Knee Arthritis and Meniscus Tears: 
An Evidence Based Approach

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Using Evidence to Guide Treatment of Degenerative Knee Conditions

• Degenerative Meniscus Tears
  – Natural history, outcomes of surgery

• Knee Osteoarthritis
  – Lifestyle Changes
  – Physical therapy
  – Bracing
  – Injections (Steroids, Visco, PRP)
  – Knee replacement

Focus on high quality studies 2013-2017 where available
Evidence Based Treatment of Degenerative Meniscus Tears

- Typically occur with no or minimal trauma
- Associated with middle ages (50-75)
- Less swelling and discomfort than acute tears
- Can be incidental finding
  - Often asymptomatic
Degenerative vs Traumatic Tears

Traumatic tears more inflammatory factors
Less collagen in the degenerative tears

“The results indicate greater differences in gene expression between obese and overweight groups than between overweight and lean groups. This may indicate that there is a weight threshold at which injured meniscus responds severely to increased BMI. BMI-related changes in gene expression present a plausible explanation for the role of meniscal injury in OA development among obese patients.”
Surgery for Meniscus Tears

- Surgery to debride meniscus/cartilage is not effective in the setting of arthritis
  - Moseley et al NEJM 2002
  - Kirkley et al NEJM 2007

Arthroscopic vs Sham surgery
No difference between groups

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Surgery for Meniscus Tears

Original Article

Arthroscopic Partial Meniscectomy versus Sham Surgery for a Degenerative Meniscal Tear

Reine Sluysman, M.D., Nils Pauwels, M.D., Ph.D., Antti Malmivara, M.D., Ph.D., Antti Jokinen, M.D., Ph.D., Helki Nummi, M.D., Juhani Kaleda, M.D., and Teppo L.N. Jäninen, M.D., Ph.D. for the Finnish Degenerative Meniscal Lesion Study (F DELITY) Group

NEJM 2013

RCT: 146 patients 35 to 65 years of age who had knee symptoms consistent with a degenerative medial meniscus tear and no knee osteoarthritis. 12 month follow up

RESULTS:
In the intention-to-treat analysis, there were no significant between-group differences in the change from baseline to 12 months in any primary outcome.

CONCLUSIONS:
In this trial involving patients without knee osteoarthritis but with symptoms of a degenerative medial meniscus tear, the outcomes after arthroscopic partial meniscectomy were no better than those after a sham surgical procedure.
No evidence could be found to support the prevailing ideas that patients with presence of mechanical symptoms or certain meniscus tear characteristics or those who have failed initial conservative treatment are more likely to benefit from APM.
**Surgery for Meniscus Tears**

**Summary:**
No mechanical symptoms
Gradual onset, mild pain—no surgery

**Mechanical symptoms,**
recent change
Acute worsening—consider surgery

No downside to PT first

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**Does having a meniscus tear mean I am getting arthritis?**


The effects of meniscus injury on the development of knee osteoarthritis: data from the osteoarthritis initiative.

Badlani JT, Borromeo C, Golla S, Hamer CD, Ingang JU.

The rate of medial meniscus lesions (tear or degeneration) was not significantly higher in those who developed incident OA (85%) compared with the control patients (68%; P = .07). However, medial meniscus extrusion, complex tears, and tears with large radial involvement were more common at baseline in cases compared with controls.

**CONCLUSION:**
Knees with meniscus tears with greater radial involvement and extrusion are at greater risk for later development of radiographic OA.
Does taking part of the meniscus out hurt my knee?

Souza, Feeley, et al KSSTA 2014

Volume of tear correlates with signal change on MRI post op

Changes occur near area of removed meniscus

-> Having tear likely increases risk of arthritis (a little bit), having surgery may or may not change history
Treatment Algorithm
degenerative tears

Suspect Meniscus Tear

Acute Meniscus tear

Chronic Degenerative

Xrays: no OA MRI: tear
Surgery vs. PT/Injection
Radial/root/buckethandle
Degen/complex

Xrays: mild/moderate OA MRI: tear
Surgery only if fail non-op

Xrays: mild/moderate OA MRI: tear
Surgery only if adamant

Level 1 evidence PT will work
Level 1 evidence surgery=placebo

PT/Injection

Evidence Based Treatment for Knee Arthritis

You have a new patient— he's wondering how long it takes that Internet arthritis cure to work

