Degenerative Meniscus Tears

Dr. Eric Samuelson
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OrthoNebraska
Journey On

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About Myself

- Medical School
  - University of Nebraska Medical Center
- Internship
  - University of Colorado Health Sciences Center
- Residency
  - University of Nebraska Medical Center
- Fellowship
  - OrthoCarolina Sports Medicine

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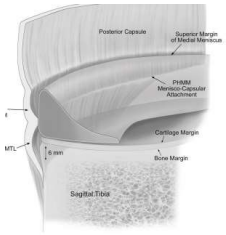
Disclosure

- Serve on the Editorial Board for the American Journal of Sports Medicine
- No relevant disclosures



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Learning Objectives

- Review boney and cartilaginous knee anatomy
- Discuss treatment options for meniscus injuries
- Review evidence of knee injectables

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Outline

- The Meniscus
- Meniscus Tear Types
- Evaluation of Knee Pain
- Treatments Options
- Injections

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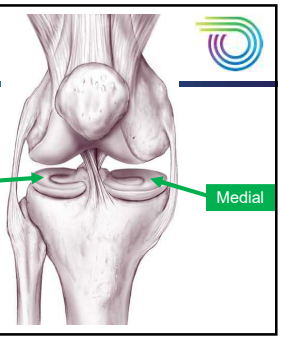
Anatomy

- Knee Joint
  - 4 bones
  - 3 “articulations”
  - Cartilage surface
  - Ligaments
  - Meniscus



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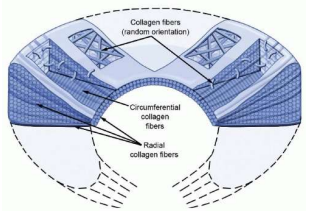
The Meniscus

- Type I collagen fibers
  - Circumferential fibers
  - Radial fibers



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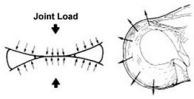
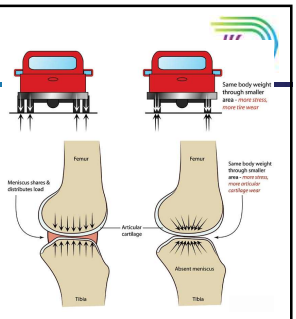
The Meniscus

- Function
  - Dissipate forces across the knee joint
    - Shock absorption
    - Increased congruency





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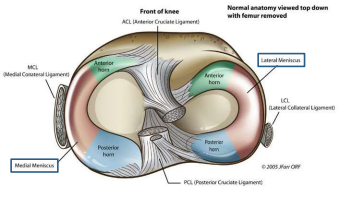
The Meniscus

- Medial meniscus
  - C-shaped
  - Less mobile
- Lateral meniscus
  - Circular
  - More mobile
  - Covers more of the cartilage surface



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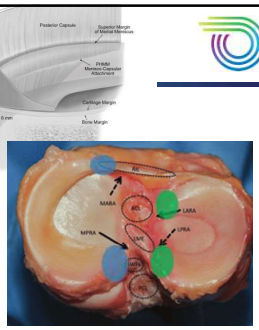
The Meniscus

- Attachment sites
  - Coronary ligaments peripherally
  - Root attachments



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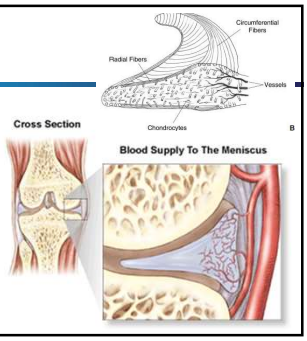
The Meniscus

- Attachment sites
  - Coronary ligaments peripherally
  - Root attachments
- Nutrition/Blood supply
  - Only the peripheral 1/3 is well vascularized
  - Inner 2/3 – diffusion



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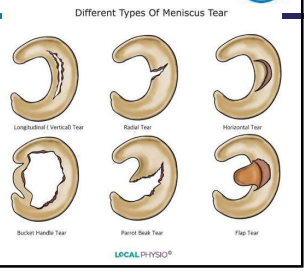
Meniscus Tear Types

- Tear types
  - Radial tear
  - Oblique/Flap tear
  - Peripheral longitudinal
  - Bucket-handle tear
  - Horizontal cleavage
  - Root tear



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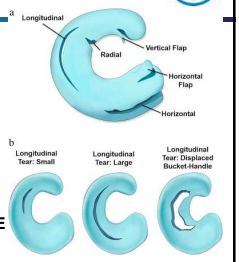
Meniscus Tear Types

- Tear types
  - Radial tear
  - Oblique/Flap tear
  - Peripheral longitudinal
  - Bucket-handle tear
  - Horizontal cleavage
  - Root tear
  - **ANY COMBINATION OF THE ABOVE**



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Evaluation of Knee Pain

- Presentation
  - When?
  - Associated with an acute event?
  - Where is the pain?
  - Aggravating factors?
  - Associated symptoms?

