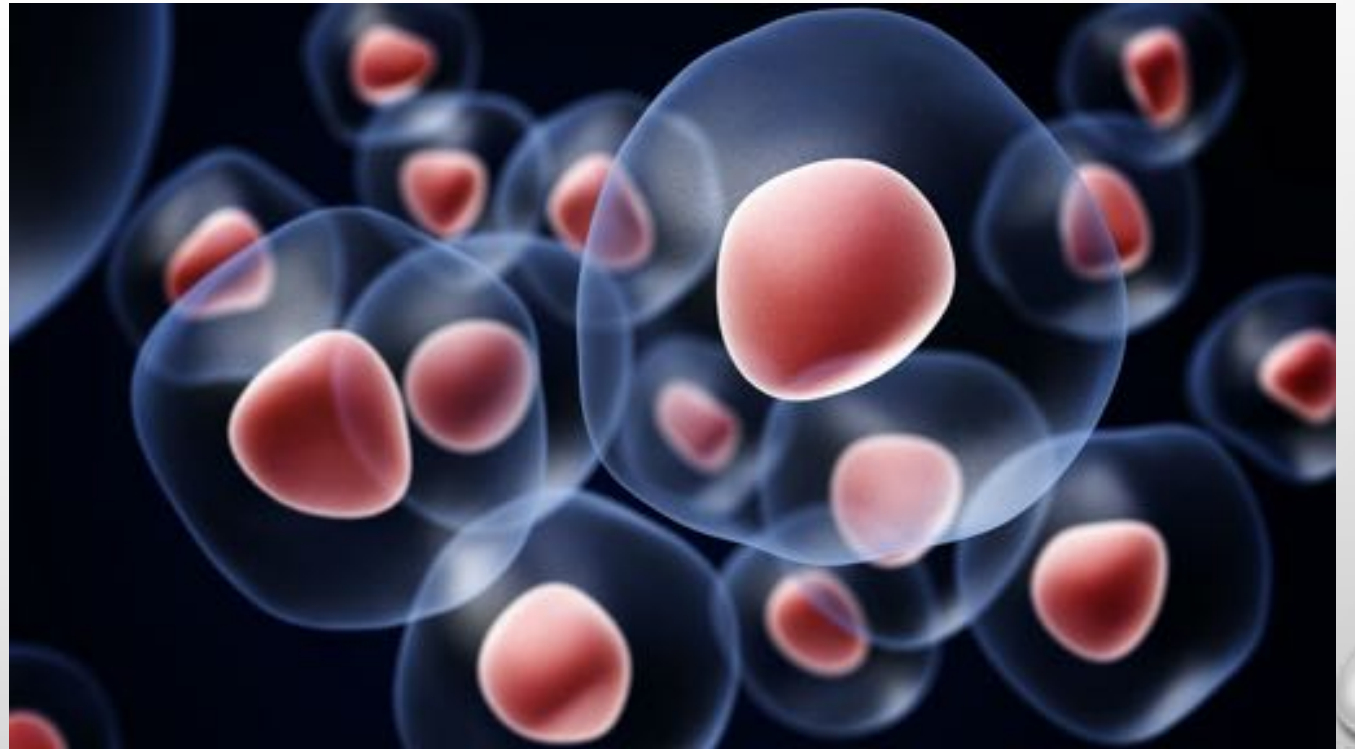



STEM CELL THERAPIES FOR MUSCULOSKELETAL PAIN

- MATTHEW MCAULIFFE, MD
- MCAULIFFEMD@PROTONMAIL.COM
- PEOPLE UNLIMITED 12/30/2019





DARN IT, THORTON!
YOU LEFT THE STEM CELLS
SITTING OUT TOO LONG!
NOW THEY'RE NO GOOD!!

Glenn
McCoy

OUTLINE OF WHAT THIS IS

TRADITIONAL TREATMENT OPTIONS

STEM CELL THERAPY

WHAT IS IT, HOW IT WORKS, SOME OF DIFFERENT
OPTIONS AVAILABLE

SOME OF THE EVIDENCE AVAILABLE – IMPOSSIBLE TO
BE COMPREHENSIVE IN A SHORT AMOUNT OF TIME

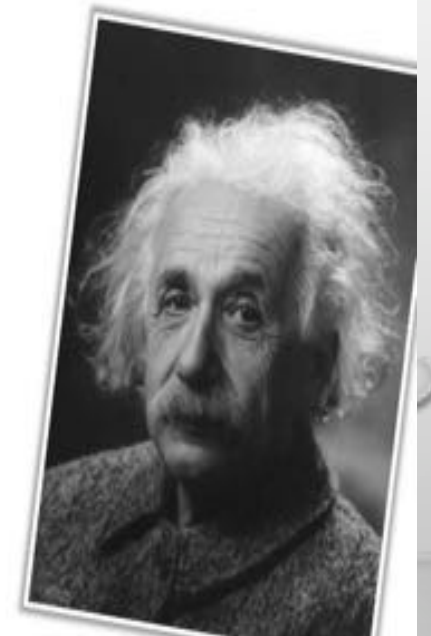
CASE EXAMPLE

WHAT THIS IS NOT

- A COMPREHENSIVE EVALUATION OF ALL POSSIBLE STEM CELL THERAPIES AND TYPES
- A DISCUSSION OF IV STEM CELL OPTIONS
 - MOSTLY FOR NON-ORTHOPEDIC CONDITIONS
 - IV THERAPIES ASSUME GOOD BLOOD SUPPLY
 - ORTHOPEDIC CONDITIONS TYPICALLY DON'T HAVE GOOD BLOOD SUPPLY AND PRONE TO INJURY
 - BE WARY OF THOSE THAT WANT TO MAKE IT SEEM SIMPLER THAN IT IS

