



# Fat Pad Restoration

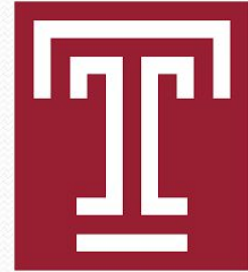
Jodi Schoenhaus, DPM, RPhs, FACFAS

# Jodi Schoenhaus, DPM, RPhs, FACFAS

## @bocafootandveindoc

## @fatpaddoc

- University of Michigan
- Temple University
- Practice in Boca Raton, FL
- Board Certified Foot and Rearfoot- ABFAS
- 17 Years of experience with FPR



# Learning Objectives

**Define Fat Pad Atrophy**

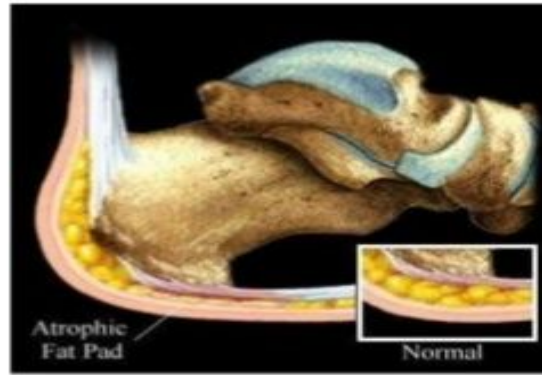
**Understand the concepts of Fat Pad Restoration (FPR)**

**Comprehend treatments of fat pad atrophy in an office setting**



# WHAT IS FAT PAD ATROPHY?

- Adipose tissue covering the plantar aspect foot atrophies or displaces
- There is a loss of shock absorbing capacity → increase peak pressure forces in gait → painful ambulation, skin reactions



# Causes of Fat Pad Atrophy/ Conditions Treated

- Diabetic Ulcerations- Wagner Stage 0 & Stage 1, Stage 2 (not infected)
- Collagen Connective Tissue Diseases- i.e. Rheumoid Arthritis causing joint deformities & skin breakdowns
- Traumatic Atrophy- i.e. calcaneal fractures
- Tissue Scarring
- Cortisone Induced Lipoatrophy
- Cavus Foot- Anterior displacement ball of the foot
- Mechanically induced hyperkeratotic lesions (corns/calluses)
- Sports Injuries, Injection through Micro needling- i.e. Plantar fasciitis and Achilles tendonosis
- Bunions, Tailor's Bunions, Hammer toes, Metatarsalgia, Heel Pain, Haglund's

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# WHAT IS FAT PAD RESTORATION?

The use of injectables with an adipose grafts, dermal fillers, dermal allografts or autologous fat transfer to increase the thickness and restore the subdermal/ subcutaneous layer.

## PURPOSE:

1. Allow decrease in pain with ambulation thus improving one's quality of life
2. Allow for healing of non-infected neuropathic wounds
3. Allow for improved cosmesis of the foot



# TIMELINE OF FAT PAD RESTORATION IN THE FOOT

**Sol Balkin**

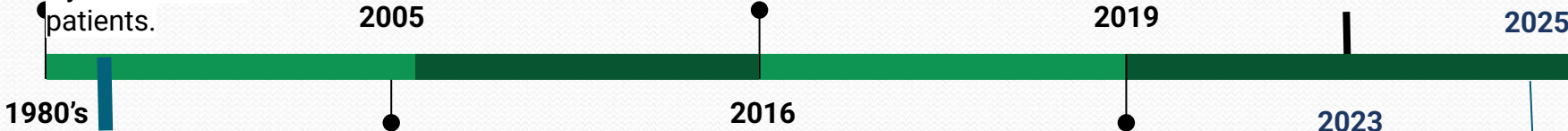
**Silicone**

Dow Corning Corporation's of 350 centistoke was injected in 1585 patients.