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Evaluation of Knee Pain

- Physical examination
  - Evaluate for effusion
    - Presence of an effusion should raise clinical concern of acute process
  - 3 possibilities
    - Acute injury (ligament tear, loose body, meniscus tear)
    - Inflammatory process (crystalline arthropathy, etc)
    - Infectious process (septic arthritis)

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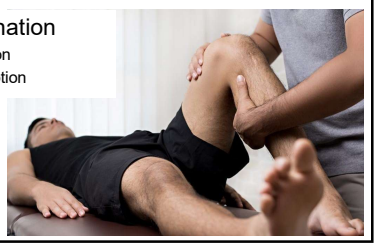
Evaluation of Knee Pain

- Physical examination
  - Evaluate for effusion
  - Check range of motion



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Evaluation of Knee Pain

- Physical examination
  - Evaluate for effusion
  - Check range of motion
  - Assess for stability
    - ACL and PCL
    - MCL and LCL

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Evaluation of Knee Pain

- Physical examination
  - Evaluate for effusion
  - Check range of motion
  - Assess for stability
  - Evaluate the meniscus
    - Joint line tenderness

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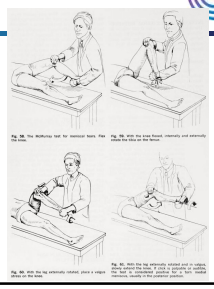
Evaluation of Knee Pain

- Physical examination
  - Evaluate for effusion
  - Check range of motion
  - Assess for stability
  - Evaluate the meniscus
    - Joint line tenderness
    - McMurray's test



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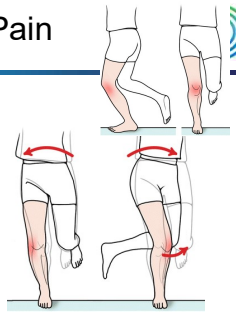
Evaluation of Knee Pain

- Physical examination
  - Evaluate for effusion
  - Check range of motion
  - Assess for stability
  - Evaluate the meniscus
    - Joint line tenderness
    - McMurray's test
    - Thessaly's test



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Evaluation of Knee Pain

- Physical examination
  - Evaluate for effusion
  - Check range of motion
  - Assess for stability
  - Evaluate the meniscus
    - Joint line tenderness
    - McMurray's test
    - Thessaly's test
    - Apley's compression

FIG. 6
The grinding test

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Treatment

- Conservative treatment
  - More to come
- Operative treatment
  - Acute injury
  - Presence of an effusion
  - Experiencing mechanical symptoms
  - Have failed appropriate conservative treatment measures

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Treatment

- Meniscal repair
  - Best chances for successful repair
    - Acute injury
    - Young patient (better blood supply)
    - Relatively simple tear
    - Location close to blood supply (red-red zone)
    - BMI with certain tear types

When all these conditions are met healing rates can reach 80-90%

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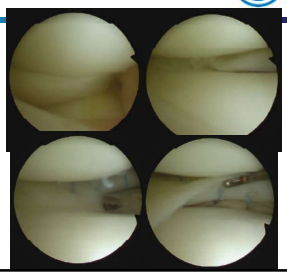
Treatment

- Meniscal repair
  - CM 17 yo M, acute football injury
    - Displaced bucket-handle tear lateral meniscus



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Treatment

- Partial Meniscectomy
  - Indications
    - Acute injury AND/OR
    - Significant mechanical symptoms
    - Irreparable meniscus tear
    - Failure of conservative management
  - The most common type of knee surgery performed

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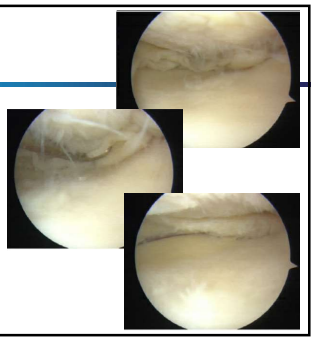
Treatment

- Partial Meniscectomy
  - VF 56 yo F, gradual onset of L knee pain, ↑BMI
    - Mild-mod knee OA
    - Irreparable complex tear type
    - Failed 6 weeks prescription NSAID, PT, and corticosteroid injection



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Treatment

- Is partial meniscectomy 1st-line treatment?
  - 2013 FIDELITY trial
  - Multicenter, RCT, double-blind
  - 146 patients w/ degenerative meniscus tears randomized
    - 70 partial meniscectomy
    - 76 sham surgery

