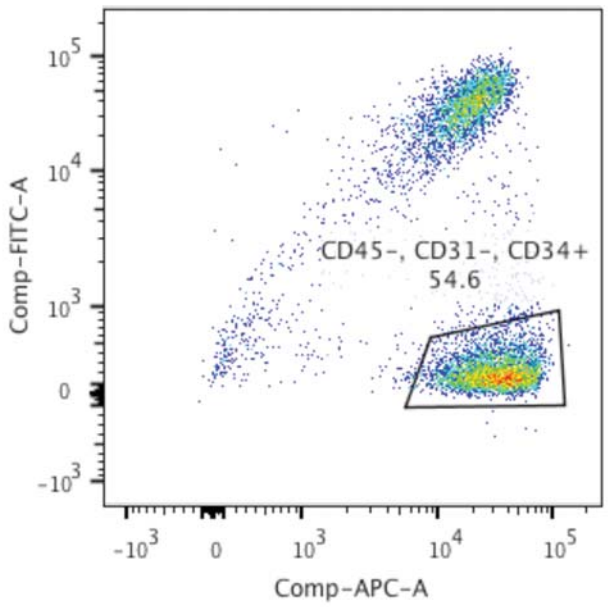

Figure 1. Representative FACS data of ADSC subpopulation.

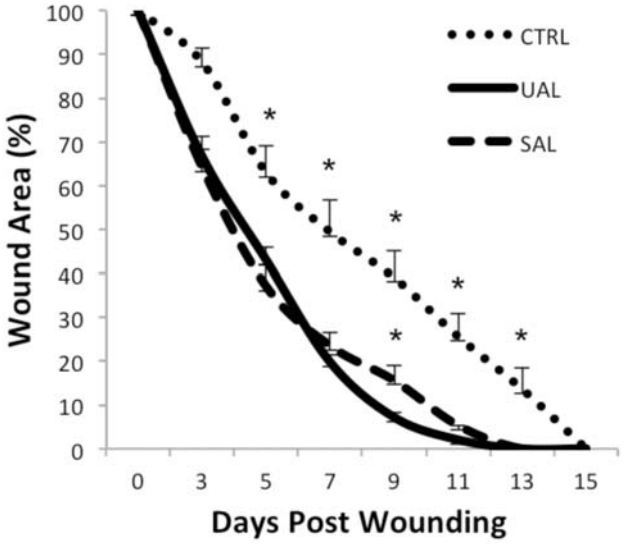

Figure 2. *In Vivo* wound healing data.

CONCLUSIONS: UAL represents an equivalently viable way to obtain functional ADSCs for cell-based therapies as compared to traditional SAL.

REFERENCE:

1. Heymans O, Castus P, Grandjean FX, Van Zele D. Liposuction: review of the techniques, innovations and applications. *Acta chirurgica Belgica.* 2006;106:647-653.

Entirely Implanted Wireless Doppler Sensor for Monitoring Venous Flow

Jignesh Unadkat, MD, MRCS; Michael Rothfuss, MSEE; Marlin H. Mickle, PhD; Ervin Sejdic, MSEE; Michael Gimbel, MD

BACKGROUND: Microvascular anastomotic failure remains an uncommon but potentially devastating problem in free tissue transfer. Implantable vascular Doppler monitoring results in increased flap salvage rates. However, these devices are cumbersome, have easily dislodged wire, possible pedicle compromise upon probe removal, and false positives due to gapping between probe head and vessel. In an effort to circumvent these shortcomings, we have developed an entirely implantable wireless Doppler sensor and tested this prototype in a pig femoral vein model.

METHODS: Phase 1 involved development and in-vitro testing of an implantable continuous wave Doppler device using discrete (commercially available) components for wirelessly transmitting received Doppler-shifted signals. Two opposing 5 MHz transducers were mounted in a custom silicone cuff. A 400mAh lithium-ion polymer battery with magnetic on/off switch was outfitted to device. The wireless link operates in Industrial, Scientific, and Medical radio bands at 915 MHz. In Phase 2, four 6-month-old Hanford swine underwent femoral vein dissection bilaterally. Doppler probes were mounted onto femoral veins and blood flow monitored for 1 minute, followed by 1 minute of venous occlusion, followed by 1 minute of release (restored flow). Paired t-test analyses performed comparing wirelessly transmitted signals in flow vs occlusion vs release periods.

RESULTS: In Phase 1, five implantable devices have been developed and tested In Vitro. The external receiver reliably detected wirelessly transmitted signals. In phase 2, wireless venous flow monitoring was achieved for all femoral veins. Mean signal strength during flow, occlusion, and release were 876.36 Hz (SD857), 72.73 Hz (SD62), and 891.74 Hz (SD758), respectively. Signal frequencies were significantly greater in flow vs occlusion($p < 0.001$) and during release vs occlusion($p < 0.001$). The response time for signal change between flow, occlusion and release phases was <1 second.

CONCLUSION: This proof-of-concept study is the first description of an entirely implanted blood flow monitor with wireless data transmission capability. Our device successfully distinguished between venous flow and occlusion, and between occlusion and release. More importantly, these differences in flow waveforms are obvious to the untrained eye (Figure 1). Future iterations will incorporate standard integrated circuitry and an integrated microelectromechanical system (MEMS) Doppler sensor that would decrease the size of the device to 1 x 1 mm, small enough to fit entirely on an anastomotic coupler ring.

