**The Elizabeth and Nicholas Slezak Super Center**

**for Cardiac Research and Medical Engineering**

**Healing of ischemic tissue using combined cell therapy and ultrasound**

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**Research achievements**

We hypothesize that dual treatment of Stem cells (SC's) and ultrasound (US) irradiation will have a synergistic effect on angiogenesis for patients with PVD. In this study, an innovative course of treatment we evaluate the effect of the combined treatment of culture-expanded stem cells derived from human adipose tissue (hADSc) transplantation and low-intensity US irradiation and regeneration on blood perfusion in a mice model of limb ischemia.

**Results**

We evaluated the effect of the treatment of culture-expanded hADSc transplantation (n=8 mice), low-intensity US irradiation (n=10 mice) and ishemic limb without treatment (n=10 mice) on blood perfusion in a mice model of limb ischemia. Hindlimb ischemia was created by ligating the femoral artery of female Balb\c mice. hADSC were extracted from human adipose tissue and cultured. hADSC cultured cells exhibit various kinds of morphologies such as elongated-fibroblastic cells, spread cells with enlarged cytoplasm. All mice were undergo basal evaluation of **hind-limb function**: Ischemic limb without treatment- cyanosis is present in the fingers while the fingers in the Ischemic limb with hADSC transplantation or US were vital and healthy. **Limb perfusion** by laser Doppler were examined: immediately after post ischemia - no perfusion, 14 days after post-ischemia; Untreated limb ischemia - show low perfusion of blood flow. Significant improvement was shown in blood flow of limb ischemia treated with hADSC or with US alone. Histological sections, assess morphological wound healing process were taken 12 days from the ischemic muscle tissue and stained with H&E. Ischemia without treatment revealed necrotic tissue while treated group with US or with cells transplantation showed proliferation of fibroblasts / myoblasts which indicates advanced stage of regenerative muscle.

We have an algorithm for processing and quantified histological images

Future steps:

* Evaluate the effect of the **combined** treatment of culture-expanded hADSc transplantation and low-intensity US irradiation on blood perfusion in a mice model of limb ischemia.
* To assess new collateral blood vessel formation by angiography obtained two weeks post-ischemia.
* Examine the expression of angiogenic factors in the ischemic tissue compare to treated tissue for VEGF 14 days post-surgery**.**