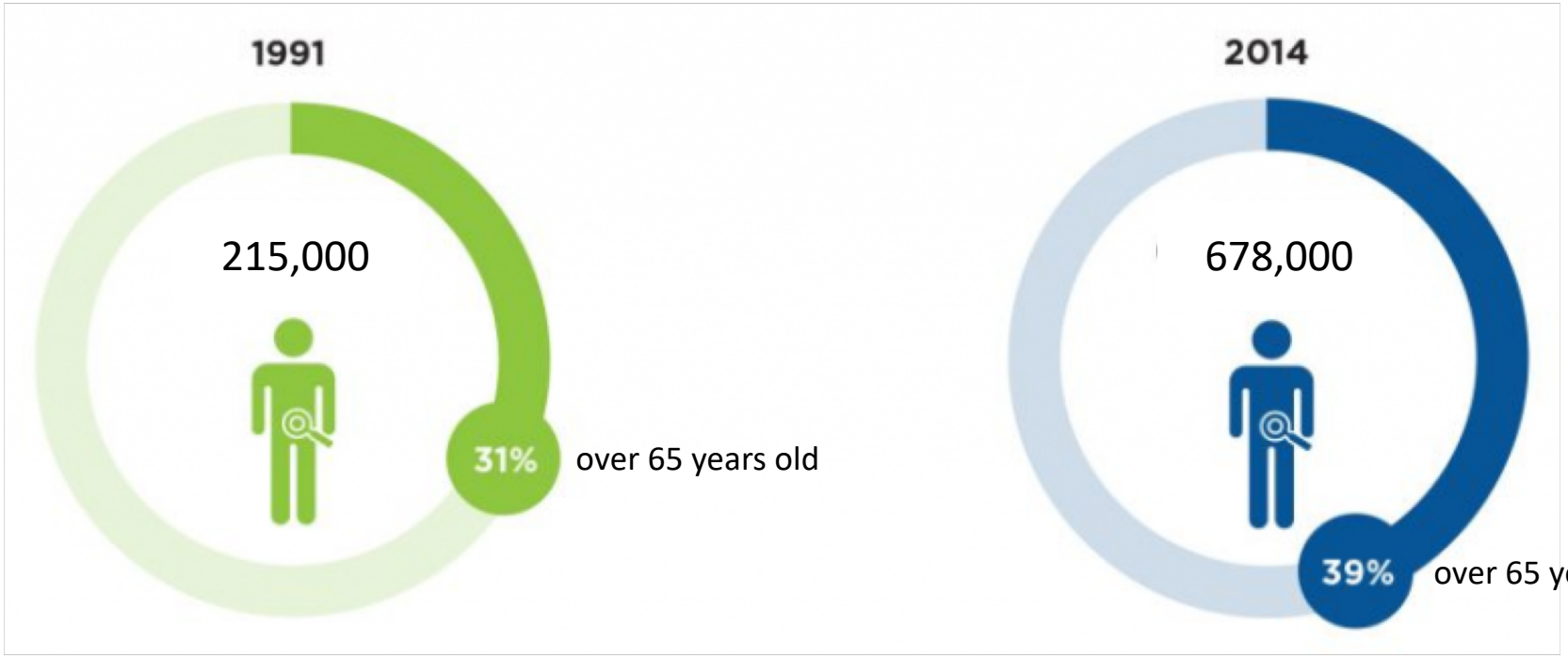
MULTISCALE ANALYSES ON ARTERIOVENOUS FISTULA MATURATION

Rosamaria Tricarico

02/13/19

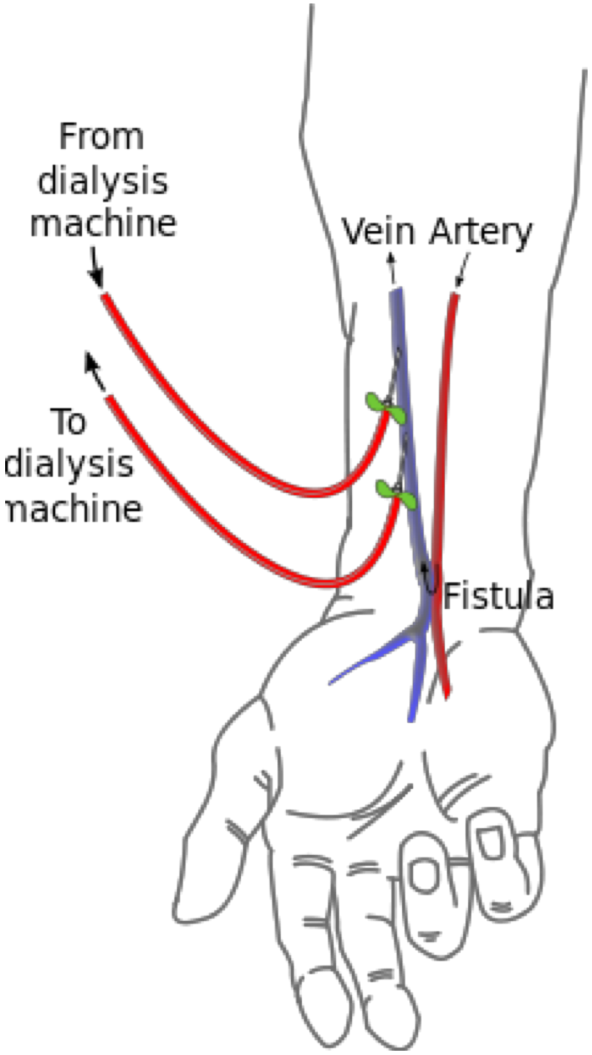
End Stage Renal Disease (ESRD)

