New Treatments for Sports Injuries

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In the days before arthroscopic surgery

IT'S HIS KNEE...TAKE HIM OUT AND SHOOT HIM.
What is New in Sports Medicine: Current - Future

- Biologics:
  - Stem Cells
  - Growth Factors (Platelet Rich Plasma)
  - Cadaver grafts
- New Procedures
  - Cartilage replacement
  - New Arthroscopic Techniques
- Joint Resurfacing
  - Biological (Genzyme)
  - Synthetic (OBI)
  - Localized
  - Spacers
  - Partial knee replacements
- Miscellaneous
Biologics:

- **Stem Cells**
  - Primal (undifferentiated) cells that have the ability to divide and differentiate to become other specialized cells.
  - Have the ability to repair or heal tissue by dividing and forming new healthy cells and tissue
    - Pluripotential: Embryonic – Best: Most undifferentiated
    - Multipotential: Limited potential
      - Adult (Bone Marrow/Mesenchymal):
      - Cord Blood: (better?)

- **Platelet Rich Plasma**
  - PRP is a source of growth factors that support bone and soft tissue healing (TGF-B, PDGF, ILGF)
  - It is derived by concentrating autologous platelets by centrifuging blood, and added to surgical wounds or grafts to support or speed up the healing process (5-8 x normal concentration)
Knee:

- ACL
- Meniscus
- Articular Cartilage
ACL: New Treatment Options

- **Currently Available**
  - Allografts
  - Robotics /computer assisted surgery
  - Two tunnel anatomic reconstruction

- **Coming attractions**
  - Add growth factors to achieve repair!
  - Grow ACL in the lab
ACL: Traditional Treatment

- Anterior Cruciate Ligament Tear
- Patella Tendon Autograft
“Igor, quick! Run over to the cemetery, dig up a corpse, and bring me an anterior cruciate ligament.”
Allograft ACL

- **Benefits:**
  - Less invasive, faster rehab,

- **New advances**
  - Methods of prep
  - Safety
  - biocleanse
Enhanced ACL Repair:

Avoid replacement
Keep your original !!

– Add growth factors to achieve repair!
  * Martha Murray Childrens Hosp of Boston. collagen sponge + PRP in ptl ACL tears in animal model showd greater defect filling and 40% increase in mech strength
    – *Orthop Research 4/06*
Double Bundle ACL
Computer Assisted ACL
Grow ACL in lab

- Ultimate goal:
  - Off the shelf ligament. Sized to match
  - Zero risk of disease transmission
  - Decreased cost

With scaffold made of silk and stem cells + bioreactor to simulate stress

.........Tufts
Meniscus

- Repair
  - All inside repair
  - Enhanced repair
  - Stem Cells (Chondrogen)
  - PRP (Cascade)
What’s so important about the Meniscus?

- **Load Transmission**
- Removal of meniscus leads to same forces/smaller surface area
- Dramatically increases stress concentration
- Removal of up to a third of meniscus can lead to a 350% increase in stress concentration
Long-term Follow-up of Meniscectomy in Athletes
Jorgensen, et al. JBJS; 69B. 1987

- 147 athletes, f/u > 14 yrs
- complete meniscectomy
- 89% DJD @ 14.5 yrs
- more frequent w/ lateral men
  - (49% @ 4.5 yrs)

Isolated arthroscopic partial meniscectomy
Bolano, et al. AJSM 1993

- 50 pts, f/u > 5 yrs
- partial meniscectomy
- 62% Fairbank’s changes
New Options After Partial Meniscus Removal

- **Chondrogen:**
  - Injection of mesenchymal stem cells
  - Clinical trials underway

- **Collagen Meniscus Scaffold**
Options After Complete Meniscus Removal
Meniscus Allograft
Biological Resurfacing...

Cartilage Replacement

- Healing
  - Microfracture (BM stimulation)

- Replacement
  - OCG
    - Auto
    - Allo
    - OBI

- Cartilage Growth
  - Genzyme
  - Second generation (MACI)

- Coming attractions
OCG

- **Allograft**
  - For large defects
  - Don't Rob Peter to pay Paul!
  - ..Risks?

- **OBI**
  - Resorbable (6mo), porous scaffold, which allows the ingrowth of new healing tissue.
  - Synthetic (polylactide-co-glycolide + Ca Sulfate to enhance bone ingrowth)
  - As good as cartilage?
Genzyme

Carticel™ Treatment

1. Healthy cartilage biopsy taken from patient

2. Biopsy sent to Genzyme Tissue Repair for processing

3. Cultured cells sent to surgeon

4. Cultured cartilage cells injected under periosteal flap

Chondrocyte Implantation (Pre-Surgery)

Chondrocyte Implantation (Post-Surgery)
Cartilage Resurfacing: Second Generation

- MACI (matrix induced ACI)
  - Avoids need for periosteum
  - Bovine collagen membrane
  - Arthroscopic

- Coming Attractions
  - Allogenic Cells
    - "off the shelf"?

