Snow Cone vs. Shaved Ice

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They are the same thing!?!?!

- Yes, they are both a delicious cold treat
- Yes, they both have delicious syrup dumped on them in a variety of flavors (my personal favorite Tigers Blood or Rainbow)
- Yes, they both end up on your shirt after you enjoy them
- And yes, I will eat the S%*& out of both

Snow Cone

- Snow cones are made by shaving ordinary ice cubes.
- They're more common than shaved ice and often found at baseball games and parks.
- Crunchy ice
- Much of the syrup settles to the bottom making the last bites delicious
- Served in cone-shaped wax paper cup

Shaved Ice

- Shaved ice is a fine and fluffy ice - like real snow.
- The fluffy texture is typically created from shaving a block of ice.
- Syrup evenly distributed making every bite delicious
- Toppings sometimes added such as sour spray or sweet cream

So, which is better

-Snow Cones vs. Shaved Ice. *Journal of Sweet Treats.* *Dulle, Jack, Dulle, Sam, Chhabra, Sophie, Chhabra, Devin*

*75% of people enjoyed shaved ice better (the other 25% accidently dropped there treat on the ground)

-What is More Messy. *Journal of babies who dress better then their parents. Makovicka, Remy, Hassebrock, Owen, Patel, Aarev, Patel, Vyan*

*Snow cones 80% more messy then shaved ice

-More Delicious to Enjoy on Tropical Vacation. *Journal of Mayo Expensed Beach Vacations. Hassebrock, J, Makovicka, J Chhabra, A*

*Found that shaved ice was the preferred method of recovering from hangover when compared with snow cones

You Decide!!

The answer is Shaved Ice by a mile!!!!!!

MAYO CLINIC

Biologics and Their Place in Orthopedics

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Holy Grail in Orthopedics

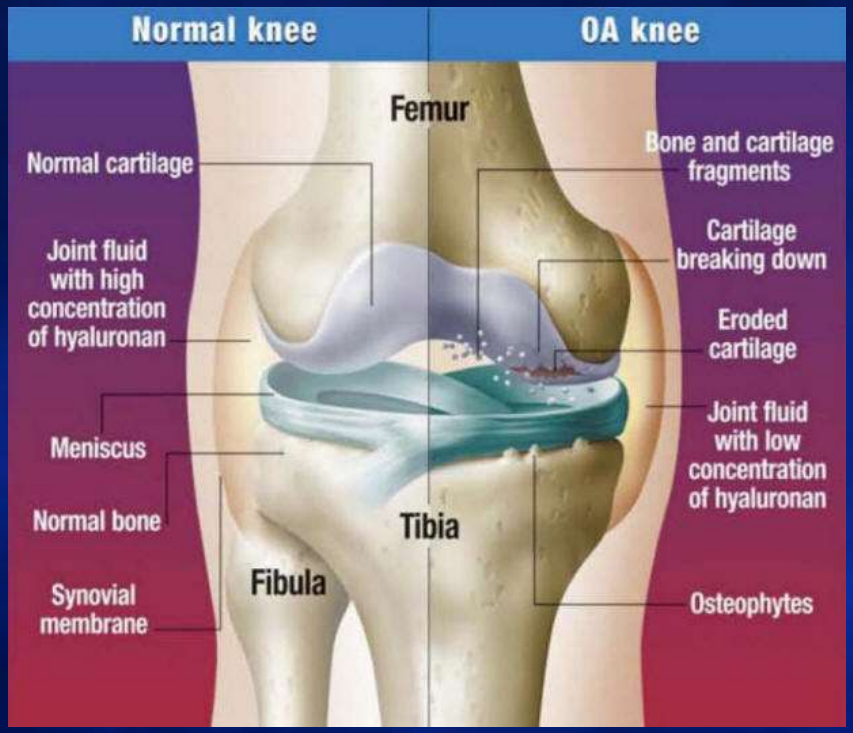
- Eternal youth!!
- Heal without surgery!!
- Cure arthritis!!