ESRD patients and percent of patients over age 65 years between 1991 and 2014.



Article: Moving Toward Kidney Supportive Care, by Dugan Maddux, MD. September 18, 2017
Source: https://www.usrds.org/2016/view/Default.aspx

Arteriovenous fistula for hemodialysis



https://en.wikipedia.org/wiki/Cimino_fistula

Arteriovenous (AV) fistula is a surgical connection between a vein and an artery and it is recognized as the best access for hemodialysis.

However between **20-50% of fistulas fail to become clinically usable** (stenotic, thrombotic, etc.).

The *causes* of fistula maturation mechanisms are unknown.

Project goal

After fistula creation, variations occur at:

- *Genetic scale*
- *Cellular scale*
- *Tissue scale*

The project goal is to identify and correlate unique signatures at different *scales* that play a role in fistula failure mechanisms through patient-specific analyses.

Specific aims:

1. identify a list of genes that are potentially involved in fistula adaptation
2. identify anatomic characteristics able to predict fistula failure using non-invasive measurements

These results can be utilized by *hospital* and *biomedical companies* for better patient-selection and treatment.

Data-sets:

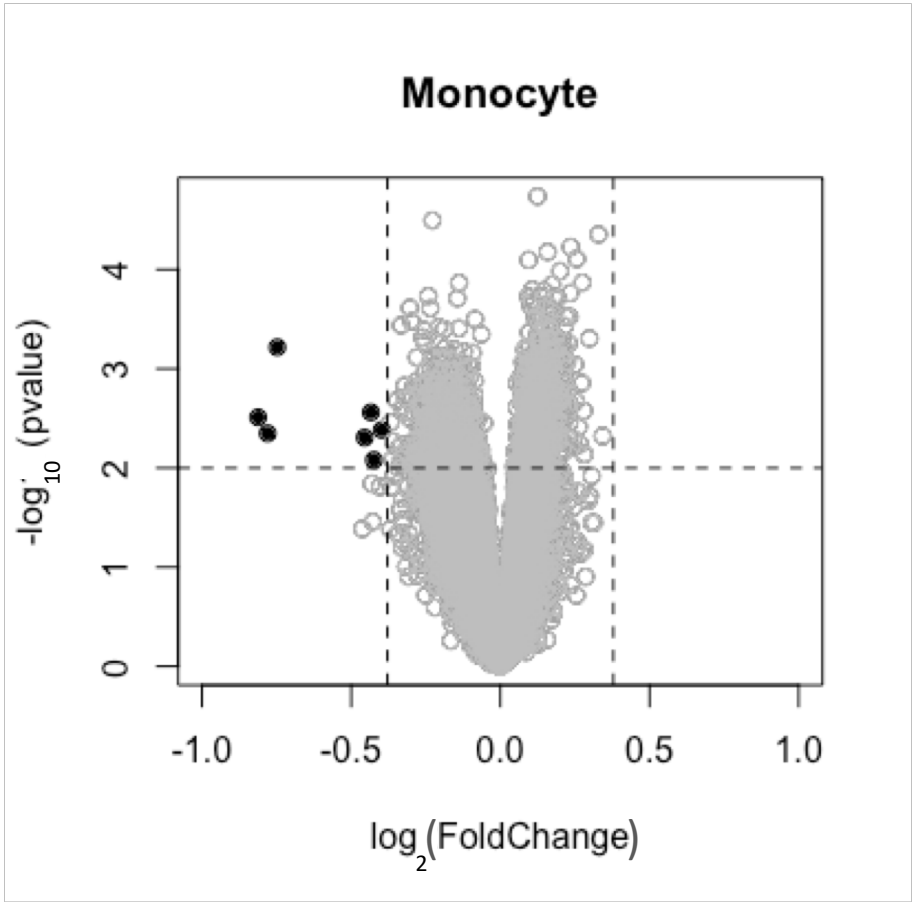
1. **Gene expression of monocytes and neutrophils** (53,662 total) on 50 patients at two time points (baseline, 2 weeks).

