

# Amniotic Membrane Tissue Allografts: Arthrofibrosis & TKR



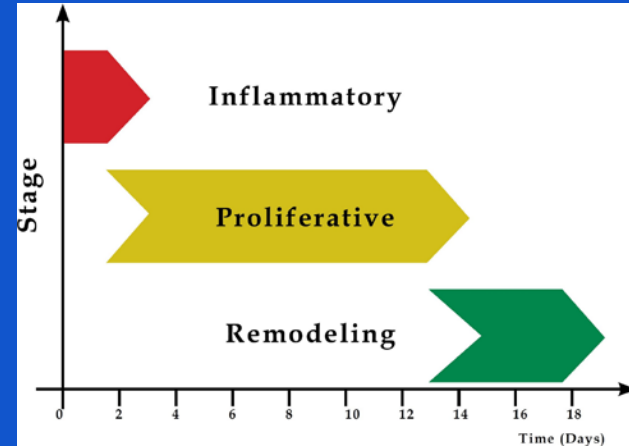
Orthopaedic Summit 2017, Evolving Techniques  
Michael J. Kaplan MD

**Disclaimer: Consultant for MiMedx**



# Normal Wound Healing Physiology

- Inflammation → Hours to Days
- Proliferation → Days to Weeks
- Remodeling → Weeks to Months

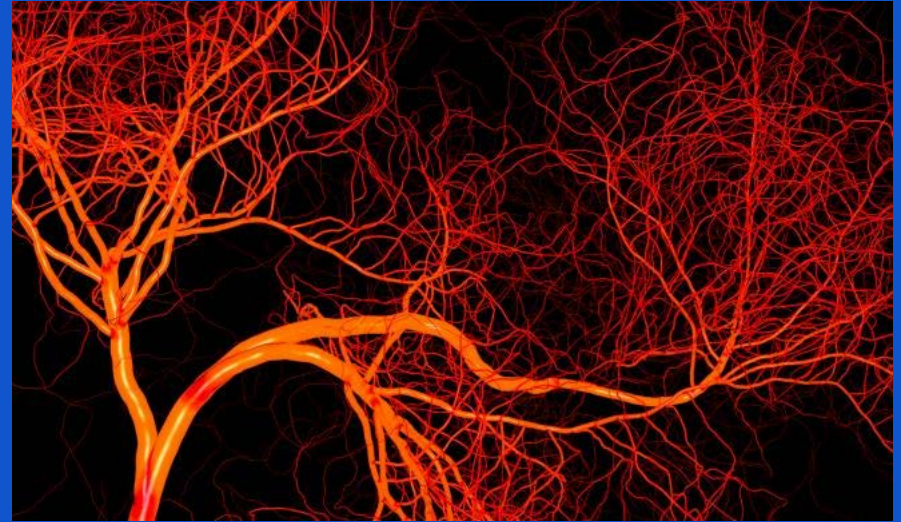


# Modulation of Inflammation

- Proper Balance of Pro & Anti-inflammatory signals
- Chronic inflammation – Homeostasis altered by imbalance of immunoregulatory cytokines
- Molecular mediators, extracellular matrix, pH, and nutritional environment all play some role

# Cell Proliferation

- Inflammation subsides
- Stem cells migrate and proliferate to replace damaged tissue
- Extracellular Matrix → Granulation Tissue
- Angiogenesis



# Remodeling

- Disorganized scar removed
- Tissue synthesis and degradation by MMPs (Matrix Metalloproteinases)
- Excessive fibrous tissue proliferation results in scarring



# Science: American Journal of Sports Medicine

Amniotic Membrane Study in Rats: David Kovacevic M.D. Yale University

Results:

- Increased fibrocartilage
  - Promotes bone healing
  - Promotes COL-1 and MMP-2 expression
- Translates Fibroblastic granulation tissue to more mature, organized collagen
- No immunogenic host response to allograft

