THE INDUSTRIAL ATHLETES SHOULDER

ROGER N CHAMS MD

SPORTS MEDICINE / ARTHROSCOPIC SURGERY OF SHOULDER AND KNEE
HIGH DEMANDS OF THE INDUSTRIAL WORKER
WHY CONSIDERED INDUSTRIAL ATHLETES

• SIMILAR FXNAL DEMAND-- BUT NO SCREENING PREVENT PROGRAM OR “PITCH COUNT”/ ROTATION
• RISK OF INJURY ENDING CAREER / LIVELIHOOD
• EXTERNAL PUSH TO BTW / RTP PRIOR TO PHYSIOLOGIC HEALING
• COST OF PROLONGED CONSERVATIVE MGMNT
• NARROW WINDOW TO EARLY RETURN WITHOUT CATASTROPHIC FAILURE  *TIME, MONEY, OUTCOME*
• NEED GRADUATED ACTIVITY  *LIGHT DUTY, NO CONTACT*
INDUSTRIAL ATHLETE’S SHOULDER

• VERY DIFFICULT TO DIFF CHRONIC VS ACUTE-ON- CHRONIC W/C SHOULDERS

• DEGENERATIVE CHANGES VERY COMMON IN LABORERS W/REPETITIVE MOTIONS

• LIKE ATHLETES NEED CLEAR PLAN AS TO NOT PROLONG RETURN TO WORK

• THE TIDE SEEMS TO BE CHANGING MORE D ROSE vs ADRIEN PETERSON
• LIABILITY AND SAFETY ISSUES WITH PRESSURE TO GET BACK “ON FIELD”

• IMPORTANCE TO SEPARATE PTS THAT WILL DO WELL W CONSERVATIVE MGNT VS SURGICAL EARLY TO AVOID COST AND DELAY BTW.

• IME SAME AS INSURED NOW PUSH TO MAXIMIZE CONSERVATIVE MGMT
NEW CHALLENGES

- **DELAY** in initial visit, imaging, sx
- Non-diagnostic imaging (Libertyville MR, no arthrogram)
- Flawed time consuming IME process
- Protect repair while pressured to RTW
- No prevention program (no time or money)
- Accurate dx. sx indication should not be WC
- Wrong MD referral WC-TIES
- Timeliness loss of money
- Insurance similar now w/ peer – peer review
- Light duty avail

- Goal is to avoid the disastrous revision / failure $$$$$$
IME

- Flawed Incentive - Get paid to deny care
- 15 min apt decision making can delay or even deny claim
- Biased to PT/ TX MD
- Valuable screen if done well
- I know what individual IME MD will do
- Hypocritical IME MD
- "Forensic" IME
- Cost and major time delay

- Need documentation
IMPROVING RESULTS

- EARLY SX. GETTING THROUGH WC PROCESS
- BETTER PROCEDURES
- BIOLOGIC AUGMENTATION VS LOCAL ENVIRONMENT
- REHAB
- BRIDGE PROGRAM
- UNDERSTANDING UNIQUENESS PTS
- EXPECTATION NEED TIME TABLES
- PREVENTION PROGRAMS
- “PRE SEASON PHYSICAL” SCREEN
CURRENT DATA ON PREVALENCE OF SHOULDER INJURIES IN THE WORK PLACE

• SECOND ONLY TO LOW BACK INJURIES 23%
• HEALTHY WORKER BIAS

**RISK FACTORS:**
• OVERHEAD WORK
• HEAVY LIFTING, PUSH, PULLING, CARRYING
• HIGHLY REPETITIVE WORK
• AWKWORD POSTURES
• CUMULATIVE EFFECT OF MULTIPLE EXPOSURES
MOST COMMON WORK RELATED SHOULDER PATHOLOGY

• 1  IMPINGEMENT, BURSITIS, TENDONITIS
• 2  ROTATOR CUFF TEAR
• 3  INSTABILITY  [ SLAP, BANKART, MDI ]
• 4  ACROMIAL-CLAVICULAR SEPARATION
• 5  BICEPS TENDONITIS, TEARS, RUPTURES
• 6  ADHESIVE CAPSULITIS
• 7  FRACTURES
CAUSATION ACUTE VS CHRONIC