©1997 APE

UCSF
Understanding Arthritis

<table>
<thead>
<tr>
<th>Cartilage properties</th>
<th>Normal Cartilage</th>
<th>Arthritis Cartilage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Few cells</td>
<td>Super smooth</td>
<td>Cannot make more cartilage</td>
</tr>
<tr>
<td>No nerve endings</td>
<td>Don’t feel joints move back and forth</td>
<td>Don’t sense early damage to the cartilage</td>
</tr>
</tbody>
</table>

History-Osteoarthritis

Symptoms of arthritis
- Pain—‘achy’
- Swelling/effusion
- Loss of range of motion
- Deformity
- Inability to exercise/perform ADLs
- Weight gain
- Depression

Physical Exam findings
- Deformity
- Crepitus (grinding, popping)
- Loss of range of motion
- Tenderness along the joint line
Imaging-Osteoarthritis

Obtain weight bearing xrays

Mild arthritis  Moderate arthritis  Severe arthritis

Severity of arthritis does not predict symptoms

Treatment options for arthritis

Activity/Lifestyle changes  Physical Therapy  Bracing/Unloading  Injections-Steroid vs Visco  Surgery-TKA

TREATMENT OF OSTEOARTHRITIS OF THE KNEE
EVIDENCE-BASED GUIDELINE
2ND EDITION
Modifiable vs Non Modifiable Risk Factors

**Modifiable**
- Activities/Activity levels
- BMI
- Engagement in healthcare

**Non Modifiable**
- Previous Injury/Surgery
- Genetic predisposition

**Possibly Modifiable**
- Extreme BMI
- Alignment
- **Biologic Environment**

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**Activity/Lifestyle changes**

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**RECOMMENDATION 6**
We cannot recommend using glucosamine and chondroitin for patients with symptomatic osteoarthritis of the knee.

**Strength of Recommendation: Strong**

Description: Evidence is based on two or more “High” strength studies with consistent findings for recommending for or against the intervention. A **Strong** recommendation means that the quality of the supporting evidence is high. A harms analysis on this recommendation was not performed.

Implications: Practitioners should follow a **Strong** recommendation unless a clear and compelling rationale for an alternative approach is present.
Pharmacologic Treatments: Recommendation 7

RECOMMENDATION 7A
We recommend nonsteroidal anti-inflammatory drugs (NSAIDs; oral or topical) or Tramadol for patients with symptomatic osteoarthritis of the knee.

Strength of Recommendation: Strong

Activity/Lifestyle changes

The most important thing you can tell him is that he needs to lose weight.

Surgery does not lead to weight loss (JBJS 2015, Arthritis 2017)

Weight loss does lead to less knee pain.
Activity/Lifestyle changes

Benefits of massive weight loss on symptoms, systemic inflammation and cartilage turnover in obese patients with knee osteoarthritis

Pascal Richette, Christine Poitou, Patrick Garnier, Eric Vicaut, Jean-Luc Bouillot, Jean-Marc Lacorte, Arnaud Basdevant, Karine Clément, Thomas Bardin, Xavier Chevalier

Table 4 Serum levels of joint biomarkers at baseline and 6 months after bariatric surgery

<table>
<thead>
<tr>
<th>Baseline</th>
<th>6 Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean ± SD</td>
<td>Mean ± SD</td>
</tr>
<tr>
<td>PIAPP: ng/ml</td>
<td>443.6 ± 257.5</td>
</tr>
<tr>
<td>Helix-II, ng/ml</td>
<td>5.9 ± 4.6</td>
</tr>
<tr>
<td>COMP, U/mL</td>
<td>10.5 ± 3.5</td>
</tr>
<tr>
<td>HA, ng/ml</td>
<td>31.3 ± 26.8</td>
</tr>
</tbody>
</table>

Values are mean ± SD or median ± IQR.

COMP: cartilage oligomeric matrix protein; HA: hyaluronic acid; Helix-II: type II collagen helical peptide; PIAPP: N-terminal propeptide of type II procollagen.

Ann Rheum Dis 2011;70:139–144. doi:10.1136/ard.2010.134015

IDEA Trial (NIH/NIA)

Activity/Lifestyle changes

- What about mild weight loss?