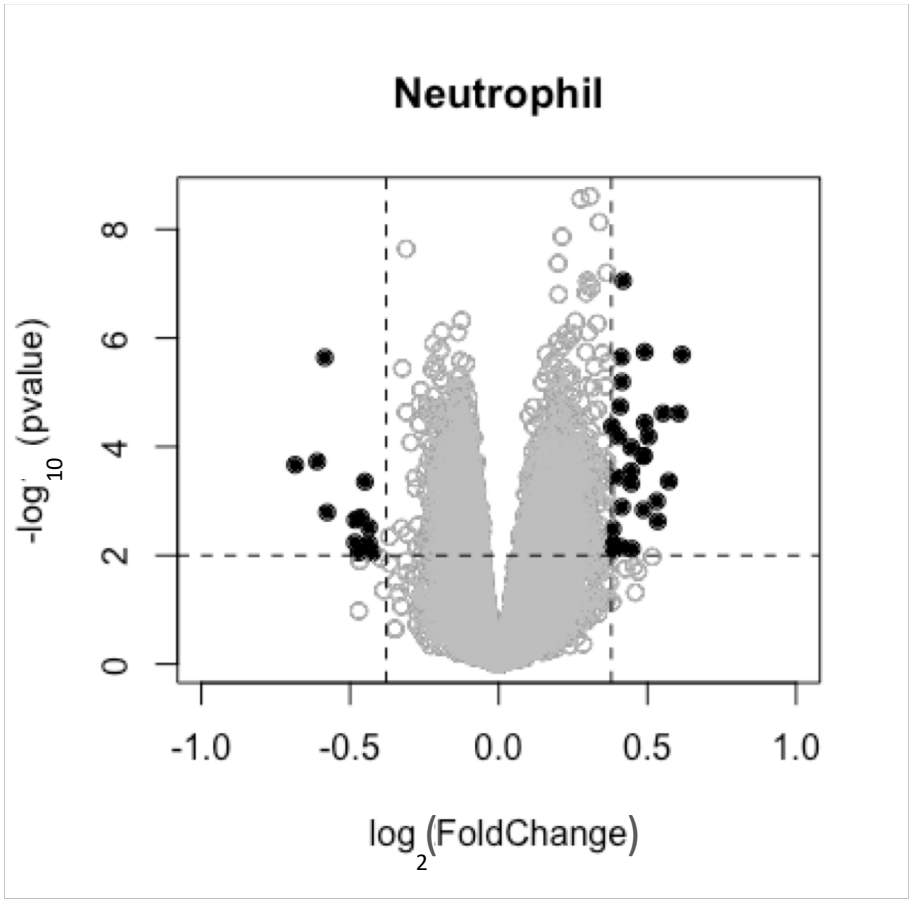
2. **Anatomic and hemodynamic data** along the fistula length of 50 patients at 3 time points (baseline, 6 weeks, 6 months).

3. **Brachial artery dilation** on 50 patients at two time points (pre- and post-fistula).

Results: gene expression (fold change from baseline)

Marked genes with p-value > .01 and fold change > 1.3
AIM: to identify genes that might play a role in fistula remodeling and adaption.