# Science: American Journal of Sports Medicine

- Human Amniotic Membrane - Derived Products in Sports Medicine
- Basic Science, Early Results, and Potential Clinical Applications
  - Riboh, Saltzman, Yanke, Cole, November 19, 2015
- Systematic Review of Literature Conducted
- 6,870 Articles Screened, 80 Relevant to Topic



# Science: American Journal of Sports Medicine

## Conclusions:

- “Amniotic membranes have promising applications in Sports Medicine”
- “They are a source of pluripotent cells, highly organized collagen, antifibrotic and anti-inflammatory cytokines, immunomodulators, and matrix proteins.”
- Improves tissue organization in healing and the treatment of the arthritic joint

# Science: American Journal of Sports Medicine

## Conclusions Continued:

- The evidence in sports medicine is heavily biased toward in vitro and animal studies with little to no human clinical data
- 14 companies or distributors offer commercial amniotic products
- Preparations and formulations differ, and an understanding of their distinctions will guide their use in sports medicine research

# Amniotic Allografts

- Improved technology
- Ultimate biologic for healing and regeneration
- Historically sound principles
- Modulates inflammation
- Reduces scar tissue formation

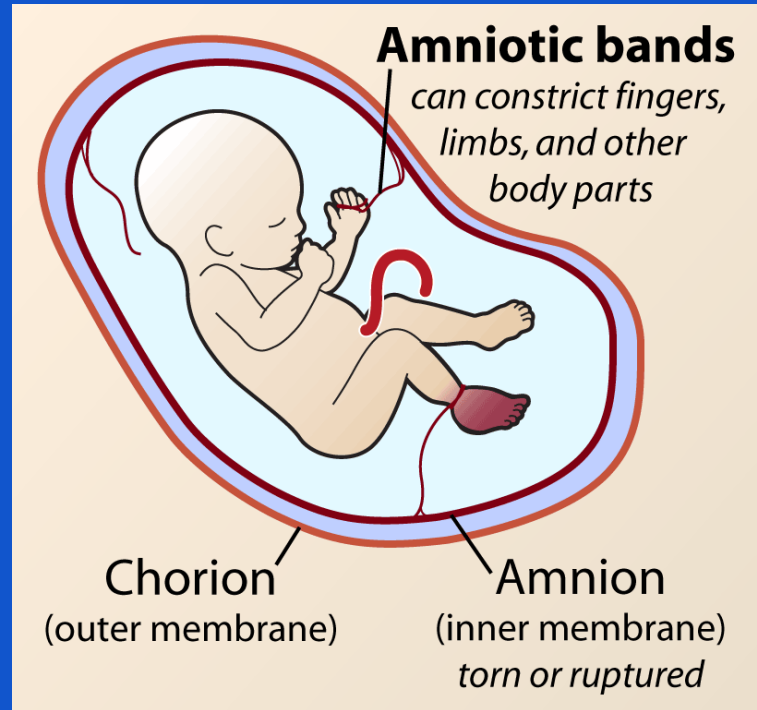


# Tissue Allograft: MiMedx

- Dehydrated for preservation
- Inhibits viability of microorganisms
- Retains biologic activity
- Easy storage and handling properties
- Once rehydrated, tissue matrix is bioactive