- DON’T HAVE LUXURY OF PRE-EMPLOYMENT AND YEARLY M.S.
- HX OF ACUTE TRAUMATIC EVENT RESULTING IN REDUCED SHOULDER FXN
- HX AGE 45YO; CURRENT HEALTH
- HEMATOMA, DROP ARM, SWELLING
- US W/IN 3 WKS
- MRI W/IN 6WKS -BONE EDEMA
MRI FINDINGS ACUTE VS CHRONIC

• ATROPHY
• RETRACTION
• FATTY INFILTRATE
• LOSS OF ELASTICITY
• DJD
• HIGH RIDING HUMERAL HEAD

• LACK OF ACUTE BONEY SIGNS 6WKS
• HIGH RIDING HUMERUS
• ACROMIAL CHANGES
PTRCT INCIDENCE REVIEW

- Asymptomatic by US 17.2% (mean 50)
- MRI 15.9% (mean 44)
- 5-10% of presenting shoulder pain
- Articular almost 2x bursal

- 1 year follow up 18% progressed to PTRCTs
- 34% increased grade
- Good news is that most PTRCT in throwers are small
- Possibly because they complain earlier

Arthroscopic eval for instability 30-70% had RC pathology
ROTATOR CUFF PREVALENCE IN ASYMPTOMATIC GENERAL POPULATION

• FTRCT
  40-49  5%
  50-59  10%
  60-69  25%
  >70    50%

HARD TO DECIDE CAUSATION WITH INCREASING AGE
KNOWLEDGE OF SHOULDER INJURIES

• DEGENERATION PROB NOT A FACTOR UNTIL 59 YO
• DISABLING SHOULDER TRAUMA FOR REPET WORK EXPOSURE NEED TO DOCUMENT WORK EXPOSURE
• AVE ELAPSED TIME FROM INJURY TO REPAIR WAS 3 MO AND GOING UP
• FOR ACUTE TEAR; RESULTS ARE TIME DEPENDANT
• EARLY REPAIR BETTER FXNAL OUTCOMES REGARDLESS OF TEAR SIZE
• EARLY REPAIR GROUP 2-3X MORE LIKELY TO BE WORKING AT FINAL FOLLOW UP
NEW IMPROVED TREATMENT OPTIONS

• DOUBLE ROW FIXATION
• BIOLOGIC AUGMENTATION ?
• NEW ANCHORS
• GOOD UNDERSTANDING ABOUT INDIVIDUALS VARIABLE OUTCOMES
• NEW OPTIONS FOR INSTABILITY BONE LOSS
• REDEFINING CRITICAL BONE LOSS INSTABILITY
• SMARTER REHABILITATION
SHOULDER IMPINGEMENT [BURSITIS / TENDONITIS]

- CONTINUUM TO RC TEAR
- TRAUMATIC VS DEGENERATIVE VS OVERUSE
- TREATMENT ALMOST ALWAYS NONOP
- P.T., STEROID INJECTION, REST
- PRP?
- SURGERY?
WORK COMP

• RESTRICTED AFTER CORTISONE FOR 10-14 D
• LIMIT 2
• LIMIT REPETITIVE OVERHEAD, INCITING ACTIVITY
• S/P SUBACROMIAL DECOMPRESSION
  6-8 WKS MMI
  GOAL FROM / FULL STRENGTH
ROTATOR CUFF TEAR
MECHANISM/ ETIOLOGY
“FORENSIC MD”

- ANATOMY OR PATHOLOGIC DEFICITS IN KINETIC CHAIN
- REPETATIVE HIGH SPEED/ STRESS/ MICROTRAUMA
- TRAUMA
- INSTABILITY
- POSITIONAL “ATHLETES” TRACTION
- ATTRITION / DEGENERATIVE
- AGE
DEBRIDEMENT & PASTA REPAIR
PASTA REPAIR
RESULTS IN GEN POPULATION

• PASTA REPAIR RESULTS OVER 50% DEPTH

• RYU, BURKHART, SNYDER

• 85-95% GOOD EXCELLENT RESULTS

• MIXED POPULATION OVERHEAD ATHLETES
Fig. 7-4. A small crescent-shaped tear. Note deforming forces. (After Hengst.)
CONFOUNDING CONCOMINENT SYMPTOMS