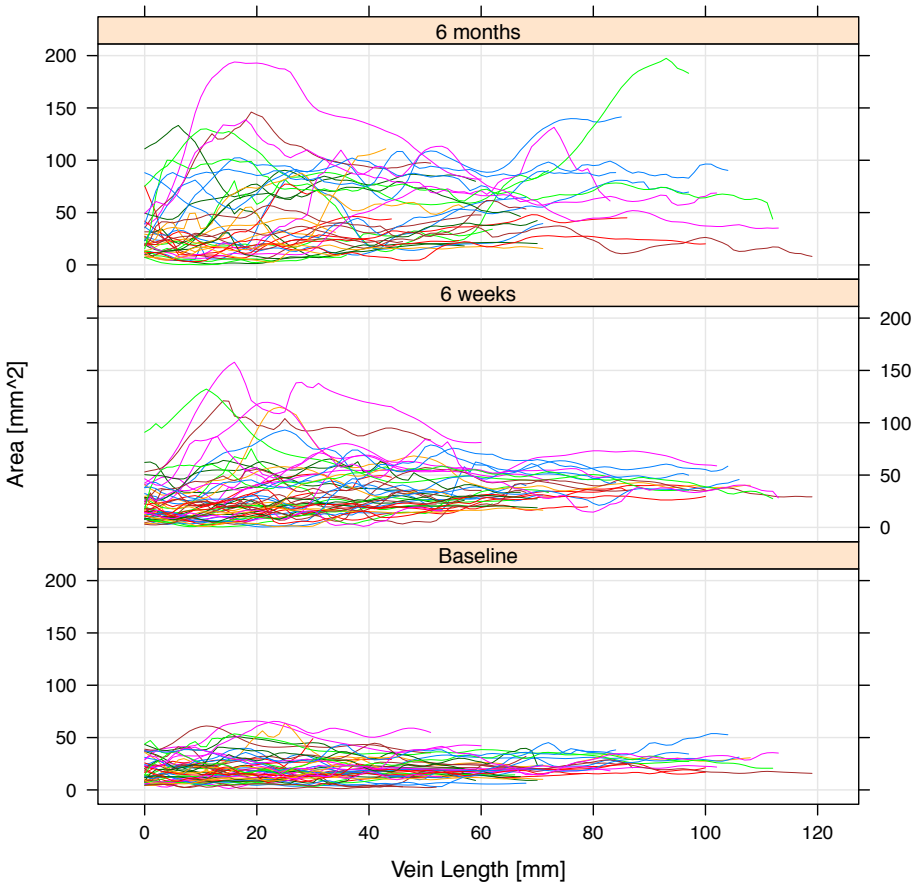


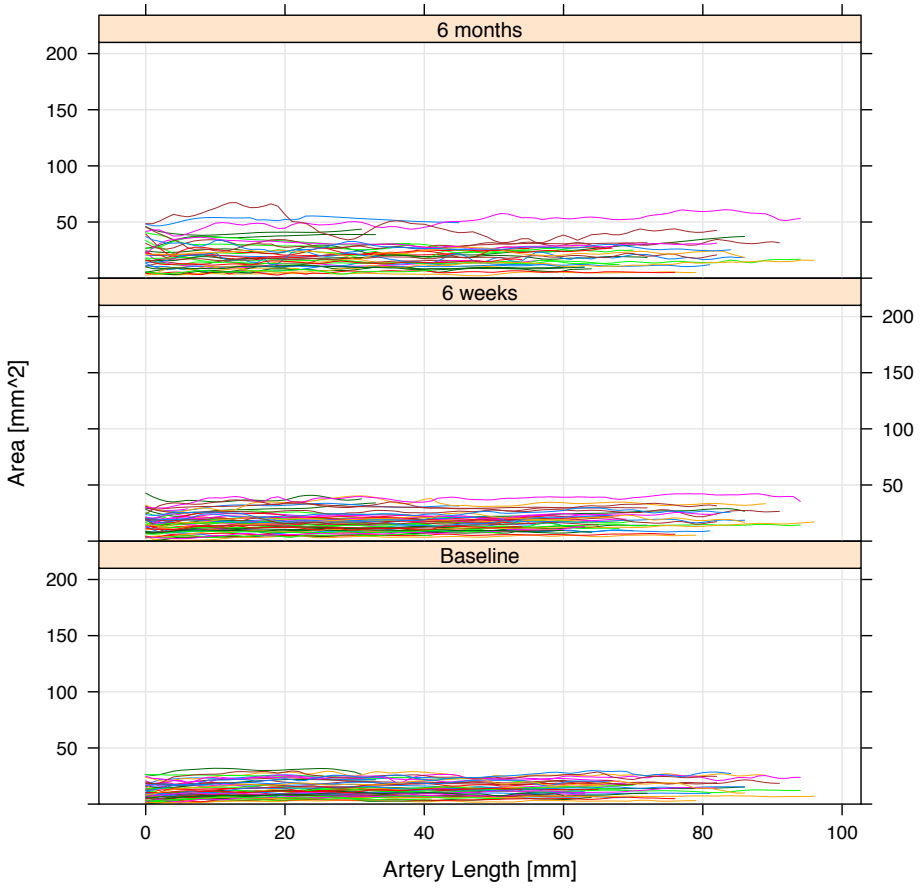


Total number of significant genes from monocytes = 7

