

A woman in a light blue lab coat is pointing her right index finger at a large digital screen. The screen displays a microscopic image of cells, with a bright blue line highlighting a specific path. The woman is looking intently at the screen. The background is a dimly lit room with horizontal blinds.

# **AUTOLOGOUS STEM CELL THERAPY**

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**IMPLEMENTING BONE MARROW DERIVED STEM CELLS  
IN YOUR PRACTICE**

***Stem Genix Solutions LLC***

# AUTOLOGOUS STEM CELL THERAPY

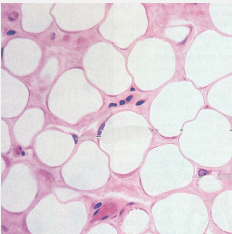
- Cell based therapy is giving your body the opportunity to heal itself, you healing you.
- Marrow Stem Cells are our body's natural repair mechanism when we sustain injuries to include wear and tear on our joints.
- Our body stores stem cells in our bone marrow, and calls them into action when an injury occurs. This process is called vasculogenesis.
- As we age our marrow still has stored stem cells, but in fewer numbers and we lose the ability to mobilize these cells as effectively to heal our injuries.
- Mechanically aspirating and transplanting marrow cells to a defect area exactly mimics and supplements your body's natural response to injury.

# FACTOR VS. CELL BASED THERAPIES



## **Factor Based Therapies:**

- PRP
- A2M
- Amniotic Fluid
- Umbilical Cord Blood



## **Cell Based Therapies:**

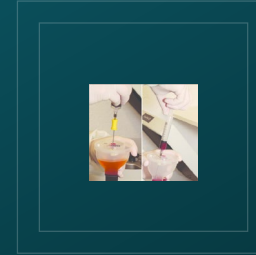
- Bone Marrow Derived MSC
- Adipose Derived MSC

# FACTOR BASED THERAPIES



## PRP

- PRP – whole blood biologic – inflammatory phase of healing cascade.
- In a stalled, partially healed situation, may start a new healing cascade by creating a corresponding vasculogenic response marrow cells to complete the healing cascade.
- PRP may be a good strategy for healthy older patients with minor defects or younger patients.



## Cord Blood /Amniotic Fluid

- Cells from cord blood have an HLA (immune profile).
- Transplantation of cells with an immune profile, with no immune conditioning results in an inflammatory response and rejection.
- Not all patients have a marrow match.
- Placental matrix tissue has growth factors and collagen can be helpful when combined with other biologics.

# ADIPOSE VS MARROW

- The number of nucleated cells that are isolated from enzyme digested fat is approximately 650 thousand per cc compared to approximately 37 million cells per cc from a marrow aspirate (marrow cellution).
- The surface markers and general type of cell found in enzyme digested fat is also present in marrow.
- Taking into account the plasticity of CD34+ cells to convert down a MSC lineage both in-vitro and in-vivo, there is significantly more of every type of cell (including MSC) in a marrow aspirate than a fat aspirate.
- This is manipulated by both enzymatic digestion and centrifugation and is not indicated for orthopedic procedures except as a fat graft in conjunction with PRP.

# BMA

- Through cytokine release and cell to cell contact, bone marrow stem cells orchestrate the transition from inflammation to proliferation and remodeling in the healing cascade.
- It targets the inflammatory phase of the healing cascade.
- Bone marrow cells naturally mobilize to the defect site to repair tissue.
- Bone marrow cells naturally thrive and function in hypoxic conditions, the conditions of damaged tissue.
- Bone Marrow MSC's and supporting cells are a corner stone of practice because their natural role is to hone and repair.
- Use marrow to treat orthopedic indications.



