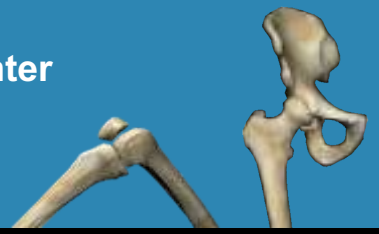
SAVING YOUR JOINTS

Regenerative Medicine and Stem Cell Therapy for the Treatment of Osteoarthritis of the Hip, Knee, and Shoulder

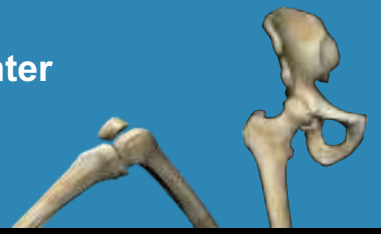
Jeffrey P. Rosen, MD
Orlando Orthopaedic Center



What is Osteoarthritis?

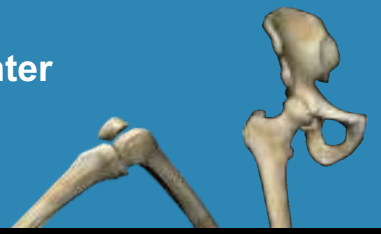
An Inflammatory Condition, causing:

- Cartilage Deterioration
- Loss of Joint Space
- Secondary Bone Changes
- Pain, Disability, Deformity



Traditional Treatment Options Provide Symptom Relief but do nothing to slow the progression or reverse the problem

- Over the counter anti-inflammatory medications (Advil / Aleve)
- Physical Therapy
- Prescription anti-inflammatory medications
- Cortisone Injections
- Hyaluronic Acid Injections (knee only)
- Weight Loss



And . . .

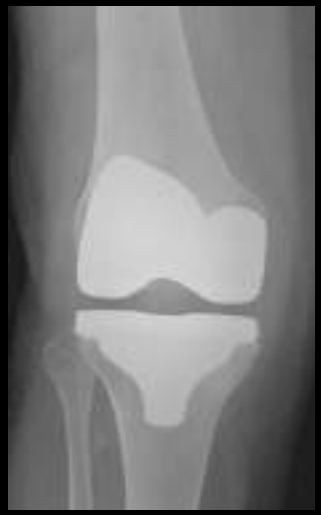
These Treatments can have Adverse Side Effects

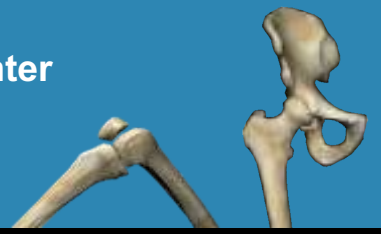
Anti-Inflammatory medications:

- 100,000 hospitalizations and 17,000 deaths due to GI bleeding
- 20 – 50% increased risk of heart attack
- Kidney and liver damage
- Elevated blood pressure

Repeat Cortisone shots cause cartilage damage

Traditional Treatments Do Not Reduce the Risk that the Joint will Ultimately Fail to the Point that the Only Option is Joint Replacement Surgery



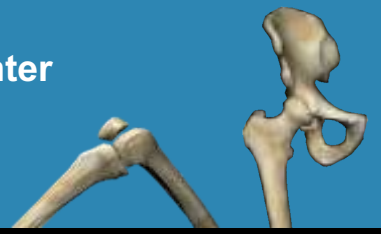


Regenerative Medicine . .

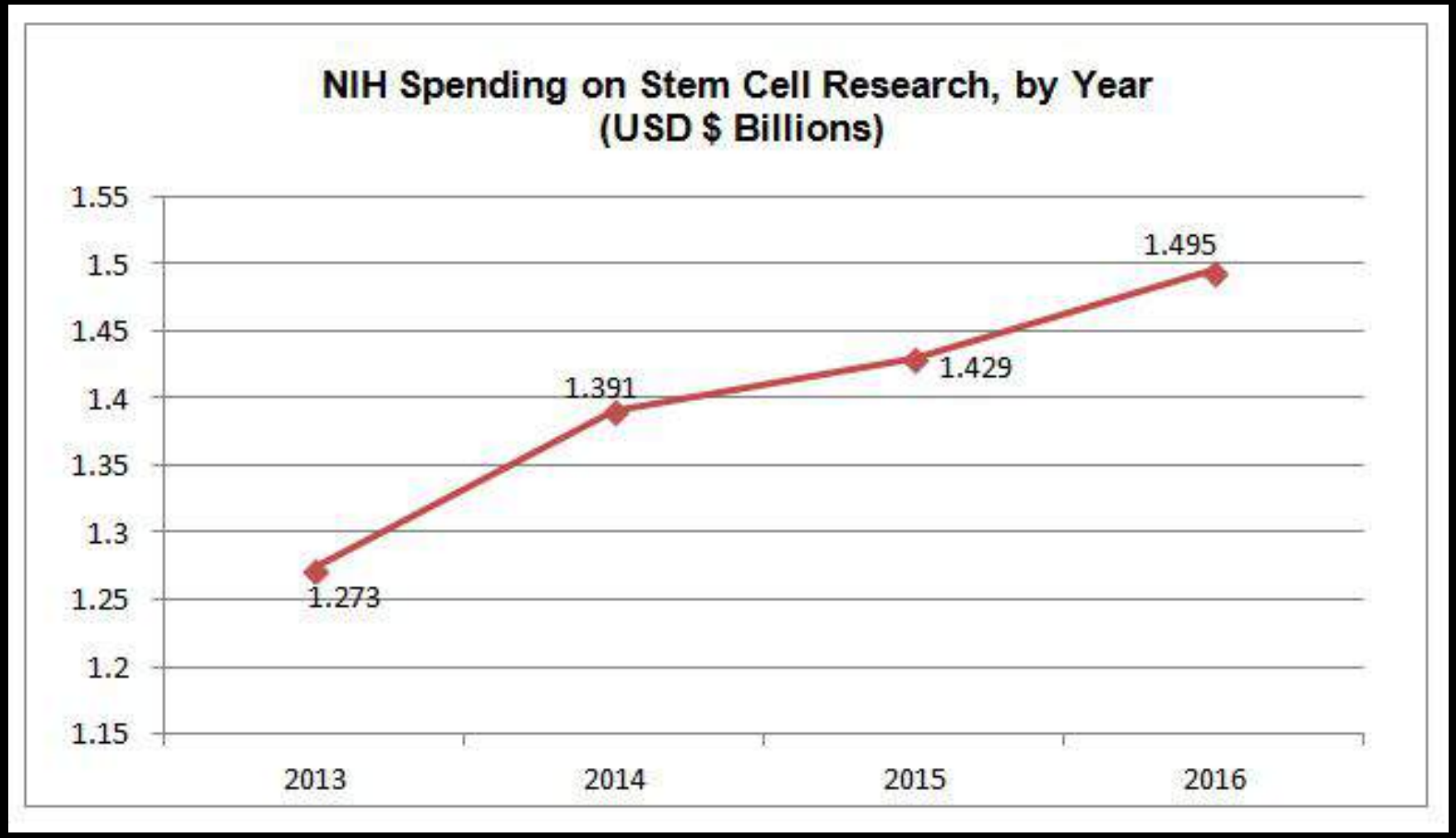
A new and innovative approach to the damaged joint

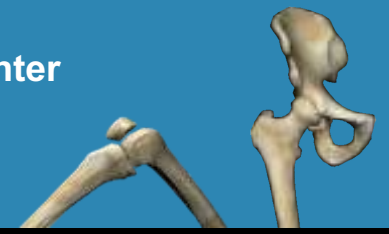
Repair: The process through which the body attempts to fix injured or damaged tissues – the human body does this well in some areas, such as skin lacerations, and very poorly in others, such as cartilage damage

Regeneration: replacing an injured tissue with one that is equally mature and identical in structure and function



THE FIELD OF REGENERATIVE MEDICINE DEVISES AND DEVELOPS NEW THERAPIES FOR PATIENTS WITH SEVERE INJURIES OR CHRONIC DISEASE IN WHICH THE BODY'S OWN RESPONSES ARE NOT SUFFICIENT TO RESTORE THE TISSUE TO IT'S NORMAL STRUCTURE AND FUNCTION


NIH Spending on Stem Cell Research, by Year
(USD $ Billions)
1.55
1.5
1.45
1.4
1.35
1.3
1.25
1.2
1.15
1.273
1.391
1.429
1.495
2013
2014
2015
2016



The global landscape of stem cell clinical trials

Aim: To provide a comprehensive analysis of clinical trials (CTs) listed in worldwide registries involving new applications for stem cell-based treatments and account for the role of industry. **Materials & methods:** We developed a data set of 4749 stem cell CTs up to 2013 in worldwide registries. We defined 1058 novel CTs (i.e., trials that were not observational in nature; did not involve an established stem cell therapy for an established indication, such as hematopoietic stem cells for leukemia; and did not investigate supportive measures). Based on trial descriptions, we manually coded these for eight additional elements. **Results:** Our analysis details the characteristics of novel stem cell CTs (e.g., stem cell types being tested, disease being targeted, and whether interventions were autologous or allogeneic), geotemporal trends, and private sector involvement as sponsor or collaborator. **Conclusion:** The field is progressing at a steady pace with emerging business models for stem cell therapeutics. However, therapeutic rhetoric must be tempered to reflect current clinical and research realities.

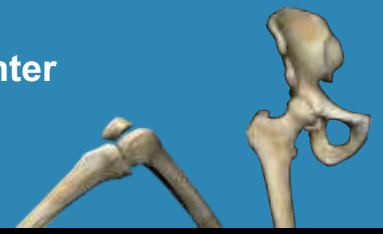
KEYWORDS: business model · cardiac · clinical translation · clinical trial · hematopoietic stem cell · industry · mesenchymal stem cell · neurological · stem cell mobilization · stem cell therapy

Matthew D Li[1,2], Harold Atkins[3] & Tania Bubela*[1]

[1]School of Public Health, 3-279 Edmonton Clinic Health Academy, 11405-87 Ave, University of Alberta, Edmonton, AB, T6G 1C9, Canada
[2]Stanford University, School of Medicine, 291 Campus Dr, Stanford, CA 94305, USA
[3]The Ottawa Hospital Research Institute, The Ottawa Hospital General Campus, 501 Smyth Rd, Ottawa, ON, K1H 8L6, Canada
*Author for correspondence:

Stem cell therapies are a category of regenerative medicine, the promise of which includes innovative therapies for organ failure and degenerative diseases. The first human hematopoietic stem cell (HSC) transplant (HSCT) or bone marrow transplant (BMT) was performed more than 50 years ago [1], and it is estimated that more

contributed to public expectations for stem cell therapies, and we have previously noted that proponents need to make a concerted effort to temper claims to reflect current research and clinical realities [3]. As stated by Daley, "premature application runs the risk of high-profile failure that would sully the credibility of this



AAOS Now

Periodical Links

- AAOS Now Home
- Current Issue
- About *AAOS Now*
- Access App
- Writer's Guidelines
- Editorial Board
- Email the Editor
- Advertising Rates & Data
- Classified Advertising Rates
- The Annual Meeting Daily Edition of AAOS Now
- Classifieds

Will Biologic Treatments for Cartilage Restoration Become the Standard of Care?