Everything should be made as simple as possible, **but not one bit simpler**

Albert Einstein



TRADITIONAL TREATMENT OPTIONS

- PHYSICAL THERAPY
- ANTI-INFLAMMATORY MEDICATIONS/OTHER PAIN MEDICATIONS
- CHIROPRACTOR/ACUPUNCTURE
- CORTISONE INJECTIONS
- SURGERY

TRADITIONAL TREATMENT OPTIONS

- STEROID INJECTIONS HAVE SOME DEGREE OF TOXIC EFFECTS ON CARTILAGE AND TENDON CAUSING ATROPHY
 - RCT TENNIS ELBOW SHOWED ONE YEAR PEOPLE WITH CORTISONE DID WORSE (MALANGA 2010)
- NSAIDS TOXIC EFFECTS – IN VITRO STUDIES SHOW TISSUE ATROPHY OF TENDON, CARTILAGE TISSUE
- 30% OF PEOPLE WHO UNDERGO TOTAL KNEE REPLACEMENT STILL HAVE PAIN AFTERWARDS
 - SIMILAR FINDINGS WITH HIP REPLACEMENT

SCOPE OF THE PROBLEM

- 574 MILLION PHYSICIAN VISITS PER YEAR FOR MUSCULOSKELETAL RELATED INJURIES/DEGENERATIVE DISEASES SUCH AS ARTHRITIS
- DIRECT TREATMENT COST OF 200 BILLION – NOT COUNTING OPPORTUNITY COST (TIME LOST AT WORK/PRODUCTIVITY)

SCOPE OF THE PROBLEM

- 230,000 TOTAL HIP REPLACEMENTS AND 475,000 TOTAL KNEE REPLACEMENTS DONE ANNUALLY IN USA
- AROUND 7 MILLION AMERICANS LIVING WITH A KNEE OR HIP JOINT REPLACEMENT

THE SHIFT TOWARDS BIOLOGIC THERAPIES

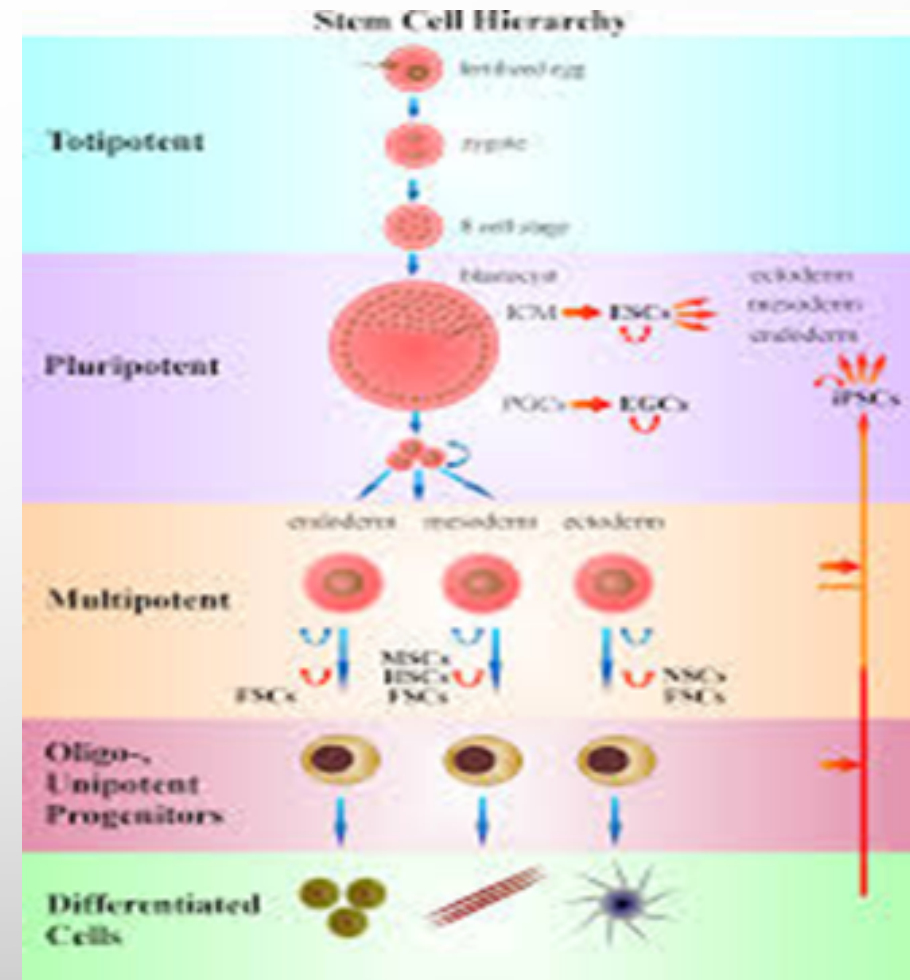
- ACTIVE SEARCH FOR ALTERNATIVE LESS INVASIVE TREATMENT OPTIONS THAN SURGERY.
- QUESTIONS:
 - CAN WE TREAT AND HEAL MUSCULOSKELETAL PAIN AS OPPOSED TO JUST MASKING THE SYMPTOMS?
 - CAN WE REPAIR TISSUES THAT ARE TOO DAMAGED TO HEAL ON THEIR OWN?
 - CAN WE AMPLIFY THE BODY'S HEALING RESPONSE TO DAMAGED TISSUE?

CAN WE PREVENT THIS?



WHAT ARE STEM CELLS?

- STEM CELLS HAVE THE ABILITY TO DIFFERENTIATE INTO DIFFERENT MORE MATURE CELL TISSUES DEPENDING ON THE ENVIRONMENT THEY ARE IN
- MESENCHYMAL STEM CELLS HAVE THE ABILITY TO DIFFERENTIATE INTO TENDON, LIGAMENT, MUSCLE, CARTILAGE, BONE TISSUE – TERM CAME FROM ARNOLD CAPLAN



WHAT ARE STEM CELLS?