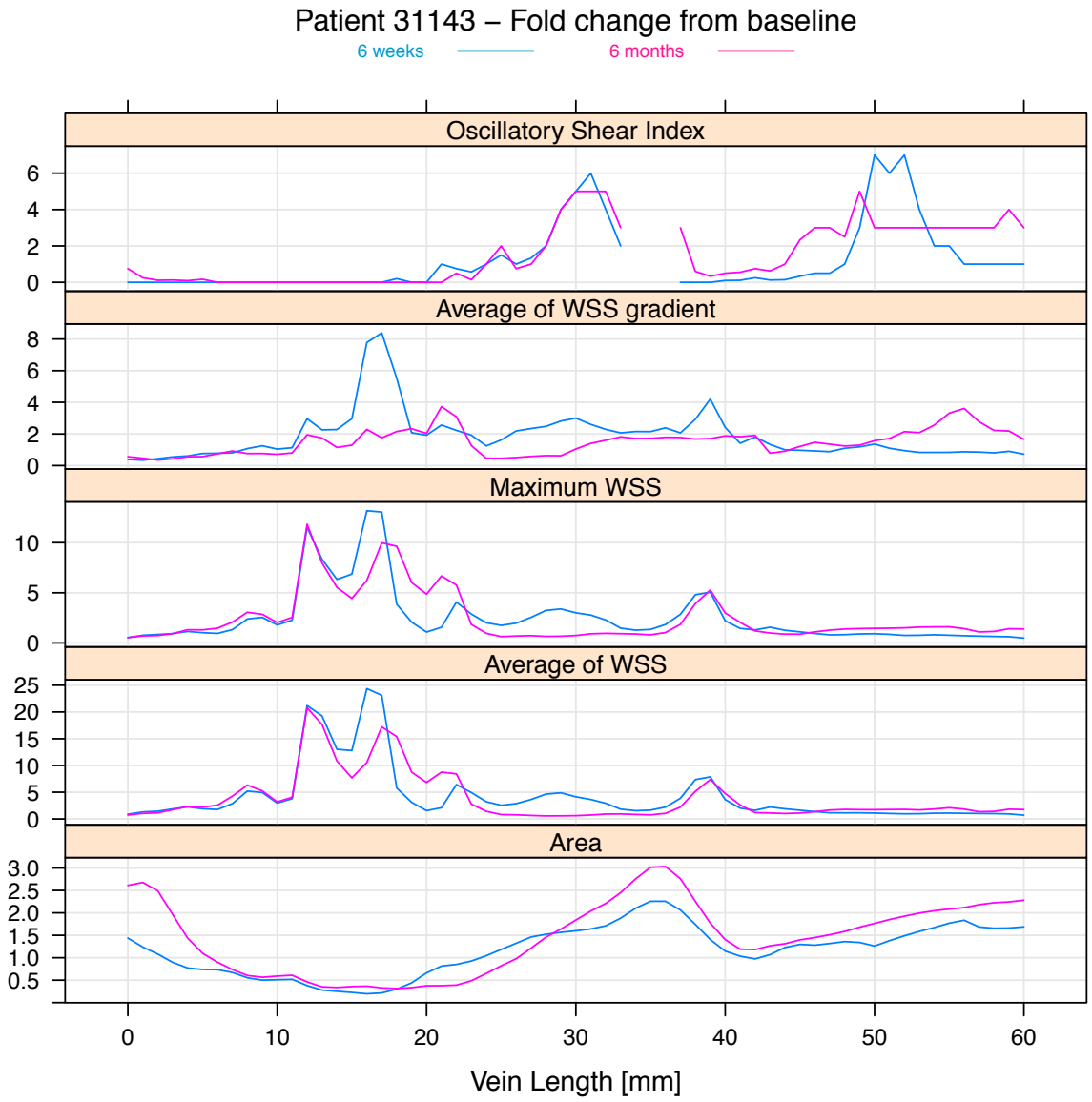
Total number of significant genes from neutrophils = 42

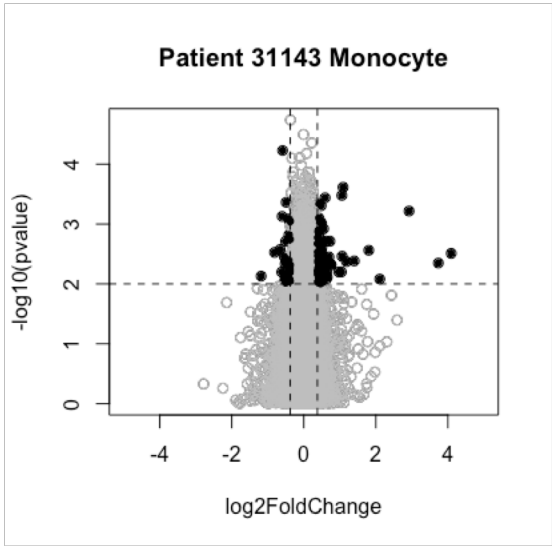
Results: Anatomy
(full data set)

