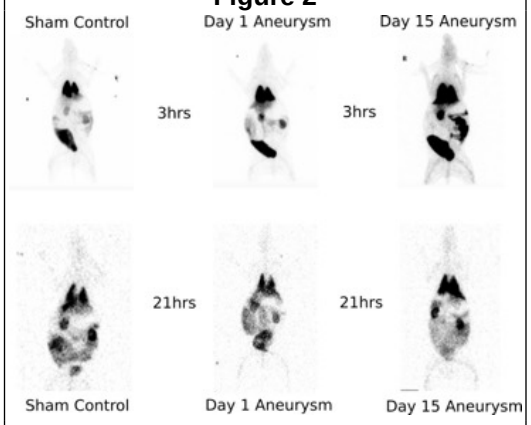
- 8 rabbits randomly assigned to 2 control groups (1 rabbit each), a sham surgery group (2), an early aneurysm group (2) and a late aneurysm group (2)
- Aneurysm groups underwent elastase-induced surgical creation of right common carotid artery (CCA) saccular aneurysm; sham surgery rabbits had right CCA dissected but not manipulated
- Technetium-99m (Tc) used to tag MSCs; observed systemic distribution with planar gamma camera
- 1 control group received IV Tc only, compared to control group with Tc-MSCs
- All surgical groups received IV Tc-MSCs
- After imaging, tissue harvested for radiation quantification in gamma counter

Figure 1



Experimental plan for in vivo MSC localization study. Eight rabbits were randomly assigned to 5 groups. Planar gamma camera imaging with Techentium-99m (Tc). Radiation in harvest tissues was quantified with gamma counter.

Figure 2

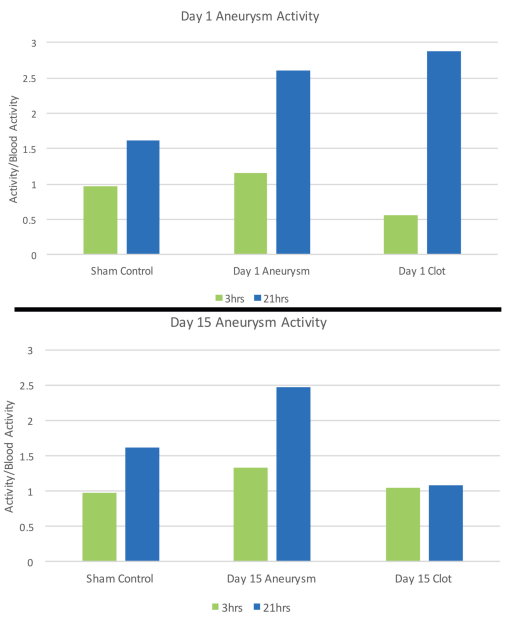


Planar scintigraphy of sham control, early aneurysm and late aneurysm rabbits at 3hrs and 21hrs after Tc-MSC injections showing similar MSC distributions. Harvested tissues showed localization of MSCs to developing aneurysms.

Results

- Systemic distribution of Tc-MSCs differed from Tc, indicating stable Tc tag
- Tc-MSCs localize largely to lungs
- Tc-MSC distribution similar in all surgical groups (Figure 2)
- Gamma counter showed small degree of MSC localization to early and late developing aneurysms and acute intra-aneurysmal thrombus (Figure 3)

Figure 3



Gamma counter radioactivity quantification of harvested tissues relative to arterial blood radioactivity. (Top) Day 1 Aneurysm and (Bottom) Day 15 Aneurysm rabbits.

Conclusions

- MSCs injected IV become entrapped in the lung
- Portion of MSCs traverse and localize to developing aneurysm and acute intra-aneurysmal thrombus
- MSC effects on developing aneurysm likely occur through combination of local release of factors and secretion of factors from within pulmonary capillary bed

References

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