Common Biologics Used

- Hyaluronic Acid- viscosupplementation
- Platelet Rich Plasma- PRP
- Mesenchymal Stem Cells- MSC
  - Peripheral blood
  - Amniotic derived
  - Adipose derived
  - Bone marrow aspirate
  - Matrix-induced cartilage implantation (MACI)

Hyaluronic Acid- HA

- Synvisc
- Euflexxa
- Orthovisc
- Monovisc
- Gel one
- Durolane

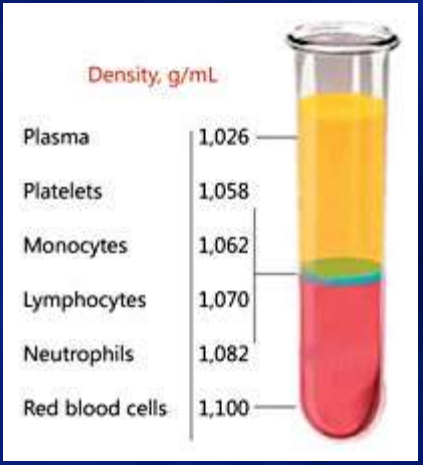


PRP: History

- 1970's in hematology, plasma with platelet count above that of peripheral blood to treat thrombocytopenia
- Went on to use in maxillofacial surgery as platelet rich fibrin because of the potential for adherence and homeostatic properties, and PRP with its anti-inflammatory characteristics that stimulated cell proliferation
- Predominantly in orthopedics now and specifically sports medicine
  - Avoidance of surgery
  - Quicker return to play
  - Latest and greatest

PRP: Definition and Preparation

- Biological product defined as portion of the plasma fraction of autologous blood with a platelet concentration above the baseline. This is obtained from the patients blood and placed in centrifuge. After centrifuge and according to their different density gradients, the separation of the blood components can be done. 16 Commercial devices available that simplify the preparation of PRP



PRP: how does it work?

- Autograft
- Blood is mostly plasma with small solid components (WBC, platelets, RBC)
- Platelets best known for their role in clotting
- Platelets also contain hundreds of growth factors crucial to healing of injured tissue
- PRP has a much higher concentration of platelets and associated growth factors than blood
- Mechanism: hypothesis is increased concentration of growth factors promote healing of injured tissue

PRP: Classification

- 1. Leucocyte-poor PRP: the preparation obtained is without leucocytes and shows a low-density fibrin network after activation.
- 2. Leucocyte-rich PRP: the preparations contain leucocytes and show a low-density fibrin network after activation.
- 3. Leucocyte-poor PRF: preparations are without leucocytes and with a high-density fibrin network. Unlike pure PRP or PRP containing leukocytes, these products cannot be injected and exist in an activated gel form.
- 4. Leucocyte-rich fibrin and PRF: products are preparations with leucocytes and with a high-density fibrin network.

Dohan Ehrenfest et al. 2009

PRP: Osteoarthritis

- Mostly studied in knee
- Positive results compared to HA and placebo
- Low side effect profile

PRP: Mechanism in knee OA

- Alters the joint homeostasis
- In cartilage it decreases catabolism, improves anabolism, and promotes chondral remodeling
- Some hypothesis and animal studies suggest it downregulates the expression of programmed cell death (apoptosis)
- Decrease in joint inflammation- by effecting inflammatory cascade
- May increase level of analgesic and anti-inflammatory receptors

PRP: OA questions??

- Type of PRP
- How often to give injections
- Activation of the platelets
- Leukocyte rich vs. poor preparation
- PRP + HA
- Efficacy in other joints

SICOT J. 2017; 3: 27.
Published online 2017 Mar 22. doi: 10.1051/sicotj/2017004
PMCID: PMC5360094
PMID: 28322719

PRP in OA knee – update, current confusions and future options

Mandeep S. Dhillon,[1] Sandeep Patel,[1,*] and Rakesh John[1]

PRP: Hip and Ankle

Orthopedics. 2013 Dec;36(12):e1501-8.