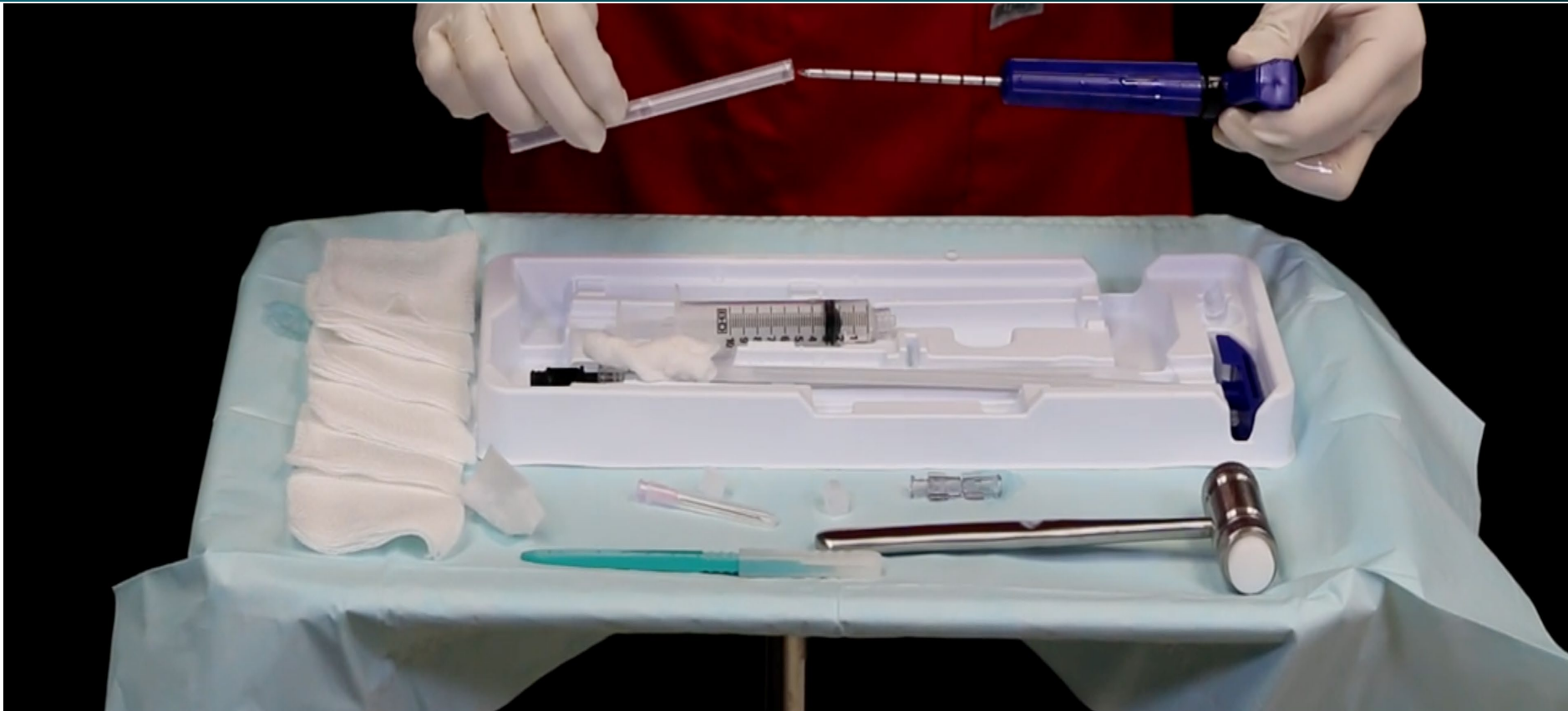
# OBTAINING CELLS FROM BONE MARROW

## Traditional Trocar

- Traditional method is to aspirate from the distal which collects a high level of peripheral blood requiring filtration and centrifugation.
- Centrifuge systems work by removing lower density plasma and higher density cells; the cells discarded have been shown to be rich in stem cells.
- Traditionally this requires aspiration from several sites, upwards of 60cc draws.
- **WARNING:** Many office clinics that perform these centrifuge based procedures do not use FDA cleared devices and can represent a safety risk to patients for disease transmission. For example Regenxx sites.