By: Rivka C. Ihejirika, MD

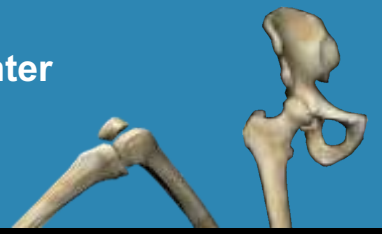
Newer therapies show promise

Prevention of degenerative joint disease and the restoration of articular cartilage through minimally invasive means is a major focus of basic science and orthopaedic sports research. That research has led to advances in technology that enable the long-term storage of cartilage and the replication of "chondroinductive" cells, resulting in cartilage restoration procedures that may potentially set a new standard of care in orthopaedic clinical practice.

For example, there is ongoing research into new options including methods for harvest and transplantation of tissue-forming cells. When combined with bioactive scaffold matrix materials and bioactive molecules, these stem and progenitor cells can differentiate into the appropriate cell lineage for specific tissue repair. Available cell-based strategies may utilize local cells, transplantated autogenous connective tissue progenitor cells derived from bone marrow or other tissues, or autologous growth factors obtained from a patient's own platelets.

Injections—challenging the status quo

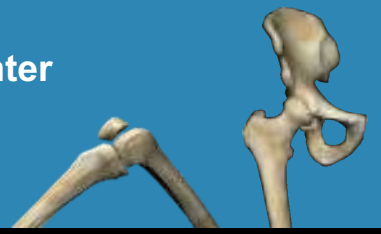
Corticosteroid and hyaluronic acid (HA) injections—the predominant minimally invasive treat



This is a Game Changer !!

FOR PATIENTS WITH OSTEOARTHRITS, REGENERATIVE MEDICINE PROVIDES AN OPPORTUNITY TO GAIN PAIN RELIEF AND IMPROVED FUNCTION BY USING TREATMENT METHODS THAT HAVE NO KNOWN ADVERSE SIDE EFFECTS.

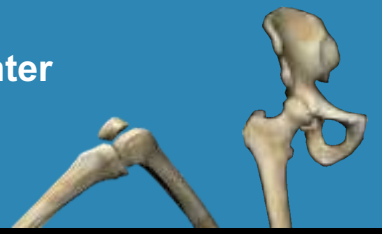
REGENERATIVE MEDICINE OFFERS THE PROSPECT OF PROTECTING AND RESTORING DAMAGED JOINT CARTILAGE AND REDUCING THE POSSIBILITY THAT A JOINT REPLACEMENT WILL BE THE ULTIMATE OUTCOME



Regenerative Medicine Techniques for Osteoarthritis:

Stem Cells, Amniotic Tissue, and Platelet Rich Plasma

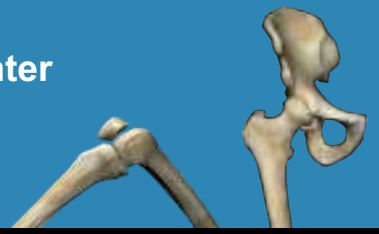
Orthobiologics refers to the spectrum of treatments using concentrated cells, including stem cells from your own body, or tissues from other biologic sources that are then implanted into the damaged joint to initiate the body's healing and regeneration processes.



The Science: Regenerative Treatments with Legitimate Uses in Osteoarthritis

- ProloTherapy
- PRP
- Bone Marrow Aspirate
- LipoAspirate
- Amniotic fluid products
- Umbilical cord products
- A2M
- Exosomes

Stem Cell Therapy at Orlando Orthopaedic Center



Regenerative Medicine Techniques for Osteoarthritis:

Stem Cells, Amniotic Tissue, and Platelet Rich Plasma

Bone Marrow Aspirate Stem Cell Treatments

These treatments contain mesenchymal stem cells, obtained from your own bone marrow. These cells promote regeneration and healing to damaged tissues by producing high levels of natural growth factors.

Platelet Rich Plasma (PRP)

This technique involves using the platelet cells from your own blood. These cells are high in growth factors. This treatment is commonly used in the treatment of professional athletes. The blood platelets are concentrated and injected into the damaged tissue.

Adipose (Fat) Stem Cells

The fat within your body has high levels of stem cells, however current FDA guidelines do not allow these to be used for joint injections. As research continues this is a promising future method of stem cell therapy.

Other Biologic Tissues

It also possible to use tissue from outside your body—this includes amniotic, placental and umbilical tissues. These tissues are obtained under strict safety and ethical guidelines. These tissues are typically discarded during childbirth, and do not involve the use of fetal tissue.

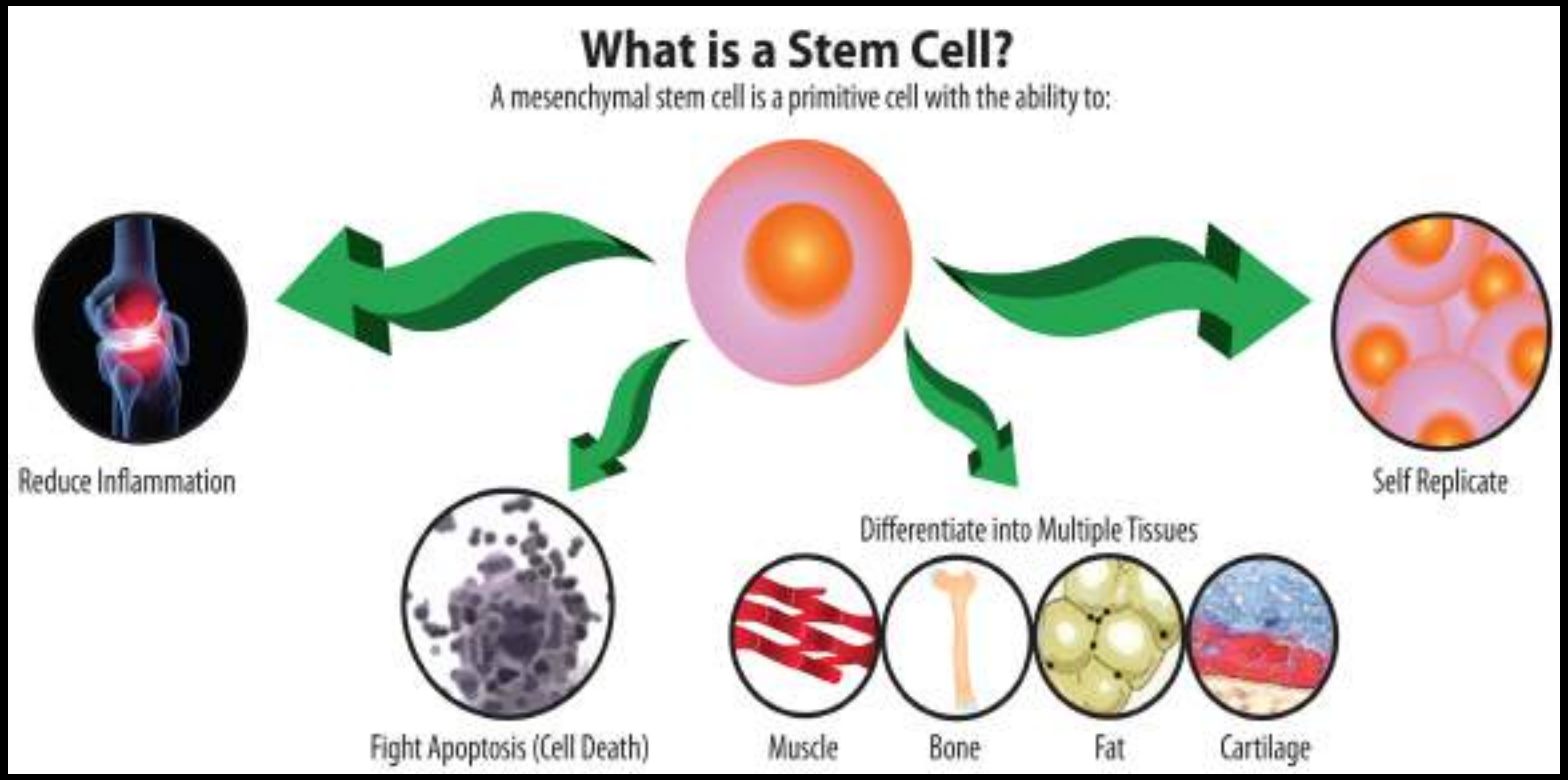
Amniotic Fluid

This fluid contains is high in growth factors, encouraging cartilage regrowth.