- THE REGENERATIVE POTENTIAL OF CELLS, PLASMA BIOMOLECULES TO TRIGGER AND ENHANCE THE NATURAL IN VIVO TISSUE MORPHOGENESIS AND REGENERATIVE CAPACITY OF DAMAGED TISSUES

WHAT ARE STEM CELLS?

IT IS THE BEGINNING OF A REVOLUTION IN MEDICINE

MY PREDICTION ORTHOBIOLOGIC THERAPIES SUCH AS STEM CELLS OR WHATEVER IS NEXT ON THE HORIZON, IS GOING TO DO TO ORTHOPEDIC SURGERY WHAT INTERVENTIONAL CARDIOLOGY DID TO CT SURGERY – MAKE THE BULK OF THE PROCEDURES OBSOLETE REPLACED BY ULTRA-MINIMALLY INVASIVE PROCEDURES PERFORMED UNDER IMAGE GUIDANCE



WHAT ARE STEM CELLS?

DIFFERENT TYPES OF CELL THERAPY

PLATELET RICH PLASMA

BONE MARROW ASPIRATE (BMAC)

LIPOASPIRATE (FAT TISSUE)

AMNIOTIC TISSUE DERIVED CELL PRODUCTS

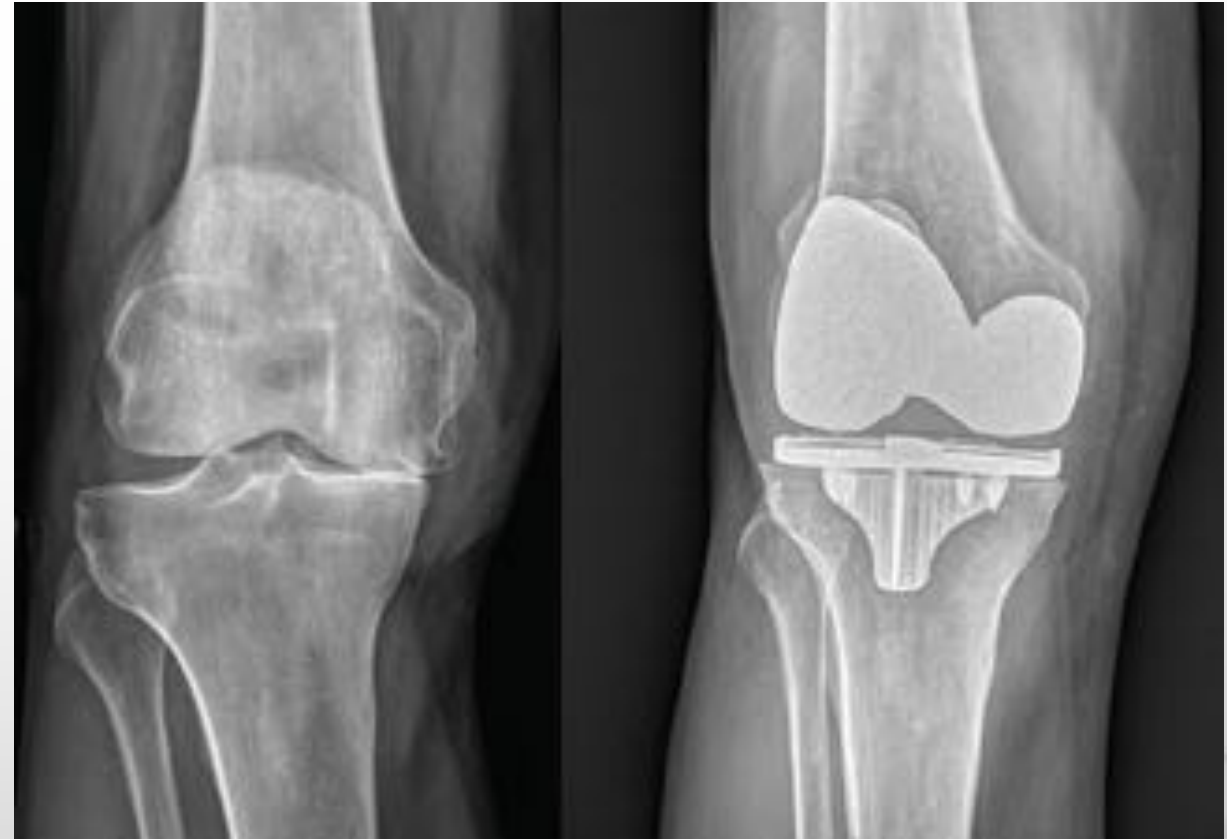


WHAT ARE STEM CELLS?