ORIGINAL ARTICLE

Arthroscopic Partial Meniscectomy versus Sham Surgery for a Degenerative Meniscal Tear

Raine Sihvonen, M.D., Mika Paavola, M.D., Ph.D., Antti Malmivaara, M.D., Ph.D., Ari Itälä, M.D., Ph.D., Antti Joukainen, M.D., Ph.D., Heikki Nurmi, M.D., Juha Kalske, M.D., and Teppo L.N. Järvinen, M.D., Ph.D., for the Finnish Degenerative Meniscal Lesion Study (FIDELITY) Group

For the sham surgery, a standard arthroscopic partial meniscectomy was simulated. To mimic *the sensations and sounds of a true arthroscopic* partial meniscectomy, the surgeon asked for all instruments, manipulated the knee as if an arthroscopic partial meniscectomy was being performed, pushed a mechanized shaver (without the blade) firmly against the patella (outside the knee), and used suction. The patient was also kept in the operating room for the amount of time required to perform an actual arthroscopic partial meniscectomy.

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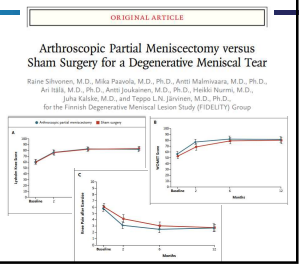
Treatment

- Is partial meniscectomy 1st-line treatment?
  - 2013 FIDELITY trial
  - Multicenter, RCT, double-blind
  - 146 patients w/ degenerative meniscus tears randomized
    - 70 partial meniscectomy
    - 76 sham surgery
  - No significant difference in outcomes


ORIGINAL ARTICLE

Arthroscopic Partial Meniscectomy versus Sham Surgery for a Degenerative Meniscal Tear

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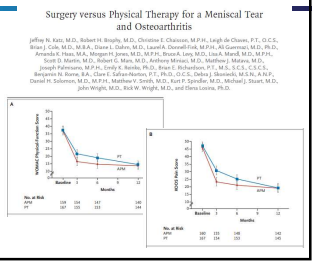
Treatment

- Is partial meniscectomy 1st-line treatment?
  - 2013 METEOR trial
  - Multicenter, RCT
  - 351 patients w/ degenerative meniscus tears randomized
    - 174 partial meniscectomy w/ PT
    - 177 physical therapy
  - No significant difference


Surgery versus Physical Therapy for a Meniscal Tear and Osteoarthritis

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Treatment

- Conservative Treatment
  - Don't meet indications for meniscus repair
    - No effusion (chronic issue?)
    - Older patients (decreased blood supply)
    - Degenerative/complex tear types
    - No mechanical symptoms
    - Mainly pain-based complaints

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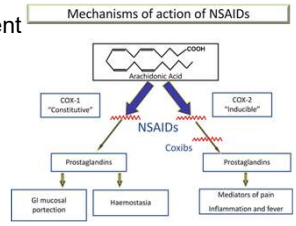
Treatment

- Conservative Treatment
  - Oral analgesics
    - Acetaminophen
    - NSAIDs
    - COX-2 inhibitors



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Treatment

- Conservative Treatment
  - Oral analgesics
  - Physical therapy/home-exercises
    - Mechanics/biomechanics minimize loading
    - Aquatic therapy

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Treatment

- Conservative Treatment
  - Oral analgesics
  - Physical therapy/home-exercises
  - Injections
    - Corticosteroid
    - Viscosupplementation
    - Orthobiologics

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Treatment

- When to perform an injection?
  - When patients are not improving with other appropriate conservative treatment options (i.e. oral medications, PT/HEP, etc)
  - AND/OR
  - At an appropriate position on the "Misery Scale"

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Treatment

- Misery Scale

No Injection → Injection

Mild Issue
- Mild pain
- Intermittent symptoms
- Not affecting ADLs
- Haven't tried any other treatment modalities

Severe Issue
- Severe pain
- Constant symptoms
- Affecting ADLs and QOL
- Have already tried other treatment modalities

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Intraarticular Knee Injection

- Site preparation and technique
  - No consensus
    - Skin antiseptics
    - Sterile vs non-sterile gloves
    - Anesthetic spray/injection
    - Sterile field

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What to Inject?