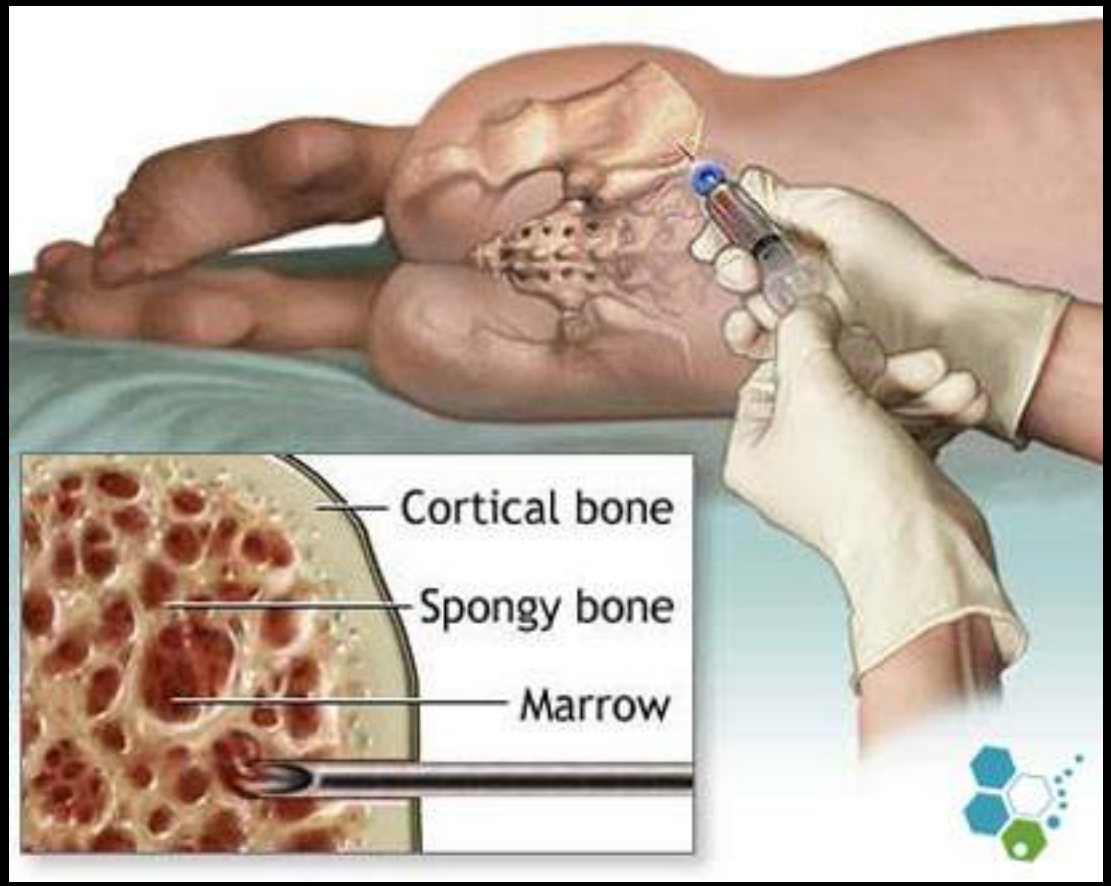
Umbilical Tissue

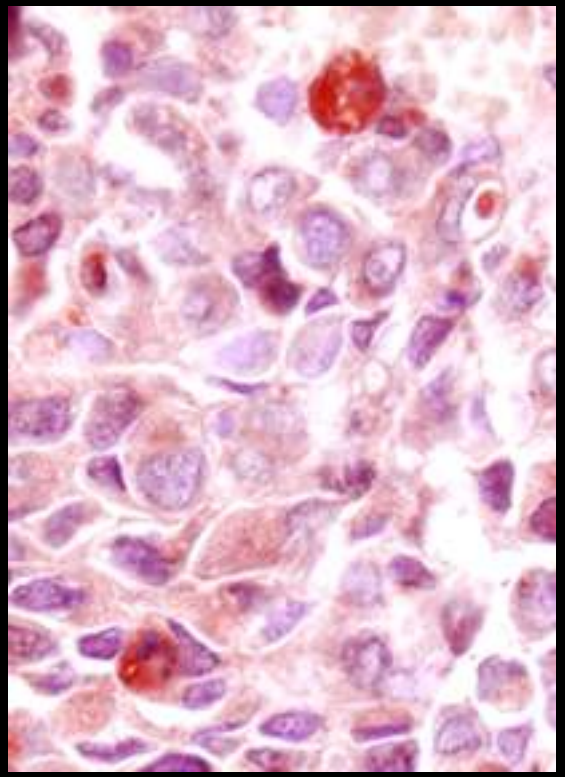
This tissue from the umbilical cord contains high concentrations of growth factors, anti-inflammatory factors and structural scaffolding. It contains a tissue knows as Wharton's Jelly – a rich source of growth factors and mesenchymal cells.

Autologous Stem Cells – Bone Marrow Aspirate



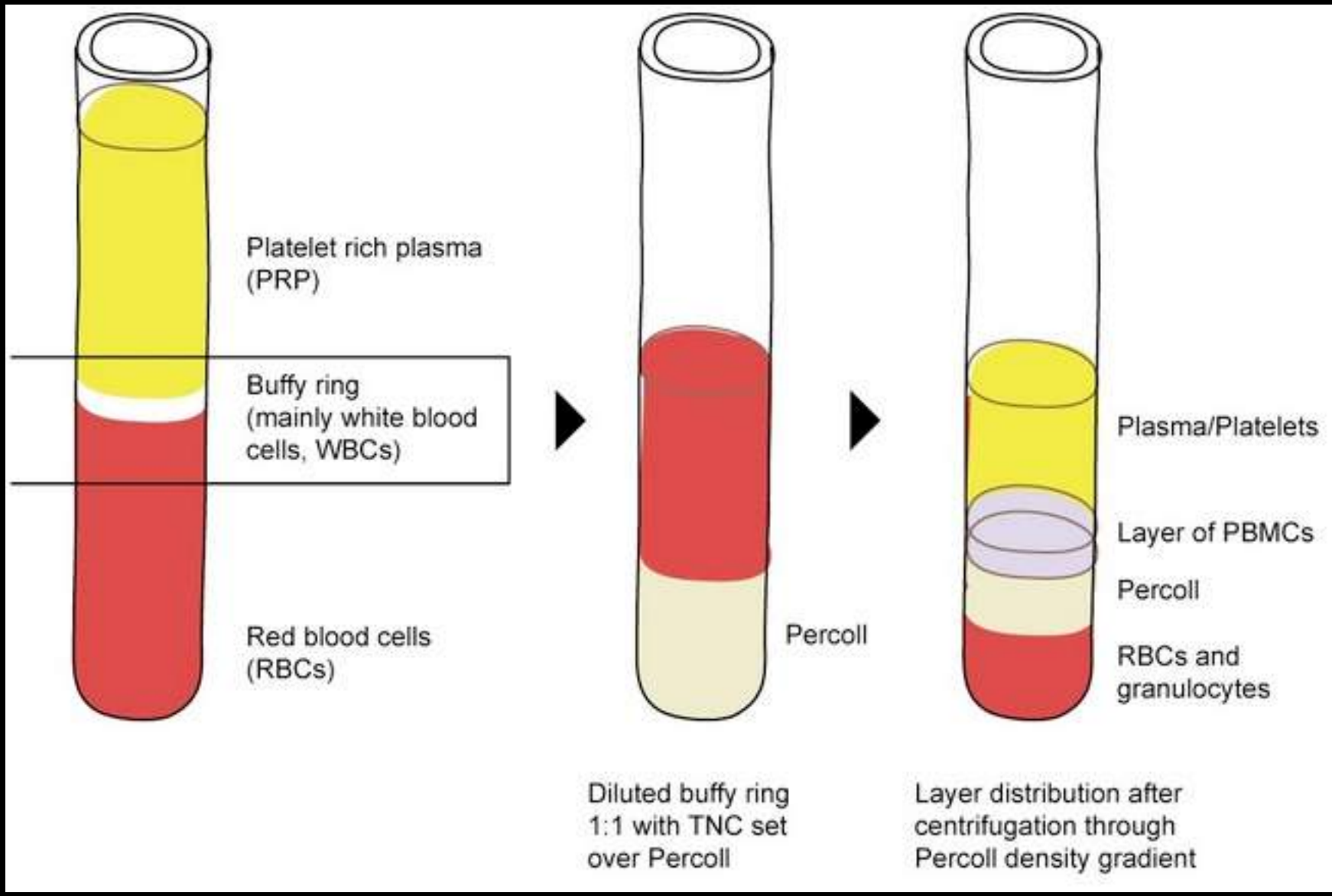
Autologous Stem Cells – Bone Marrow Aspirate





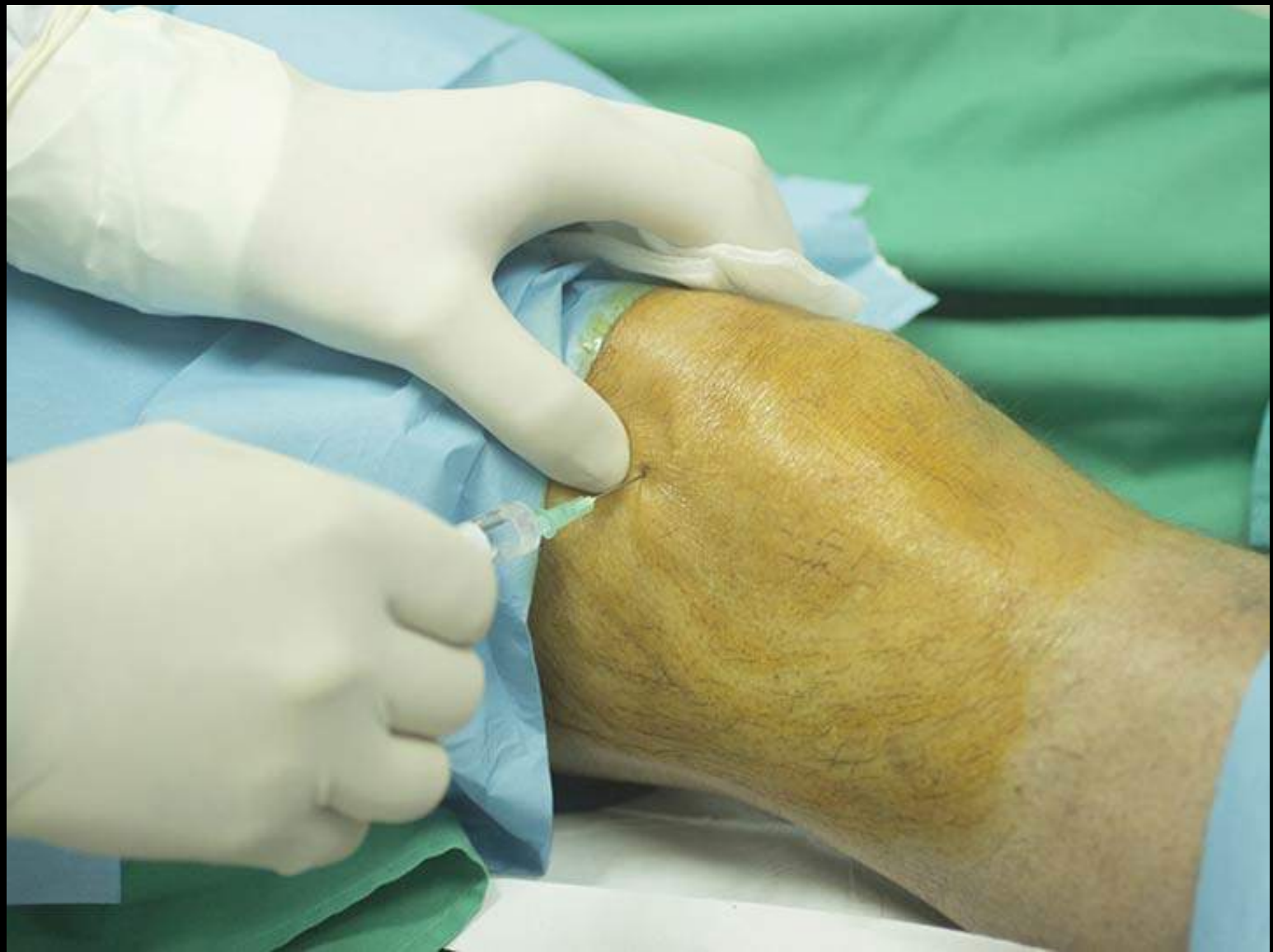
Orlando Orthopaedic Center

Stem Cell Therapy at Orlando Orthopaedic Center


Platelet rich plasma (PRP)
Buffy ring (mainly white blood cells, WBCs)
Red blood cells (RBCs)
Percoll
Plasma/Platelets
Layer of PBMCs
Percoll
RBCs and granulocytes
Diluted buffy ring 1:1 with TNC set over Percoll
Layer distribution after centrifugation through Percoll density gradient