- ADHESIVE CAPSULITIS
- DJD
- BICEPS TENDONOPATHY
- INSTABILITY
- CERVICLE RADICULOPATHY
- NEUROPATHY
- PARASCAPULOPATHY
DIAGNOSTICS

• X-RAYS 4 VIEWS (ACROMIAL TYPE, CA+, AC JNT, DJD, OS ACROMIALE)
• MRI 95% SENS UNDERESTIMATES PATH/SIZE
• MRI/ARTHROGRAM -- <45, INSTABILITY, PARTIAL TEARS, PREVIOUS SX LOOSE BODY

ULTRASOUND—TECH DEPENDANT
TIMING OF SURGERY

• ASAP FOR ACUTE & LARGE RETRACTED TEARS
• NEED FULL ROM PRIOR TO SURGERY
• SMALLER TEARS MAY WORK W/ RESTRICTIONS DURING CONSERVATIVE MANAGEMENT
• WORK COMP SHOULD BE TREATED LIKE AGE APPROPRIATE PUBLIC WITH CONSIDERATION TO TIME LOST
WHATS NEW FTRC REPAIR

• DOUBLE ROW FIXATION— MAYBE NOT FOR ATHLETES
• SUTURE BRIDGE FIXATION-
• ORTHO BIOLOGICS
• BIOLOGICS- PLATELET RICH PLASMA vs MICROFX/ (GROWTH FACTORS- ANGIOGENESIS, CELL REPLICATION, GRANULATION)
DOUBLE ROW RC REPAIR
DOUBLE ROW FXN
PRP AUGMENTED RC REPAIR
REHAB

ALL RC TEARS ARE DIFFERENT
DOESN’T START TO HEAL 8 WKS
SHARPY FIBERS AT 12 WKS
MATURES INTO BONE 4 MO

80% STRENGTH 6 MO
CONTINUE TO INCR STRENGTH 18MO
ROTATOR CUFF RESULTS

• SMALL 1-2 CM: 5% FAILURE
• MODERATE 1-3 CM: 20% FAILURE
• LARGE 3-5 CM: 30% FAILURE
• MASSIVE >5 CM/ MULTIPLE TENDONS: 50% FAILURE

> 62yo  PATIENT SATISFACTION = 87%  <
40 GOOD/EXCELLENT  98%
PAIN RELIEF 95% FXNAL IMPROVEMENT
FAILURE RC REPAIR

• POOR TENDON QUALITY (ATROPHY, FATTY INFIL, RA, OLD)
• NEW TRAUMA
• CHRONIC LOSS OF MOBILITY
• SIZE
• INADEQUATE MOBILIZATION
• BAD SURGERY
WORK COMP

POSITIVE PREDICTOR OF POOR FUNCTIONAL OUTCOME

METANALYSIS ‘80-’17

Work Accident Solicitors
Expert Solicitors in Shoulder Injuries
0800 158 2454

Did You Know?
We have won thousands of Work Injury Cases
NEW CONCEPTS IN ATHLETE’S SHOULDER INSTABILITY

ROGER N. CHAMS, MD

SPORTS MEDICINE / ARTHROSCOPIC SURGERY OF SHOULDER AND KNEE
MECHANISM/CAUSES OF INSTABILITY

- REPETITIVE TORSION OF SHOULDERS, OVER SHOULDER WORK
- DISLOCATION/SUBLUXATION
- TRAUMATIC TENSION/COMPRESSION {MVA}
- TRACTION PULL, OR FALL OUTSRETCHED ARM
Pan capsular plication
SUPERIOR LABRUM ANTERIOR TO POSTERIOR TEARS
( SLAP / BICEPS ANCHOR )
MECHANISM

- FALL ONTO ABD/ EXTENDED ARM
- TRACTION PULL ON ARM
- MVA REAR ENDED
- REPETATIVE THROWING/OVERHEAD WORK
- POSTER SLAP IN THROWERS PEEL BACK
TREATMENT OPTIONS

- CONSERVATIVE TX = SYMPTOMATIC RELIEF FOLLOWED BY STRENGTH
- SLAP TEARS COMMON IN GENERAL, OVERHEAD SPORTS, AND WORK COMP POPULATIONS
- NO TIME DEPENDENCE ON SURGICAL INTERVENTION
- NO STUDIES SHOW REHAB CAN CORRECT SLAP
- SURGICAL SLAP/ LABRAL REPAIR VS BICEPS TENODESIS VS TENOLYSIS
WORK COMP PT
SLAP REPAIR VS BICEPS TENODESIS VS TENOTOMY