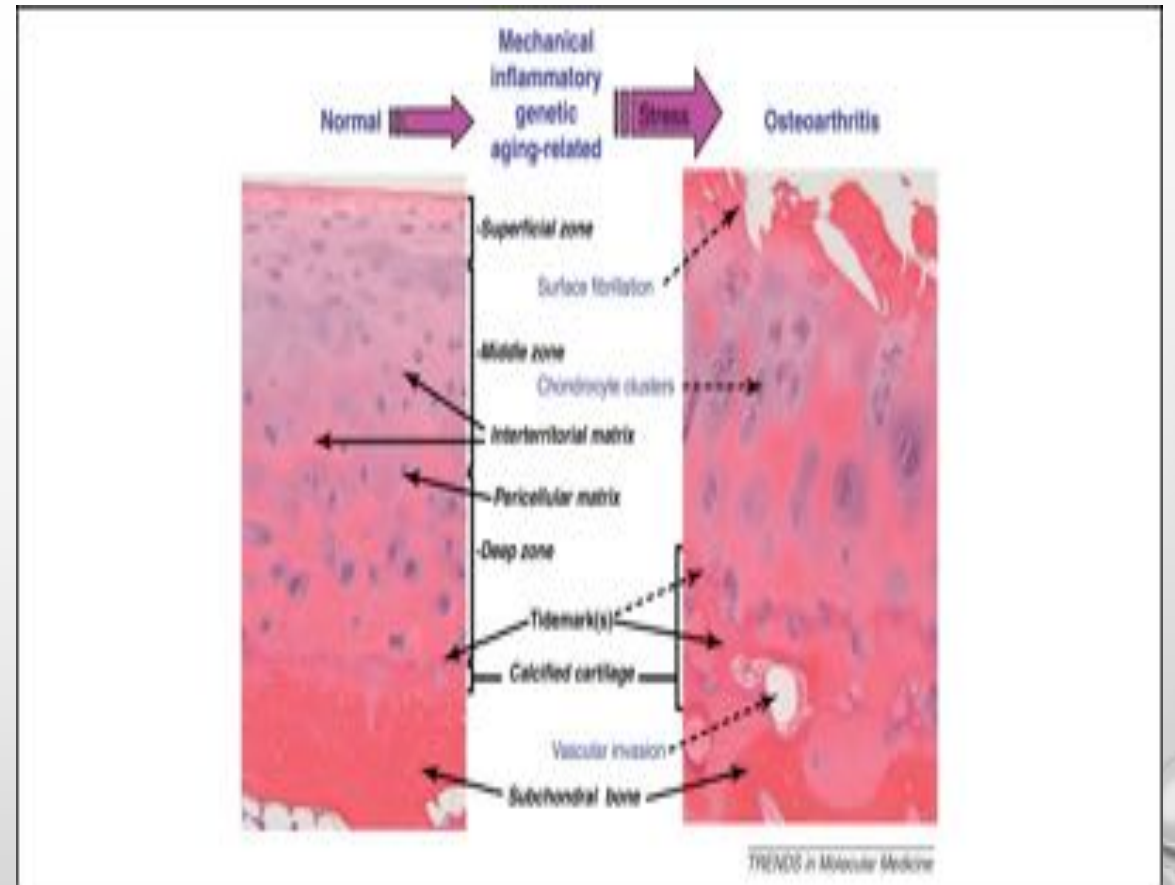
KNEE OSTEOARTHRITIS

- 59-YEAR-OLD FEMALE PRESENTS WITH A 2-MONTH HISTORY WITH PAIN LOCATED IN DEEP IN KNEE
- TIME FOR KNEE REPLACEMENT?