Effects of Intensive Diet and Exercise on Knee Joint Loads, Inflammation, and Clinical Outcomes Among Overweight and Obese Adults With Knee Osteoarthritis:

The IDEA Randomized Clinical Trial

Stephen P. Messier, PhD, Shannon L. Mihalko, PhD, Claudine Legault, PhD, Gary D. Mill PhD, Barbara J. Nicklas, PhD, Paul DeVita, PhD, Daniel P. Beavers, PhD, David J. Hunter MBBS, PhD, Mary F. Lyles, MD, Felix Eckstein, MD, Jeff D. Williamson, MD, Jeffery C. MD, Ali Guermazi, MD, PhD, and Richard F. Loeser, MD

RECOMMENDATION 2

We suggest weight loss for patients with symptomatic osteoarthritis of the knee and a BMI ≥ 25.

Strength of Recommendation: Moderate
Does physical therapy work for patients with knee osteoarthritis?

No single PT intervention was best...aerobic, aquatic, strengthening worked well
Gimmicky things—didn’t work well (magnets, Orthotics, ultrasound)
Wang et al, AIM 2015

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Study/Study Group</th>
<th>Exercise Mean</th>
<th>Exercise SD</th>
<th>Exercise Total</th>
<th>Control Mean</th>
<th>Control SD</th>
<th>Control Total</th>
<th>Weight</th>
<th>Std. Mean Difference (IV, Random, 95% CI)</th>
<th>Std. Mean Difference (IV, Random, 95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-weight-bearing strengthening exercise</td>
<td>Gur 2002</td>
<td>10.3</td>
<td>4.5</td>
<td>9</td>
<td>28</td>
<td>5.2</td>
<td>6</td>
<td>3.3%</td>
<td>-3.48 [-5.27, -1.70]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Saha 2010</td>
<td>2.5</td>
<td>1.7</td>
<td>23</td>
<td>6.5</td>
<td>1.8</td>
<td>24</td>
<td>9.2%</td>
<td>-2.05 [-2.80, -1.30]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gur 2002</td>
<td>16.6</td>
<td>7.3</td>
<td>8</td>
<td>28</td>
<td>5.2</td>
<td>6</td>
<td>5.2%</td>
<td>-1.94 [-2.92, -0.96]</td>
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<tr>
<td></td>
<td>Saha 2010</td>
<td>3.9</td>
<td>1.9</td>
<td>24</td>
<td>6.5</td>
<td>1.8</td>
<td>24</td>
<td>10.0%</td>
<td>-1.38 [-2.62, -0.75]</td>
<td></td>
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<tr>
<td></td>
<td>Lee 2009</td>
<td>4.2</td>
<td>3.6</td>
<td>36</td>
<td>7.3</td>
<td>3.6</td>
<td>36</td>
<td>11.4%</td>
<td>-0.98 [-1.45, -0.57]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Schlichke 1996</td>
<td>9.7</td>
<td>4.7</td>
<td>10</td>
<td>10.1</td>
<td>4.4</td>
<td>10</td>
<td>7.9%</td>
<td>-0.07 [-0.64, 0.48]</td>
<td></td>
</tr>
<tr>
<td>Subtotal (95% CI)</td>
<td></td>
<td>-110</td>
<td></td>
<td>106</td>
<td></td>
<td></td>
<td></td>
<td>47.2%</td>
<td>-1.42 [-2.89, -0.75]</td>
<td></td>
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<tr>
<td>Heterogeneity: Tau² = 0.49; Ch² = 10.90, df = 5 (P = 0.004); P = 79%</td>
<td></td>
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</table>

Test for overall effect: Z = 4.10 (P < 0.0001)

1.2 Weight-bearing strengthening exercise

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Study/Study Group</th>
<th>Exercise Mean</th>
<th>Exercise SD</th>
<th>Exercise Total</th>
<th>Control Mean</th>
<th>Control SD</th>
<th>Control Total</th>
<th>Weight</th>
<th>Std. Mean Difference (IV, Random, 95% CI)</th>
<th>Std. Mean Difference (IV, Random, 95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-weight-bearing strengthening exercise</td>
<td>Jan 2000</td>
<td>4.8</td>
<td>2.7</td>
<td>34</td>
<td>7.1</td>
<td>3.4</td>
<td>34</td>
<td>11.4%</td>
<td>-0.74 [-1.23, -0.25]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Jan 2000</td>
<td>4.8</td>
<td>3.5</td>
<td>34</td>
<td>7.1</td>
<td>3.4</td>
<td>34</td>
<td>11.4%</td>
<td>-0.88 [-1.35, -0.41]</td>
<td></td>
</tr>
<tr>
<td>Subtotal (95% CI)</td>
<td></td>
<td>68</td>
<td></td>
<td>68</td>
<td></td>
<td></td>
<td></td>
<td>22.8%</td>
<td>-0.79 [-1.46, -0.13]</td>
<td></td>
</tr>
<tr>
<td>Heterogeneity: Tau² = 0.00; Ch² = 0.95, df = 1 (P = 0.32); P = 0%</td>
<td></td>
<td></td>
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<td></td>
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</tbody>
</table>