**AUTOLOGOUS FAT TRANSFER**

First published research on fat transfers to the foot

**LIPOSANA-Adipose Graft**



1980's

**2001  
Chairman**

First published work on fat transfers to the foot

2005

**DERMAL FILLERS/DERMAL ALLOGRAFT**

Restylane, Sculptra, Radiesse, Juvederm, GraftJacket Xpress, Dermal Allograft

2016

2019

**LENEVA**

Injectable Allograft Adipose Matrix

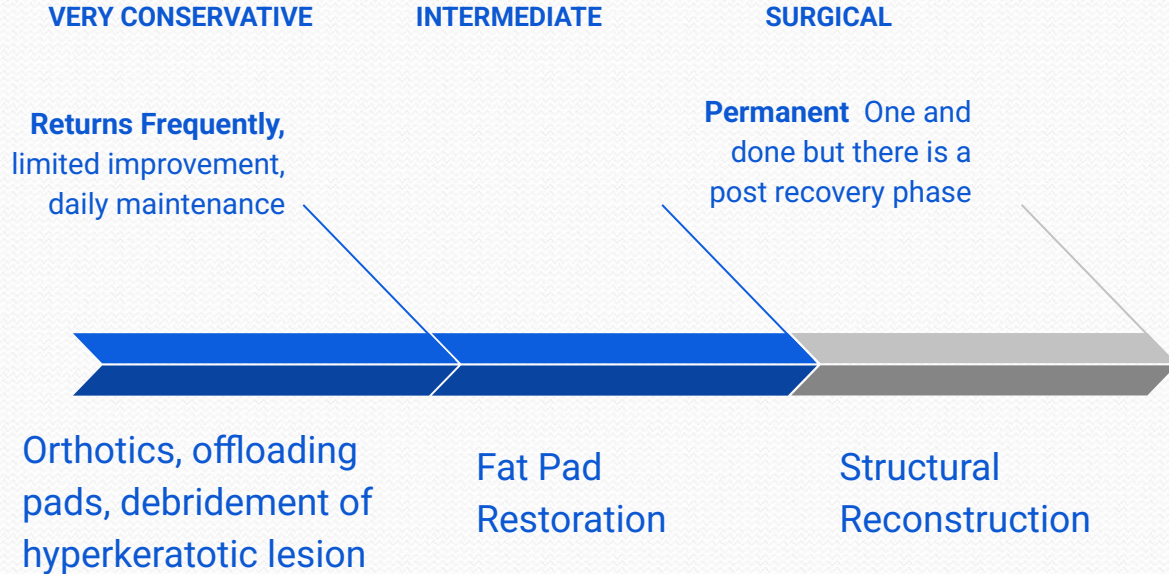
2023

2025

**MICRO  
Collage  
bone**



# WHERE DOES FAT RESTORATION FIT INTO YOUR CARE?



# Fat Pad Atrophy Diagnostics

- X-ray- initial
- Ultrasound
- Gait Plate Scanning
- MRI
- Clinical

# ULTRASOUND



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# Measure thickness from dermis to bone cortex

