

BIOLOGICS IN SPORTS MEDICINE

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DISCLOSURES

- HOUSTON MARATHON COMMITTEE: MEDICAL DIRECTOR
- 2ND.MD: CONSULTANT
- MUSCULOSKELETAL ULTRASOUND CONSULTANTS: OWNER
- DEMOS MEDICAL PUBLISHING: ROYALTIES

OBJECTIVES

- DISCUSS BIOLOGIC TREATMENTS:
 - PROLOTHERAPY, PRP & DHACM
- REVIEW EVIDENCE FOR THESE TREATMENTS
- PROPOSE A RATIONALE FOR USE
- PRESENT CLINICAL EXAMPLES

PROLOTHERAPY

- VARIOUS CONCENTRATIONS OF DEXTROSE (5%, 12.5%-25%) INJECTED IN SMALL AMOUNTS INTO THE REGIONAL ANATOMY OF AN AFFECTED AREA
- PROLIFERATING EFFECT
- OSMOLAR INJURY AT A CELLULAR LEVEL
 - AN INFLAMMATORY (HEALING) RESPONSE
 - INDUCES TISSUE REMODELING
- TREAT THE REGION; NOT A POINT
- INJECTED AROUND NERVES AND INTO TENDONS, LIGAMENTS AND JOINTS
- TREATMENTS IN SERIES, 4-6 WEEKS APART



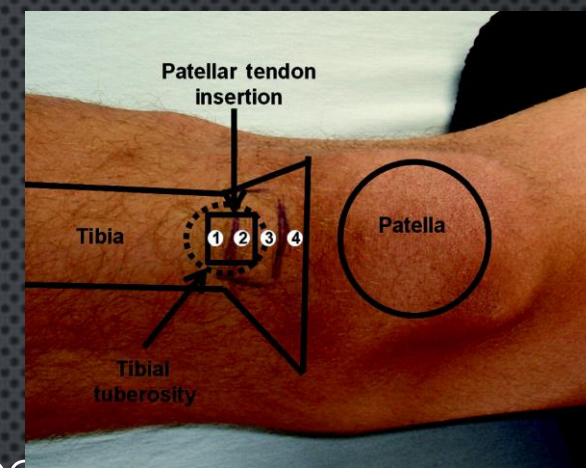
PROLOTHERAPY IN OA

- TOPOL GA, PODESTA LA, REEVES DR, ET AL. CHONDROGENIC EFFECT OF INTRA-ARTICULAR HYPERTONIC-DEXTROSE (PROLOTHERAPY) IN SEVERE KNEE OSTEOARTHRITIS. PM R 2016;1:1-11
 - CASE SERIES WITH BLINDED ARTHROSCOPIC EVALUATION PRE AND POST
 - 6 SUBJECTS WITH KL IV MFC CARTILAGE LOSS
 - INTRAARTICULAR 12.5% DEXTROSE (10ML) X 4-6 MONTHLY TREATMENTS
 - ARTHROSCOPIC, HISTOLOGIC, WOMAC OUTCOME MEASURES
 - CHONDROGENIC EFFECTS

PROLOTHERAPY IN OA

- RABAGO, MILLER, ZAJIERSKA. DEXTROSE PROLOTHERAPY FOR KNEE OSTEOARTHRITIS: RESULTS OF A RANDOMIZED CONTROLLED TRIAL. OA RESEARCH SOCIETY 2011
 - SIGNIFICANTLY GREATER IMPROVEMENT IN WOMAC SCORES AT 52 WEEKS IN DEXTROSE PROLOTHERAPY GROUP COMPARED WITH SALINE AND EXERCISE
 - HIGH PATIENT SATISFACTION IN PROLOTHERAPY GROUP

PROLOTHERAPY IN OA

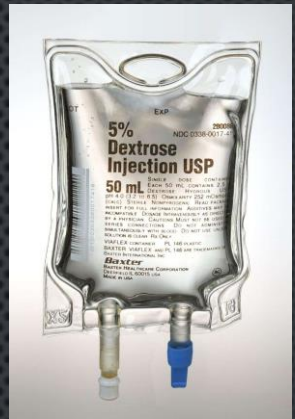


- TOPOL GA ET AL. HYPEROSMOLAR DEXTROSE INJECTION FOR RECALCITRANT OSGOOD-SCHLATTER DISEASE. PEDIATRICS 2011;128:e1121-e1128
 - DEXTROSE INJECTION OVER THE APOPHYSIS AND PATELLA TENDON WAS SAFE AND WELL TOLERATED AND RESULTED IN MORE RAPID AND FREQUENT ACHIEVEMENT OF UNALTERED SPORT AND ASYMPTOMATIC SPORT
- RABAGO D, PATTERSON JJ, MUNDT M, ET AL. DEXTROSE PROLOTHERAPY FOR KNEE OSTEOARTHRITIS: A RANDOMIZED CONTROLLED TRIAL. ANNALS OF FAMILY MEDICINE MAY/JUNE 2013
- JAHANIGIRI A, MOGHADDAM FR, NAJAFI S. HYPERTONIC DEXTROSE VERSUS CORTICOSTEROID FOR THE TREATMENT OF OSTEOARTHRITIS IN THE FIRST CARPOMETACARPAL JOINT: A DOUBLE-BLIND RANDOMIZED CLINICAL TRIAL. J ORTHOPAEDIC SCIENCE 2014
- VORA A, BORG-STEIN ET AL. REGENERATIVE INJECTION THERAPY FOR OSTEOARTHRITIS: FUNDAMENTAL CONCEPTS AND EVIDENCE-BASED REVIEW. PM R 2012; 4:S104-S109

PROLOTHERAPY IN TENDINOPATHY

- TOPOL GA, REEVES DK, HASSANEIN KM. EFFICACY OF DEXTROSE PROLOTHERAPY IN ELITE MALE KICKING-SPORT ATHLETES WITH CHRONIC GROIN PAIN. ARCH PHYS MED REHABIL 2005;86: 697-702.
 - 72 ELITE ATHLETES
 - MONTHLY INJECTIONS OF 12.5% DEXTROSE ABDOMINAL AND ADDUCTOR ATTACHMENTS
 - RETURN TO SPORT OCCURRED IN AVERAGE OF 3 MOS.
 - OUTCOME MEASURE AT 0 AND AVG 26 MONTHS POST
 - AVG VAS: 82% IMPROVED / AVG NIRSCHL: 78% IMPROVED