- Corticosteroids
  - No **strong** evidence to suggest one corticosteroid is better than another
  - JAAOS 2009 Systematic Review suggested triamcinolone was most effective
  - American College of Rheumatology study noted providers chose medication based on "availability" or out of "habit"

Table 1

Common Injectable Corticosteroids, Concentrations, and Dosage

Injectable Corticosteroids	Concentration (mg/mL)	Common Dose for Large Joint (mg)
Betamethasone (often mixture of betamethasone acetate and betamethasone sodium phosphate)	6	6-12
Methylprednisolone acetate	20, 40, or 80	20-80
Triamcinolone acetonide	10 or 40	10-40
Triamcinolone diacetate	40	20-40
Triamcinolone hexacetonide	20	10-20
Dexamethasone sodium phosphate	4 or 8	2-4

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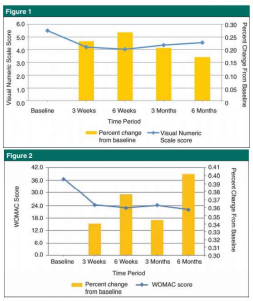
What to Inject?

- Corticosteroids
  - Fairly poorly studied compared to other tx modalities
  - Matzkin et al 2017 – 100 pts
    - Triamcinolone
    - Statistically sig improvements in Visual Numeric Pain and total WOMAC Scores



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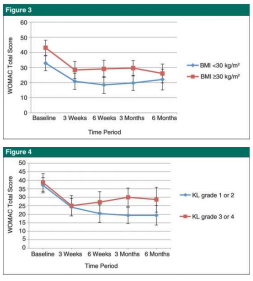
What to Inject?

- Corticosteroids
  - Fairly poorly studied compared to other tx modalities
  - Matzkin et al 2017 – 100 pts
    - Triamcinolone
    - Statistically sig improvements in Visual Numeric Pain and total WOMAC Scores
    - Those with BMI > 30 and worse OA did not see as much improvement



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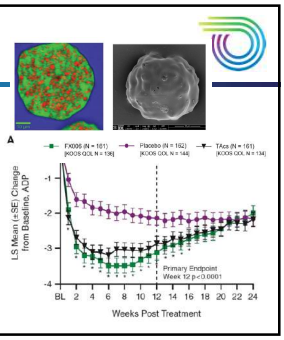
What to Inject?

- Corticosteroids
  - Conaghan et al 2018 – 484 pts
    - ER triamcinolone (Zilretta)
    - Industry-sponsored phase III trial – level I study
    - Average Daily Pain (ADP)
      - Zilretta >> placebo
      - Zilretta = triamcinolone



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What to Inject?

- Corticosteroids
  - Adverse events/Complications
    - Similar systemic effects as oral route, but less severe
    - Hyperglycemia typically occurs in the hours and days following injection
    - Risk of infection less than 0.05%
    - Post-injection "flare"

Table 3

Possible Adverse Effects and Complications of Intra-articular Corticosteroid Injections

Adverse Effects and Complications
Skin pigmentation changes
Fat or skin atrophy
Residual injection site pain
Facial flushing
Hypothalamic-pituitary-adrenal axis suppression
Increased blood glucose
Septic arthritis
Direct injury to the cartilage with a needle

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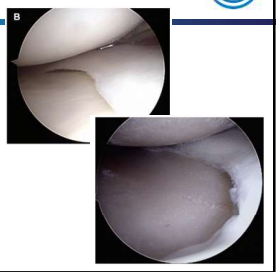
What to Inject?

- Corticosteroids
  - Addition of local anesthetic
    - Somewhat controversial
    - Case reports of chondrolysis after use of local anesthetics in post-op infusion pumps
    - No high-quality clinical studies show this phenomenon following single-dose injection



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Addition of Local Anesthetic

The In Vitro Chondrotoxicity of Single-Dose Local Anesthetics

Jason L. Dragoo,*† MD, Hillary J. Braun,‡ BA, Hyeon Joo Kim,‡ PhD, Huy D. Phan,‡ BS, and S. Raymond Golish,‡ MD, PhD
Investigation performed at the Department of Orthopaedic Surgery, Stanford University, Palo Alto, California

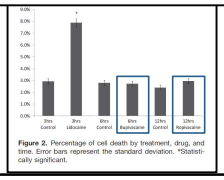

Figure 2. Percentage of cell death by treatment, drug, and time. Error bars represent the standard deviation. *Statistically significant.

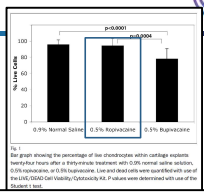

Fig. 1
Bar graph showing the percentage of live chondrocytes within cartilage explants twenty-four hours after a thirty-minute treatment with 0.9% normal saline solution, 0.5% ropivacaine, or 0.5% bupivacaine. Live and dead cells were quantified with use of the LIVE/DEAD Cell Viability/Cytotoxicity Kit. P-values were determined with use of the Student t test.