SUBDERMAL



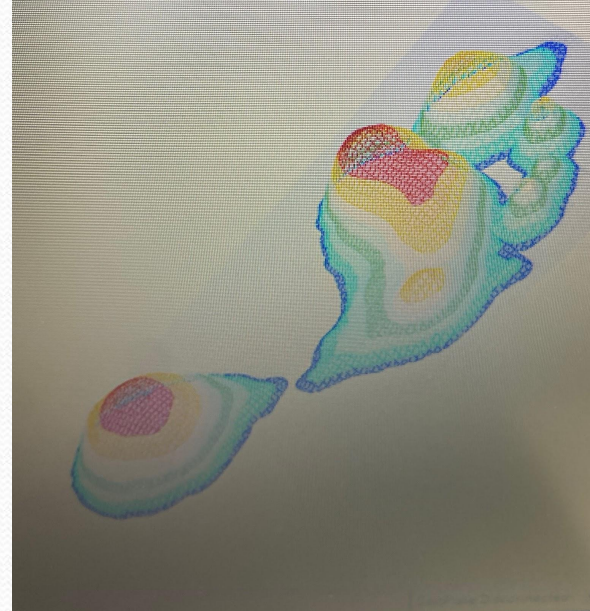
EXAMPLE: RIGHT  
HEEL FAT PAD  
MEASUREMENT

CORTEX OF BONE



# Gait Scan Analysis

Submetatarsal Five decrease in peak pressure load



# MRI

Show increase in fat pad plantar foot SEPT 2006 and MARCH 2008 with almost 1/2cm increase in fat pad  
**before**



**after**



# PROCEDURE OPTIONS

## 1. Off the shelf injectables

### SYNTHETIC

Restylane®- Hyaluronic Acid

Juvederm Voluma®- Hyaluronic Acid higher crossed linked

Sculptra®- Poly L Lactic Acid

Radiesse®- Calcium Hydroxyapatite

## 2. Surgical allograft insertion

## 3. Fat transfer Autolipotransplation

### NATURAL

Graft Jacket Xpress®- Dermal Allograft Matrix injectable

Integra Allograft®- Dermal Allograft Matrix

Leneva™- Adipose Allograft Matrix

Liposana™-- Cryopreserved Adipose Allograft

MicroVisc™-- Demineralized collagen tissue

# Pre procedure

Every patient- should get at least x-rays

Bonus- ultrasound for diagnostic and injection procedure

Gait scan

AOFAS scores pre and 12 weeks post injection

Consent

Photos

Payment outlined/ quote



# Room Set Up



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# Injection Technique

18-21 G blunt tip microcannula- avoid NV structures

Use cannula to break up scar tissue and make a pathway

Inject solution on the way out

Adjust cannula 15° and make another pass

Inject solution in at least directions

\*Yoshimura- central zones for necrosis

Mashiko T, Yoshimura K. How does fat survive and remodel after grafting? *Clin Plast Surg.* 2015;42(02):181–190.

[\[PubMed\]](#) [\[Google Scholar\]](#)

\*Coleman- avoidance of central necrosis with bolus

[The Current State of Fat Grafting: A Review of Harvesting, Processing, and Injection Techniques](#)

Amy L. Strong, Paul S. Cederna, J. Peter Rubin, Sydney R. Coleman, Benjamin Levirom Jodi R. Schoenhaus,

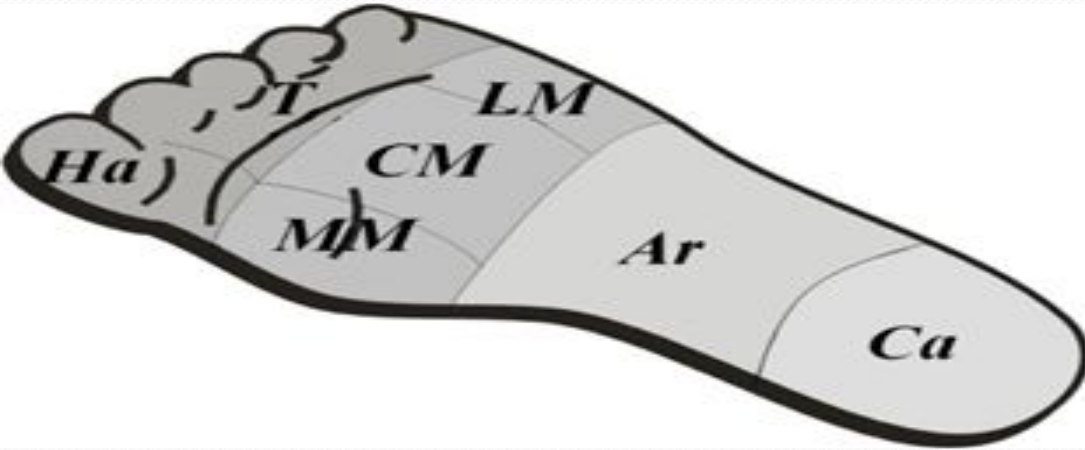


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Plast Reconstr Surg. Author manuscript; available in PMC 2016 Oct 1. Published in final edited form as: *Plast Reconstr Surg.* 2015 Oct; 136(4): 897–912.