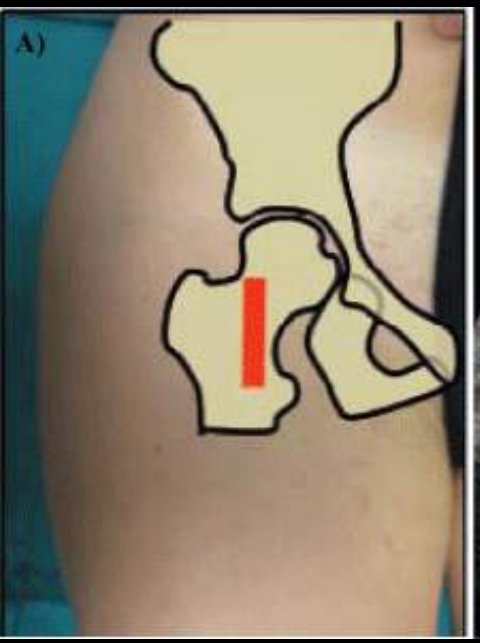
Orlando Orthopaedic Center

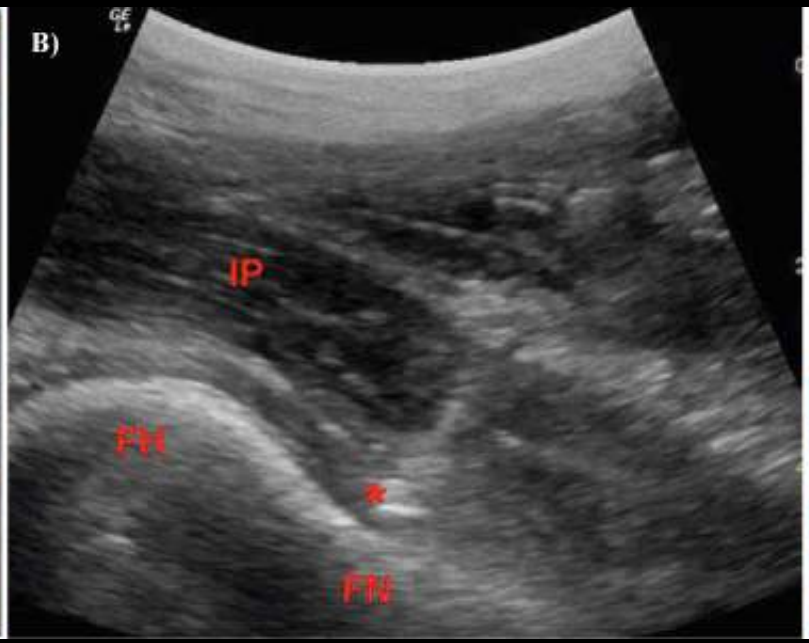
Stem Cell Therapy at Orlando Orthopaedic Center

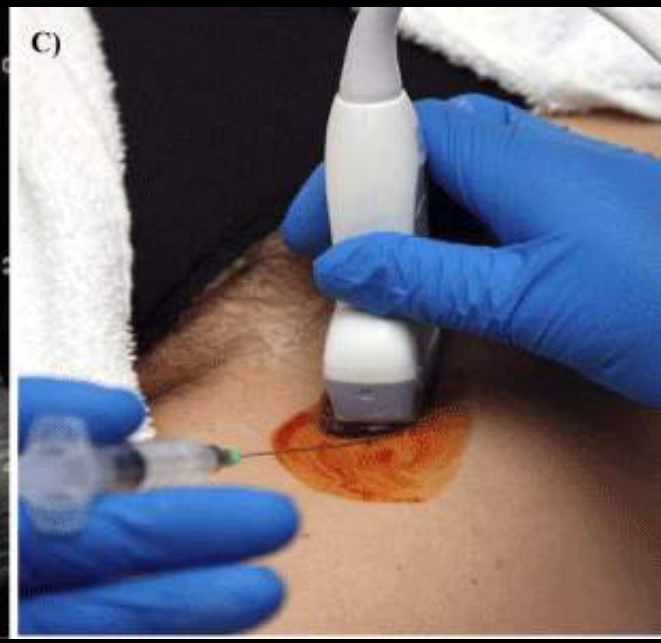


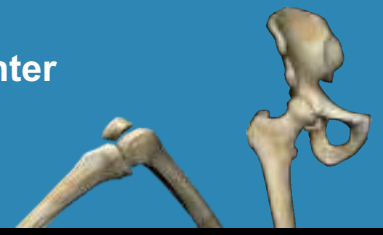
Orlando Orthopaedic Center

Stem Cell Therapy at Orlando Orthopaedic Center









Cartilage. 2017 Nov 1:1947603517741169. doi: 10.1177/1947603517741169. [Epub ahead of print]

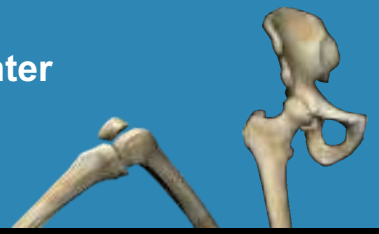
Bone Marrow Aspirate Concentrate for Cartilage Defects of the Knee: From Bench to Bedside Evidence.

Cotter EJ[1], Wang KC[2], Yanke AB[2], Chubinskaya S[3].

Author information

Abstract

Objective To critically evaluate the current basic science, translational, and clinical data regarding bone marrow aspirate concentrate (BMAC) in the setting of focal cartilage defects of the knee and describe clinical indications and future research questions surrounding the clinical utility of BMAC for treatment of these lesions. Design A literature search was performed using the PubMed and Ovid MEDLINE databases for studies in English (1980-2017) using keywords, including ["bone marrow aspirate" and "cartilage"], ["mesenchymal stem cells" and "cartilage"], and ["bone marrow aspirate" and "mesenchymal stem cells" and "orthopedics"]. A total of 1832 articles were reviewed by 2 independent authors and additional literature found through scanning references of cited articles. Results BMAC has demonstrated promising results in the clinical application for repair of chondral defects as an adjuvant procedure or as an independent management technique. A subcomponent of BMAC, bone marrow derived-mesenchymal stem cells (MSCs) possess the ability to differentiate into cells important for osteogenesis and chondrogenesis. Modulation of paracrine signaling is perhaps the most important function of BM-MSCs in this setting. In an effort to increase the cellular yield, authors have shown the ability to expand BM-MSCs in culture while maintaining phenotype. Conclusions Translational studies have demonstrated good clinical efficacy of BMAC both concomitant with cartilage restoration procedures, at defined time points after surgery, and as isolated injections. Early clinical data suggests BMAC may help stimulate a more robust hyaline cartilage repair tissue response. Numerous questions remain regarding BMAC usage, including cell source, cell expansion, optimal pathology, and injection timing and quantity.



MSCs in Osteoarthritis

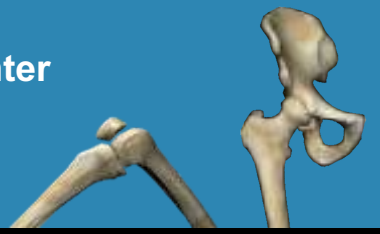
Concentrated Bone Marrow Aspirate for the Treatment of Chondral Injuries and Osteoarthritis of the Knee

A Systematic Review of Outcomes

Jorge Chahla, MD,[*] Chase S. Dean, MD,[*] Gilbert Moatshe, MD,[*†] Cecilia Pascual-Garrido, MD,[‡] Raphael Serra Cruz, MD,[*§] and Robert F. LaPrade, MD, PhD[*‖¶]

Results:

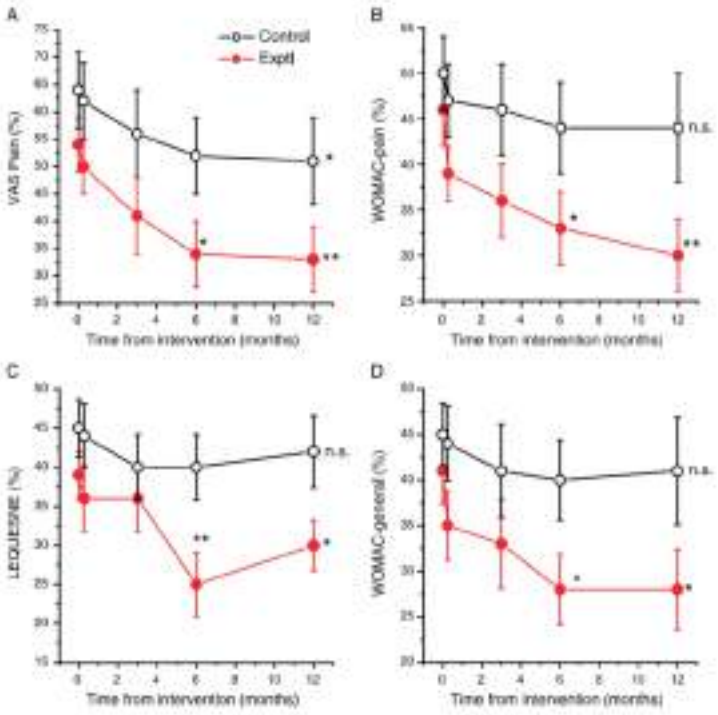
Eleven studies were considered. Of these, 5 were prospective studies, 1 was a retrospective study, 2 were case series, and 3 were case reports. Three comparative studies (2 with level 2 evidence, 1 with level 3 evidence) were found in our search; none of them were randomized. Three studies investigated the clinical efficacy of BMAC in the treatment of osteoarthritis, and 8 studies evaluated the efficacy of BMAC on focal cartilage injuries. All 3 studies regarding osteoarthritis and all 8 studies regarding focal chondral defects reported good to excellent overall outcomes with the use of BMAC.

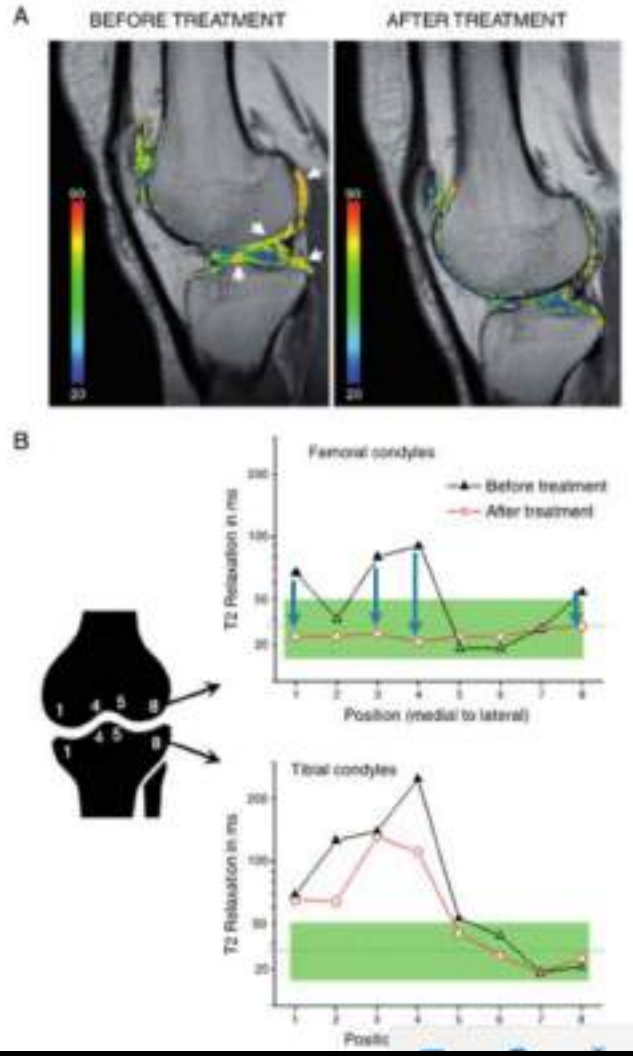


Original Clinical Science

Treatment of Knee Osteoarthritis With Allogeneic Bone Marrow Mesenchymal Stem Cells: A Randomized Controlled Trial