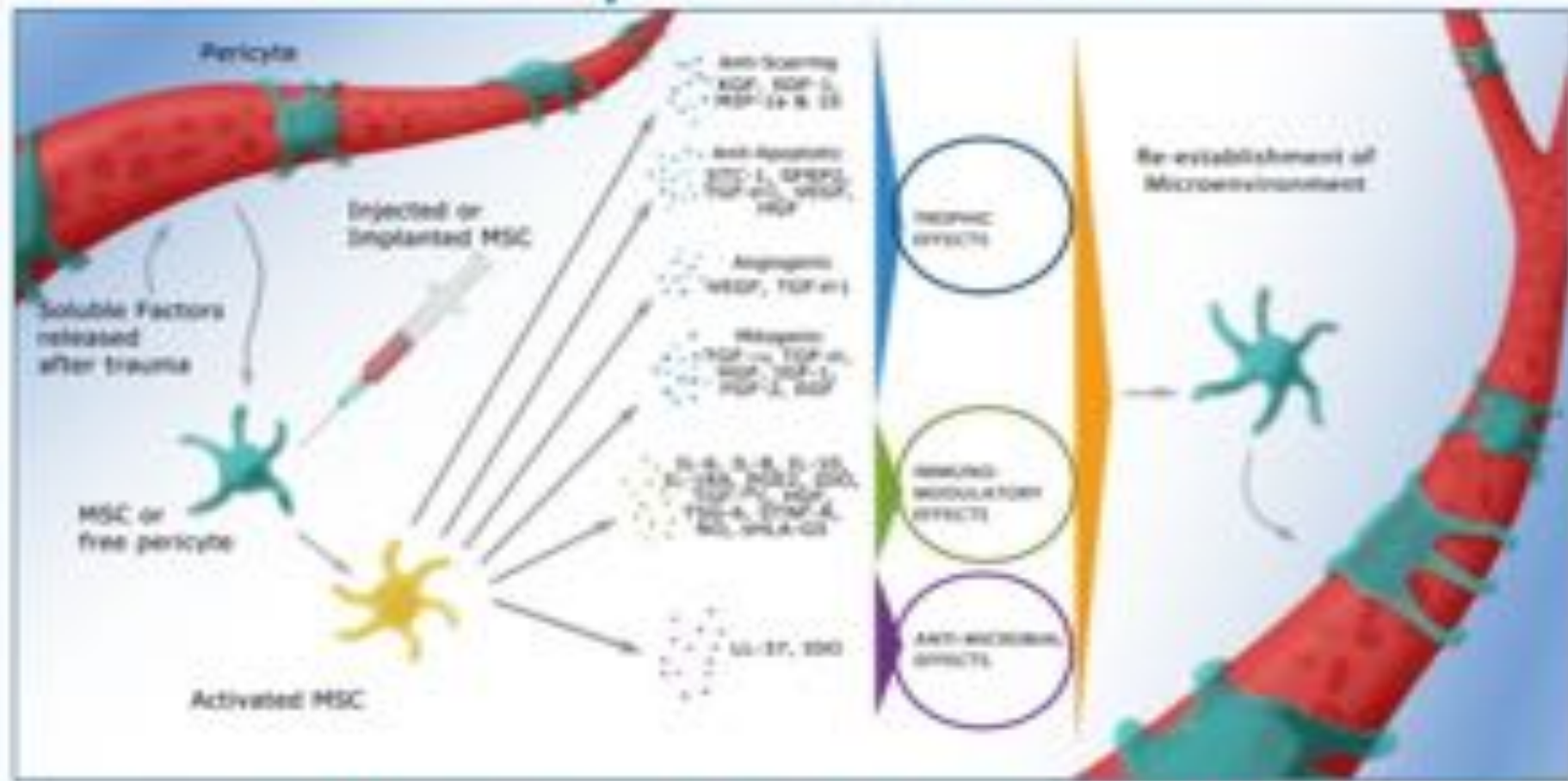


OSTEOARTHRITIS

- ESSENTIALLY THE WEARING OUT OF THE LINING (CARTILAGE) OF THE JOINT OVER TIME
- COMPLEX PATHOLOGY – MULTIFACTORIAL OF BOTH INTRINSIC CAUSE (GENETICS) AND EXTRINSIC CAUSES (HISTORY OF INJURY)
- CARTILAGE IS LARGELY AVASCULAR AND HAS A LOW HEALING CAPACITY



Chang's hypothesis of pericytes, MSCs and repair mechanism



All MSCs are pericytes...but all pericytes are not MSCs....



WHAT ARE STEM CELLS?

DIFFERENT TYPES OF CELL THERAPY

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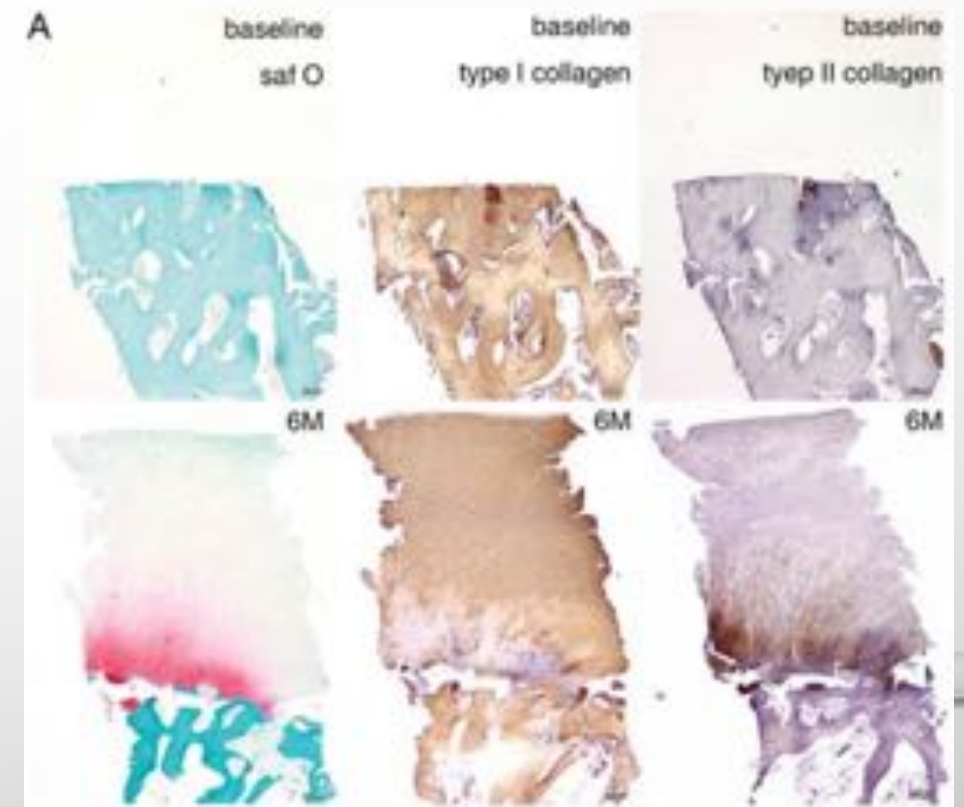


EFFECTIVENESS OF STEM CELL THERAPY

- JO ET AL SHOWED BENEFIT IN TERMS OF PAIN AND FUNCTION AND CARTILAGE WAS SHOWN TO BEEN REGROWN ON HISTOLOGIC STUDIES IN 6 PATIENTS AT 6 MONTHS

FOLLOW HIGH DOSE MSC INJECTIONS 10^8

NO ADVERSE EVENTS REPORTED



C.H. Jo, Y.G. Lee, W.H. Shin, H. Kim, J.W. Chai, E.C. Jeong, et al.
Intra-articular injection of mesenchymal stem cells for the treatment of osteoarthritis of the knee: a proof-of-concept clinical trial
Stem Cells, 325 (2014), pp. 1254-1266

EFFECTIVENESS OF STEM CELL

- VANGSNESS ET AL SHOWED 15% INCREASE IN MENISCUS VOLUME FOLLOWING PARTIAL MENISCECTOMY AND BMAC INJECTION IN RCT OF 60 PATIENTS USING SALINE AS A CONTROL AT 6 MONTHS SEEN ON MRI
- EVIDENCE OF ACTUAL REGENERATION



Vangsness et al. Adult human mesenchymal stem cells delivered via intra-articular injection to the knee following partial medial meniscectomy: a randomized, double-blind, controlled study. J Bone Joint Surg Am. 2014 Jan