Comparison of Ropivacaine and Bupivacaine Toxicity in Human Articular Chondrocytes

By Samantha L. Piper, BA, and Hubert T. Kim, MD, PhD
Investigation performed at the San Francisco VA Medical Center, San Francisco, California

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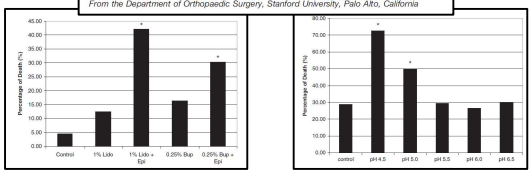
Addition of Local Anesthetic

Chondrotoxicity of Low pH, Epinephrine, and Preservatives Found in Local Anesthetics Containing Epinephrine

Jason L. Dragoo,* MD, Tatiana Korotkova, Hyeon Joo Kim, PhD, and Anubhav Jagadish, MD
From the Department of Orthopaedic Surgery, Stanford University, Palo Alto, California



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What to Inject?

- Corticosteroids
  - What I do:
    - Betadine swab, Non-sterile gloves, No sterile field, Ethyl Chloride spray
    - Triamcinolone (40mg/mL)
    - No local anesthetic
    - OK to reinject every 3-4 months, if necessary

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What to Inject?

- Viscosupplementation
  - Hyaluronic acid
    - Approved for use in the US in 1997
    - Viscoelastic properties
    - Anti-inflammatory
    - Anti-nocioceptive

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What to Inject?

- Viscosupplementation

TABLE I Characteristics of Common Viscosupplement Formulati TABLE I (continued)

Product Name	Active Ingredient	Molecular Weight (kDa)	Cross-Linked	No. of Injections*	Cost Per Syringe† ($)
Hyalgan	Sodium hyaluronate	500 to 720	No	3 to 5	228.00
Synvisc	Hylan G-F 20 (80:20 ratio of hylan A to hylan B)	5,000 to 6,000	Yes	3	473.88
Supartz, Supartz FX	Sodium hyaluronate	620 to 1,200	No	3 to 5	276.36
Orthovisc	Sodium hyaluronate	1,000 to 2,900	No	3 to 4	626.40
Nuflexxa, Euflexxa	Sodium hyaluronate	2,400 to 3,600	Yes	3	388.48
Synvisc One	Hylan G-F 20 (80:20 ratio of hylan A to hylan B)	5,000 to 6,000	Yes	1	1,421.65
Gel-One	Hyaluronan hydrogel	NA‡	Yes	3	1,170.00
Monovisc	Sodium hyaluronate	1,000 to 2,900	Yes	1	1,252.80

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What to Inject?

- Viscosupplementation
  - Adverse events/Complications
    - Similar to those undergoing corticosteroid injections
    - Localized pain and effusion
    - Risk of infection less than 0.05%
    - Pseudoseptic reaction

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What to Inject?

- Viscosupplementation
  - Bellamy et al 2006 - Cochrane Review
    - Beneficial effects on pain and physical function most pronounced at 5-13 weeks after injection
  - Campbell et al 2007 - review of 6 meta-analyses
    - Concluded that viscosupplementation results in improvements in physical function and pain reduction with a low risk for harm

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What to Inject?

- Viscosupplementation
  - Bellamy et al 2006 - Cochrane Review
    - Beneficial effects
      most pronounce
  - Campbell et al 2007
    - Concluded that v
      improvements in
      reduction with a

Declarations of interest

The original review was externally supported by Genzyme Biosurgery (formerly Biomatrix, Inc) and Wyeth-Synerjia an unrestricted educational grant. Finances supported research staff to research this treatment area for all products, not just that manufactured by Genzyme BioSurgery (formerly Biomatrix, Inc). The interpretation of the results are those of the reviewers who retain the right to publish.

Dr. Nicholas Bellamy and Dr. Robert Bourne participated in the Raynauld (Raynauld 2002) trial. Dr. Bellamy was a co-investigator on the Steering Committee of the Raynauld (Raynauld 2002) trial, and previously provided consulting services to Biomatrix and Genzyme Inc.

Dr. Bourne was a clinical investigator in the Raynauld (Raynauld 2002) trial.

Product-based analyses were circulated to each respective manufacturer prior to finalisation of the original review to permit any factual errors to be addressed. Comments were received from some but not all manufacturers.

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What to Inject?