Efficacy of ultrasound-guided intra-articular injections of platelet-rich plasma versus hyaluronic acid for hip osteoarthritis.

Battaglia M, Guaraldi F, Vannini F, Rossi G, Timoncini A, Buda R, Giannini S.

Am J Sports Med. 2016 Mar;44(3):664-71. doi: 10.1177/0363546515620383. Epub 2016 Jan 21.

Ultrasound-Guided Injection of Platelet-Rich Plasma and Hyaluronic Acid, Separately and in Combination, for Hip Osteoarthritis: A Randomized Controlled Study.

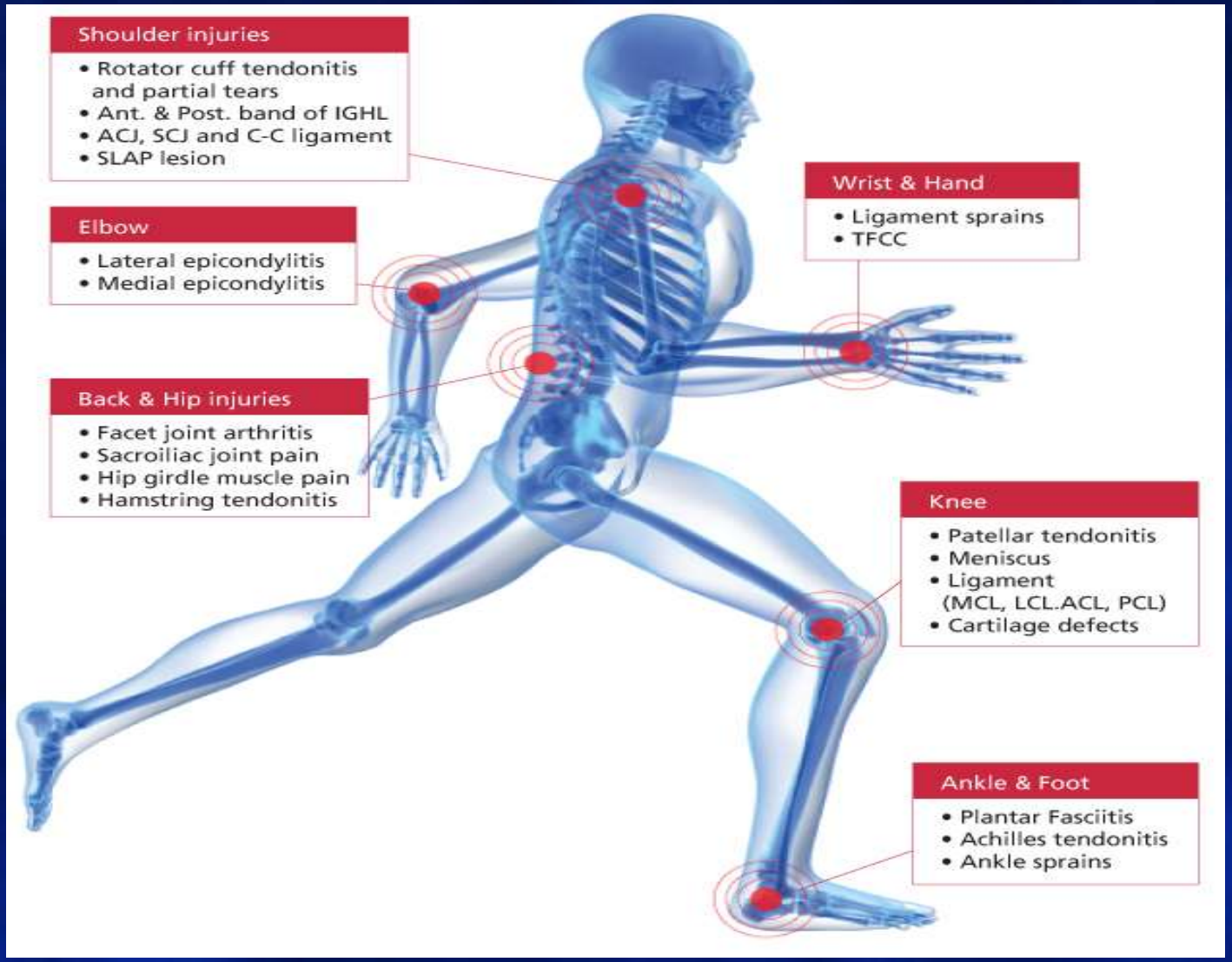
Dallari D[1], Stagni C[2], Rani N[2], Sabbioni G[2], Pelotti P[3], Torricelli P[4], Tschon M[4], Giavaresi G[4].