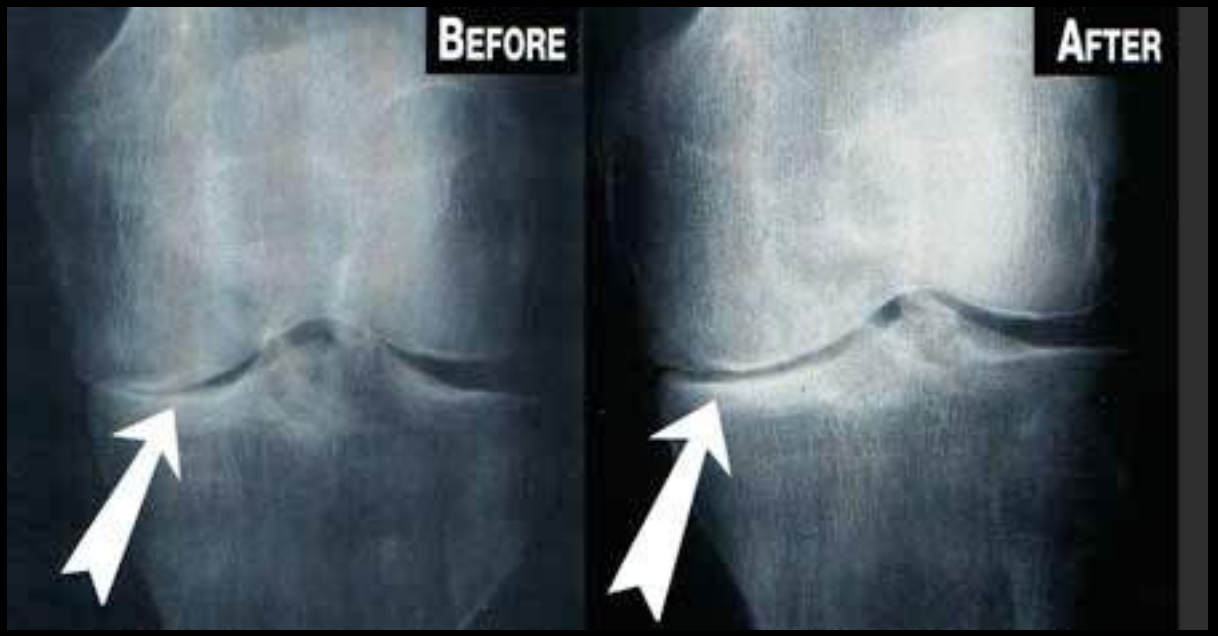
Aurelio Vega, MD, PhD,[†] Miguel Angel Martín-Ferrero, MD, PhD,[†] Francisco Del Canto, MD,[†] Mercedes Alberca, PhD,[‡] Verónica García, BS,[‡] Anna Munar, MD,[§] Luis Orozco, MD, PhD,[∥] Robert Soler, MD, PhD,[¶] Juan José Fuentes, MD,[#] Marina Huguet, MD,[**] Ana Sánchez, MD, PhD,[‡] and Javier García Sancho, MD, PhD[‡]