PERI-NEURAL INJECTION THERAPY



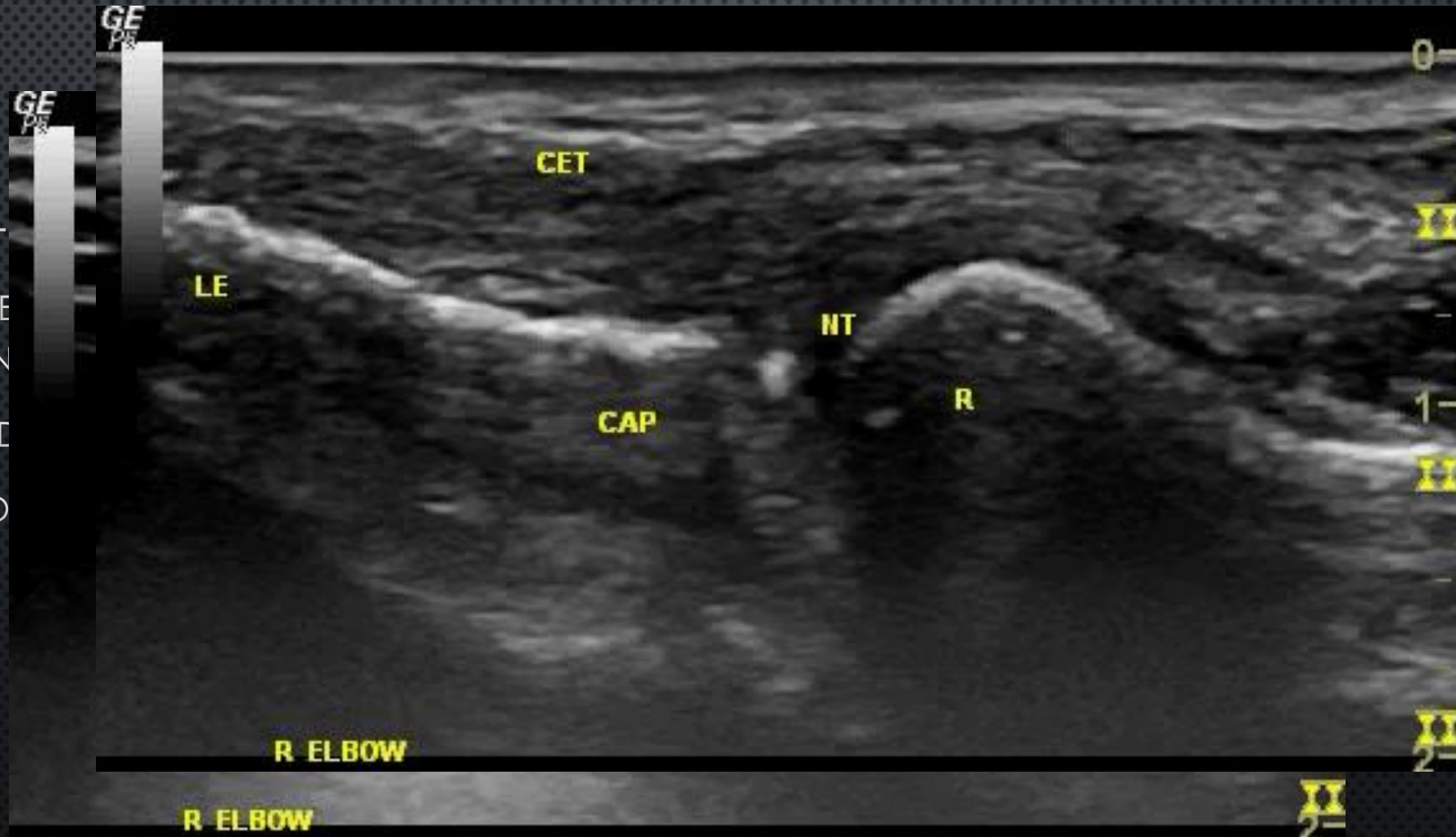
- LYFTOGT J. SUBCUTANEOUS PROLOTHERAPY TREATMENT OF REFRACTORY KNEE, SHOULDER AND LATERAL ELBOW PAIN. AUSTRALIAN MUSCULOSKELETAL MEDICINE. 2005
 - TREATMENT FOCUSES ON TREATMENT OF NEUROGENIC PAIN AND INFLAMMATION FROM THE SMALL SENSORY PEPTIDERGIC NERVES
 - MULTIPLE SMALL INJECTIONS ALONG THE PATH OF TENDER SUPERFICIAL NERVES, IN AREAS OF FASCIAL CONSTRICTION, WITH A SMALL AMOUNT OF 5% DEXTROSE (OR MANNITOL)
 - THIS BLOCKS THE TRPV-1 OR CAPSACIN RECEPTOR ON THE NERVE.



Anterior Femoral Nerves and CCI's

PROLOTHERAPY: CLINICAL EXAMPLE

- 50+
- SEVE
PAIN
- TEND
- PRO

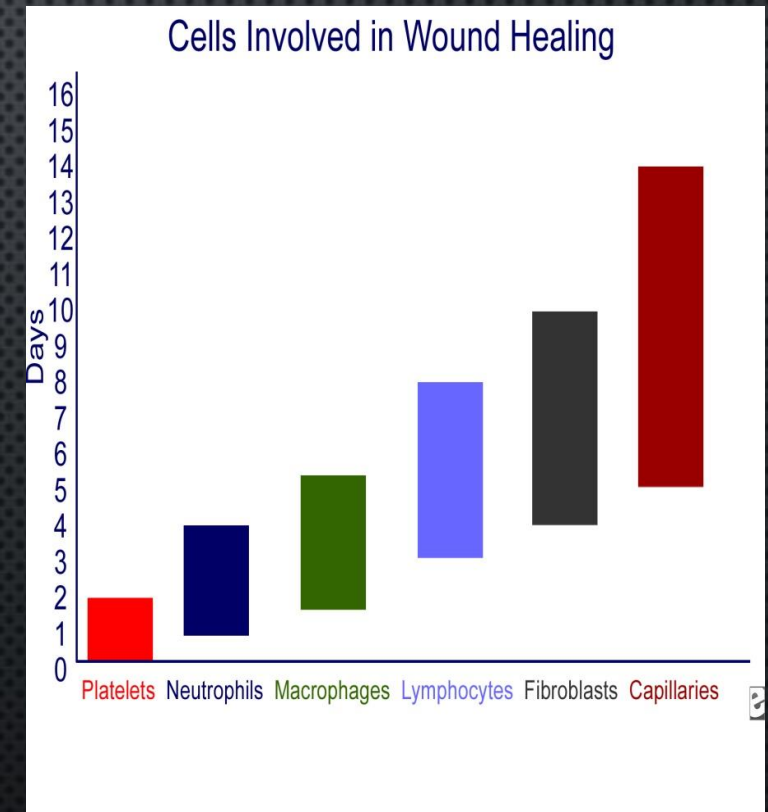


SUMMARY

- PROLOTHERAPY IS SAFE, INEXPENSIVE AND EFFECTIVE
- ROBUST EVIDENCE IN TENDINOPATHY AND OA
- REQUIRES SUPERIOR COMMAND OF ANATOMY AND INJECTION SKILLS
- RESULTS ARE SLOW BUT PROGRESSIVE