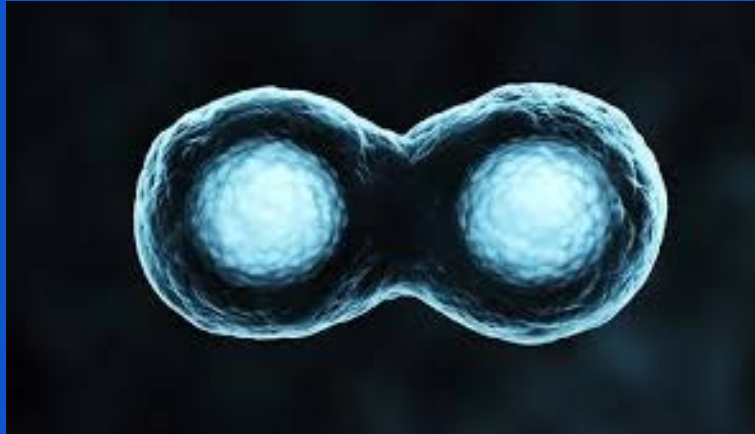
# Immunologically Privileged

- No host rejection → Low levels of Antigens
- Biological Barrier
- Modulates inflammation
- Decreases scar Formation
- Enhances soft tissue healing



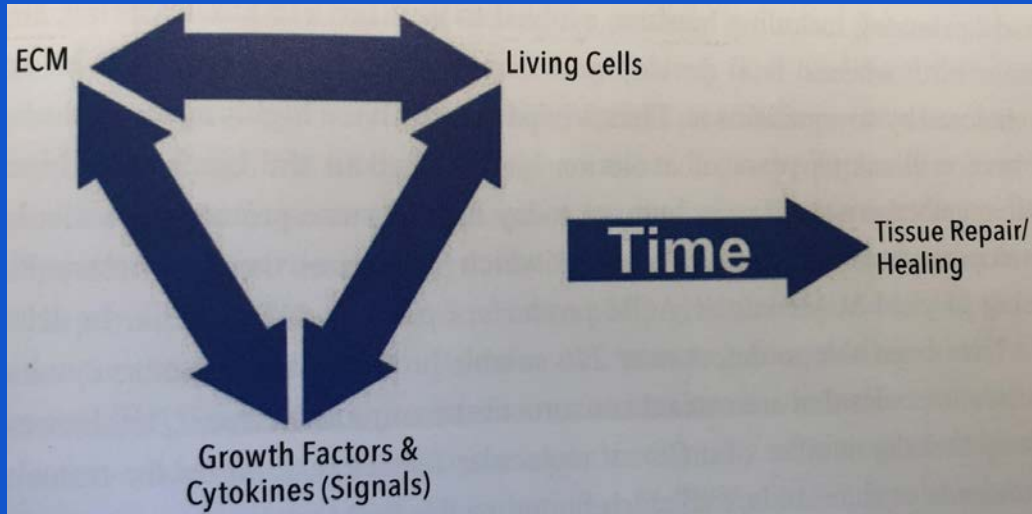
# Mesenchymal Stem Cells

- Self-renewing → dividing and replicating
- Embryonic stem cells → Pluripotent (i.e. no limitations)
- Can develop into any of the three germ layer types
- Differentiate and therefore valuable for tissue repair



# Human Amnion Chorion Membranes

- d-HACM: Dehydrated Human Amnion Chorion Membrane
- 226 Growth Factors, Cytokines, and Regulatory molecules which modulate healing identified
- All can influence cell behavior



# History

- Clinical applications for greater than one hundred years
- 1910: skin transplantation, 1960: burns and chronic wounds
- Three hundred articles for various indications
- Randomized studies show reduced scarring w/laminectomy
- Prostate surgery & craniotomy procedures





# Total Knee Arthroplasty Experience With Allograft Membrane

- Over 190 TKRs supported with amniotic membranes
- Over 125 with amniofix membranes
- 65 Patients with AmnioCord



# Empirical Findings

- Patients have increased ROM
- Decreased incidence of MUA 7/190
- Less pain leading to reduced narcotic need
- No serious post-op complications