Am J Sports Med. 2012 Mar;40(3):534-41. doi: 10.1177/0363546511431238. Epub 2012 Jan 17.

Platelet-rich plasma or hyaluronate in the management of osteochondral lesions of the talus.

Mei-Dan O[1], Carmont MR, Laver L, Mann G, Maffulli N, Nyska M.

PRP: Where else can we use it?



Varying Results

- Best results
  - Lateral epicondylitis
  - OA knee
- Moderate effect
  - Patellar tendonitis
  - Plantar fasciitis
- Some promise
  - Rotator cuff tendinopathy
  - Osteoarthritis of the hip
  - Donor site pain in ACL reconstruction with patellar tendon autograft
  - High ankle sprains

Not enough clinical evidence for…

- Achilles tendinopathy
- Acute fracture, or nonunion
- Surgical augmentation with PRP in rotator cuff repair
- Achilles tendon repair
- ACL reconstruction
- Muscle injuries

But we do still use it

- Ankle syndesmotic injuries
- Hamstring injuries
- Patella tendinopathy
- Surgical augmentation

Orthopedic Surgical Uses

Tendon, ligament, bone, muscle

- Shoulder- Rotator cuff, biceps
- Elbow- UCL
- Hip arthroscopy,
  hamstring repair
- Wrist- TFCC tears
- Knee- meniscus, ACL, MCL
- Achilles
- Cartilage surgery

Rotator Cuff Repair-PRP

- Techniques vary-
  - One time PRP injection intraoperatively
  - Platelet-rich fibrin matrices scaffold between tendon and bleeding bone
  - Dipped sutures

Fig. 1

Fig. 2

Rotator Cuff Repair Outcomes

- PRP
  - Positive results with early improvement of symptoms, higher load to failure rates, lower retear rates, and improved repair integrity
  - Studies that show no difference in outcome scores, functional performance, or healing of repair


PM&R

Volume 7, Issue 4, Supplement, April 2015, Pages S41-S52

Regenerative Medicine

Regenerative Treatments to Enhance Orthopedic Surgical Outcome

William D. Murrell MD [a,*], Adam W. Anz MD [b], Humeira Badsha MD [c], William F. Bennett MD [d], Robert E. Boykin MD [e], Arnold I. Caplan PhD [f]

S. Gumina, V. Campagna, G. Ferrazza, *et al.*

Use of platelet-leukocyte membrane in arthroscopic repair of large rotator cuff tears: A prospective randomized study

J Bone Joint Surg Am, 94 (2012), pp. 1345-1352

Ann N Y Acad Sci. 2016 Nov;1383(1):97-114. doi: 10.1111/nyas.13267. Epub 2016 Oct 17.

Advances in biologic augmentation for rotator cuff repair.

Patel S[1], Gualtieri AP[2], Lu HH[1], Levine WN[2].