Test for overall effect: Z = 3.95 (P < 0.0001)

1.3 Aerobic exercise

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Study/Study Group</th>
<th>Exercise Mean</th>
<th>Exercise SD</th>
<th>Exercise Total</th>
<th>Control Mean</th>
<th>Control SD</th>
<th>Control Total</th>
<th>Weight</th>
<th>Std. Mean Difference (IV, Random, 95% CI)</th>
<th>Std. Mean Difference (IV, Random, 95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-weight-bearing strengthening exercise</td>
<td>An 2008</td>
<td>71.1</td>
<td>11.0</td>
<td>11</td>
<td>138.2</td>
<td>112.6</td>
<td>10</td>
<td>7.9%</td>
<td>-0.99 [-1.46, -0.53]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kver 2002</td>
<td>3.77</td>
<td>1.73</td>
<td>47</td>
<td>4.77</td>
<td>2.12</td>
<td>49</td>
<td>12.1%</td>
<td>-0.51 [-0.93, -0.09]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bremser 2006</td>
<td>15.39</td>
<td>5.7</td>
<td>22</td>
<td>18.64</td>
<td>4.57</td>
<td>18</td>
<td>10.1%</td>
<td>-0.23 [-0.86, 0.39]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Subtotal (95% CI)</td>
<td>80</td>
<td></td>
<td>73</td>
<td></td>
<td></td>
<td></td>
<td>36.1%</td>
<td>-0.48 [-0.77, -0.21]</td>
<td></td>
</tr>
<tr>
<td>Heterogeneity: Tau² = 0.00; Ch² = 0.63, df = 2 (P = 0.73); P = 0%</td>
<td></td>
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</tbody>
</table>

Test for overall effect: Z = 2.73 (P = 0.006)

Total (95% CI) | 258 | 247 | 100.0% | -0.94 [-1.51, -0.37] | Favors exercise

Test for subgroup differences: Ch² = 0.89, df = 2 (P = 0.06); P = 69.9%
Orthotics for Osteoarthritis

Knee OA without bracing (bone-on-bone contact)

The 3-Point Leverage System

Knee OA with bracing (space created between bones)

Bracing improves clinical outcomes but does not affect the medial knee joint space in osteoarthritic patients during gait

Jeffrey A. Haladik · William K. Vasileff · Cathryn D. Peltz · Terrence R. Lock · Michael J. Bey

WOMAC total improved 33+/-39%
pain improved 41+/-42%
fxn improved 33 +/- 44%

Improved outcomes short term
Does not change natural history

May help choose patients for osteotomy (re-alignment)
Orthotics for Osteoarthritis

**BRACING**

**RECOMMENDATION 4**
We are unable to recommend for or against the use of a valgus direct force brace (medial compartment unloader) for patients with symptomatic osteoarthritis of the knee.

*Strength of Recommendation: Inconclusive*

**HEEL WEDGES**

**RECOMMENDATION 5**
We cannot suggest that lateral wedge insoles be used for patients with symptomatic medial compartment osteoarthritis of the knee.

*Strength of Recommendation: Moderate*

Injections for Osteoarthritis
Corticosteroid Injections

- Risks:
  - Can kill cartilage cells
    - Lidocaine and steroid
  - Transiently increase blood sugar

- Not Risks:
  - Will not turn you into this:

Healthy cartilage cells  | Cartilage cells after lidocaine
---|---
UCSF Orthopaedic Research

Summary:

Favors Steroid

RECOMMENDATION 8

We are unable to recommend for or against the use of intraarticular (IA) corticosteroids for patients with symptomatic osteoarthritis of the knee.

Strength of Recommendation: Inconclusive
Viscosupplementation

- Viscosupplementation (Synvisc, Euflexxa)
  - Lubricates and cushions joint
  - Made from a natural substance similar to healthy joint fluid
- Improves viscosity
  - Increases molecular weight and quantity of synovial fluid synthesized by the synovium
- Decrease pain (mechanism uncertain)
  - Decreases inflammatory mediators?
“The experts achieved unanimous agreement in favor of the following statements: VS is an effective treatment for mild to moderate knee OA; VS is not an alternative to surgery in advanced hip OA; VS is a well-tolerated treatment of knee and other joints OA.”