- Other
Combined Procedures

- ACL
- Meniscal Allograft
- HTO
- Patella Realignment
Complex and Uncontained lesions

- patella
- tibia
- multiple lesions
- large lesions
- uncontained
- bipolar
Complex lesions

- Internal osteophyte
- \textquote{Skip} lesions
- \textquote{Ovalize} irregular borders
ACI: Meniscal Allograft

- Chondral defect with absent meniscus
- Single or two stage
- Allograft first
Bipolar Lesions

- ACI for femoral condyle
- Microfracture for small tibial lesions
- Meniscal allograft
Bipolar Lesion:
LM + Genzyme + Microfx

Video
RL:
LM + LFC Genzyme + LTP Micrfx
1 year f/u
ACI/ HTO

- Minimal joint space narrowing
- Physiologic varus
- Single vs 2 stage
- Opening wedge
Autologous Chondrocyte Implantation

Concomitant Procedures in Complex Knees

38 y/o male forklift driver with MFC defect, mild varus alignment, mild medial compartment narrowing, intact medial meniscus.

TX: Medial Opening wedge HTO, Puddu plate fixation, ACI
"Mr. Osborne, may I be excused? My brain is full."
Patella

- Arthroscopic realignment for instability
Patella Instability

- Problem:
  - Improper tracking, dislocation

- Solution:
  - Realign Patella

- Old Method

- New Method
Example: Arthroscopic Proximal Realignment

Pre-op

Post-op
Osteoarthritis

- Synvisc
- Arthrosurface
- Orthoglide
- Unispacer
- Conformis
- MIS TKR
- Coming Attractions
  - Genetic treatments?
Knee Osteoarthritis: Non Surgical Treatments

- **Synvisc:**
  - Hyaluronate. Joint lubricant.
  - Derived from rooster combs
  - Anti inflam effect/ stimulate synoviocyte to synthsize HA/ block pain receptors/absorbs shock/nourishes ctlg
  - 50-70% effective.. Better in early stages

- **Glucosamine (amino sugar: precursor to art ctlg):**
  - May help in early stages of OA
  - Ctlg nutritional supplement
  - Derived from crustacean chitin (seafood allergy)
  - 1500 mg /day
  - NIH Study 2006: benefit for pts w mod/severe sxs only (used Glu-HCL) not Glu-S
  - Not as effective as Celebrex
Non Surgical Management: Continued

- Unloader brace
  - Shift weight away from damaged side of knee
Surgical Options:
HTO & Unicompartmental

- Unicompartmental Indications:
  - age 65 +
  - under 180 lbs


- age 50 +

- HTO Indications
  - Coventry: Less than 1.32X ideal body weight

UniSpacer Advantages

- Addresses the problem where it exists (in the joint)
- No extra-articular deformity or bone loss
- Easy conversion to next step procedure
- Similar recovery to HTO
- Similar pain relief (80% on average)
UniSpacer Concept: The “Internal” Osteotomy

- **Restores alignment**
  Replaces Cartilage lost from the Tibia and Femur
- **Improves stability**
  Re-Tensions the cruciate and collateral ligaments
- **Adapts to the kinematics of the individual knee**
New Spacer Options

- Orthoglide
- Conformis
Partial Knee Replacement

- Unicompartment
- Duo Compartment
- Mobile Bearing
Tendonitis: Non Surgical Treatment

- **Inject PRP**
  - **Tennis elbow**
    - Growth factors are released from activated platelets.
    - 8 weeks 60% improvement vs 16% for lidocaine 93% improved at 25 months
  - **Achilles**
    - Israeli study: Hebrew U. Mesenchymal stem cells injected into torn rat tendons allowed repair and regeneration.
    - *4/06 Jnl Clin Investigation*
Tendonitis: Non Surgical Treatment - cont.

- **Shockwave Therapy:** equivocal results
  - Localized shock waves.
    - Inhibits pain due to nerve cell membrane changes. Chemical alteration of painful stimuli. And neovascularization
    - No anesthesia.
    - Side effects: numbness, muscle pain, bruising. Resolve within 48 hrs
Tennis Elbow

- Open Release

- Arthroscopic Release!
Shoulder

- RTC
  - Arthroscopic repair
  - Dual row
  - Graft enhancement
  - Reverse prosthesis

Figure 1: Normal anatomy of the shoulder

Rotator cuff tendons
  - Supraspinatus
  - Subscapularis
  - Teres minor
  - (Infraspinatus behind, not shown)
Definitions

- Bursitis
- Impingement
- Rotator cuff tendinitis
- Tendinosis
- Partial tear
- Rotator cuff tear
Footprint: Summary

- Approximately 12-16mm
- reasonable estimate:
  6-8 mm = 50%

12-16 mm
**Benefit:**
- Double row of suture maximizes compression onto tuberosity, increasing fixation footprint

**Technique**
- Medial row:
  - anchor first, lock suture, pass through tendon, non sliding knots
  - Transtendon (daisy chain)
- Lateral row: suture first
Trident

A New Technique for
Arthroscopic Knotless Rotator Cuff Repair.....

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Trident Benefits

- Simple technique:
  - Single step insertion and fixation
Trident Benefits:

- Allows tensioning of repair *after* anchor inserted! (before deployment)
- Secure suture tension every time
- Tensioning wheel for accuracy
Trident Technique #2: Double row fixation

Medial and lateral row fixation

Larger repair footprint!
Trident Technique #2:
Inverted Mattress
RTC Graft

- Allograft derived from cadaver skin or
- Xenograft derived from fetal bovine skin
Shoulder

- Osteoarthritis
  - Biological resurfacing
    - Fascia/ LM allograft to glenoid
  - Partial arthroplasty
    - arthrosurface
Instability

- Arthroscopic repair update
  - Absorbable anchors
  - RTI closure
THANK YOU!