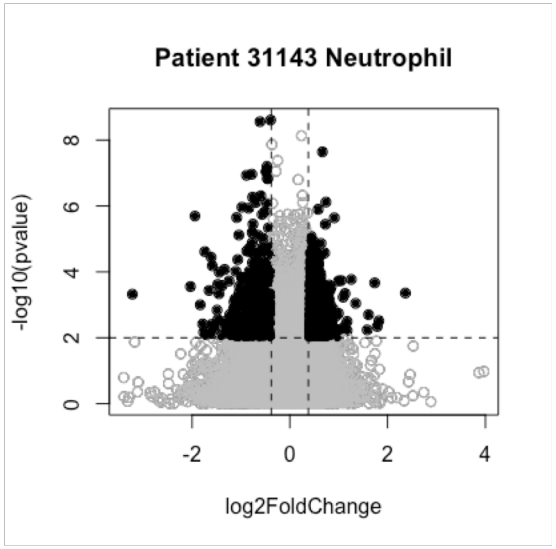




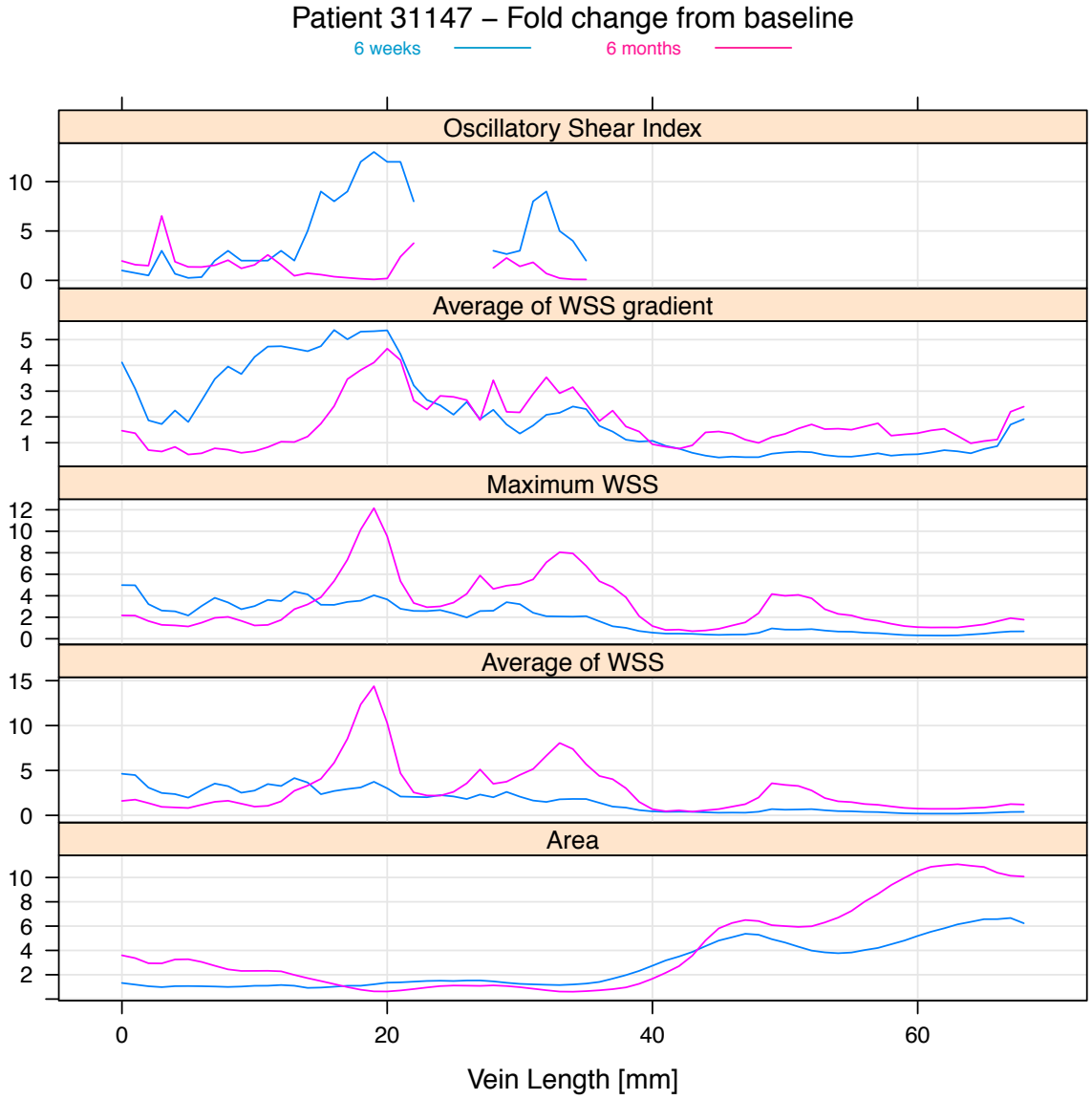
Results: P31143

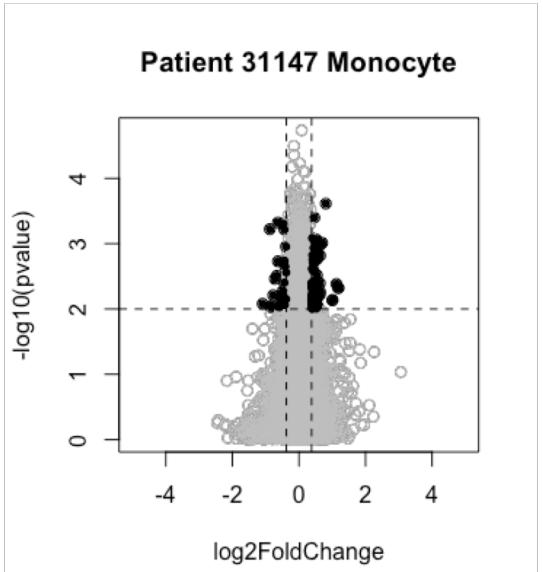


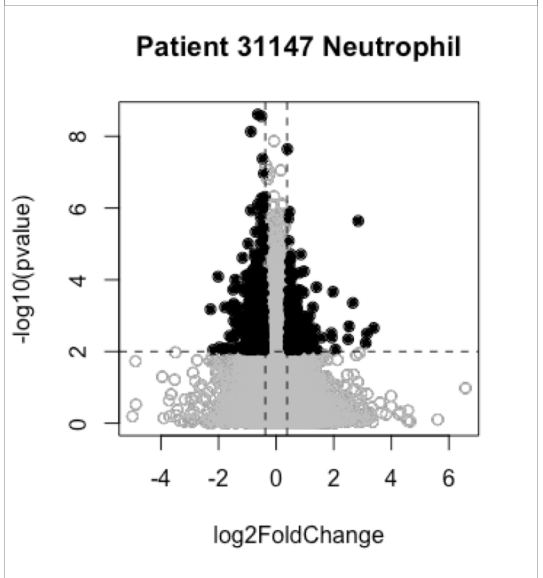




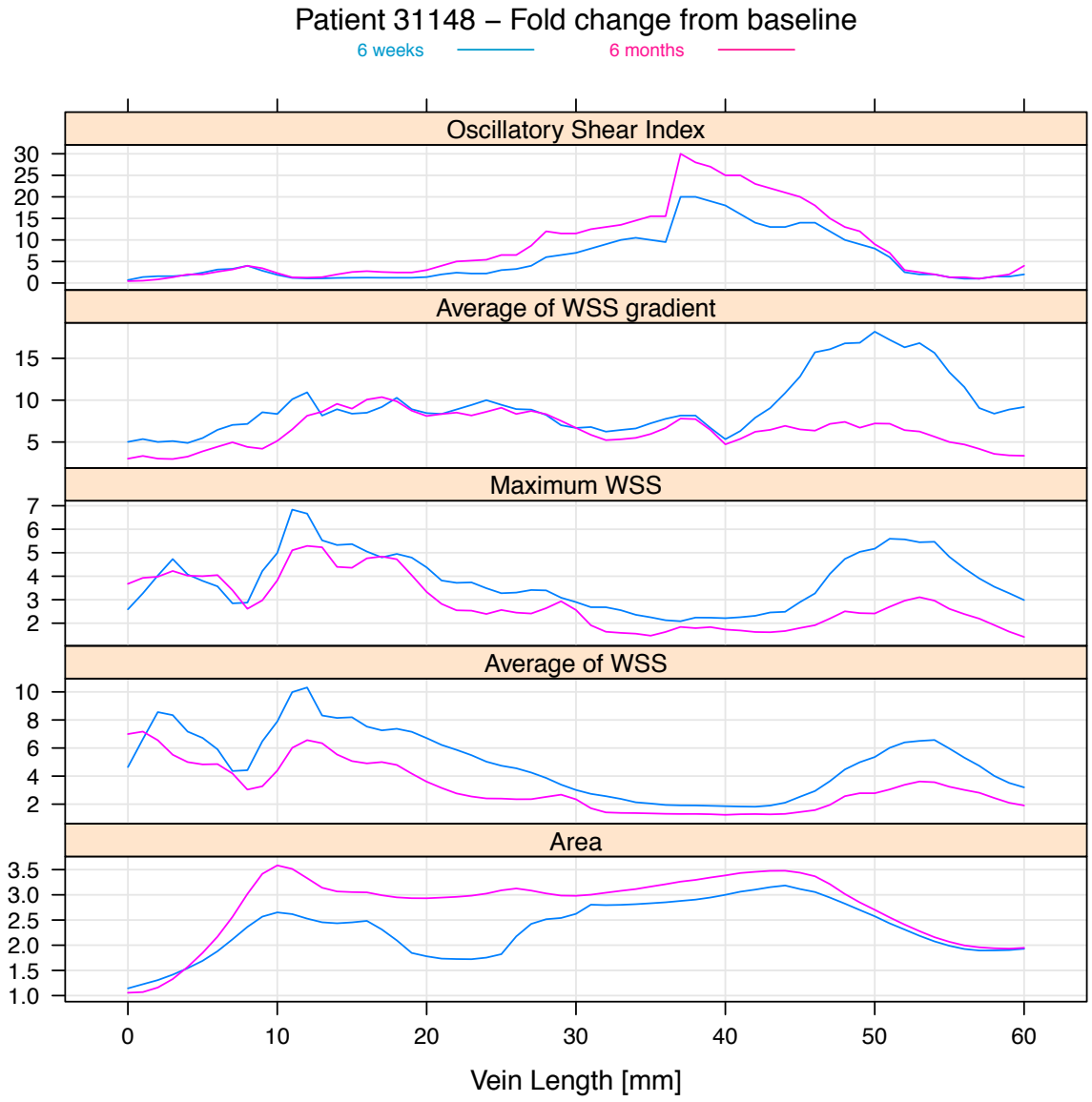
Results: P31147