PLATELET RICH PLASMA

- PLATELETS ARE THE FIRST CELLS TO ARRIVE AT THE SITE OF INJURY
- RESPONSIBLE FOR INITIATION OF HEALING CASCADE
- A-GRANULES AND DENSE GRANULES

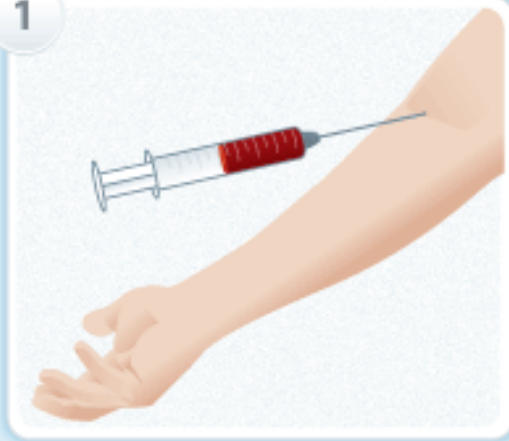


PLATELET RICH PLASMA

- PRP CAN STIMULATE PRODUCTION & RECRUITMENT OF GROWTH FACTORS AND STEM CELLS TO PROMOTE ANGIOGENESIS, EXTRACELLULAR MATRIX PRODUCTION AND COLLAGEN FORMATION
 - ACTIVATED BY THROMBIN
 - CHANGE SHAPE AND ADHERE TO TISSUES
 - ALPHA & DENSE GRANULES WITHIN PLATELETS RELEASE GROWTH FACTORS AND CYTOKINES

PROCESS OF PRP THERAPY

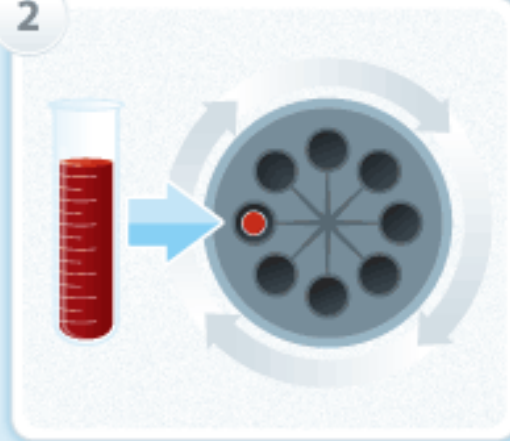
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Collect blood

30-60ml of blood is drawn from the patient's arm.

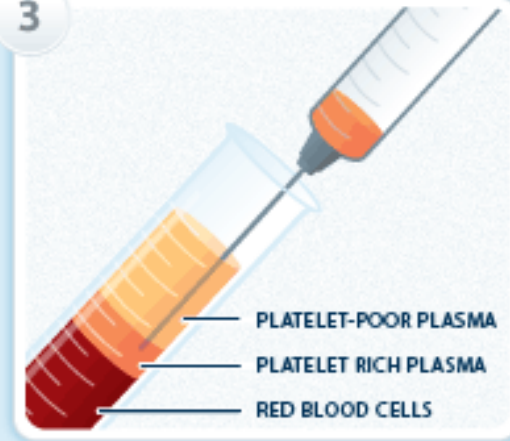
2



Separate the platelets

The blood is then placed in a centrifuge. The centrifuge spins and separates the platelets from the rest of the blood components.

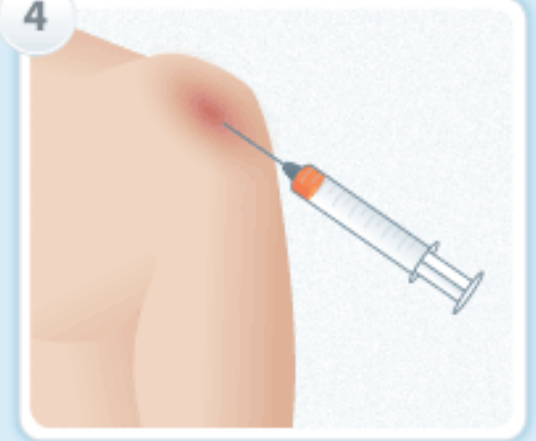
3



Extract platelet-rich plasma

Extract 3-6ml of platelet-rich plasma.

4



Inject injured area with PRP

Using the concentrated platelets, we increase the growth factors up to eight times, which promotes temporary relief and stops inflammation.

PLATELET RICH PLASMA

- SAMPSON S, GERHARDT M, MANDELBAUM B. PLATELET RICH PLASMA INJECTION GRAFTS FOR MUSCULOSKELETAL INJURIES: A REVIEW. CURR REV MUSCULOSKELET MED
- SUPERNATANT OF WHOLE BLOOD RESULTING IN A CONCENTRATED AMOUNT OF PLATELETS
- PLATELETS >>> CLOTTING.
- PLATELETS RELEASE: BIOACTIVE PROTEINS RESPONSIBLE FOR ATTRACTING MACROPHAGES, MESENCHYMAL STEM CELLS, AND OSTEOBLASTS
 - PROMOTES REMOVAL OF NECROTIC TISSUE,
 - ENHANCES TISSUE REGENERATION AND HEALING.

PLATELET RICH PLASMA

Eppley BL, Woodell JE, Higgins J.

Platelet quantification and growth factor analysis from platelet-rich plasma: implications for wound healing. Plast Reconstr Surg. 2004 Nov;114(6):1502–8

- PLATELET-DERIVED GROWTH FACTOR (PDGF)
 - STIMULATES CELL REPLICATION
 - PROMOTES ANGIOGENESIS
 - PROMOTES EPITHELIALIZATION
 - PROMOTES GRANULATION TISSUE FORMATION
- TRANSFORMING GROWTH FACTOR (TGF)
 - PROMOTES FORMATION OF EXTRACELLULAR MATRIX
 - REGULATES BONE CELL METABOLISM
- VASCULAR ENDOTHELIAL GROWTH FACTOR (VEGF)_R
 - PROMOTES ANGIOGENESIS
 - EPIDERMAL GROWTH FACTOR (EGF) PROMOTES CELL DIFFERENTIATION AND STIMULATES
 - RE-EPITHELIALISATION, ANGIOGENESIS AND COLLAGENASE
 - ACTIVITY
- FIBROBLAST GROWTH FACTOR (FGF)
 - PROMOTES PROLIFERATION OF ENDOTHELIAL CELLS AND FIBROBLASTS
 - STIMULATES ANGIOGENESIS