- Viscosupplementation
  - Miller et al 2013
    - Systematic review and meta-analysis

US-Approved Intra-Articular Hyaluronic Acid Injections are Safe and Effective in Patients with Knee Osteoarthritis: Systematic Review and Meta-Analysis of Randomized, Saline-Controlled Trials

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Abstract: We conducted a systematic review and meta-analysis of randomized saline-controlled trials to determine the safety and efficacy of US-approved intra-articular hyaluronic acid (IAHA) injections for symptomatic knee osteoarthritis. A total of 29 studies representing 4,866 unique subjects (IAHA: 2,673; saline: 2,193) were included. IAHA injection resulted in very large treatment effects between 4 and 26 weeks for knee pain and function compared to pre-injection values, with standardized mean difference (SMD) values ranging from 1.07–1.37 (all $P < 0.001$). Compared to saline controls, SMDs with IAHA ranged from 0.38–0.43 for knee pain and 0.32–0.34 for knee function (all $P < 0.001$). There were no statistically significant differences between IAHA and saline controls for any safety outcome, including serious adverse events (SAEs) ($P = 0.12$), treatment-related SAEs ($P = 1.0$), study withdrawal ($P = 1.0$), and AE-related study withdrawal ($P = 0.46$). We conclude that intra-articular injection of US-approved HA products is safe and efficacious in patients with symptomatic knee osteoarthritis.

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What to Inject?

- Viscosupplementation
  - Miller et al 2013
    - Syste… meta…

US-Approved Intra-Articular Hyaluronic Acid Injections are Safe and Effective in Patients with Knee Osteoarthritis: Systematic Review and Meta-Analysis of Randomized, Saline-Controlled Trials

…in Francisco, CA, USA.

Funding

This work was supported by the HA Viscosupplementation Coalition (Bioventus LLC, Durham, NC; DePuy Synthes Mitek Sports Medicine, Raynham, MA; Ferring Pharmaceuticals Inc., Parsippany, NJ; Fidia Pharma USA, Inc., Parsippany, NJ; Zimmer, Inc., Warsaw, IN).

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What to Inject?

- Viscosupplementation
  - Jevsevar et al 2015 – Systematic review
    - Randomized controlled trials
    - Minimum of 4 weeks follow-up
    - Minimum of 30 patients per treatment group
    - Utilized VAS pain and/or WOMAC (MCID available)

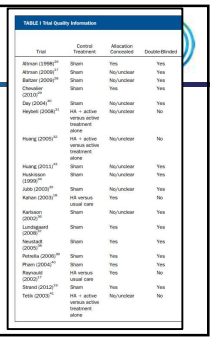

TABLE | Trial Quality Information

Trial	Control Treatment	Allocation Concealed	Double-Blinded
Altman (1998)[40]	Sham	Yes	Yes
Altman (2009)[37]	Sham	No/unclear	Yes
Bellamy (2009)[39]	Sham	No/unclear	Yes
Chevalier (2010)[38]	Sham	Yes	Yes
Day (2004)[36]	Sham	No/unclear	Yes
Heybeli (2008)[21]	HA + active versus active treatment alone	No/unclear	No
Huang (2005)[42]	HA + active versus active treatment alone	No/unclear	No
Huang (2011)[43]	Sham	No/unclear	Yes
Huskisson (1999)[41]	Sham	No/unclear	Yes
Jubb (2003)[35]	Sham	No/unclear	Yes
Kahan (2003)[18]	HA versus usual care	Yes	No
Karlsson (2002)[34]	Sham	No/unclear	Yes
Lundgaard (2008)[17]	Sham	Yes	Yes
Neustadt (2005)[16]	Sham	Yes	Yes
Petrella (2006)[44]	Sham	Yes	Yes
Pham (2004)[33]	Sham	Yes	Yes
Raynauld (2002)[7]	HA versus usual care	Yes	No
Strand (2012)[15]	Sham	Yes	Yes
Tetik (2003)[45]	HA + active versus active treatment alone	No/unclear	No

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What to Inject?

- Viscosupplementation
  - Jevsevar et al 2015 – Systematic review
    - Statistically significant improvements in VAS pain and WOMAC function scores
    - These statistically significant improvements did NOT reach the minimal clinical important difference (MCID)

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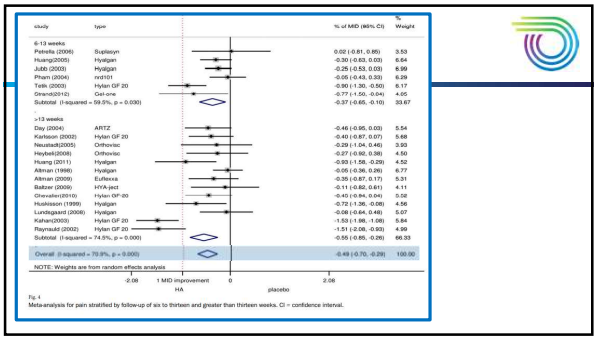

Fig. 4
Meta-analysis for pain stratified by follow-up of six to thirteen and greater than thirteen weeks. CI = confidence interval.