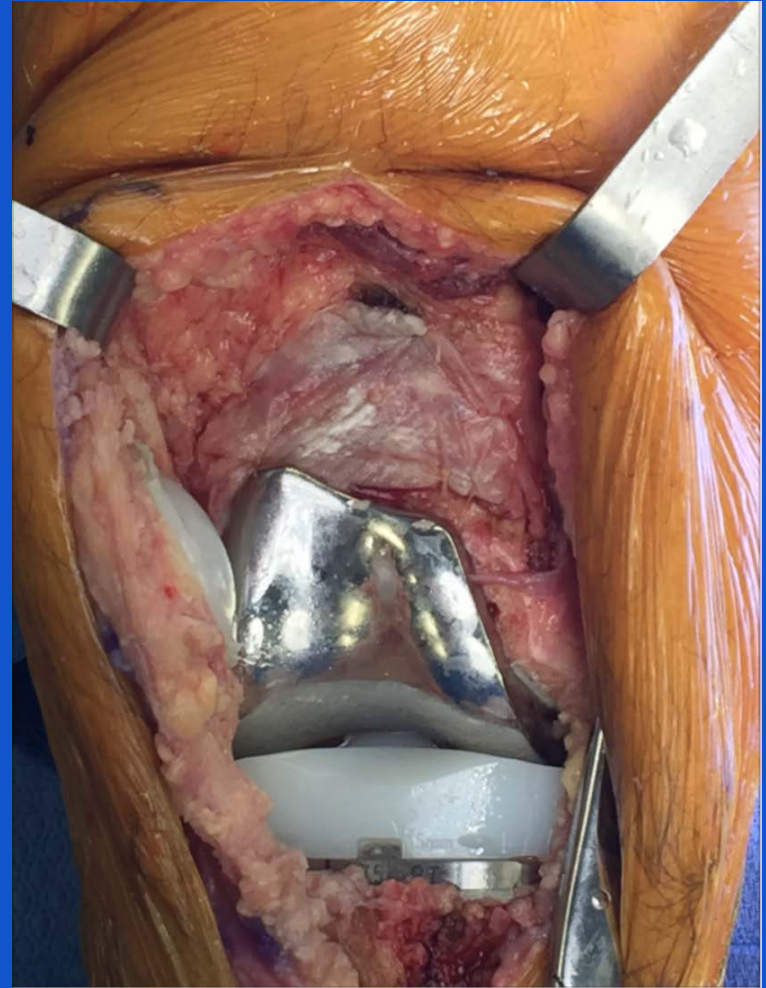
# Prospective Randomized Trial-Using dHACM in TKA

- One hundred patients for elective surgery
- 50/50 split with and without membrane usage
- Exclusion criteria include infection previous arthroplasty, severe medical morbidity