PLATELET RICH PLASMA

- VARIETY OF PREPARATIONS:
 - L-PRP (LEUCOCYTE RICH)
 - P-PRP (LEUCOCYTE POOR)
 - PLASMA RICH GROWTH FACTORS (PGRF)
 - PLATELET LYSATE
 - AUTOLOGOUS CONDITIONED PLASMA
- NO CLEAR EVIDENCE FOR WHAT IS BEST
 - NGUYEN, BORG-STEIN ET AL, PM R, MARCH 2011, 226-211
 - EHRENFEST ET AL, 2008, TRENDS IN BIOTECHNOLOGY, 158-167

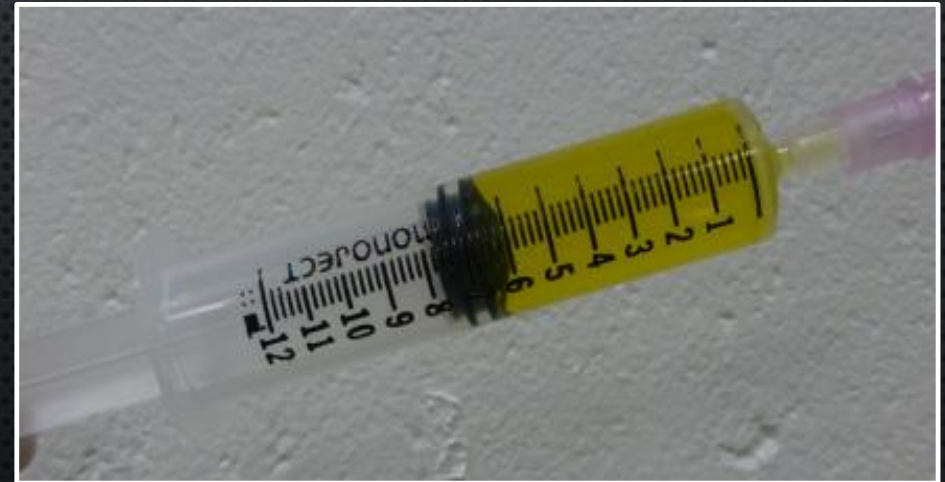


PLATELET LYSATE

- SERUM WITH GROWTH FACTORS
- PRP IN WHICH THE PLATELETS HAVE BEEN ACTIVATED (“LYSED”)
 - THROUGH UNFREEZING PROCESS OR MECHANICAL “LYSIS”
 - WILL CAUSE MORE IMMEDIATE RELEASE OF GF’S
 - CONCENTRATION OF INDIVIDUAL GF’S CAN BE UNPREDICTABLE
 - MAY WORK AS “NATURAL CORTICOSTEROID”
 - MAY NOT HAVE THE SAME REGENERATIVE POTENTIAL AS PRP

PRP VARIABLES

- BUFFERING
- ACTIVATION
- SINGLE VS MULTIPLE INJECTIONS
- TIMING OF INJECTIONS FOR ACUTE OR CHRONIC CONDITIONS
- NSAIDs
- POST PROCEDURE REHABILITATION
- NOTHING SUBSTANTIATED



PRP CLASSIFICATION

- MAUTNER K, MALANGA, GA, SMITH J, ET AL. A CALL FOR A STANDARD CLASSIFICATION SYSTEM FOR FUTURE BIOLOGIC RESEARCH: THE RATIONALE FOR NEW PRP NOMENCLATURE

		Criteria	
P	Platelet count	____P Volume Injected	____M Concentration/ uL
L	Leukocyte Concentration ¹	>1%	+
		<1%	-
R	Red Blood Cell Concentration	> 1%	+
		< 1%	-
A	Activation ²	Yes	+
		No	-

	P	L	R	A
Final Score				

¹ If WBC are present (+) the % of neutrophils should also be reported.

² The method of exogenous activation should be reported

EVIDENCE: MUSCLES

- REURINK NEJM 2014:
 - PRP (ACP) NO BETTER THAN SALINE FOR RTP (42 DAYS AVG)
- HAMID ET AL. AJSM 2014
 - L+PRP MAY REDUCE RECOVERY TIME IN HAMSTRING INJURIES
- HAMILTON ET AL.
 - PRP NO BETTER THAN REHAB; BUT BETTER THAN PPP IN HAMSTRING INJURIES FOR RTP
- DRAGOO J. AOSSM MEETING 2016
 - L+ PRP BETTER THAN L- PRP IN ACUTE HAMSTRING INJURIES.
 - NEITHER BETTER THAN REHAB

EVIDENCE: TENDONS

- FILARDO, KON, ET AL. PLATELET RICH PLASMA INJECTIONS FOR THE TREATMENT OF REFRACTORY ACHILLES TENDINOPATHY: RESULTS AT 4 YEARS. BLOOD TRANSFUSION 2014 ++
 - 27 SUBJECTS, 34 TENDONS, MID PORTION ACHILLES TENDINOPATHY
 - 3 INTRA-TENDINOUS PRP INJECTIONS
 - EVALUATED AT BASELINE, 2, 6 AND 54 MONTHS
 - IMPROVED THROUGH 6 MONTHS, STABLE AT 4.5 YEARS USING VISA-A
 - TEGNER SCORES INDICATED ONGOING FUNCTIONAL RECOVERY
 - LONGER DURATION OF SYMPTOMS PRETREATMENT PREDICTED A SLOWER RETURN TO FUNCTION

EVIDENCE: TENDINOPATHY

- MISHRA A, PAVELKO T. TREATMENT OF CHRONIC ELBOW TENDINOSIS WITH BUFFERED PLATELET-RICH PLASMA. AM J SPORTS MED 2006; 34:1774-1778
 - PROSPECTIVE COHORT OF 15 PTS. LE, 93% IMPROVED AT 1 YR.
- PEERBOOMS J, SLUMER J ET AL. POSITIVE EFFECT OF AN AUTOLOGOUS PLATELET CONCENTRATE IN LATERAL EPICONDYLITIS IN A DOUBLE BLIND RANDOMIZED CONTROLLED TRIAL: PLATERLET-RICH PLASMA VERSUS CORTICOSTEROID INJECTION WITH 1-YEAR FOLLOW-UP. AM J SPORTS MED 2010; 38:255-262
 - RCT OF LE, 100 SUBJECTS PRP VS CORTICOSTEROID, 1 YR FU
PRP SUPERIOR IN DURATION OF IMPROVEMENT, 73% VS 49%
- FILARDO G, KON E ET AL. USE OF PLATELET-RICH PLASMA FOR THE TREATMENT OF REFRACTORY JUMPER'S KNEE. INT ORTHOP 2010; 34:909-915
 - PROSPECTIVE CONTROLLED TRIAL, 15 PTS WITH PAT. TEND.
 - PRP IMPROVED IN ALL MEASURES