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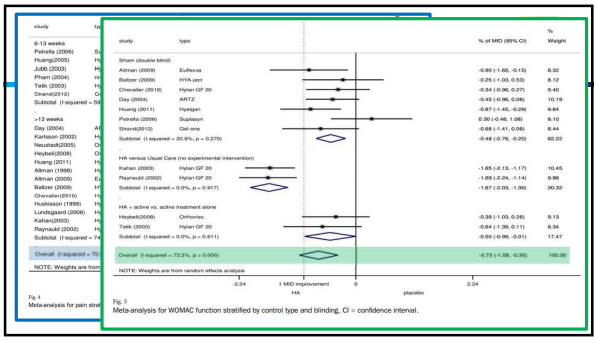

Fig. 5
Meta-analysis for WOMAC function stratified by control type and blinding. CI = confidence interval.

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What to Inject?

- Viscosupplementation
  - What I do:
    - Utilized for those patients with mild-moderate knee OA or degenerative meniscus tears
    - Failed other appropriate conservative tx options
    - Same technique as steroid injection
    - Seems to either “really work” or “didn’t do anything”
    - Still approved by insurance carriers

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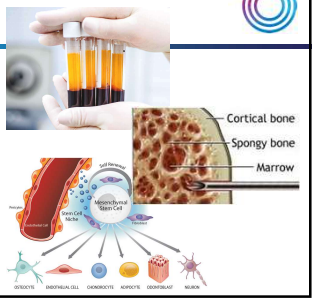
What to Inject?

- Orthobiologics
  - Platelet-rich plasma (PRP)
  - Mesenchymal “stem” cells



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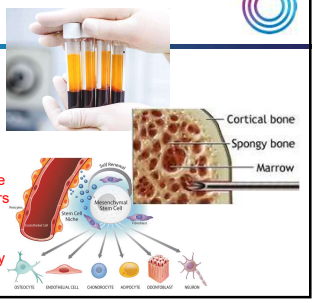
What to Inject?

- Orthobiologics
  - Platelet-rich plasma (PRP)
  - Mesenchymal “stem” cells

* These treatments are NOT FDA-approved for the treatment of knee OA or degenerative meniscus tears

AND

They are NOT typically covered by insurance carriers



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What to Inject?

- Platelet-rich plasma (PRP)
  - Venous blood draw
  - Centrifugation
  - Platelet concentration “above baseline”
    - Release of growth factors

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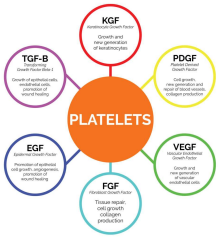
60

What to Inject?

- Platelet-rich plasma (PRP)
  - Venous blood draw
  - Centrifugation
  - Platelet concentration “above baseline”
    - Release of growth factors



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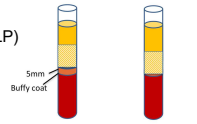
What to Inject?

- Platelet-rich plasma (PRP)
  - Leukocyte-rich (LR) vs Leukocyte-poor (LP)
    - LR-PRP results in much higher platelet concentrations but necessitates the inclusion of leukocytes
    - LP-PRP results in moderately elevated concentration of platelets without inclusion of leukocytes



Cell type	Leukocyte-poor PRP	Leukocyte-rich PRP
Platelet	+ +	+ + +
Leukocyte	±	+ +

*

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What to Inject?

- Platelet-rich plasma (PRP)
  - Meheux et al 2016
    - 6 level I randomized controlled trials comparing PRP to HA (visco)

Table 1

	WOMAC Score (Meheux et al)		
	PRP	HA	p-value
Baseline	52.36	52.05	=0.42
12-26 weeks	28.5	43.4	=0.0008
26-52 weeks	22.8	38.1	=0.0062

WOMAC Score

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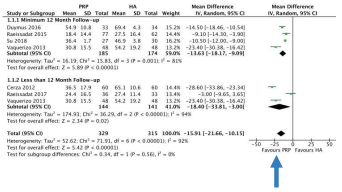
What to Inject?

- Platelet-rich plasma (PRP)
  - Belk et al 2020
    - 18 level I RCTs comparing PRP to HA (visco)

WOMAC Score



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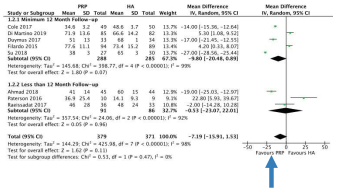
What to Inject?

- Platelet-rich plasma (PRP)
  - Belk et al 2020
    - 18 level I RCTs comparing PRP to HA (visco)

VAS Pain Score



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What to Inject?