• **NO CONSENSUS**
• FULL DUTY RTW after REPAIR <50 %
• FUNCTIONAL SCORES 65% GD/EXC VS 90+%  
• SINGLE TRAUMATIC EVENT MAY COMPROMISE BICEPS  
• AGE OVER 40 ALSO FACTOR IN FAILURE
LONG HEAD BICEPS PATHOLOGY
OVERHEAD WORKERS / THROWERS
SHOULDER

- TENDINOSIS
- TENOSYNOVITIS
- PARTIAL/FULL TEAR
- INSTABILITY
- SLAP LESIONS
- PASCAL BOILEAU MD DESCRIBES PATHOLOGY IN 95% OF RC DISEASE “HIDDEN LESION”
LONG HEAD BICEPS

- FXN IS TO CENTER HEAD
- LEADING CAUSE RESIDUAL POST OP PAIN
- CONTINUUM - TENDONITIS; PARTIAL TEAR; RUPTURE
- NML DEGENERATION (KNEE MENISCUS)
- INJECTION CORTISONE, PRP

TENOTOMY vs SOFT TISSUE TENODESIS vs  ARTHROSCOPIC GROOVE vs SUBPEC TENODESIS
LHB TENOTOMY VS SUBPEC TENODESIS

TENOTOMY

- ADVANTAGES
- QUICKER RECOVERY
- CHEAPER?
- LESS POST OP PT

- META-ANALYSIS RESULTS:
- PATIENT SATISFACTION, FINAL OUTCOME, PAIN RELIEF MAY BE SAME
BICEPS TENODESIS

- RE-ESTABLISH RESTING MUSCLE LENGTH
- PREVENT MUSCLE ATROPHY
- AVOID CRAMPING PAIN 20%
- MAINTAIN ELBOW FLEXION AND SUPINATION STRENGTH
- AVOID COSMETIC DEFORMITY 24-60%
- (POPEYE)
- WORKER’S COMP ARENA DEFORMITY AND CRAMPING GIVE 2 REASONS FOR REVISION SURGERY AND DELAY RTW
REHAB

- SLING FOR 2 WKS  COMFORT
- EARLY ROM
- STRENGTH PARASCAP BELOW SHOULD CUFF
- 3-4 MO  to FULL sport & MMI
BANKART/ANT-INF LABRAL TEAR
LABRIMAL COMPLEX TEARS
BANKART/REVERSE BANKART

- LABRUM
- GLENOID/BONEY
- INFERIOR G-H LIGAMENT COMPLEX
- TRAUMATIC
- DISLOCATION/SUBLUXATION
SOFT TISSUE BANKART & REPAIR
NON OPERATIVE TX

• BANKART LESIONS ALL HEAL BUT NOT IN RIGHT PLACE
• SX REDISLOCATION RT 8% VS 40-90% NON OP
• SLING FOR COMFORT
• PT EARLY ROM & STRENGTH
• NO LITERATURE SHOWS BRACING HELPFUL
• IN SEASON/SEASONAL WORK TIMING?
• AGE
• WORK TYPE
HOW DO WE MEASURE RESULTS IN 2019?

- RECURRENT INSTABILITY: INADEQUATE
- RETURN TO UNRESTRICTED ACTIVITY/SPORTS
- RETURN TO PREVIOUS LEVEL WORK/SPORTS
- OUTCOMES MEASURE:
  
  ROWE SCORE
  SIMPLE SHOULDER TEST
  SANE SCORE
  WOSI

  WESTERN ONTARIO SHOULDER INSTABILITY SCORE
## The Western Ontario Shoulder Instability Index (WOSI)

**Clinician's name (or ref) .................................**  

**Patient's name (or ref) .................................**

**The following questions concern the symptoms you have experienced due to your shoulder problem. In all cases, please enter the amount of the symptom you have experienced in the last week. (please move the slider on the horizontal line.)**

1. How much pain do you experience in your shoulder with overhead activities?
   - No pain
   - Extreme pain

2. How much aching or throbbing do you experience in your shoulder?
   - No aching/throbbing
   - Extreme aching/throbbing