P. Randelli, P. Arrigoni, V. Ragone, A. Aliprandi, P. Cabitza

Platelet rich plasma in arthroscopic rotator cuff repair: A prospective RCT study, 2-year follow-up

J Shoulder Elbow Surg, 20 (2001), pp. 518-528


Arthroscopy: The Journal of Arthroscopic & Related Surgery

Volume 27, Issue 8, August 2011, Pages 1029-1035

Original Article

Rotator Cuff Repair Healing Influenced by Platelet-Rich Plasma Construct Augmentation

F. Alan Barber M.D. [a,*], Scott A. Hrnack M.D. [a], Stephen J. Snyder M.D. [b], Onur Hapa M.D. [c]

ACL reconstruction

- Some animal studies have shown promise with use of stem cells
- Mostly PRP
  - Injected into/around graft
  - Graft soaked in PRP
  - PRP soaked gel foam
  - Administered into the tunnels
  - Injected at graft site (BTB)
  - Internal bracing with PRP sutures

Fig. 1

Fig. 2

Results with ACL Reconstruction

- PRP is safe to use- no increase in adverse outcomes
- Some benefit found for partial ACL tears and for repairs
- Evidence that PRP can help with morbidity associated with graft site (BTB) and for graft maturation (as evidenced by more homogenous signal seen on post op MRI scan)
- However, no improvement in graft integration specifically in regards to tunnel widening,
- No improvement in overall short term outcomes with PRP

Achilles Tendon Repair

- PRP, Bone marrow aspirate, stem cells
- Delivery methods vary and need to be uniform
- PRP seems to help with faster healing, less thickening of the tendon, and high levels of growth factors in the wound site

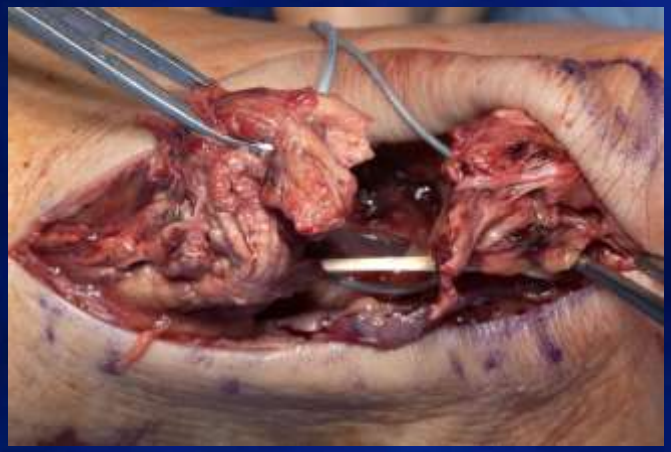


Fig. 1

Fig. 2

Achilles Repair Results

J Orthop Res. 2013 Jan;31(1):111-8. doi: 10.1002/jor.22199. Epub 2012 Aug 6.

The role of platelets in the treatment of Achilles tendon injuries.

Sadoghi P[1], Rosso C, Valderrabano V, Leithner A, Vavken P.

Curr Rev Musculoskelet Med. 2015 Mar; 8(1): 9–17.
Published online 2015 Feb 6. doi: 10.1007/s12178-015-9257-z

Biologics in Achilles tendon healing and repair: a review

Evan Shapiro, Daniel Grande,✉ and Mark Drakos

Meniscal Repairs

- 3 zones-
  - red-red=good healing(good vascularization at periphery of meniscus)
  - Red-white=potentially good healing (middle third with some vascularization)
  - White-white=no healing (no blood capillaries)
- Occur with ACL tears and increased rate of healing encouraged further study (potentially d/t marrow stimulation done in ACL repair)

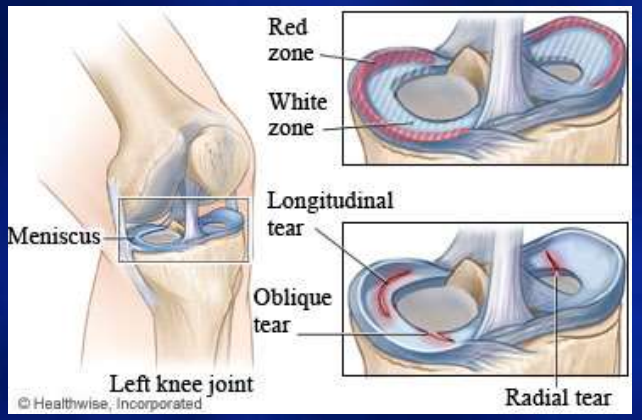


Fig. 1

Meniscal Repair Results

- Marrow venting
  - No change in rate of repair failure
- Fibrin clot
  - Good result with no comparative analysis
- PRP
  - Improvement in functional scores but no difference in reoperation rate
- Stem Cells
  - Isolated positive results in avascular zone