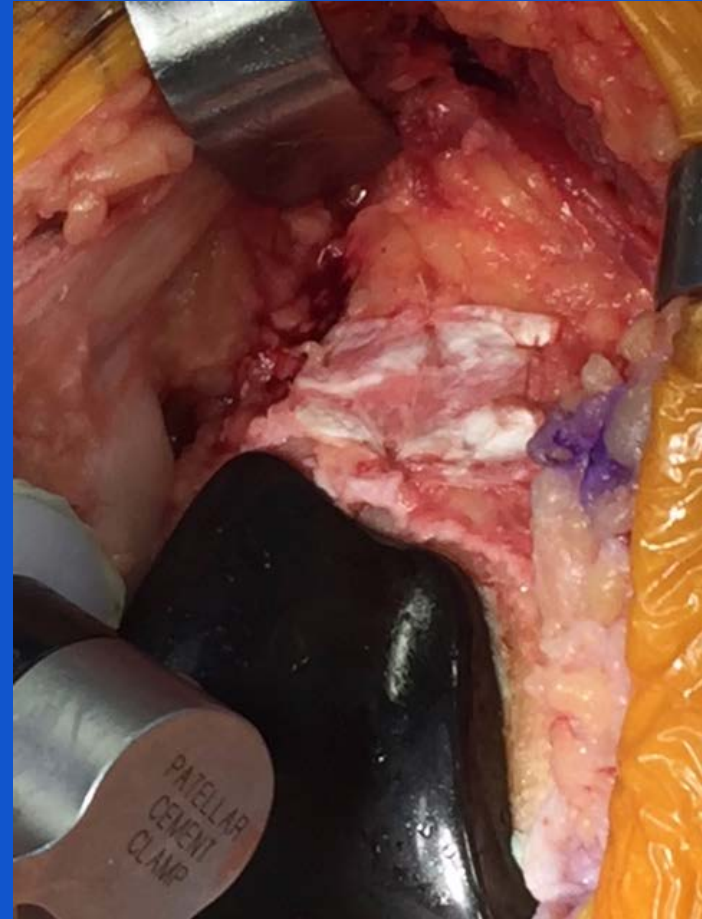


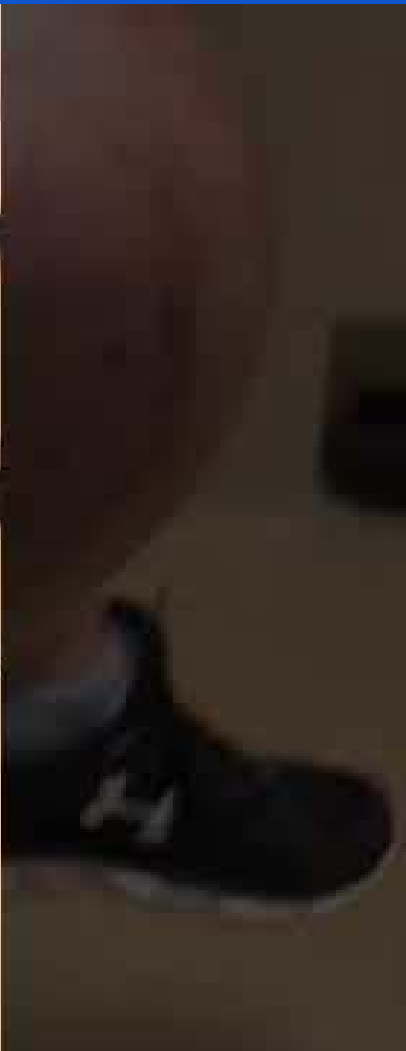
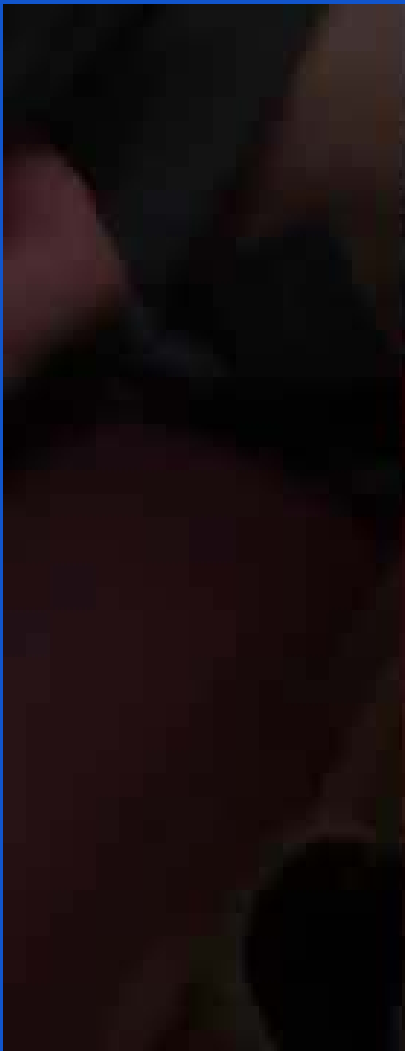
# Technique

- Allograft membrane sewn above femoral component
- Deep to quad muscle
- All knees drained
- Routine PT protocols



# Technique Continued:





# Conclusion

- Amniotic Tissue Allografts → Clinically Useful
- Reduce cost with abundance of donor tissues
- Ease of handling
- Immunologically privileged biologic
- Potential efficacy for other orthopaedic purposes

# Thank You