RECOMMENDATION 9
We cannot recommend using hyaluronic acid for patients with symptomatic osteoarthritis of the knee.
Strength of Recommendation: Strong

Description: Evidence is based on two or more “High” strength studies with consistent findings for recommending for or against the intervention. A Strong recommendation means that the quality of the supporting evidence is high. A harms analysis on this recommendation was not performed.

Implications: Practitioners should follow a Strong recommendation unless a clear and compelling rationale for an alternative approach is present.

NEJM-2015

- In this clinical setting of a prevalent disabling disease, for which the therapy in question has, at best, modest efficacy for relief of pain, the tolerance for treatment expense and adverse events is limited. Therefore, the current evidence base would not advocate the use of intraarticular hyaluronate for the management of knee osteoarthritis.

Conclusions—
mild benefit, often less than MCID
May be worth trying in younger people with OA, mild disease
PRP-Platelet Rich Plasma
Stimulates Hair Growth
- Criminal Hair
- Forehead
- Neck & Jawline
- Sports Injury or Chronic Tension
- Chest & Decolletage

PRP FOR DRY EYES
PRP Therapy for Dry Eyes
Better Self-Image
WITH PLATELET-RICH PLASMA

Athletes and PRP Therapy
THE ULTIMATE GUIDE TO

PRP Injections Helped Kobe
They Can Help You Also!
If you suffer from knee, shoulder or any joint pain,
PRP Injections may be your answer.
Contact us today for a free screening.

Request A Free Screening

STEM CELL THERAPY
FOR JOINT DISORDERS
You Will Learn:
- Are you a good candidate?
- What does the treatment involve?
- Will your insurance cover everything?
- Stem cell therapy vs. surgery

FREE EBOOK
DOWNLOAD NOW
Platelet Rich Plasma: “Volume of plasma that has a platelet count above the baseline of whole blood.”

Two additional factors causing variations in PRP products

- Presence or absence of white blood cells in the final product
- +/- activation of platelets with exogenous thrombin

Plasma and platelets

WBC’s

RBC’s

Role of WBCs?

White Blood Cells:
- Play a key role in the initial phases of inflammation.
  ...but increase muscle damage ...and may be detrimental to the healing process

The exact effect of including WBC is unclear... May differ on the treatment goal For Knee Problems—WBC removed may be better
PRP Basic Science

**Platelet-membrane-based**

- > 1100 proteins
- TGF-B – Transforming growth factor
- PDGF – Platelet derived growth factor
- IGF – Insulin-like growth factor
- FGF – Fibroblast growth factor
- VEGF – Vascular endothelial growth factor
- Cell-adhesion molecules – fibronectin, fibrin, vitronectin
- Growth factor inhibitors…

### PRP and Growth Factors

#### Platelet-Rich Plasma Differs According to Preparation Method and Human Variability

Augustas D. Mazocca, MS, MD, Mary Beth R. McCarthy, BS, David M. Chowaniec, BS, Mark P. Cote, DPT, Anthony A. Romeo, MD, James P. Bradley, MD, Robert A. Arciero, MD, and Knut Bittzad, MD

Investigation performed at the Department of Orthopaedic Surgery, University of Connecticut Health Center, Farmington, Connecticut

- 8 subjects
  - Mean age 31.6 years
  - 3 repetitive blood draws
- Conclusions
  - PRP > whole blood in plt conc
  - Single = Double spin techniques
  - High variability within systems
  - High variability with intra-individual measurements
Platelet-Rich Plasma Differs According to Preparation Method and Human Variability

Augusten D. Mazzocco, MS, MD, Mary Beth R. McCarthy, BS, David M. Chowaniec, BS, Mark P. Cote, DPT, Anthony A. Romeo, MD, James P. Bradley, MD, Robert A. Arciero, MD, and Knut Beitzel, MD

Investigation performed at the Department of Orthopaedic Surgery, University of Connecticut Health Center, Farmington, Connecticut

- Cell counts inconsistent
- Has implications since PRP is often given repetitively
- Biologic factors that may influence this variability unknown

Hyaluronic Acid Versus Platelet-Rich Plasma

A Prospective, Double-Blind Randomized Controlled Trial Comparing Clinical Outcomes and Effects on Intra-articular Biology for the Treatment of Knee Osteoarthritis