EVIDENCE: TENDINOPATHY

- DE VOS R, WEIR A ET AL. PLATELET-RICH PLASMA INJECTION FOR CHRONIC ACHILLES TENDINOPATHY- A RANDOMIZED CONTROLLED TRIAL. JAMA 2010; 303:144-149
 - STRATIFIED BLOCK RCT OF 54 PTS WITH ACHILLES TEND. BOTH PRP AND SALINE IMPROVED (BOTH USED ECCENTRICS)
- MAUTNER K, COLBERG R ET AL. OUTCOMES AFTER ULTRASOUND GUIDED PLATELET-RICH PLASMA INJECTIONS FOR CHRONIC TENDINOPATHY: A MULTICENTER, RETROSPECTIVE REVIEW. PM R 2013; 5:169-175
 - RETROSPECTIVE, CROSS SECTIONAL SURVEY OF 180 PTS., MULTI-CENTER, VARIETY OF TENDONS
 - 68% REPORTED NO PAIN DURING ACTIVITIES

EVIDENCE: BLOOD VS PRP

- CREANEY L, WALLACE A, CURTIS M, CONNELL D. GROWTH FACTOR-BASED THERAPIES PROVIDE ADDITIONAL BENEFIT BEYOND PHYSICAL THERAPY IN RESISTANT ELBOW TENDINOPATHY: A PROGRESSIVE, SINGLE-BLIND, RANDOMIZED TRIAL OF AUTOLOGOUS BLOOD VERSUS PLATELET RICH PLASMA INJECTIONS
- AT 6 MONTHS:
 - 66% SUCCESS RATE IN PRP GROUP >> 10% CONVERTED TO SURGERY
 - 72%SUCCESS RATE IN ABI GROUP >> 20% CONVERTED TO SURGERY

EVIDENCE: BLOOD

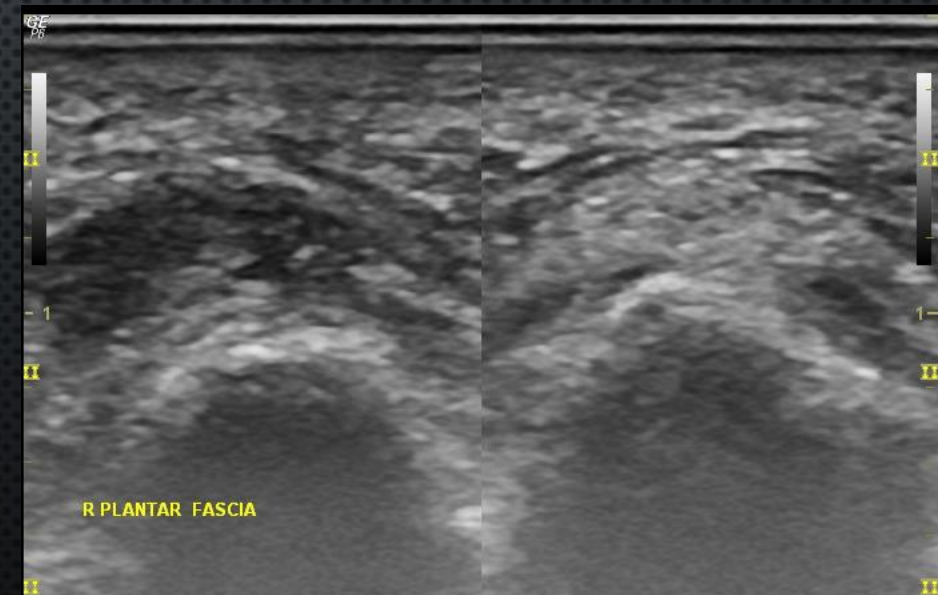
- EDWARDS S, CALANDRUCCIO J. AUTOLOGOUS BLOOD INJECTIONS FOR REFRACTORY LATERAL EPICONDYLITIS. J HAND SURG MARCH 2003, 272-278
- CONNELL D, ALI K ET AL. ULTRASOUND-GUIDED AUTOLOGOUS BLOOD INJECTION FOR TENNIS ELBOW. SKELETAL RADIOL 2006; 35:371-377
- SURESH S, ALI K ET AL. MEDIAL EPICONDYLITIS: IS ULTRASOUND GUIDED AUTOLOGOUS BLOOD INJECTION AN EFFECTIVE TREATMENT. BR J SPORTS MED 2006; 40:935-939
- JAMES S, ALL K ET AL. ULTRASOUND GUIDED DRY NEEDLING AND AUTOLOGOUS BLOOD INJECTION FOR PATELLAR TENDINOSIS. BR J SPORTS MED 2007; 41:518-521

TENOTOMY FOR TENDINOPATHY

- FINNOFF ET AL, PM R, OCTOBER 2011, 900-911
 - N=41,US GUIDED TENOTOMY FOLLOWED BY PRP. 83% SATISFACTION, PAIN SCORE REDUCTIONS
- MCSHANE J, NAZARIAN L ET AL; SONOGRAPHICALLY GUIDED PERCUTANEOUS TENOTOMY FOR TREATMENT OF COMMON EXTENSOR TENDINOSIS IN THE ELBOW: IS A CORTICOSTEROID REALLY NECESSARY. JUM 2008; 27:1137-1144
- MCSHANE J, NAZARIAN L ET AL; SONOGRAPHICALLY GUIDED PERCUTANEOUS TENOTOMY FOR TREATMENT OF COMMON EXTENSOR TENDINOSIS IN THE ELBOW. JUM 2006; 25:1281-1289