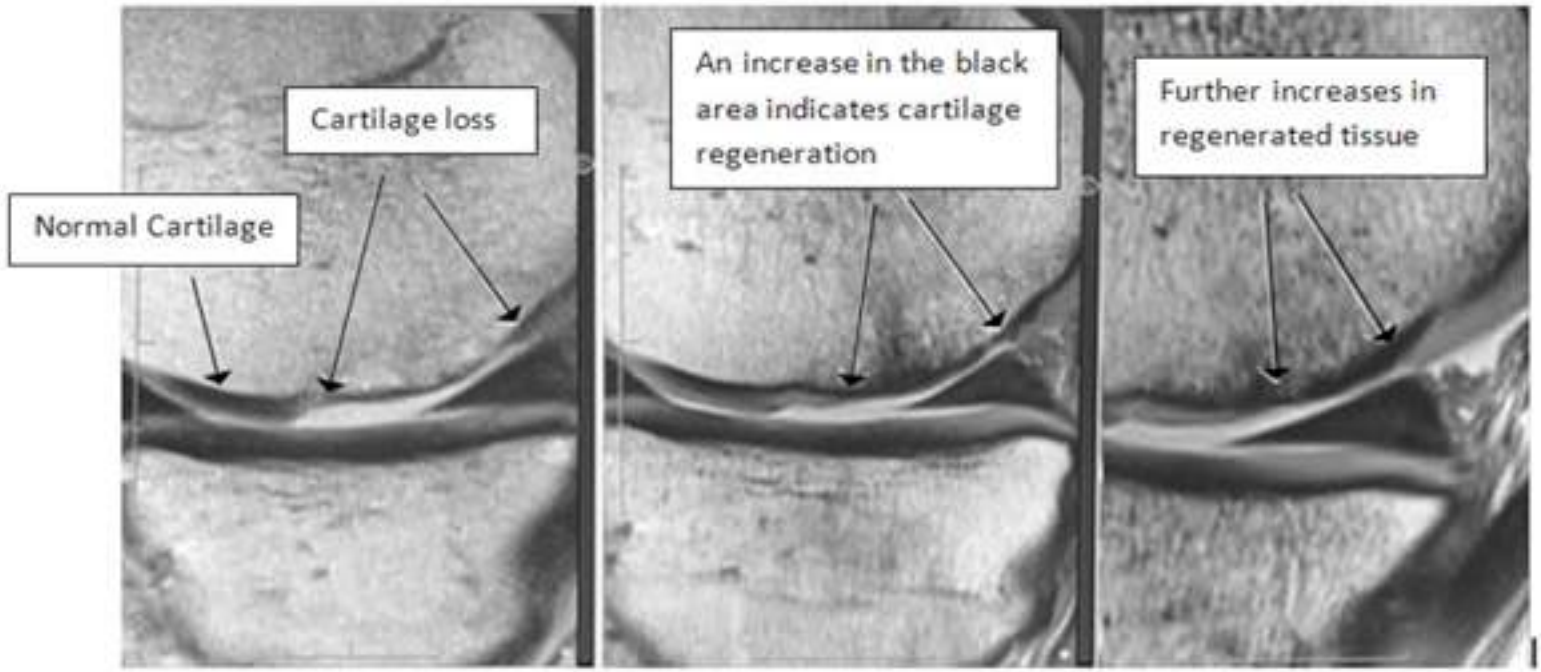
Orlando Orthopaedic Center

Stem Cell Therapy at Orlando Orthopaedic Center

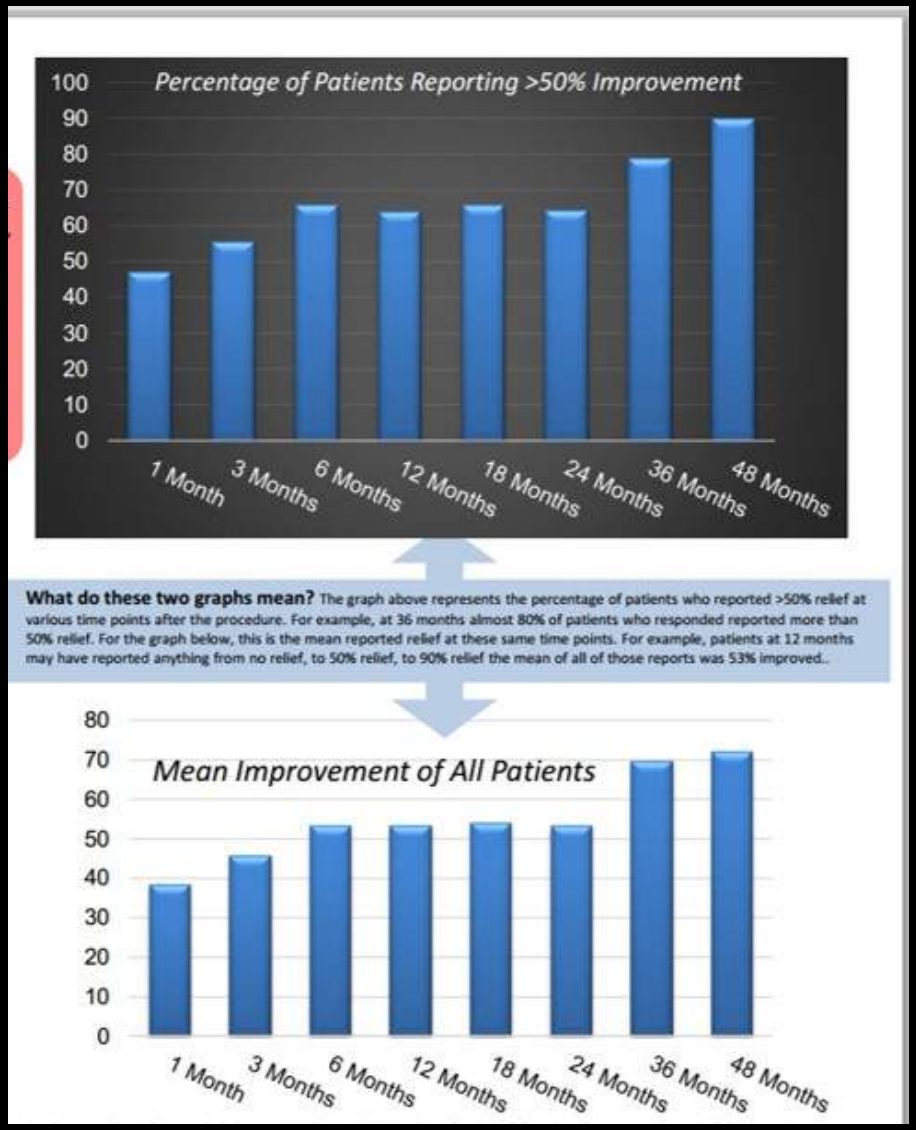


Orlando Orthopaedic Center

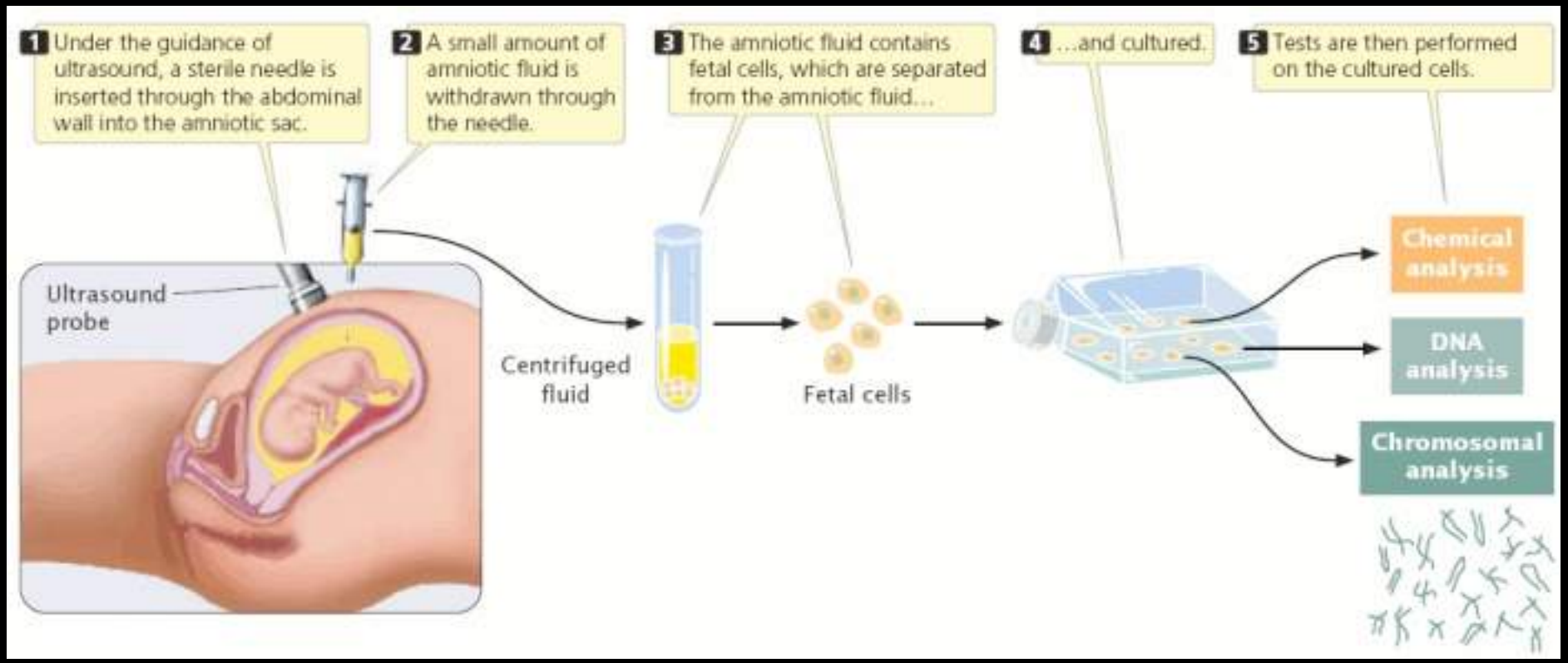
Stem Cell Therapy at Orlando Orthopaedic Center



Stem Cell Therapy at Orlando Orthopaedic Center



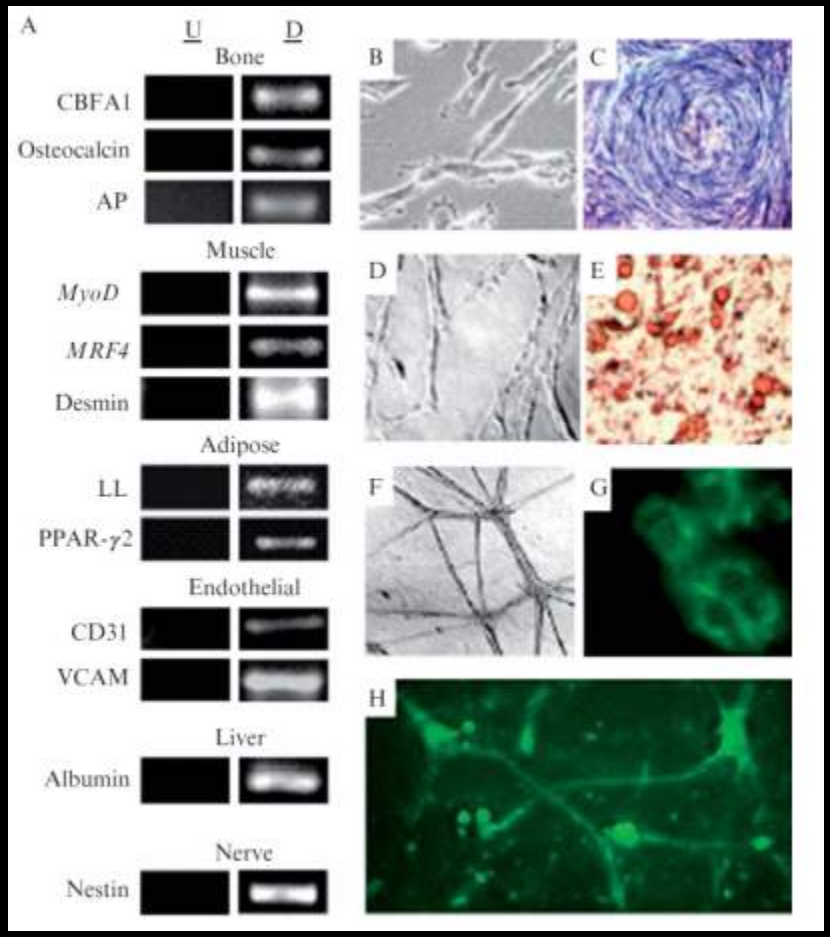
Amniotic and Placental Tissues

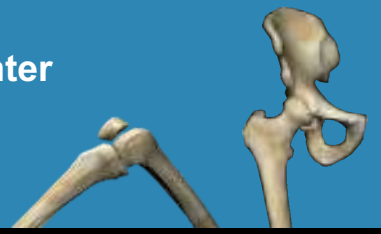


Amniotic Fluid Cells

Amniotic fluid cells produce high quantities of growth factor.

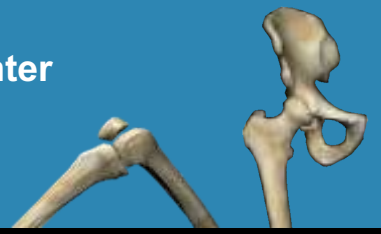
They have tremendous capacity for the production of growth and anti-inflammatory factors, and can differentiate into multiple tissues including bone, cartilage, and muscle among other cell types





Growth factors found in Amniotic Fluid Concentrate

- HGF: Hepatocyte Growth Factor → **Myogenesis, Wound Healing, Organ Regeneration**
- EGF: Epidermal Growth Factor → **Cell Growth, Proliferation, Differentiation**
- TNF-α: Tumor Necrosis Factor-Alpha → **Apoptosis, Angiogenesis**
- GRO-α: Chemokine → **Angiogenesis, Wound Healing**
- MCP-1: Monocyte Chemoattractant Protein-1 → **Immune Modulation**
- TIMP (1,2,3,4): Tissue Inhibitor of Metalloproteinases (2,3,4) → **Growth Promotion**
- IGF-1: Insulin-Like Growth Factor-1
- IGF-2: Insulin-Like Growth Factor-2
- IL1-RA: IL1-Receptor Antagonist => **Anti-inflammatory**
- TGF-α: Transforming Growth Factor-Alpha
- TGF-β1: Transforming Growth Factor-Beta 1
- TGF-β2: Transforming Growth Factor-Beta 2
- IL6: Interleukin 6 => **Immune modulation**



J Knee Surg. 2016 Aug;29(6):443-50. doi: 10.1055/s-0035-1569481. Epub 2015 Dec 18.

Cryopreserved Amniotic Suspension for the Treatment of Knee Osteoarthritis.

Vines JB[1], Aliprantis AO[2], Gomoll AH[3], Farr J[4].

Author information

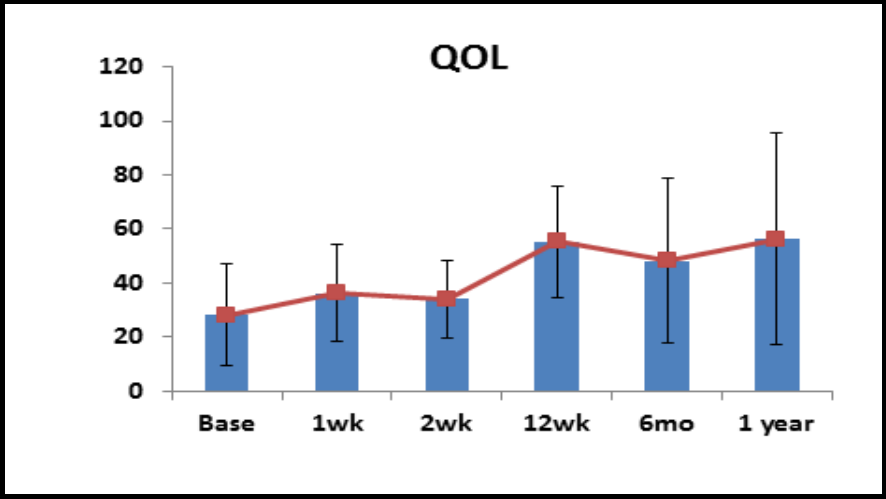
Abstract

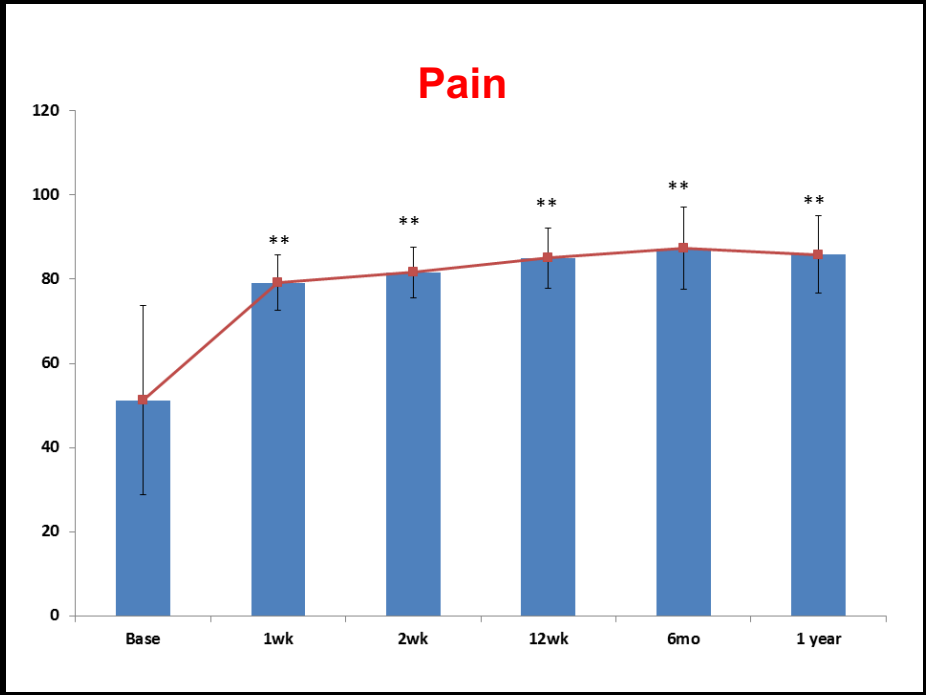
There are few treatment options for symptomatic knee osteoarthritis (OA). Human amniotic suspension allografts (ASA) have anti-inflammatory and chondroregenerative potential and thus represent a promising treatment strategy. In anticipation of a large, placebo-controlled trial of intra-articular ASA for symptomatic knee OA, an open-label prospective feasibility study was performed. Six patients with Kellgren-Lawrence grades 3 and 4 tibiofemoral knee OA were administered a single intra-articular ASA injection containing cryopreserved particulated human amnion and amniotic fluid cells. Patients were followed for 12 months after treatment. No significant injection reactions were noted. Compared with baseline there were (1) no significant effect of the ASA injection on blood cell counts, lymphocyte subsets, or inflammatory markers and (2) a small, but statistically significant increase in serum IgG and IgE levels. Patient-reported outcomes including International Knee Documentation Committee, Knee Injury and Osteoarthritis Outcome, and Single Assessment Numeric Evaluation scores were collected throughout the study and evaluated for up to 12 months. Overall, this study demonstrates the feasibility of a single intra-articular injection of ASA for the treatment of knee OA and provides the foundation for a large placebo-controlled trial of intra-articular ASA for symptomatic knee OA.