# OBTAINING YOUR STEM CELLS

## Bone Marrow Aspiration





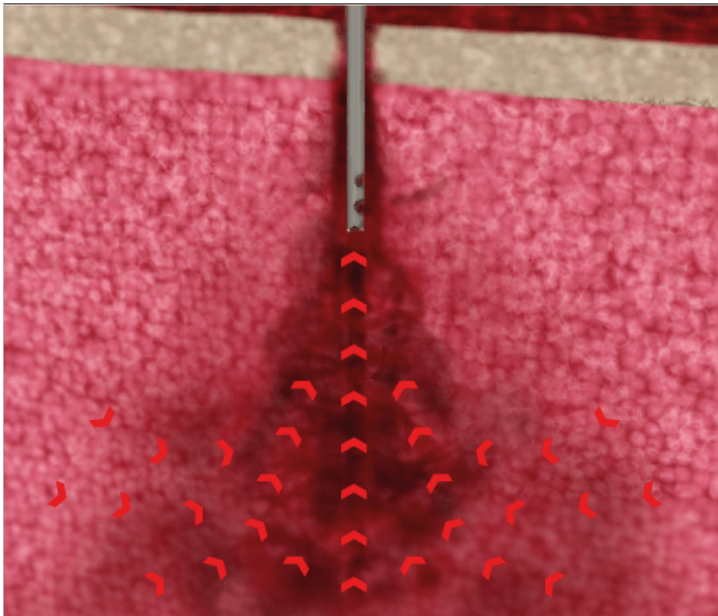
# MARROW CELLUTION™ & AN INTACT BONE MATRIX

## Obtaining Your Stem Cells

- Aspiration technique is important.
- The pockets in the bone hold only so much bone marrow so taking larger volumes extracts peripheral blood verses marrow blood.
- Also, the needle hole itself causes the blood infiltration.
- MC system starts distal in the ileum and works proximal only aspirating from the side.
- Aspirate to Application without Centrifugation.

# TRADITIONAL TROCAR VS MARROW CELLUTION™

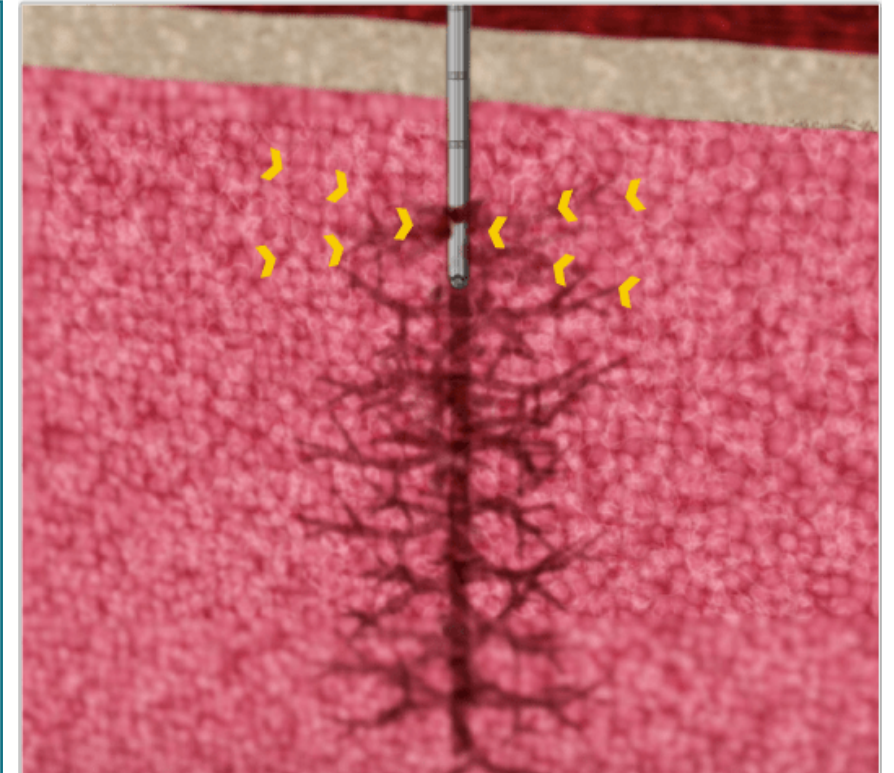
## Traditional Trocar



- Mostly Peripheral Blood
- Needs to be Centrifuged
- Few Regenerative Cells Remain
- Typically Requires Multiple (up to 6) Points of Entry



## Marrow Cellution™



- Class 2 FDA Cleared, Patent Pending Device
- Single Point Entry
- Threaded Handle Precisely Repositions within the Marrow Space from Multiple Geographies
- Mostly Bone Marrow with Unique designed Side Ports
- No Need to Centrifuge
- Never leaves the Sterile Field
- Higher CFU-f count
- Regenerative Cells Remain



Heparin Flush: rinse all kit components with heparin (2,000 Units/ml)



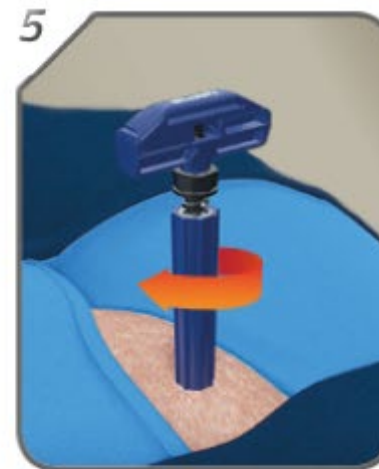
Insert Introducer Needle with Sharp Stylet just past cortex into medullary space  
*Ensure longitudinal orientation*