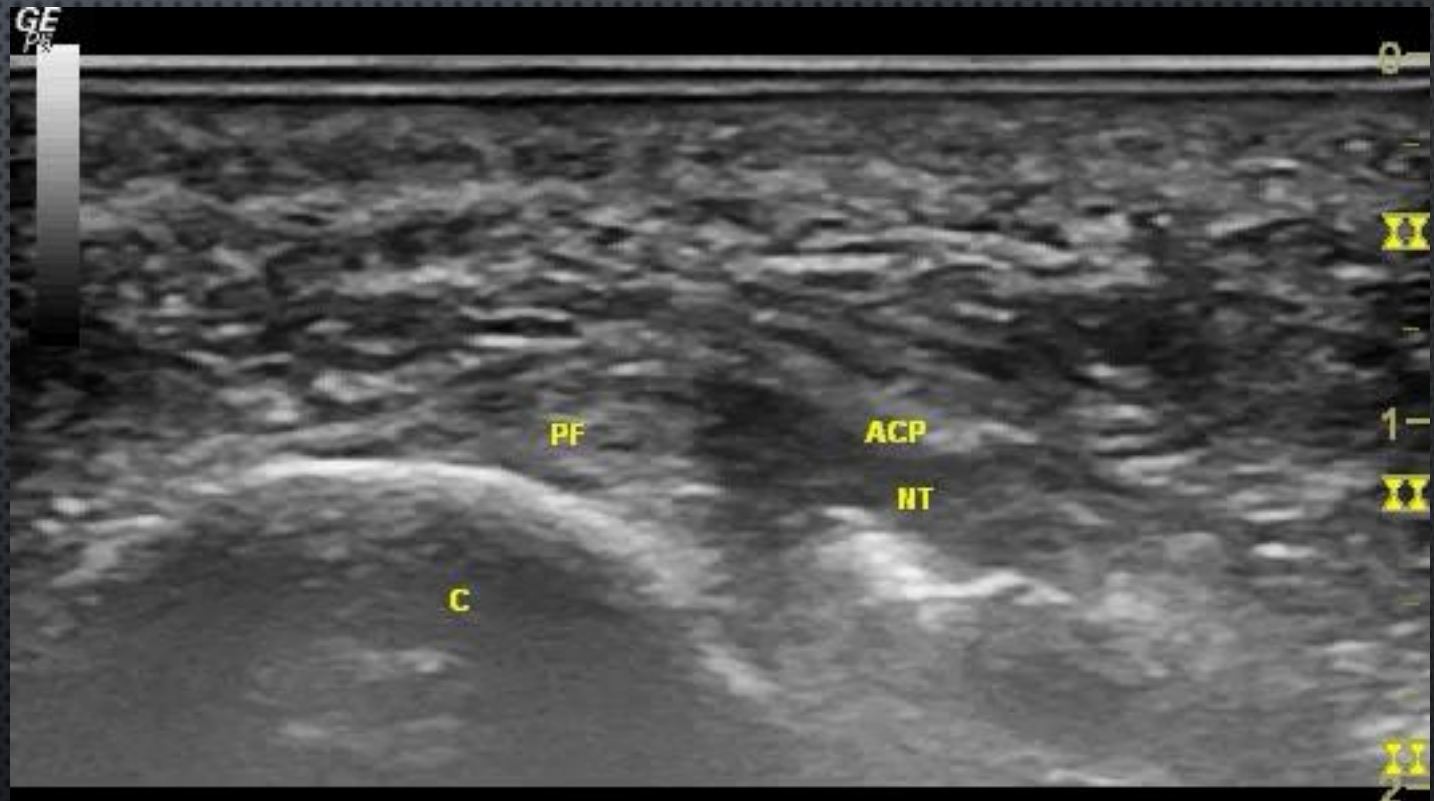
PRP: CLINICAL EXAMPLE

- 40 YO FEMALE DISTANCE RUNNER
- ACUTE PLANTAR FASCIA TEAR



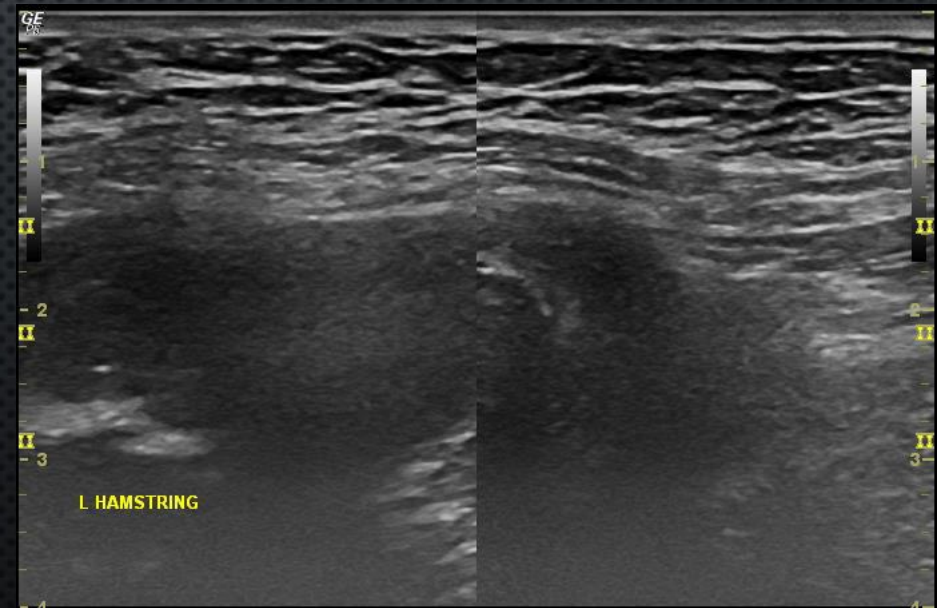
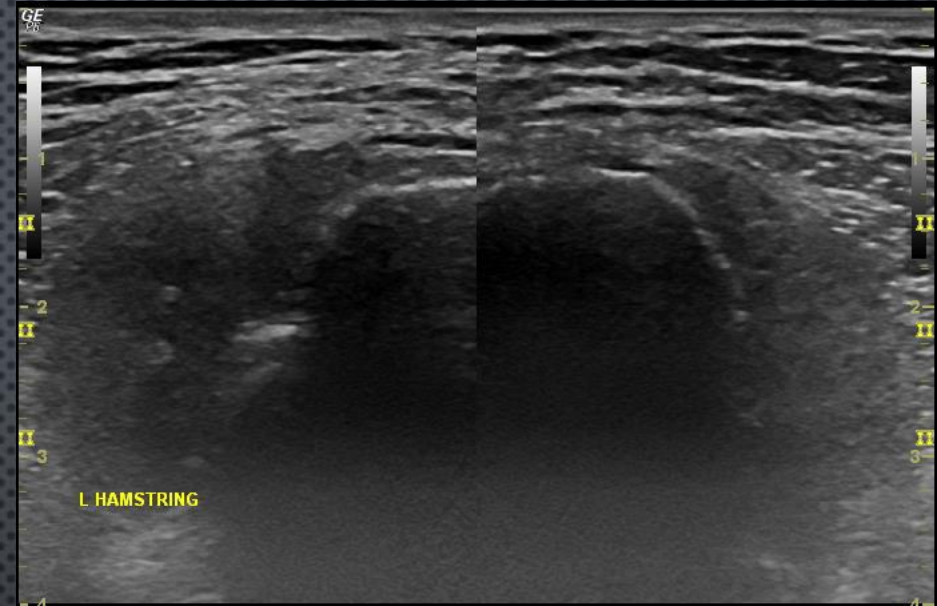
PRP: CLINICAL EXAMPLE