# HOW MUCH DO I INJECT?



HA/ Toes- 0.5mL

Single spot

MM/CM/LM- 1.0-1.5mL

Double spot

MM + CM- 2.0-3.0

AR- 3.0- 4.5mL

CA- 3.0-4.5mL



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# Post Injection Offloading Procedure

## TWO WEEK PROTOCOL

In-vitro studies have shown adipose derived stem cells attach, infiltrate and differentiate into adipocytes within 7-14 days.

**Plast Reconstr Surg. 2019 Jul;144(1):264.**

1. Off- loading pads- provide for patient and have them take a photo with THEIR phone so they know where to place the pads
2. Sneaker, Orthopedic Sandal, Post op Shoe, CAM boot or TCC- no high heels
3. Minimal low impact activity



# Post Procedure

## Patient leaves with Procedure Pocketbook

- Post procedure instructions
- Post Procedure Offloading Pictures
- Ice Pack
- Squeeze Ball they had during the procedure
- Extra Pads
- Post procedure Shoe- either tall boot, post op forefoot offloading shoe, post op shoe or heel relief shoe



# Fat Pad Restoration

IFAF Schoenhaus et al.- hyaluronic acid- Study was one year, participants came in 1.5-2 years later stating it still held

Gusenoff- University of Pittsburgh- autologous fat transfer- two year follow up

Volumetric Analysis in Autologous Fat Grafting to the Foot. Ruane EJ, Minter DM, Wyse AJ, Gusenoff BR, Gusenoff JA. *Plast Reconstr Surg*. 2019 Sep;144(3) Decrease in walking forces and pressures were found to be positively correlated with increase in fat pad volume [ $p=0.013$ ,  $r=0.441$ ;  $p=0.032$ ,  $r=0.382$  respectively]. Improvements in reported work leisure and activities of daily living scores were found to be positively correlated with decrease in standing forces [ $p=0.024$ ,  $r=-0.431$ ;  $p=0.043$ ,  $r=0.362$  respectively] and pressures

Chairman EL: Restoration of the plantar fat pad with autolipotransplantation. *J Foot Ankle Surg*, 33(4):373–9.1994.



# Benefits of Fat Pad Restoration

1. Increase thickness of subcutaneous tissue
2. Increased density of subcutaneous tissue
3. Regenerate tissue - dermis and epidermis improvement
4. Provide insulation around a nerve sheath for neural healing