Brian J. Cole, 1,4,5,8,9,10 MD, MBA, Vesali Kassaei, 4 MD, MS, Kristen Huxsey, 1 MS, Kyle Pitz, 1,4 MMIS, PA-C, and Lisa A. P folka, 11,12 DVM, PhD, DACVS

Investigation performed at the Rush University Medical Center, Chicago, Illinois, USA

| TABLE 3 |
| WOAMC Pain Score at Study Time Points a |

<table>
<thead>
<tr>
<th></th>
<th>PRP Group</th>
<th>HA Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before treatment</td>
<td>7.00 ± 0.53</td>
<td>7.52 ± 0.58</td>
</tr>
<tr>
<td>Treatment visit 2 (week 2)</td>
<td>6.15 ± 0.54</td>
<td>6.32 ± 0.65</td>
</tr>
<tr>
<td>Treatment visit 3 (week 3)</td>
<td>5.06 ± 0.48</td>
<td>5.53 ± 0.61</td>
</tr>
<tr>
<td>Follow-up</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 weeks</td>
<td>4.57 ± 0.48</td>
<td>4.66 ± 0.47</td>
</tr>
<tr>
<td>12 weeks</td>
<td>3.98 ± 0.63</td>
<td>4.00 ± 0.60</td>
</tr>
<tr>
<td>24 weeks</td>
<td>4.11 ± 0.56</td>
<td>5.00 ± 0.50</td>
</tr>
<tr>
<td>52 weeks</td>
<td>3.02 ± 0.48</td>
<td>4.00 ± 0.60</td>
</tr>
</tbody>
</table>

11/21/2017
Mild OA, lower BMI worked better, lowers pro-inflammatory cytokines.

Conclusion: “significant improvements were seen in other patient-reported outcome measures, with results favoring PRP over HA.”
PRP and Early OA

Level 1, 2 evidence

Likely mildly beneficial with LP-PRP
Minimal side effects
No long term data on natural history
Stem Cells

- **Adult** and Embryonic Stem Cells
  - Mesenchymal, hematopoietic, juvenile
  - Induced pluripotent stem cells (iPSC)

How do Stem Cells Work?

- **Cellular repletion**
  - Less cartilage cells—inject stem cells, cartilage will develop from stem cells

- **Trophic release**
  - Less cartilage cells--inject stem cells
  - Release of cytokines into the local environment
  - Less *in situ* differentiation
  - Dependent on cells in the environment
There is level-3 or level-4 evidence for the use of stem cell injection of different types in the treatment of KOA when evaluating PROMs, pain and radiographic, arthroscopic and histological outcomes. It should be noted that all treatments were additional to surgery, HA or PRP injections. All studies were found to be at high risk of bias. Therefore, we do not recommend to use stem cell therapy for patients with KOA.
Knee Replacement

- Final common pathway for all people with moderate to severe arthritis

Knee Replacement

- How does it work?
  - Designed cuts in the knee joint to remove injured cartilage
  - Replacement of cartilage surface with metal and plastic (Polyethylene) surface
Knee Replacement

- Excellent procedure for low to moderate demand patients
  - Pain relief immediate (no more injured cartilage)
  - Good range of motion
  - 90-95% good to excellent results at 10-15 years

Knee Surgery

<table>
<thead>
<tr>
<th>Time</th>
<th>Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 weeks</td>
<td>‘50% better’</td>
</tr>
<tr>
<td>3 months</td>
<td>‘75% better’</td>
</tr>
<tr>
<td>1 year</td>
<td>‘98% better’</td>
</tr>
</tbody>
</table>

How long does a knee replacement last?

Does the computer/laser do a better job than a surgeon?


**The Clinical Outcome of Computer-Navigated Compared with Conventional Knee Arthroplasty in the Same Patients: A Prospective, Randomized, Double-Blind, Long-Term Study.**

Kim YH¹, Park JW, Kim JS.

Bilateral TKA (Computer vs Surgeon)

12 year outcomes

No difference in function (90%)
100% survivorship in both knees
KNEE ARTHRITIS

MODIFIABLE
- Weight
- Activity
- PT/Diet
  Level II works

NON MODIFIABLE
- Family Hx
- Injury History

POSSIBLY MODIFIABLE
- Alignment
- Biologic
- Large BMI
- Consulting Gen Surg
  Level III works well

Intervention Risks

- Biologic
  - Injections
    - Steroid
    - HA
    - PRP
  - Consult Gen Surg
    Level III works well

Bracing
Consider osteotomy
If 'young'
Level IV brace
Level II, IV osteotomy

Level 1, works well

Thank you!
Questions
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