- WALKING BOOT X 2 WEEKS
- PT FOR LOADING PROGRESSION
- GRADUAL PROGRESSION OF WALKING TO RUNNING



PRP: CLINICAL EXAMPLE

- 42 YO FEMALE RUNNER
- 10 MONTHS OF L HAMSTRING ORIGIN PAIN
- REDUCED RUNNING



PRP: CLINICAL EXAMPLE



SUMMARY: MUSCLE AND TENDON

- PRP FOR MUSCLE INJURY RECOVERY DOES NOT APPEAR TO OFFER ADVANTAGE OVER TRADITIONAL THERAPY
- PRP FOR TENDINOPATHY APPEARS TO BE USEFUL PARTICULARLY FOR THE ELBOW
 - SUCCESSFUL STUDIES USE LR-PRP
 - NEED MONTHS FOR OUTCOMES FROM EVEN A SINGLE INJECTION
- WHOLE BLOOD HAS + EFFECTS FOR TENDON HEALING ALSO
- TENOTOMY HAS CLINICAL BENEFIT FOR TENDINOPATHY WITH OR WITHOUT SALINE (PLACEBO) OR DEXTROSE (PROLOTHERAPY)
- US GUIDANCE SHOULD BE USED FOR ALL TENDON RELATED PROCEDURES AS IT IMPROVES ACCURACY AND SHOULD IMPROVE EFFICACY

PRP EVIDENCE: JOINTS

- JOINTS:
 - CERZA ET AL, AJSM, OCTOBER 2012 +
RCT OF 120 PTS. TREATED WITH ACP OR HA. 4 WEEKLY INJECTIONS. FOLLOWED FOR 6 MONTHS.
MORE EFFECTIVE THAN HA IN TREATMENT OF GRADES I, II AND III OA OF THE KNEE. WOMAC
BETTER FOR ACP IN ALL GRADES
 - DOLD ET AL, CLIN J SPORTS MED, JANUARY 2014: 31-43 +/-
REVIEW OF 10 STUDIES (2 RCTs) MAINLY OF OA KNEE AND ALSO CHONDRAL DEFECTS. POSITIVE
RESULTS DECLINE AFTER 6 MONTHS
 - HALPERN ET AL, CLIN J SPORTS MED, MAY 2013: 238-239 +
PROSPECTIVE COHORT, 22 PTS. TREATED WITH PRP. 15 FOLLOWED FOR 1 YR. DECREASED PAIN,
IMPROVED FUNCTIONAL SCORES, 73% NO CHANGE IN MRI

PRP: HIP OA

- SANCHEZ ET AL, *RHEUMATOLOGY*, 2011
 - 45 PTS WITH MODERATELY SEVERE HIP OA GIVEN US GUIDED HIP INJECTION WEEKLY X 3 WKS
 - 57.5% HAD CLINICALLY RELEVANT REDUCTION IN PAIN
 - 40% WERE EXCELLENT RESPONDERS
 - PAIN REDUCTION BY 6-7 WKS
 - RESULTS SUSTAINED AT 6 MONTHS
- DALLARI D, STAGNI C, RANI N, ET AL. ULTRASOUND GUIDED INJECTION OF PLATELET RICH PLASMA AND HYALURONIC ACID, SEPARATELY AND IN COMBINATION, FOR HIP OSTEOARTHRITIS: A RANDOMIZED CONTROLLED STUDY
 - PRP >> HA
 - PRP +HA NOT ANY ADDED BENEFIT

SUMMARY: PRP FOR OA

- REASONABLY GOOD STUDIES AND POSITIVE RESULTS FOR OA
 - KNEE JOINT AND HIP JOINT STUDIED
 - L- PRP PREFERRED OVER L+ PRP
 - MIGHT SERVE AS PREVENTATIVE FOR FURTHER DAMAGE
 - PRP MECHANISM IS LIKELY AN INCREASE ANABOLIC EFFECT ON CHONDROCYTES AND A DECREASE CATABOLIC EFFECT IN THE INFLAMMATORY ENVIRONMENT
 - MAY PREVENT APOPTOSIS OF CHONDROCYTES.

EVIDENCE: PRP

- NGUYEN R, BORG-STEIN J ET AL. APPLICATIONS OF PLATELET-RICH PLASMA IN MUSCULOSKELETAL AND SPORTS MEDICINE: AN EVIDENCE-BASED APPROACH. PM R 2011; 3:226-250
- SAMPSON S, GERHARDT M, MANDELBAUM, B. PLATELET RICH PLASMA INJECTION GRAFTS FOR MUSCULOSKELETAL INJURIES: A REVIEW. CUR REV MUSCULOSKELET MED 2008; 1:165-174
- CASTILLO T, POULIOT M, ET AL. COMPARISON OF GROWTH FACTOR AND PLATELET CONCENTRATION FROM COMMERCIAL PLATELET RICH PLASMA SEPARATION SYSTEMS. AJSM 2011; 39:266-271
- FINNOFF J, FOWLER S, ET AL. TREATMENT OF CHRONIC TENDINOPATHY WITH ULTRASOUND-GUIDED NEEDLE TENOTOMY AND PLATELET-RICH PLASMA INJECTION. PM R 2011; 3:900-911

DEHYDRATED HUMAN AMNION/CHORION MEMBRANE (DHACM)