PMID: 26683979 DOI: 10.1055/s-0035-1569481

[Indexed for MEDLINE]

Clinical Outcome Studies

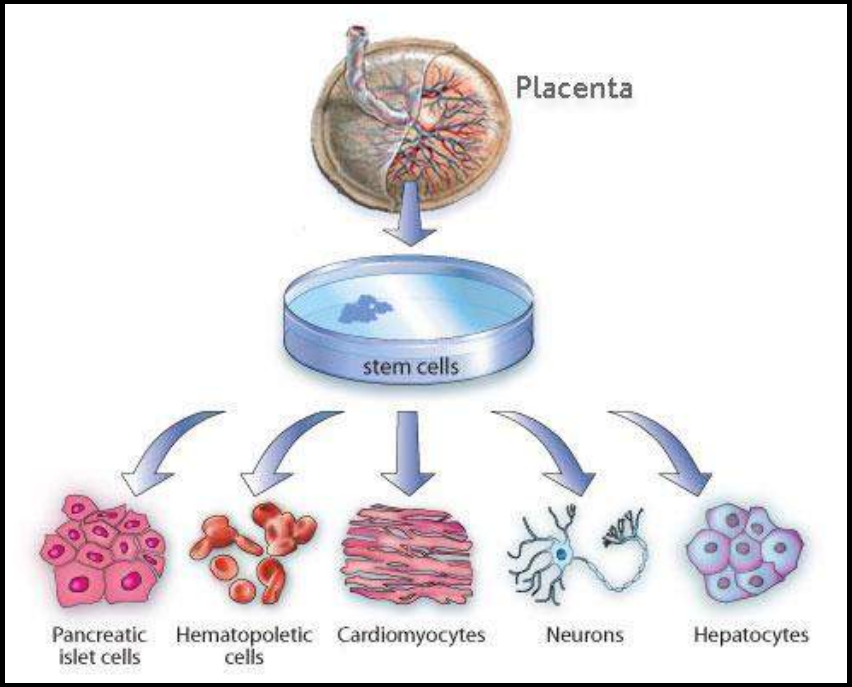




Placental and Umbilical Tissues

Tissue from placenta and umbilical cord has high concentrations of Stem Cells and a substance known as Wharton's Jelly.

This functions along with the growth factors present in amniotic fluid concentrate to provide a scaffold for new cartilage growth



J Cell Biochem. 2016 Apr;117(4):815-27. doi: 10.1002/jcb.25375. Epub 2015 Sep 17.

Freezing of Fresh Wharton's Jelly From Human Umbilical Cords Yields High Post-Thaw Mesenchymal Stem Cell Numbers for Cell-Based Therapies.

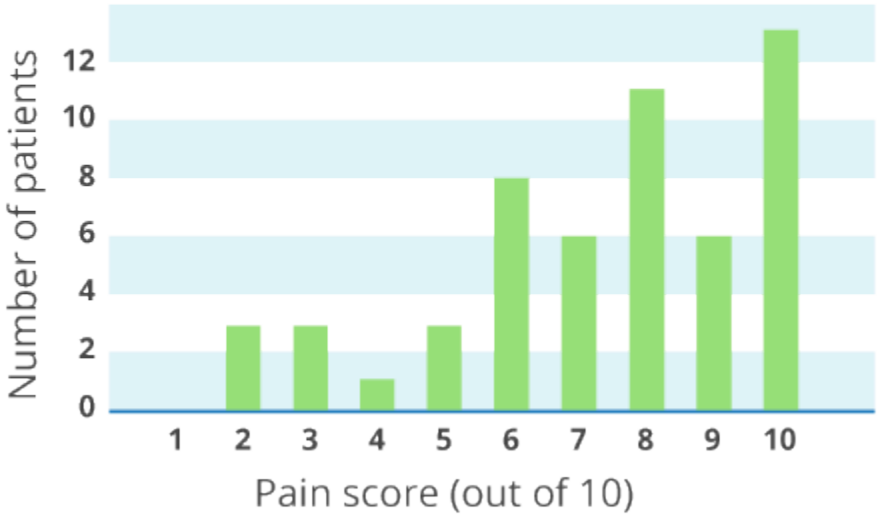
Fong CY[1], Subramanian A[1], Biswas A[1], Bongso A[1].

Author information

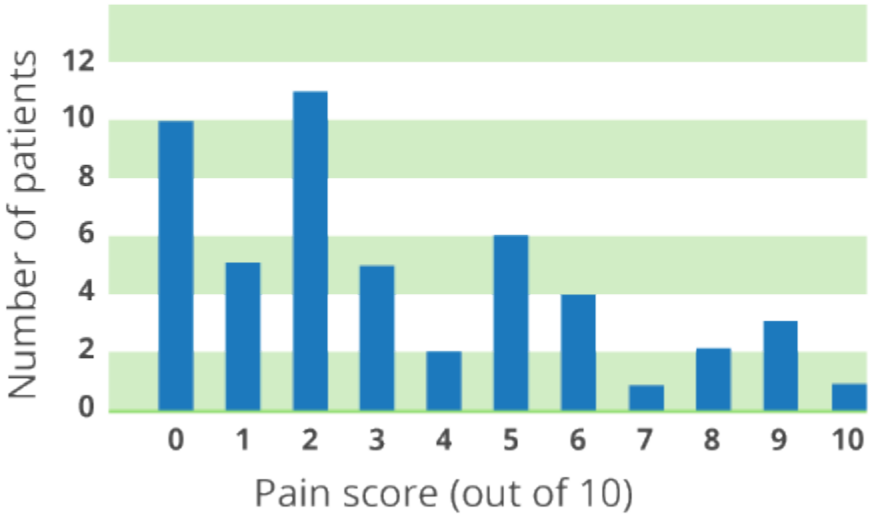
Abstract

Some cord blood banks freeze entire pieces of UC (mixed cord, MC) which after post-thaw yields mixed heterogeneous populations of mesenchymal stem cells (MSCs) from all its microanatomical compartments. Freezing of such entire tissues results in sub-optimal post-thaw cell recovery because of poor cryoprotectant diffusion and intracellular ice-formation, heat and water transport issues, and damage to intercellular junctions. To develop a simple method of harvesting pure homogeneous MSCs for cord blood banks, we compared the post-thaw behavior of three groups of frozen UC tissues: (i) freshly harvested WJ without cell separation; (ii) MSCs isolated from WJ (WJSC); and (iii) MC, WJ, and WJSC produced high post-thaw cell survival rates (93.52 ± 6.12% to 90.83 ± 4.51%) and epithelioid monolayers within 24 h in primary culture whereas post-thaw MC explants showed slow growth with mixed epithelioid and fibroblastic cell outgrowths after several days. Viability and proliferation rates of post-thawed WJ and hWJSC were significantly greater than MC. Post-thaw WJ and WJSC produced significantly greater CD24(+) and CD108(+) fluorescence intensities and significantly lower CD40(+) contaminants. Post-thaw WJ and WJSC produced significantly lesser annexin-V-positive and sub-G1 cells and greater degrees of osteogenic and chondrogenic differentiation compared to MC. qRT-PCR analysis of post-thaw MC showed significant decreases in anti-apoptotic gene expression (SURVIVIN, BCL2) and increases in pro-apoptotic (BAX) and cell cycle regulator genes (P53, P21, ROCK 1) compared to WJ and WJSC. We conclude that freezing of fresh WJ is a simple and reliable method of generating large numbers of clinically utilizable MSCs for cell-based therapies.

Pain before treatment



Pain after treatment



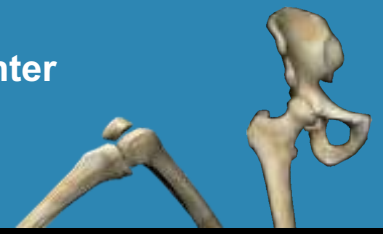
Platelet Rich Plasma

Platelets - Cells within the patient's own blood have high levels of growth factor and anti-inflammatory properties. Approximately 60cc (2 ounces) of blood is drawn, processed in a cell separator, and then injected into the damaged or inflamed tissue.

Traditionally used in athletes for torn or inflamed tendons

Anti-inflammatory properties are superior to cortisone shots without the risk of cartilage damage

Despite High Concentrations of growth factor, PRP has not been proven to regrow cartilage



PRP in Osteoarthritis

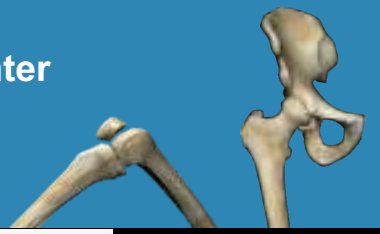
The efficacy of platelet-rich plasma in the treatment of symptomatic knee osteoarthritis: a systematic review with quantitative synthesis.

Khoshbin A[1], Leroux T, Wasserstein D, Marks P, Theodoropoulos J, Ogilvie-Harris D, Gandhi R, Takhar K, Lum G, Chahal J.

Author information

1 University of Toronto Orthopaedic Sports Medicine Program, Women's College Hospital, Toronto, Ontario, Canada; The Hospital for Sick Children, Toronto, Ontario, Canada.

CONCLUSIONS: As compared with HA or NS injection, multiple sequential intra-articular PRP injections may have beneficial effects in the treatment of adult patients with mild to moderate knee OA at approximately 6 months. There appears to be an increased incidence of



Arthroscopy. 2016 Mar;32(3):495-505. doi: 10.1016/j.arthro.2015.08.005. Epub 2015 Oct 1.

Efficacy of Intra-articular Platelet-Rich Plasma Injections in Knee Osteoarthritis: A Systematic Review.

Meheux CJ[1], McCulloch PC[1], Lintner DM[1], Varner KE[1], Harris JD[2].

Author information

Abstract

PURPOSE: To determine (1) whether platelet-rich plasma (PRP) injection significantly improves validated patient-reported outcomes in patients with symptomatic knee osteoarthritis (OA) at 6 and 12 months postinjection, (2) differences in outcomes between PRP and corticosteroid injections or viscosupplementation or placebo injections at 6 and 12 months postinjection, and (3) similarities and differences in outcomes based on the PRP formulations used in the analyzed studies.

METHODS: PubMed, Cochrane Central Register of Controlled Trials, SCOPUS, and Sport Discus were searched for English-language, level I evidence, human in vivo studies on the treatment of symptomatic knee OA with intra-articular PRP compared with other options, with a minimum of 6 months of follow-up. A quality assessment of all articles was performed using the Modified Coleman Methodology Score (average, 83.3/100), and outcomes were analyzed using 2-proportion z-tests.