- Remove Sharp Stylet
- Attach Syringe
- Aspirate 1ml marrow to ensure proper positioning of needle tip



- Remove Syringe
- Insert & lock Blunt Stylet
- Continue to advance Introducer Needle to desired depth



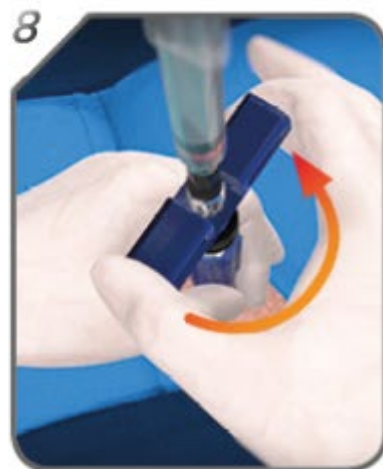
Rotate Guide Grip to skin level



- Remove Blunt Stylet
- Insert and secure Aspiration Cannula



- Attach Syringe
- Aspirate 1ml marrow



Hold Guide Grip and rotate Handle 360° counter-clockwise



Aspirate 1ml marrow



- Repeat steps 8 & 9 as needed
- Reassemble for additional puncture (if required)



# CFU-f and TNC Count Using a Traditional Needle

## Sample size of 161 with different volumes, techniques, and syringe sizes

- Regardless of technique, stem cell count is low and peripheral blood contamination is high when drawing greater than 1 mL with a traditional needle.
- Quality centrifuge systems typically concentrate 4 to 5 times so about 1,110 CFU-f per ml.
- All published literature using a traditional needle points to lower CFU-f counts compared to Marrow Cellution, regardless of centrifugation. The issue is the aspirate, NOT the centrifuge.

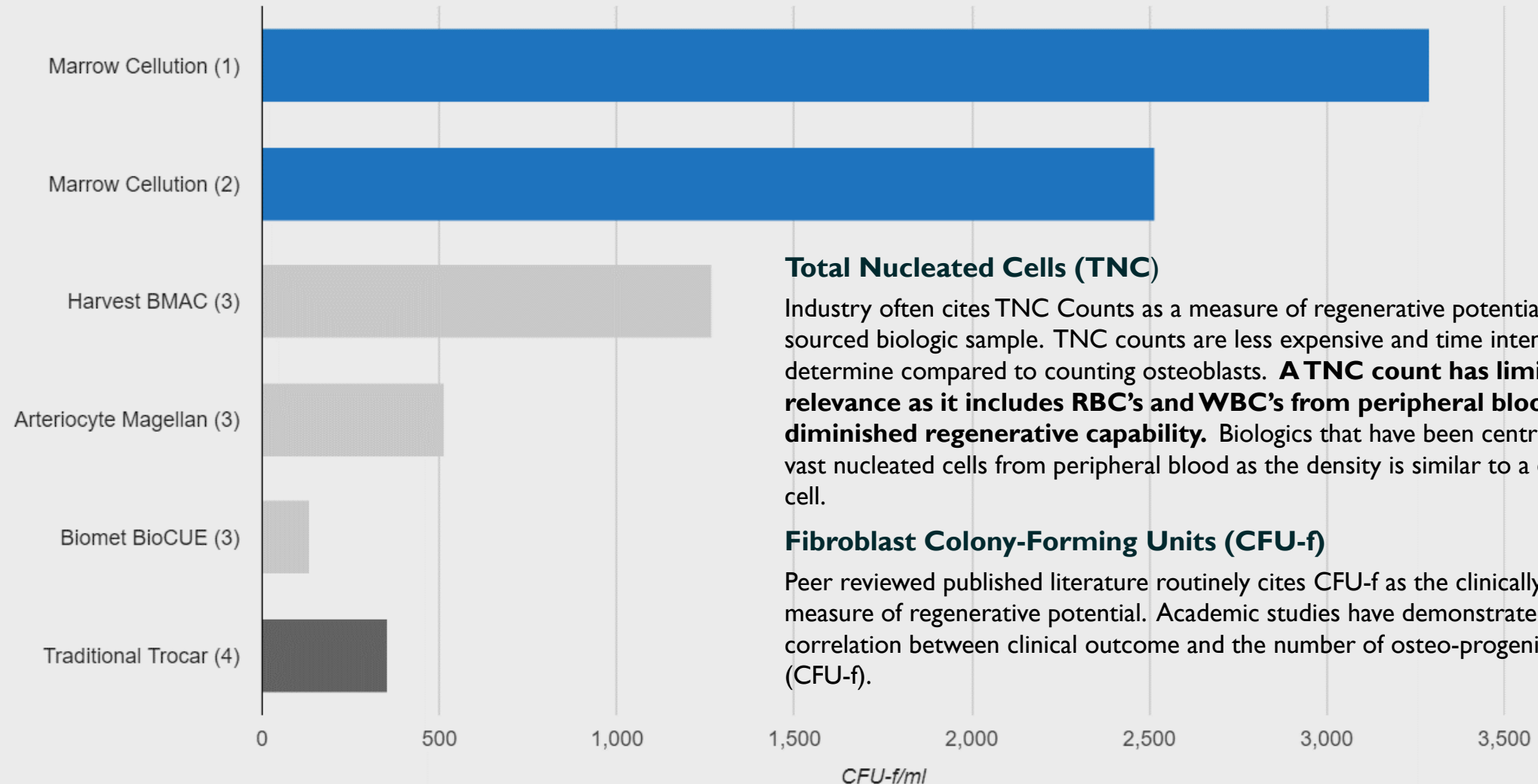
Author	Device	Sample Size	Aspirate Volume	TNC Millions	Syringe size	# of Punctures	CFU-f / mL
Muschler ref 1	Legacy Aspiration Needle	21	8	16.95	10cc	4	356
Hernigou ref 2	Legacy Aspiration Needle	30	10	20.2	10cc	1	376
Hernigou ref 2	Legacy Aspiration Needle	30	10	8.6	50cc	1	95
Hegde ref 3	Legacy Aspiration Needle	20	60	18.62	30 vac - lok	2	205
Hegde ref 3	Legacy Aspiration Needle	20	60	17.77	30 BD	2	95
Hegde ref 3	Legacy Aspiration Needle	20	60	16.62	30 vac - lok	2	303
Hegde ref 3	Legacy Aspiration Needle	20	60	15.49	30 vac - lok	2	223
Total		161		16.08 **			237 **