The Journal of Bone and Joint Surgery. 99(14):1222–1231, JUL 2017
DOI: 10.2106/JBJS.17.00297, , PMID: 28719562
Issn Print: 0021-9355
Publication Date: 2017/07/19
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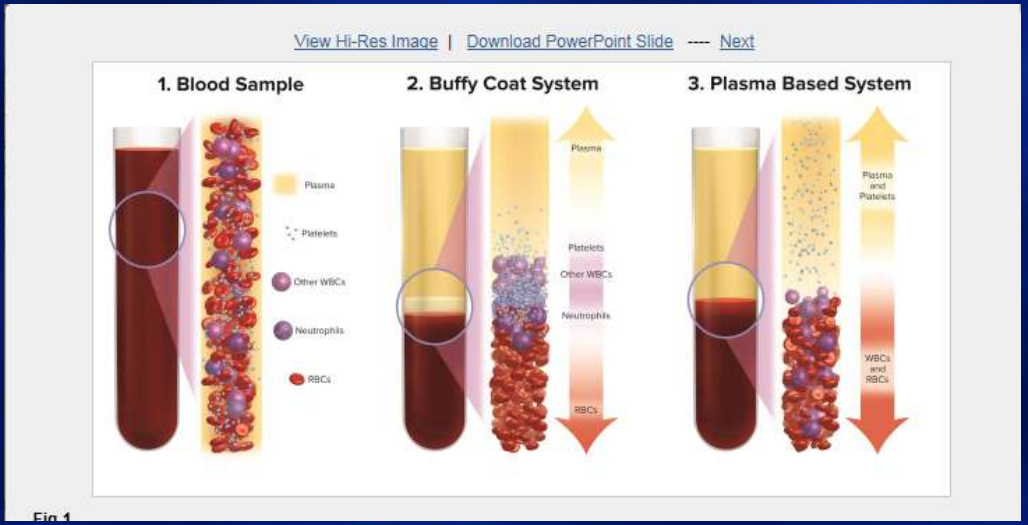
Meniscal Repair: Reconsidering Indications, Techniques, and Biologic Augmentation

Jarret M. Woodmass; Robert F. LaPrade; Nicholas A. Sgaglione; Norimasa Nakamura; Aaron J. Krych

Future of PRP

- Type of PRP
- Preparation of PRP
- Effects of NSAIDs on PRP
- Increased concentration of PRP
  - Exercise?
  - Gender?
  - Ethnicity?