- PRP
  - What about the cost?
  - Average - $715/inj
  - $50,000/QALY threshold

The Cost-Effectiveness of Platelet-Rich Plasma Compared With Hyaluronic Acid Injections for the Treatment of Knee Osteoarthritis

Eric M. Samuelson, M.D., Jeffrey A. Ebel, D.O., Scott B. Reynolds, M.D., Ryan M. Arnold, M.D., and David E. Brown, M.D.

Purpose: To examine the cost-effectiveness of a series (total of 3 injections) of intra-articular platelet-rich plasma (PRP) injections in comparison to that of hyaluronic acid (HA) viscosupplementation for the treatment of symptomatic knee osteoarthritis. **Methods:** Outcome data regarding the use of PRP or HA injections for the treatment of symptomatic knee osteoarthritis were determined from the highest-quality data (Level I) available in the literature until 2015. Health utility values were then derived from these high-quality data. Costs were determined by examining typical charges for patients undergoing a series of either PRP or HA injections for the treatment of this condition at a large private orthopaedic practice. These health utility values and costs were used to create an expected-value decision analysis model. [illegible] of PRP injections as opposed to HA was $12,628.15/QALY. **Conclusions:** Although a series of either PRP ($8,635.23/QALY) or HA ($5,331.75/QALY) injections for the treatment of symptomatic knee osteoarthritis would be considered cost-effective (cost per QALY < $50,000), PRP injections were not more cost-effective than HA injections. However, PRP was significantly more effective at 1 year, and being associated with an incremental cost-effectiveness ratio of $12,628.15/QALY when compared with HA, a series of PRP injections should be considered a reasonable and acceptable alternative to HA injections for the treatment of symptomatic knee osteoarthritis. **Level of Evidence:** Level II, economic and decision analysis of Level I studies.

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What to Inject?

- Platelet-rich plasma (PRP)
  - What I do:
    - Starting to offer more frequently
    - Those patients with mild-moderate knee OA or degenerative meniscus tears
    - Failed other appropriate conservative tx options
    - Clearly notify patients that this is NOT covered by insurance
    - Utilize LP-PRP

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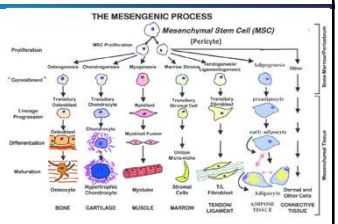
What to Inject?

- Mesenchymal stem cells (MSCs)
  - Originally described by Caplan in 1991



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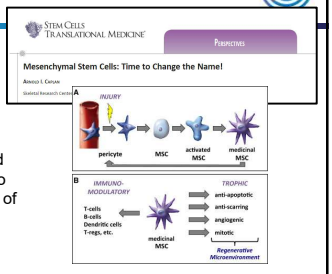
What to Inject?

- Mesenchymal stem cells (MSCs)
  - Originally described by Caplan in 1991
  - Caplan 2017 – suggested changing nomenclature to reflect our understanding of how these cells actually function



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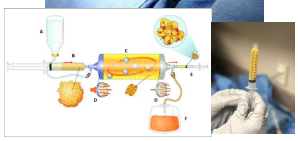
What to Inject?

- MSC injection
  - Dai et al 2020 – Systematic Review and meta-analysis
    - 13 RCTs included
    - No significant difference when compared to placebo
      - VAS Pain
      - WOMAC
        - Pain
        - Function
        - Stiffness



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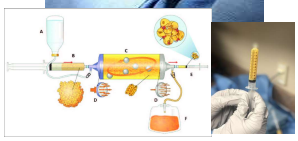
What to Inject?

- Mesenchymal stem cells (MSCs)
  - What I do:
    - We do not offer this service
    - Cost – $$$$
    - Not necessarily against autologous MSCs



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What to Inject?

- Mesenchymal stem cells (MSCs)
  - What I do:
    - We do not offer this service
    - Cost – $$$$
    - Not necessarily against autologous MSCs
    - AVOID allogeneic stem cell products

Live Well Nebraska

Nebraska, Iowa attorneys general announce lawsuits against stem cell therapy clinics

December 10, 2019 | 2 min read

Health officials issue safety alert on unapproved stem cell products after Nebraska outbreak

ADD TOPIC TO EMAIL ALERTS

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Summary

- Appropriate H&P
  - Specific PE tests for meniscus tears are unreliable
- Many different types of meniscus tears
  - Treatment recommendations differ based upon these as well as patient factors
- Many meniscus tears are treated conservatively initially
- Injections are a common conservative treatment modality
  - Ensure proper injection technique
- Injectables
  - Corticosteroid
  - Viscosupplementation
  - Orthobiologics ***

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Questions?

OrthoNebraska
Journey On

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