\*\* Weighted average for the series of 161

- (1) McLain R. et al Aspiration of Osteoprogenitor Cells for Augmenting Spinal Fusion: Comparison of Progenitor Cell Concentrations From the Vertebral Body and Iliac Crest. *Dev*; 87(12): 2655- 2661 J Bone Joint Surg Am. 2005
- (2) Hernigou. P et al "Benefits of small volume and small syringe for bone marrow aspirations of mesenchymal stem cells" *Int Orthop* 2013 Nov;37 (11): 2279-87
- (3) Vishal Hegde MD et al; "Title: A prospective comparison of three approved systems for autologous bone marrow concentration demonstrated non-equivalency in progenitor cell number and concentration." *Journal of Orthopaedic Trauma* Publish Ahead of Print

# COMPETITIVE PERFORMANCE

## Marrow Cellution™ vs. Centrifuge Systems & Traditional Needle



### Total Nucleated Cells (TNC)

Industry often cites TNC Counts as a measure of regenerative potential of a marrow-sourced biologic sample. TNC counts are less expensive and time intensive to determine compared to counting osteoblasts. **A TNC count has limited clinical relevance as it includes RBC's and WBC's from peripheral blood with diminished regenerative capability.** Biologics that have been centrifuged contain vast nucleated cells from peripheral blood as the density is similar to a quiescent stem cell.

### Fibroblast Colony-Forming Units (CFU-f)

Peer reviewed published literature routinely cites CFU-f as the clinically relevant measure of regenerative potential. Academic studies have demonstrated a direct correlation between clinical outcome and the number of osteo-progenitor stem cells (CFU-f).

# BONE MARROW DERIVED MSC'S

## Sports Medicine

- Repairs damaged tissue
- Prevents further progression of OA
- Creates a regenerative environment
- Marrow cells secrete growth factors cytokines and chemokines
- MSC's contained in marrow have regenerative, anti-inflammatory and immunomodulatory properties
- MSC also play an additional role in regenerative signaling