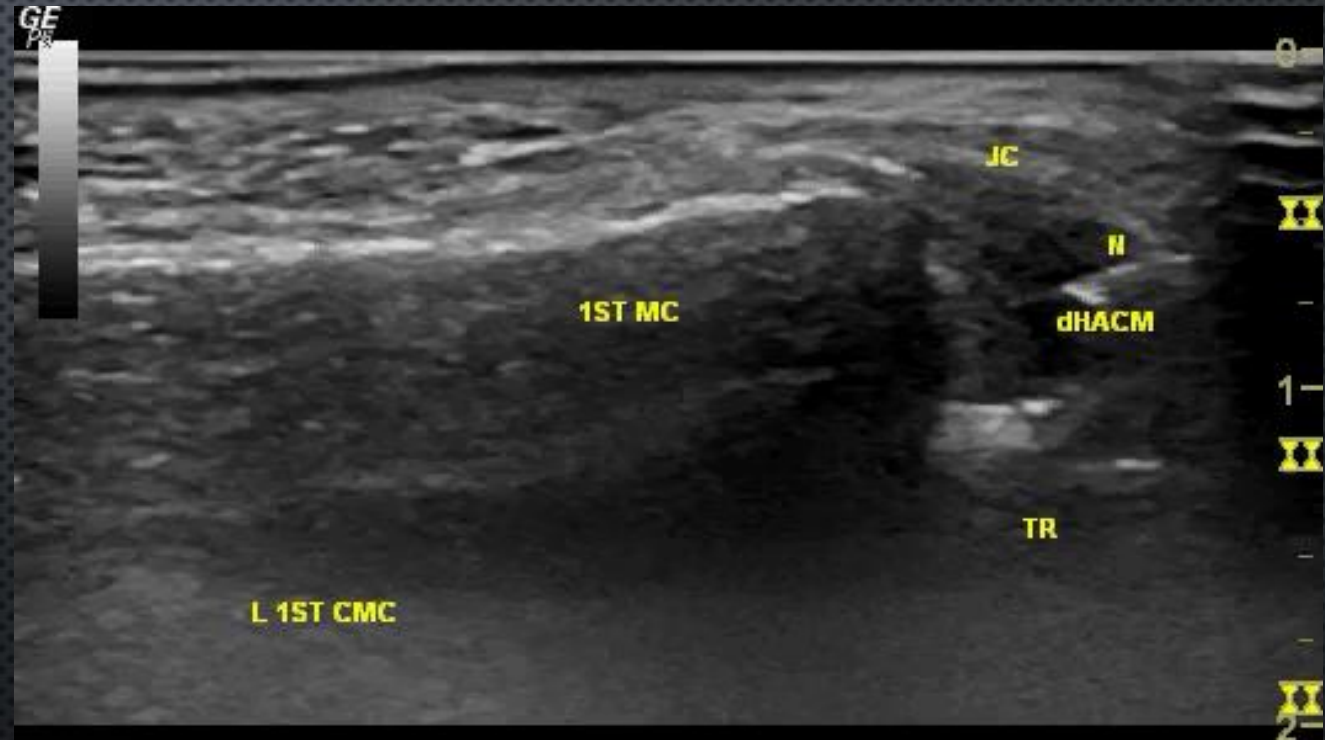
- MICRONIZED DEHYDRATED HUMAN AMNION/CHORIONIC MEMBRANE ALLOGRAFT DHACM
- KOOB TJ, RENNERT R, ZABEK N, ET AL BIOLOGICAL PROPERTIES OF DEHYDRATED HUMAN AMNION/CHORION COMPOSITE GRAFT: IMPLICATIONS FOR CHRONIC WOUND HEALING. INT WOUND J 2013; 10:493-500
 - ANTI-INFLAMMATORY CYTOKINES, TISSUE INHIBITORS OF METALLOPROTEINASES AND GROWTH FACTORS
 - CAPABLE OF INDUCING FIBROBLAST PROLIFERATION AND RECRUITMENT OF MESENCHYMAL STEM CELLS
 - DHACM IS VIABLE IN VIVO

DHACM

- GELLHORN, AC, HAN, A. THE USE OF DEHYDRATED HUMAN AMNION/CHORION MEMBRANE ALLOGRAFT INJECTION FOR THE TREATMENT OF TENDINOPATHY OR ARTHRITIS: A CASE SERIES INVOLVING 40 PATIENTS. PM R 2017; 9:1236-1243
 - CASE SERIES: 40 PATIENTS TREATED WITH DHACM INJECTION FOR TENDINOPATHY OR OA
 - OUTCOMES: PAIN LEVEL, ACTIVITY LEVEL
 - 30% IMPROVEMENT CONSIDERED SUCCESSFUL
 - DATA COLLECTED AT 1, 2 AND 3 MONTHS POST
 - 30% THRESHOLD REACHED
 - 68% AT 1 MONTH / 82% AT 2 MONTHS / 91% AT 3 MONTHS

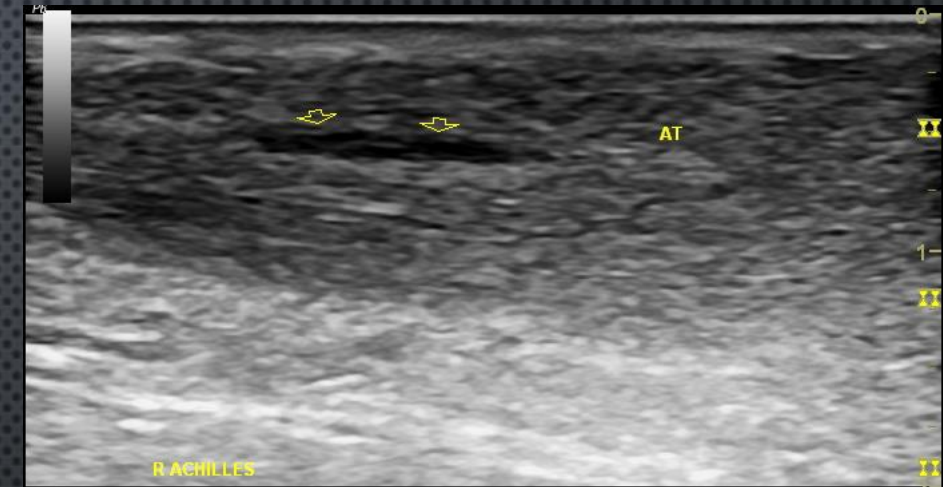
DHACM FOR CMC ARTHRITIS

- SMALL JOINT WHICH DOES NOT ACCEPT MUCH VOLUME
- DHACM 40MG IN 1CC 0.9NS SPLIT BETWEEN THE LEFT AND RIGHT 1ST CMC JOINTS
- 1-2 DAYS OF POST INJECTION PAIN
- GOOD PAIN RELIEF AND IMPROVED FUNCTION WITHIN DAYS



DHACM FOR ACHILLES TENDINOPATHY

- TREATED WITH FAIR RESULTS FOR SEVERAL CYCLES OF PROLOTHERAPY
- TRIAL OF DHACM 40 MG IN 1 CC 0.9NL SALINE
- MODERATE PAIN POST
- COMPLETE RESOLUTION OF PAIN IN 2-3 WEEKS
- POST INJECTIONS CHANGES ON EXAM AND US



DHACM FOR ACHILLES TENDINOPATHY

2/1/17



8/22/18



SUMMARY: DHACM

- DHACM IS RELATIVELY NEW
- STUDIES ARE FEW; BUT RESULTS ARE PROMISING
- MORE LIKELY TO BE PAINFUL POST INJECTION FOR 1-2 DAYS
- IMPROVEMENT MAY BE FASTER THAN PRP OR PROLOTHERAPY

SUMMARY: BIOLOGICS

- AS A WHOLE THERE IS STILL LIMITED UNDERSTANDING OF MECHANISMS OF ACTION
- PROLOTHERAPY HAS THE BEST STUDY DATA
- PRP FORMULATIONS ARE STILL BE WORKED OUT
- DHACM MAY HAVE A FASTER ONSET OF ACTION BUT IT IS MORE PAINFUL INITIALLY
- DELIVERY SHOULD BE DONE UNDER VISUALIZATION
- CLINICAL IMPROVEMENT TAKES MONTHS

THANK YOU