# POIS- pressure offloading injectable system

## FDA approved study with dermal filler

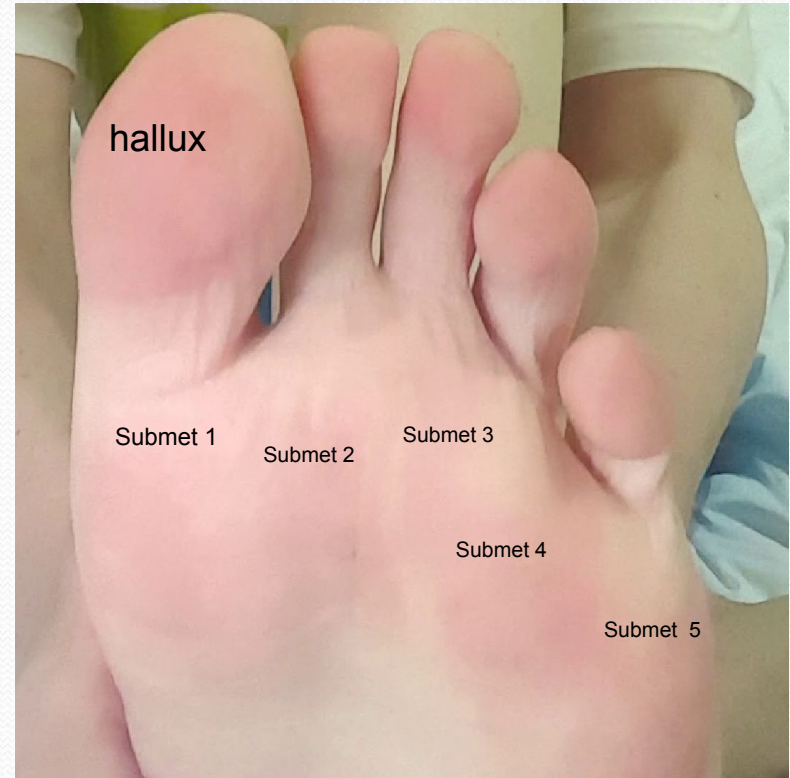
30 subjects

23 female/ 7 male

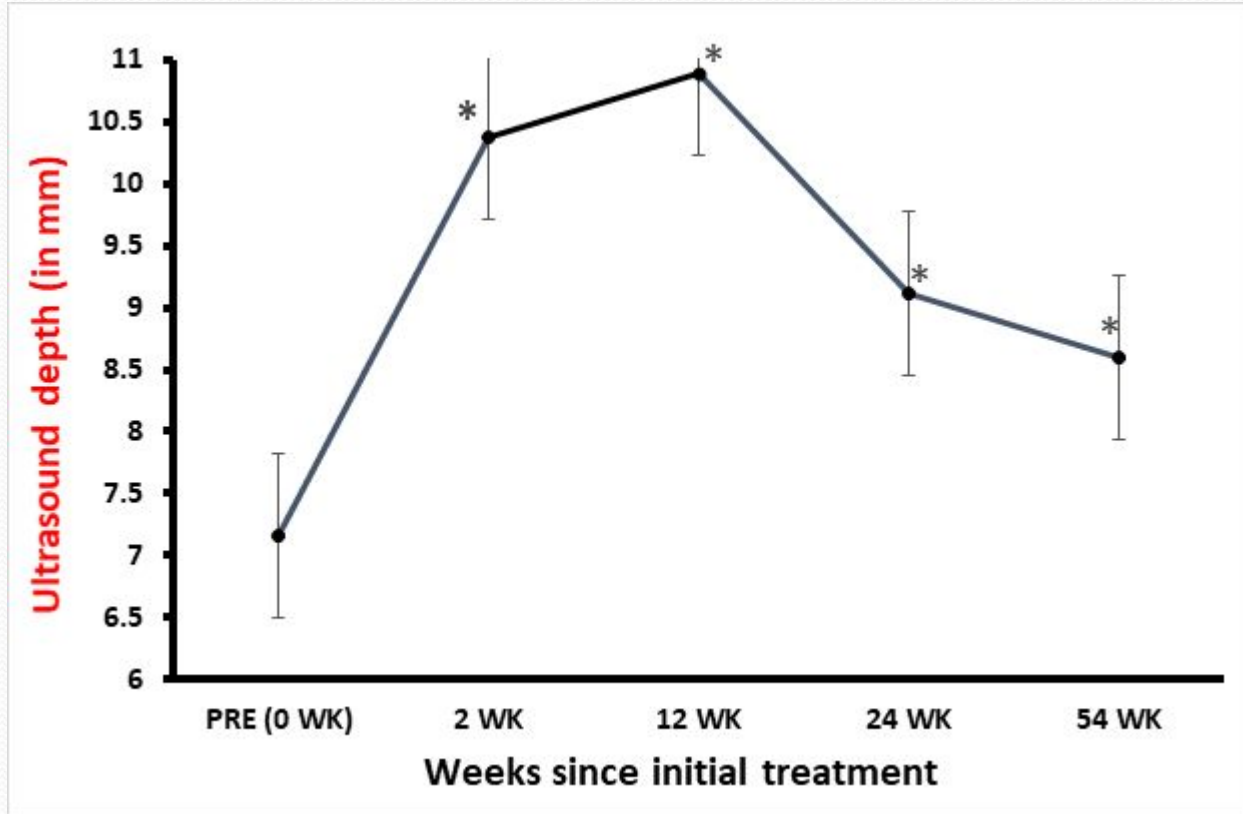
Average age 60.4

1mL per injection site

Injection site



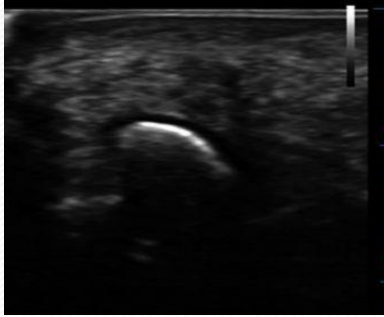
# Ultrasound Evaluation of Fat Pad Thickness



\*\* 7.63mm pre injection submetatarsal fat pad thickness \*\*  
Mean 4mm improvement in thickness