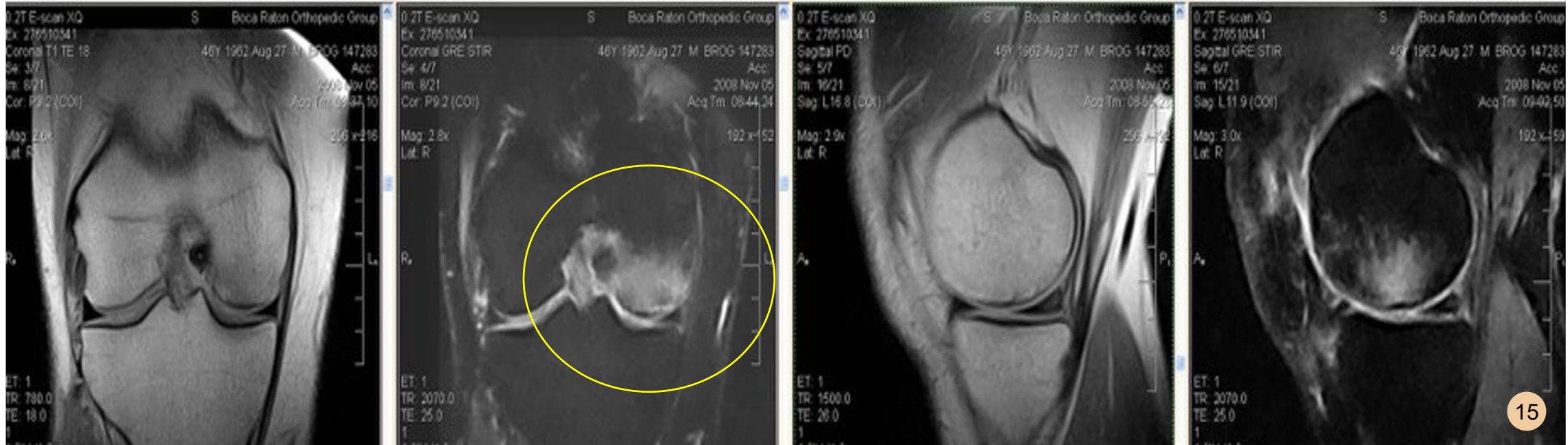
# COMPLETE RESOLUTION OF AVN BEFORE AND AFTER MC

Time lapsed is 2 years

After



Before



# BONE MARROW DERIVED MSC'S

## A Tale of Two Papers



### Upper Extremity Surgery

- <https://www.ncbi.nlm.nih.gov/pubmed/24913770>
- Biologic augmentation of rotator cuff repair with MSC's during arthroscopy improves healing and prevents further tears
- Sample size of 45 single row RCR vs control of 45 no biologic
- 100% of the 45 pt. with BMA healed at 6 months vs. 67%
- It also prevented further ruptures within the next 10 years
- 10 years post surgery 87% of BMA group were still intact via MRI vs 44% in the control group
- Significant improvement in healing outcomes can be achieved using BMA to aide in RCR



### TKA VS Stem Cell Therapy

- <https://link.springer.com/article/10.1007/s00264-018-3916-9>
- 12 year Prospective RCT, 60 knees, 30 patients
- Increased risk with TKA - thrombophlebitis TKA (15%), BMA (0%)
- Recurrent procedures - 6 of 30 knees needed repeat surgical procedures, 1 cell based therapy procedure progressed to surgery
- Post operative knee scores were improved or equal to TKA

*Important note, average age of patient is 70*

# MARROW CELLUTION™

Benefits – High Concentration of Stem Cells Ready to Use in Office in Less Than 10 Minutes



## INNOVATIVE

- Reduces Peripheral Blood Contamination
- Closed-end Aspiration Design
- Cannula via Sheath Technology
- Lateral vs. Distal Collect



## EFFICIENT

- Never Leaves Sterile Field
- Higher CFU-f Counts per mL
- Aspirate to Application without Centrifugation
- No Additional Steps- Time reduced up to 50%
- Single Puncture—Multiple Aspirations



## TARGETED

- Low Volume—High Yield & Quality
- Minimally Invasive
- FDA Regulatory Compliant
- Minimal patient discomfort during harvesting

# STRATEGIC PARTNER - STEM GENIX SOLUTIONS



- Clinical staff offers in office hands on training for all providers and staff, cases to be done on 3 – 5 live patients.
- Identifying the PSIS using both US and C Arm.
- How to adequately target and anesthetize the PSIS.
- Expert product training to ensure highest CFU-f cell counts possible for that patient.
- COMT Patient Outcome software to track Maximum Medical Improvement.
- Certificate of product competency following training and minimum of 3 cases performed.
- For follow up questions and to arrange a training, please contact:  
Name: Katherine.Molinaro@StemGenixSolutions.com

# THANK YOU

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Chief Commercial Officer