EFFECTIVENESS OF STEM CELL TREATMENTS

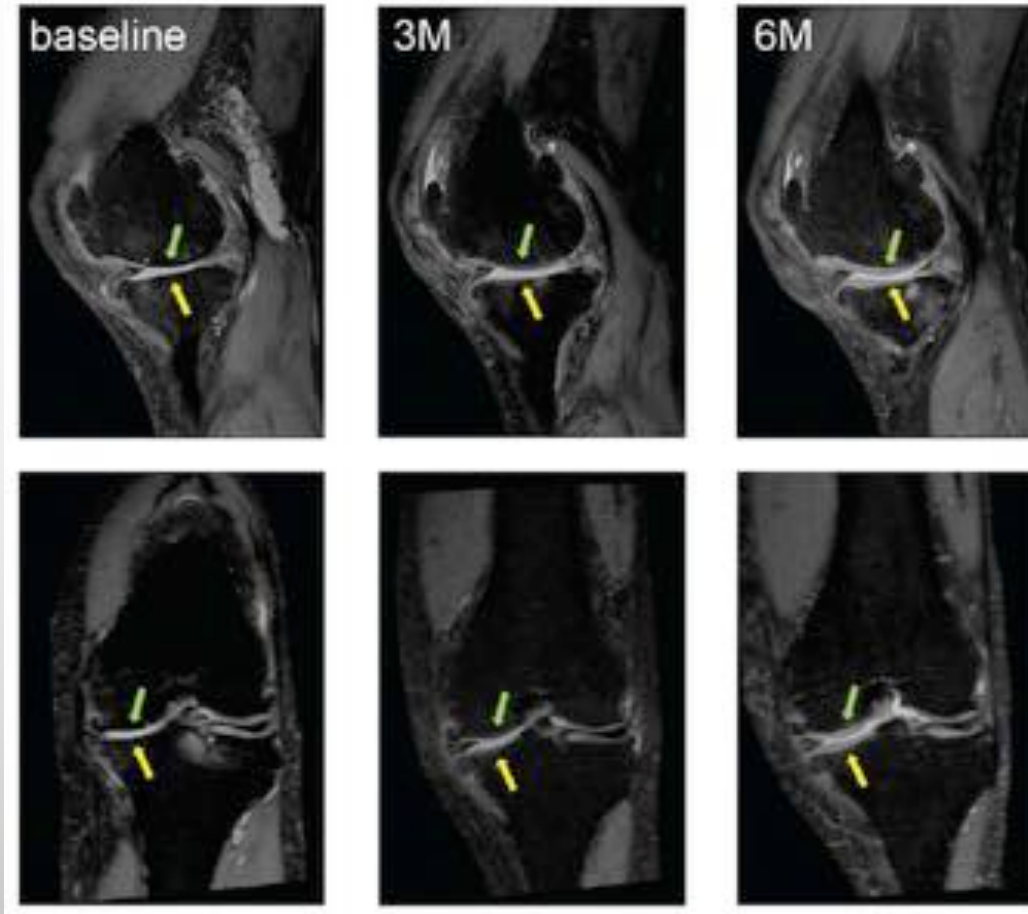
Intra-articular Injection of Mesenchymal Stem Cells for the Treatment of Osteoarthritis of the Knee

A 2-Year Follow-up Study

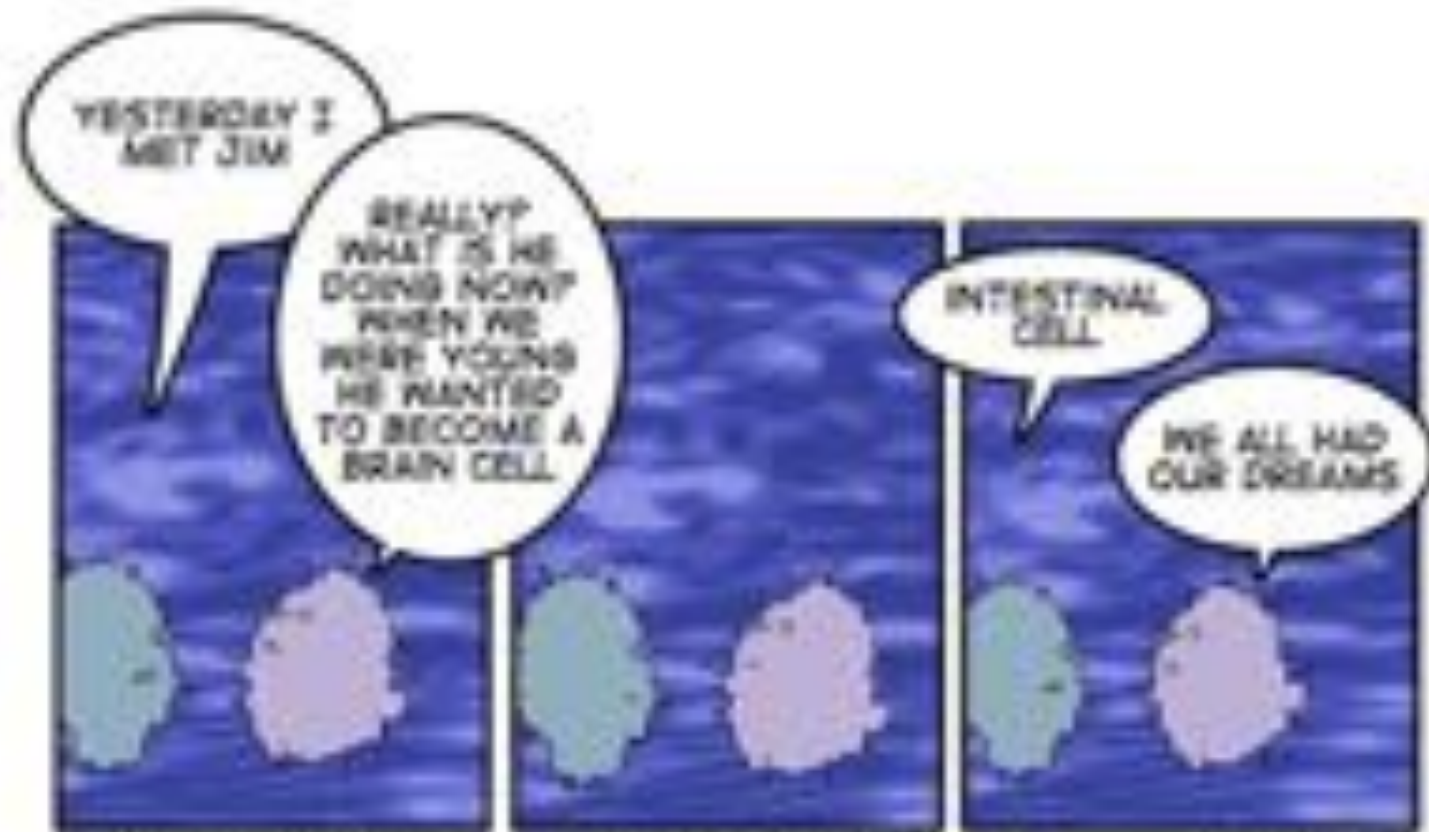
Chris Hyunchul Jo,^{*} MD, Jee Won Chai,[†] MD, Eui Cheol Jeong,[‡] MD, Sohee Oh,[§] PhD, Ji Sun Shin,^{*} BS, Hackjoon Shim,^{||} PhD, and Kang Sup Yoon,^{**} MD
Investigation performed at the Seoul Metropolitan Government–Seoul National University Boramae Medical Center, Seoul National University College of Medicine, Seoul, Republic of Korea