# Ultrasound Findings...depth and density

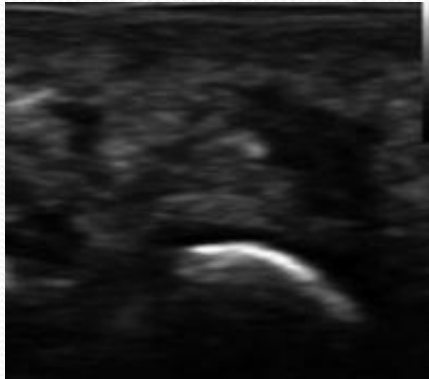
PRE INJECTION



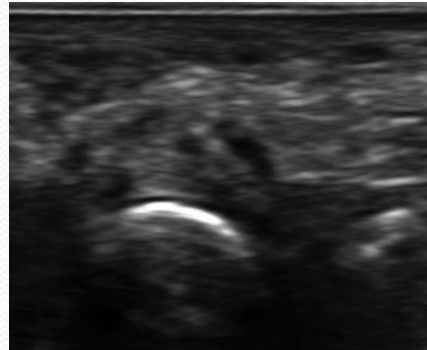
IMMEDIATELY POST INJECTION



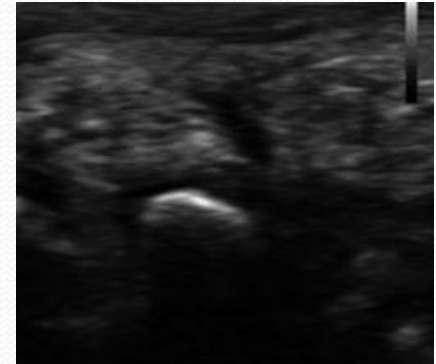
TWELVE WEEKS



TWENTY FOUR WEEKS



FIFTY FOUR WEEKS



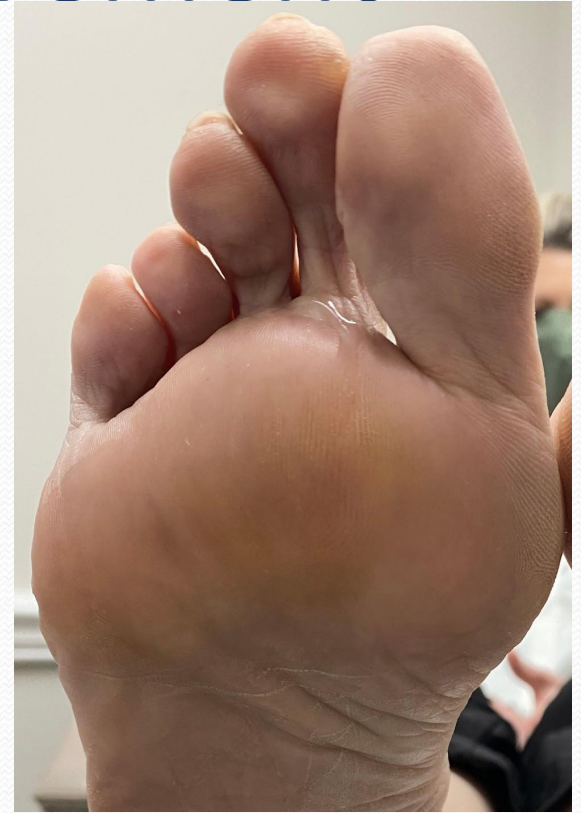
# Clinical dermal Improvement



1/14/2020



Immediately Post



2/8/2021... 13 months

# GRADE 1 NEUROPATHIC ULCERATION MRI TO RULE OUT OSTEOMYELITIS



October 19, 2016



December 21, 2016



March 2019



## GRADE 2 WAGNER TIBIALIS ANTERIOR EXPOSED

DECEMBER 11, 2019



JANUARY 8, 2020



JANUARY 15, 2020



FEBRUARY 20, 2020



**DECEMBER 26, 2019  
OR FRAME REMOVAL,  
DEBRIDEMENT  
GRAFTING**