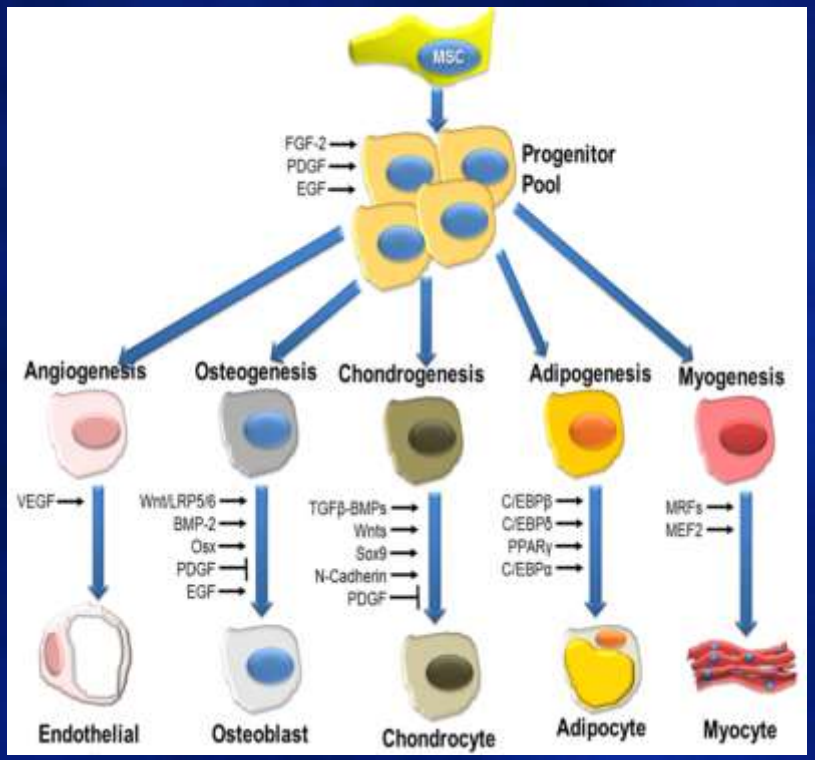


Stem Cells

- 2 types
  - Embryonic stem cells (ESCs)
    - Pluripotent- with the ability to develop into any type of cell in human body
    - Only collected from embryos
    - Ethical and legal concerns
    - Forbidden from use due to their oncogenic potential
  - Adult stem cells
    - Multipotent- ability to differentiate into cells of only one germ layer
    - Isolated from postnatal animals, usually human beings
    - Less ethical and legal concerns, better safety profile, and nonimmunogenic property
    - Limited by multipotency

Mesenchymal Stem Cells (MSC)

- Harvested from adult mesenchymal tissue
- First isolated in 1976
- Isolated from adipose tissue, peripheral blood, synovium, umbilical cord, and dental pulp
- Ability to differentiate into cartilage, bone, tendon



Results in OA

< Previous Article | January 2019 Volume 35, Issue 1, Pages 277–288.e2 | Next Article >

Intra-articular Mesenchymal Stem Cells in Osteoarthritis of the Knee: A Systematic Review of Clinical Outcomes and Evidence of Cartilage Repair

Chul-Won Ha, M.D., Ph.D., Yong-Beom Park, M.D., Ph.D., Seong Hwan Kim, M.D., Ph.D., Han-Jun Lee, M.D., Ph.D.

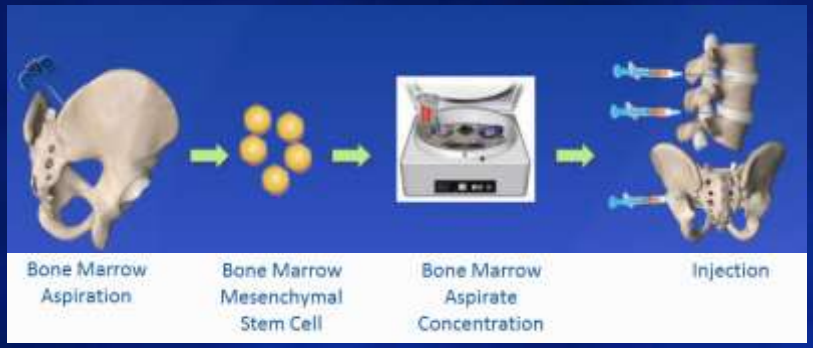
< Previous Article | January 2019 Volume 35, Issue 1, Pages 289–290 | Next Article >

Editorial Commentary: Stem Cell Treatment for Knee Osteoarthritis: Holy Grail or Tin Cup?