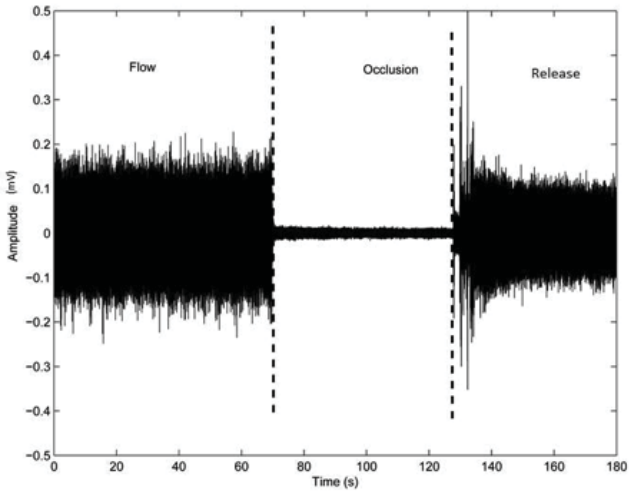

Figure 1. Representative waveforms from implanted Doppler device with wireless transmission of flow data during periods of venous Flow, Occlusion, and Release (restoration of flow).

Improved Random Component Viability of Axial Skin Flap through the Use of Human Adipose Derived Stem Cells

Chin-Jung Feng, MD; Cherng-Kang Perng, MD, PhD; Hsu Ma, MD, PhD

PURPOSE: Flap necrosis caused by inadequate blood supply and inflammation is a common postoperative complication in reconstructive surgery.[1] Lu et al. claimed adipose-derived stem cells increase the viability of random pattern skin flaps via subcutaneous injection.[2] The purpose of this study is to examine if administration of human adipose-derived stem cells via local intra-arterial injection could improve survival of the random component of axial skin flap by animal study.

MATERIALS AND METHODS: Human adipose-derived stem cells were isolated from a healthy 48 year-old woman by liposuction with patient consent and expanded ex vivo as standard protocol. After the elevation of axial epigastric flap in nude mice, human adipose-derived stem cells were then injected via right femoral artery (Figure 1) in different concentration (group A=$1x10^3$, group B=$1x10^4$, group C=$1x10^5$). The control group received 0.2 ml phosphate-buffered saline solution. After local injection, right superficial epigastric vessels were ligated to create unipedicle skin flap with random extension. The percentage of necrotic area was measured at postoperative day 7 for evaluation of flap viability. Specimens were also harvested for histologic analysis and ELISA assay.

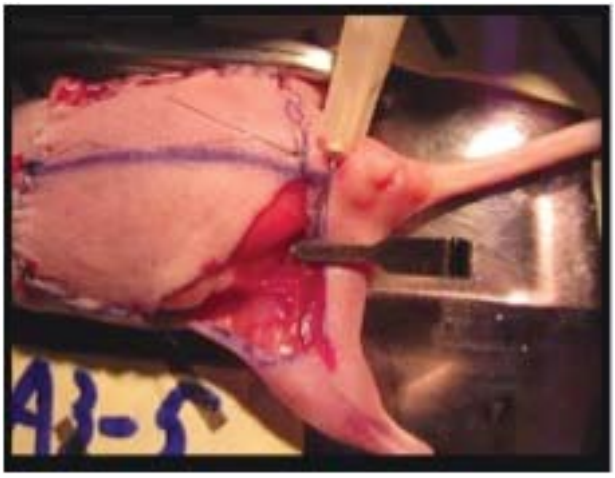

Figure 1. Human adipose-derived stem cells were then injected via right femoral artery.

RESULTS: Human adipose-derived stem cells led to a statistically significant increase in random component viability in both group A and group B compared with the control, especially group B ($1x10^4$). Histologic examination also showed some of the endothelial cells were stained positively for anti-human CD31. Moreover, ELISA assay revealed the amount of TNF- α decreased in group A, B and C compared with the control.

CONCLUSION: Human adipose-derived stem cells increase the viability of random component of axial skin flap via local intra-arterial injection. The mechanism of improved viability of skin flap might be the direct differentiation of human adipose-derived stem cells into endothelial cells or inhibited inflammation process via TNF-α.

REFERENCES:

1. Khouri RK, et al. A prospective study of microvascular free-flap surgery and outcome. *Plast Reconstr Surg.* 1998;102:711-721.

2. Lu F, et al. Improved viability of random pattern skin flaps through the use of adipose-derived stem cells. *Plast Reconstr Surg.* 2008;121:50-58.

Fabrication of Tissue Engineered Constructs with Stable Endothelial Lining after 28 Days

Rachel Hooper, MD; Adam Jacoby, BA; Ope Asanbe, MD; Hector Osoria, BS; Tarek Elshazly, PrM; Jason Spector, MD, FACS

PURPOSE: Synthesizing tissue-engineered constructs with an inherent vascular system remains one of the foremost challenges in regenerative medicine. *In Vivo*, a healthy confluent endothelial surface is critical for thrombosis-free blood flow. Here we