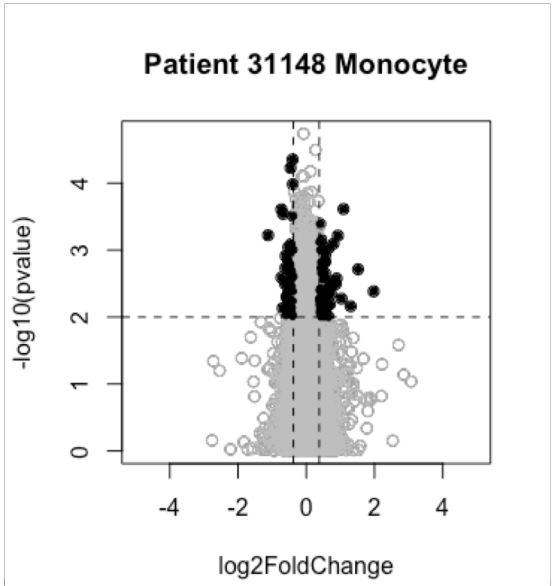


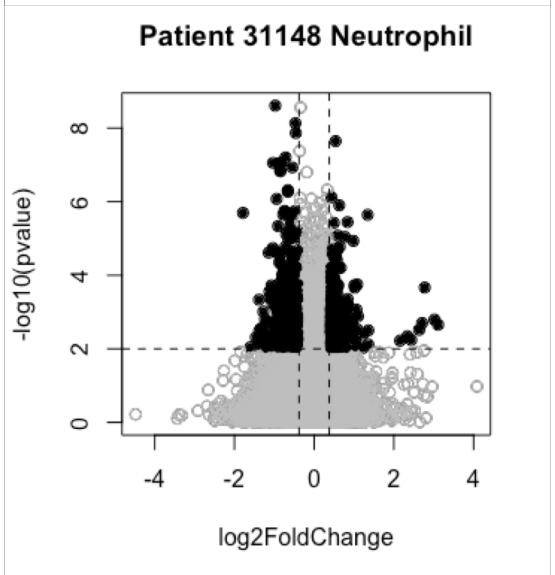




Results: P31148







The Data Incubator

Thank you for your attention!

Acknowledgement

Division of Vascular and Endovascular surgery, University of Florida

SURGICAL TEAM

Berceli Scott A., MD, PhD

Salvatore Scali, MD

ENGINEERING TEAM

Yong He, PhD

Rozowsky Jared, BS

VASCULAR LABORATORY

Allen Matthew B.

INSTITUTIONS

North Florida/South Georgia Veterans Health Service

University of Florida