- 1X108 ADSCS
- OPEN HARVEST
- N=18 PATIENTS
- **RESULTS:**
- WOMAC: 49.9 → 30.3
- LYSHOLM: 40.1 → 73.4

EFFECTIVENESS OF STEM CELL TREATMENTS



QUESTIONS?

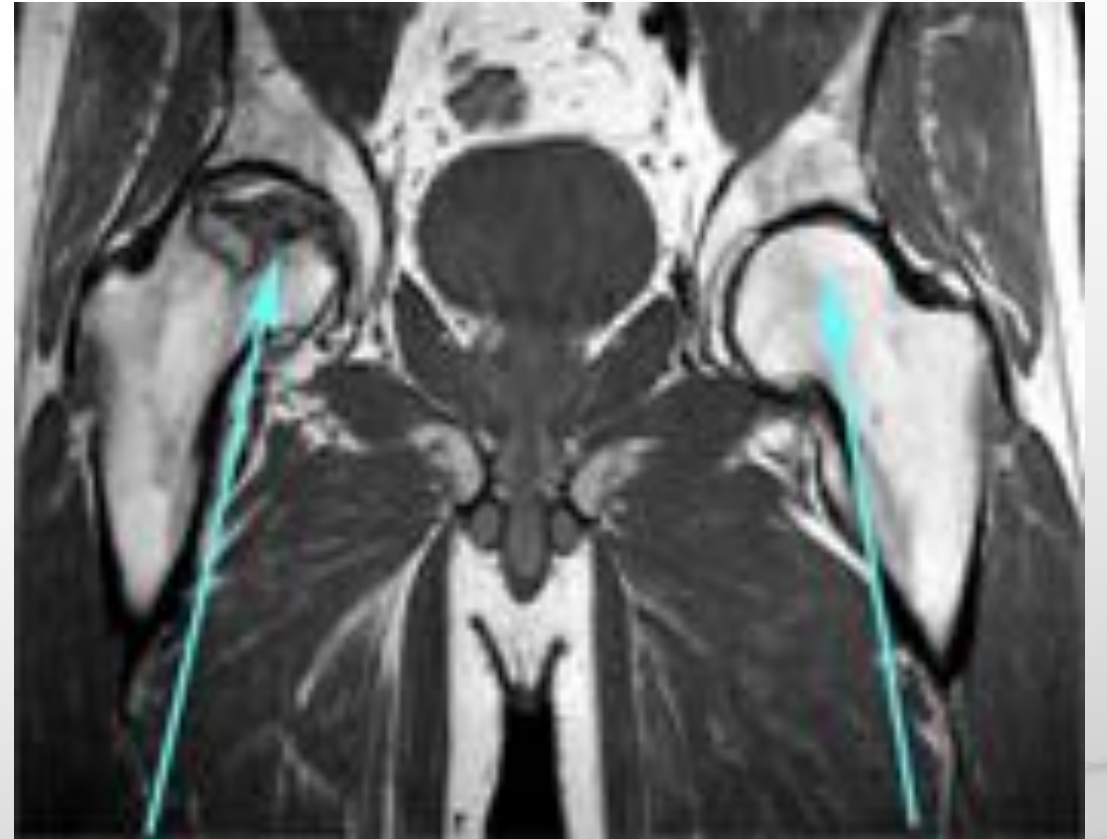


SMALL TALK OF TWO STEM CELLS

gust and pods

AVASCULAR NECROSIS OF THE HIP

- CAUSED BY LACK OF BLOOD SUPPLY TO THE BONE, WHERE THE TISSUE EVENTUALLY DIES OFF
- TRADITIONALLY, THE ONLY TREATMENT OPTION HAS BEEN HIP REPLACEMENT SURGERY