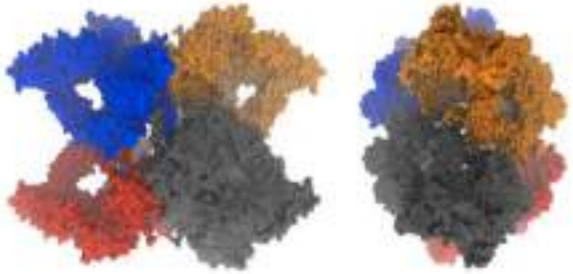
RESULTS: Six articles (739 patients, 817 knees, 39% males, mean age of 59.9 years, with 38 weeks average follow-up) were analyzed. All studies met minimal clinical important difference criteria and showed significant improvements in statistical and clinical outcomes, including pain, physical function, and stiffness, with PRP. All but one study showed significant differences in clinical outcomes between PRP and hyaluronic acid (HA) or PRP and placebo in pain and function. Average pretreatment Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) scores were 52.36 and 52.05 for the PRP and HA groups, respectively (P = .420). Mean post-treatment WOMAC scores for PRP were significantly better than for HA at 3 to 6 months (28.5 and 43.4, respectively; P = .0008) and at 6 to 12 months (22.8 and 38.1, respectively; P = .0062). None of the included studies used corticosteroids.

CONCLUSIONS: In patients with symptomatic knee OA, PRP injection results in significant clinical improvements up to 12 months postinjection. Clinical outcomes and WOMAC scores are significantly better after PRP versus HA at 3 to 12 months postinjection. There is limited evidence for comparing leukocyte-rich versus leukocyte-poor PRP or PRP versus steroids in this study.

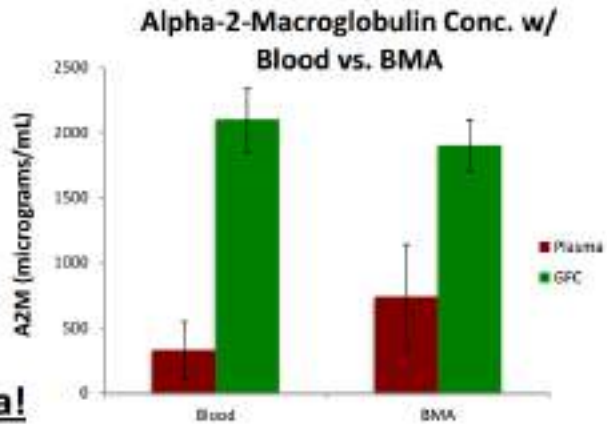
LEVEL OF EVIDENCE: Level I, systematic review of Level I studies.

A2M (Alpha-2-macroglobulin)

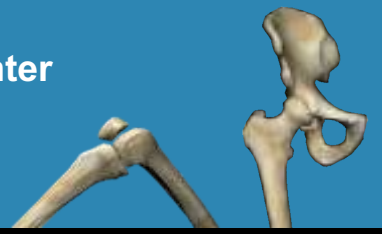
- Natural protease inhibitor in platelet poor plasma
- Slows the breakdown of articular cartilage surfaces
- A2M also binds up pro-inflammatory molecules TNF-a, TGF-b, and IL-1b
  - Less inflammation = less pain
  - Less inflammation = allows local cells to repair the ECM



Open A2M Closed A2M

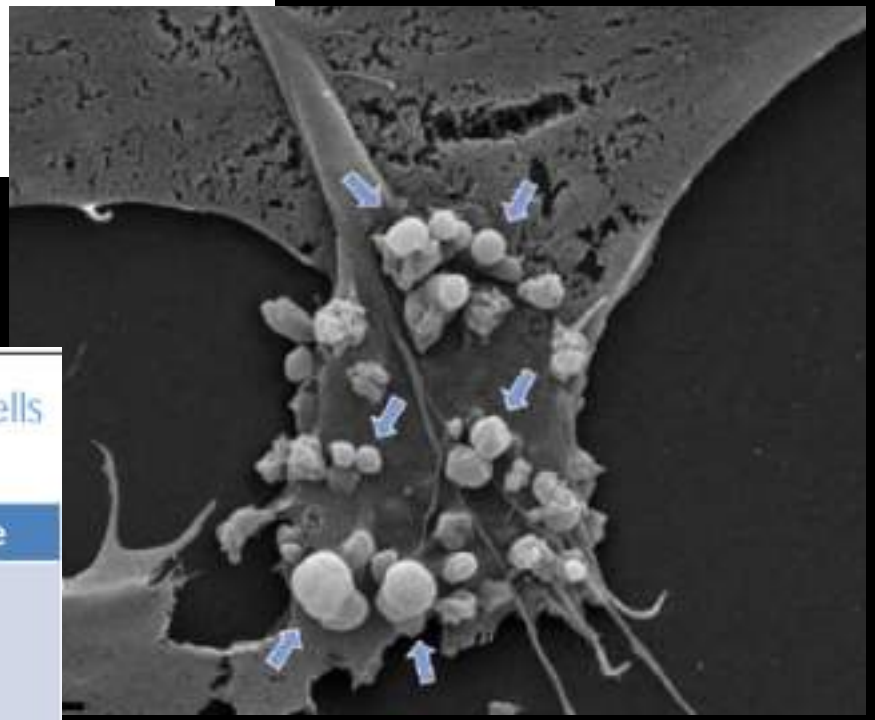


Available in blood or BMA plasma!



Exosomes

- Extracellular vesicles released via exocytosis
- Nano-sized membrane vesicles with a diameter between 40-120 nm
- Released by all kinds of cells into extracellular environment
- Contain cytokines, proteins, lipids, mRNAs, miRNAs, non-coding RNAs, and ribosomal RNAs
- Bilayer membranous shell prevents dehydration
- Appealing candidates as vectors of MSC efficacy
- Contain no live cells



Exosomes are not small cells

Components of a cell	Components of an exosome
DNA	(targeted)
Messenger RNA	Messenger RNA
Micro RNA	Micro RNA
Protein	Protein

Exosomes

Exosomes as potential alternatives to stem cell therapy for intervertebral disc degeneration: in-vitro study on exosomes in interaction of nucleus pulposus cells and bone marrow mesenchymal stem cells

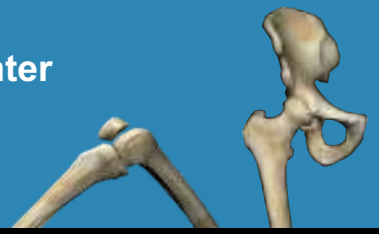
Kang Lu, Hai-yin Li, Kuang Yang, Jun-long Wu, Xiao-wei Cai, Yue Zhou and Chang-qing Li

Stem Cell Research & Therapy 2017 8:108 | https://doi.org/10.1186/s13287-017-0563-9 | © The Author(s). 2017

Received: 31 July 2016 | **Accepted:** 26 April 2017 | **Published:** 10 May 2017

- Recruitment of cells from the surrounding environment around intervertebral discs are an important aspect of the regenerative process.
- Micro-particles can activate MSC migration and cytokine secretion
- Exosomes may be a more appropriate candidate than MSCs in stem-cell based therapy of intervertebral discs as the disc itself is a hostile environment (decreased glucose, increased osmolarity, decreased pH, decreased O_2, increased mechanical variations) and exosomes are more stable and will yield better survivability.

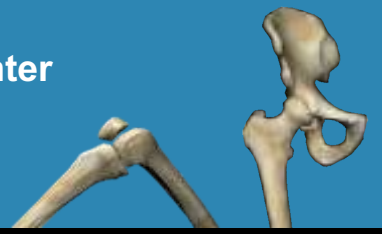
There are many clinical studies showing significant positive outcomes using exosomes in the treatment of spinal pathology and chronic pain



Who is a Candidate For Regenerative Therapy

In general, regenerative therapies are advised for moderate osteoarthritis in the hip, knee, and shoulder, where there is not complete collapse of the joint space and not “bone on bone” changes.

There are some medical issues that are contraindications to regenerative therapy



Who is Not a Candidate for a Regenerative Procedure

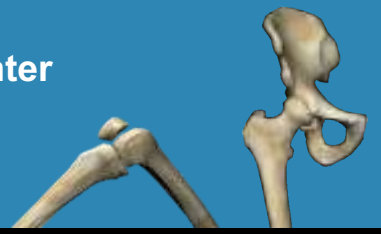
Patient with cancer history (such as prostate cancer or breast cancer), not in remission for at least 5 years

Certain other malignancies or blood borne disease

Patient with any current infection

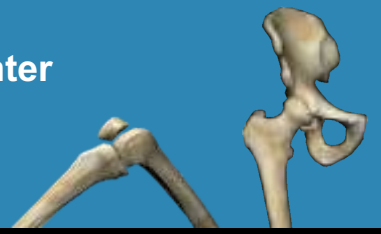
Patient who are on certain blood thinners or immunosuppressive drugs

Patients with multiple medical issues may not be good candidates



It Seems Like There are a lot of Possible Treatments. Which is the best One?

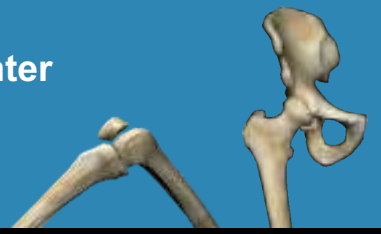
The Decision to proceed with any of the available forms of treatment will depend on many factors and be individualized to each patient's unique situation.



What is the Success Rate ?

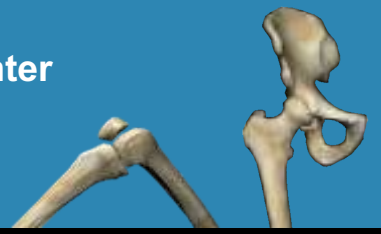
Our experience is that most patients will have significant relief of pain around 1-2 months post injection. This will often continue to improve for the first 3-6 months after the stem cell procedure.

There have not been many long term outcome studies so effectiveness years down the road is still unknown



Regenerative Medicine Therapies Represents an Innovative Alternative Treatment for Osteoarthritis

- Pain Relief
- Functional Improvement
- Regeneration of Joint Cartilage
- Reduced probability of surgical procedures, including joint replacement surgery



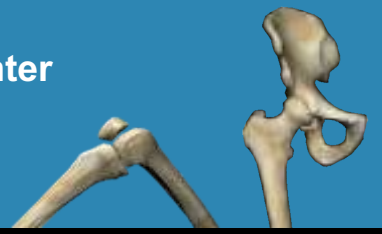
Other things to consider as you evaluate Regenerative Medicine Therapies

(the fine print)

These treatments are not covered by insurance and can be expensive

While successful in the large majority of patients, treatment results cannot be guaranteed, and there are some patients that experience only minimal improvement

Traditional treatments for arthritis can be very successful at reducing pain and improving function, though none have the potential to promote cartilage healing or regeneration.



What we offer that "stem cell clinics" don't:

Stem Cells don't cure everything and are not for everyone !

As board certified orthopaedic surgeons, pain management specialists, and podiatrists with many years of experience in the surgical and non-surgical treatment of musculoskeletal pathology, we can thoroughly evaluate a damaged or painful joint and provide any and all available treatments, many of which will be covered by insurance.

While we feel that regenerative medicine is a huge step forward in the management of arthritis, we will not recommend it if we don't honestly think it's going to help.

There have been reports of stem cell clinics providing therapies which don't adhere to the current FDA guidelines. Orlando Orthopaedic Center strictly adheres to all FDA guidelines regarding Regenerative Medicine Therapies.


Thank You
Personalized Solutions. Proven Results.
Orlando Orthopædic Center