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Neuropathic Diabetic Patient with Capillary Bleeding into Dermal Callus. Noncompliant, Neuropathic, Previous Osteomyelitis...LENEVA®

July 10, 2019

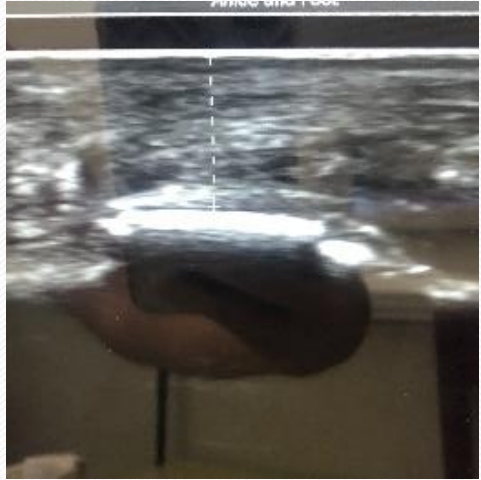


January 5, 2020



# ULTRASOUND IMAGING TO FOLLOW CARE

Pre injection- No Allograft  
May 30, 2019



Immediate post injection



10 weeks post injection  
August 15, 2019



ULTRASOUND IMAGING OF ALLOGRAFT AT 10 WEEKS IN SUBCUTANEOUS TISSUE

# FIFTH METATARSAL MALUNION

DECEMBER 9, 2019



JANUARY 6, 2020



May 5, 2020



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# HALLUX GRADE 1 ULCERATION WITH PERIPHERAL ARTERIAL DISEASE



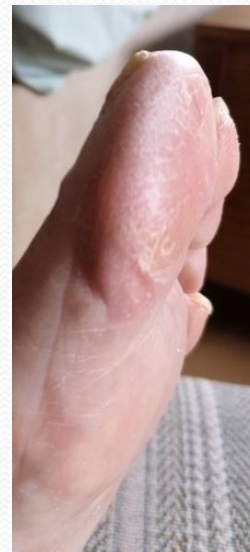
NOVEMBER 3, 2017



FEBRUARY 2, 2019



APRIL 9, 2020  
IPAD PATIENT PHOTO



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# WHAT ARE SOME ADVERSE REACTIONS?