Mark H. Getelman, M.D.
Van Nuys, California

Bone Marrow Aspirate Concentrate (BMAC)

- Autologous graft
- Thought to contain a regenerative potential due to the high MSC concentration
- However only small number of cells in the aspirate are actually MSC's
- Benefits may be from this or abundance of growth factors and cytokines
- Used in DJD, rotator cuff tears, osteonecrosis, and non unions



Results

SICOT J. 2017; 3: 17.
Published online 2017 Mar 6. doi: 10.1051/sicotj/2017007
PMCID: PMC5966837
PMID: 29792397

A systematic review of the concept and clinical applications of Bone Marrow Aspirate Concentrate in Orthopaedics

Mohamed A. Imam,[1,2,*] Samer S.S. Mahmoud,[3] James Holton,[1,2] Dalia Abouelmaati,[5] Yasser Elsherbini,[5,6] and Martyn Snow[2,4]

MSC in BMAC have the potential to self-renew, undertake clonal expansion, and differentiate into musculoskeletal tissue.

Stem Cells Int. 2017; 2017: 2638305.
Published online 2017 Jun 18. doi: 10.1155/2017/2638305
PMCID: PMC5494105
PMID: 28698718

The Holy Grail of Orthopedic Surgery: Mesenchymal Stem Cells—Their Current Uses and Potential Applications

Roberto Berebichez-Fridman, [1,2] Ricardo Gómez-García, [1] Julio Granados-Montiel, [1] Enrique Berebichez-Fastlicht, [3] Anell Olivos-Meza, [4] Julio Granados, [5] Cristina Velasquillo, [6] and Clemente Ibarra [7,*]

MSCs can be isolated from several tissues. They exert anti-inflammatory and immunomodulatory effects and can differentiate into mesenchymal and non mesenchymal cell types

AAOS- Optimizing the Clinical Use of Biologics in Orthopedic Surgery

Optimizing Clinical Use of Biologics in Orthopaedic Surgery
Consensus Recommendations From the 2018 AAOS/NIH U-13 Conference

Chu, Constance R., MD*; Rodeo, Scott, MD*; Bhutani, Nidhi, PhD; Goodrich, Laurie R., DVM, PhD; Huard, Johnny, PhD; Irrgang, James, PhD, PT; LaPrade, Robert F., MD, PhD; Lattermann, Christian, MD; Lu, Ying, MS, PhD; Mandelbaum, Bert, MD; Mao, Jeremy, DDS, PhD*; McIntyre, Louis, MD; Mishra, Allan, MD; Muschler, George F., MD; Piuzzi, Nicolas S., MD; Potter, Hollis, MD; Spindler, Kurt, MD; Tokish, John M., MD; Tuan, Rocky, PhD*; Zaslav, Kenneth, MD; Maloney, William, MD*

JAAOS - Journal of the American Academy of Orthopaedic Surgeons: January 15, 2019 - Volume 27 - Issue 2 - p e50–e63
doi: 10.5435/JAAOS-D-18-00305
Review Article

AAOS Recommendations

- 1: Define Terminology to Clearly Distinguish Uncharacterized Minimally Manipulated Autologous Cell Products From Rigorously Characterized, Culture-expanded and Purified Stem Cell and Progenitor Cell Populations
- 2: Standardize Reporting Requirements
- 3: Establish Registries for Postmarket Monitoring and Quality Assessments of Biologic Therapies
- 4: Designate Osteoarthritis as a Serious Medical Condition
- 5: Clarify, by Disease State, a Consensus Approach for Biological Markers of Interest and Clinical Trial Design
- 6: Establish the Framework for a Multicenter Knee Osteoarthritis Clinical Trial Consortium
- 7: Explore Accelerated Pathways for FDA Approval of New Drug Applications for Biologics to Treat Musculoskeletal Conditions

Conclusion

Pros-

- Biologic augmentation is generally accepted as safe with minimal reports of adverse reactions or complications
- Some studies have shown good results in functional outcome and improvement in integrity of repair/reconstruction
- Relatively easy to implement into surgical procedures with minimal increase in surgical time and difficulty

Cons-

- Infection risk
- Some studies show no statistical improvement in re injury rates or overall outcome scores
- Added expense
- Not enough comparative studies to determine efficacy or if it makes a difference in what we are already doing

More Work to Do!!