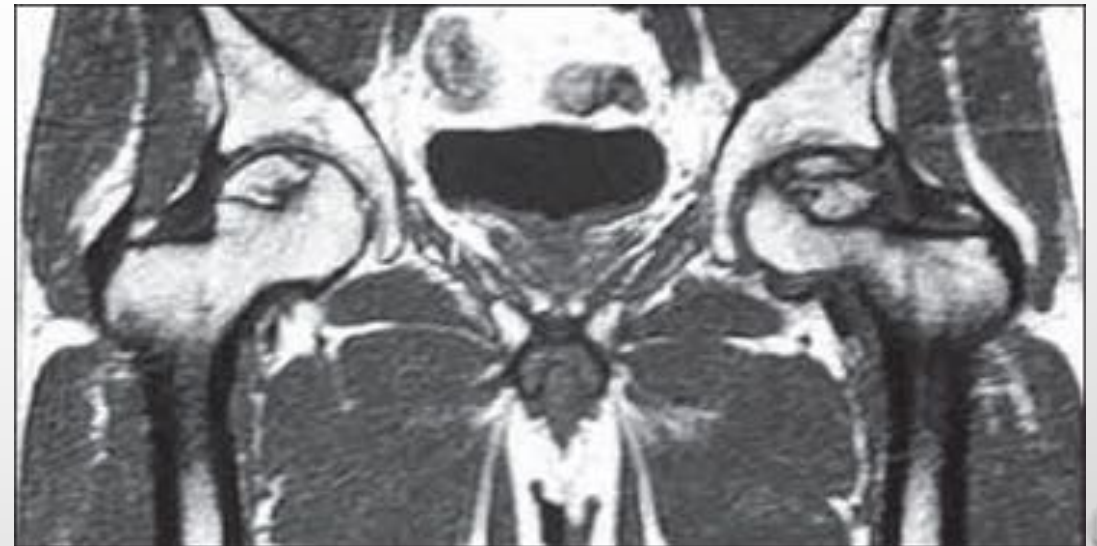
AVASCULAR NECROSIS OF THE HIP

- CAN WE PREVENT THIS?



AVASCULAR NECROSIS OF THE HIP

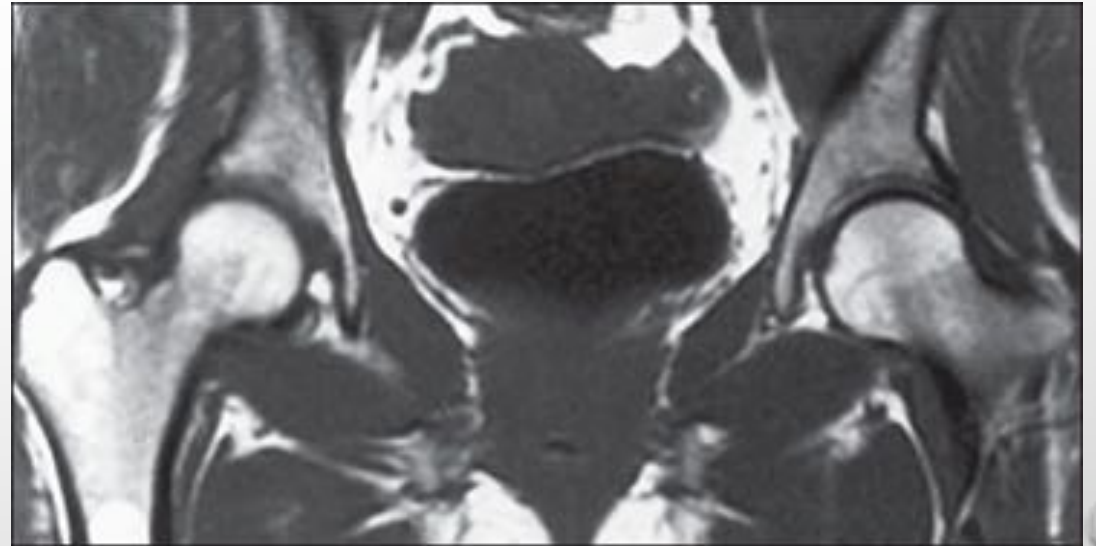
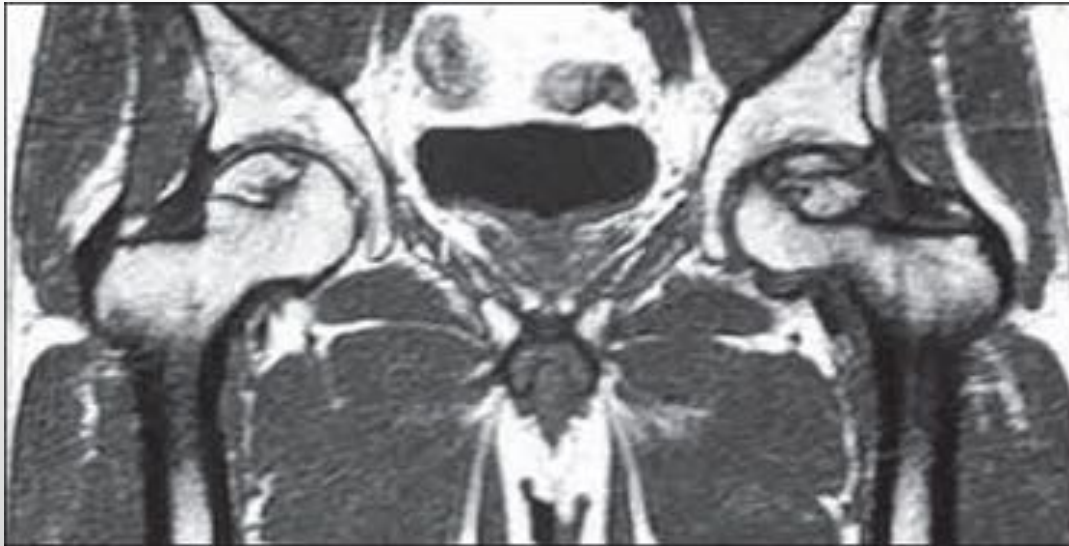
- YES!!!
- IN SOME CASES...
- HERNIGOU (2008) IN OPEN ORTHO J.,
 - SHOWED AN AVERAGE OF 50% REDUCTION IN THE OSTEONECROSIS VOLUME ON FOLLOW UP MRI AND 15/116 HAD TOTAL RESOLUTION
 - ONLY 12.5% HAD A COLLAPSE RATE AT 5 YEARS OUT REQUIRING THA



Sen RK. Management of avascular necrosis of femoral head at pre-collapse stage. Ind Journ Ortho 2008.

Hernigou P et al. Avascular necrosis of head of femur. Ind Journ Ortho 2009.

AVASCULAR NECROSIS OF THE HIP



Hernigou 2009

THANK YOU!

- EMAIL QUESTIONS TO
MCAULIFFEMD@PROTONMAIL.COM