Injection site cellulitis. Resolved with oral antibiotics

Localized Capsulitis- entered the joint. Short term oral anti inflammatory with complete resolution. No long term i

Worst Case Scenarios- It doesn't work and patient needs a tou

# DOES IT MIGRATE and DOES IT LAST?

8/27/18

Pre injection  
Painful Tailor's Bunion



8/27/18

Immediately Post



11/15/18

11 weeks Post



3/9/20

19 Months

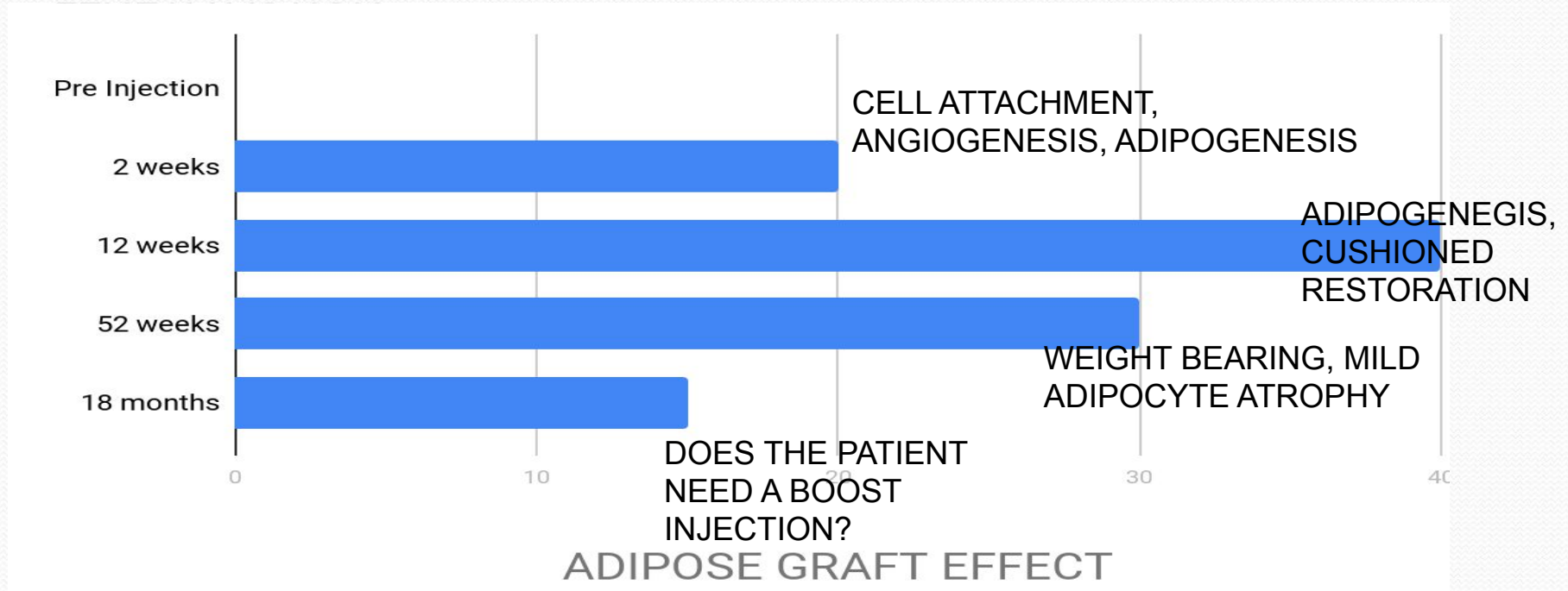


5/1/21

33 Months



# DOES IT LAST?



# Is the treatment covered by insurance?

- No office insurance coverage
- Possible operating room coverage indication for soft tissue augmentation.
- That's OK



# Fat Transfer

Can be done in the office- if I take fat from the leg

Done with plastic surgeon- if we use the OR or need fat from the abdomen

Usually used for higher volumes needed (10ml or higher) where injections are too costly



# THANK YOU!



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