3. How much weakness or lack of strength do you experience in your shoulder?
   - No weakness
   - Extreme weakness

4. How much fatigue or lack of stamina do you experience in your shoulder?
   - No fatigue
   - Extreme fatigue

5. How much clicking, cracking or snapping do you experience in your shoulder?
   - No clicking
   - Extreme clicking

6. How much stiffness do you experience in your shoulder?
   - No stiffness
   - Extreme stiffness

7. How much discomfort do you experience in your neck muscles as a result of your shoulder?
   - No discomfort
   - Extreme discomfort

8. How much feeling of instability or looseness do you experience in your shoulder?
   - No instability
   - Extreme instability

9. How much do you feel the need to protect your arm during activities?
   - Not at all
   - Extreme

10. How much difficulty do you experience lifting heavy objects below shoulder level?
    - No difficulty
    - Extreme difficulty

11. How much fear do you have of falling on your shoulder?
    - No fear
    - Extreme fear

12. How much does your shoulder affect your ability to perform the specific skills required for your sport or work?
    - Not affected
    - Extremely affected

13. How much difficulty do you experience maintaining your desired level of fitness?
    - No difficulty
    - Extreme difficulty

14. How much difficulty do you have “roughhousing” or “horseplay” with family or friends?
    - No difficulty
    - Extreme difficulty

15. How much difficulty do you have sleeping because of your shoulder?
    - No difficulty
    - Extreme difficulty

16. How conscious are you of your shoulder?
    - Not conscious
    - Extremely conscious
RECURRENCE RATES

NON – OPERATIVE TREATMENT: 60-94% RECURR

- 75% UNSATIS RESULTS
- NON OP GROUP REQUIRING SX  63% GOOD/EXC

OPERATIVE TREATMENT: 5-14% RECURRENCE

- WOSI @15 YRS : 85% NORMAL
GOAL IS NO RECURRENCE

• 25 YR F/U SHOWED LESS ARTHROPATHY XRAY
• SIGNIFICANT BONE LOSS RARE IN 1ST DISLOCATION
• BONE DEFECTS CHANGE OUTCOMES AND OPTIONS FOR SX
• ARTHROSCOPIC ALONE HAS HIGH RECURRENCE RTS FOR BONE LOSS
• RECURRENCE MORE LIKELY TO REQUIRE MORE INVASIVE BONE PROCEDURE
BEST OUTCOMES

• EVIDENCE TO RECONSTRUCT FIRST TIME DISLOCATIONS
• MINIMALLY INVASIVE PREDICTABLE ARTHROSCOPIC OPERATION
• RESTORE ANATOMY & FUNCTION
• PREDICTABLE, IMPROVED OUTCOMES
• PREVENT FURTHER BONE LOSS
• FOR BOTH W/C AND ATHLETIC POP
NEW ALL SUTURE ANCHORS
Multiple authors describe Benefits of INCREASING points of fixation

- Failure of arthroscopic labral repairs for instability has been attributed to number of fixation points with better distribution of loading \textit{boileau p jbjs 2006}

- Increasing the number of sutures decreases cyclic gap formation and increased load to failure in rotator cuffs \textit{jost pw jbjsa july 2012}

- Soft tissue fixation strength has been shown to be proportional to number of fixation points \textit{black kp am j med 1999}
KNOTLESS ANCHORS
RESULTS

• ARTHROSCOPIC: 4% REDISC (BURKHART & SNYDER); 7% (SAVOIE); INCLUDES CONTACT
• OPEN: 67% THROWERS BACK; 6% REDISC (BIGLIANI)
  70% THROWERS BACK; 7% REDISC (JOBE)
  APPROX 12 DEGREE ER

SUBSET SEVERE BONE LOSS 67%-90% FAILURE AFTER BANKART PROCEDURE
CONTRAINDICATIONS

SEVERE BONE LOSS

- "INVERTED PEAR" GLENOID 25% (LATARJET PROC)

- "ENGAGING HILL-SACHS LESION (OVER TIGHTEN, ALLOGRAFT, ROTATIONAL OSTEOTOMY)"
BONE LESIONS
HILL SACHS IMPACTION FX
REPLISSAGE
REPLISSAGE
18 YO M BANKART/ MASSIVE HILL SACHS
BANKART + REMPLISSAGE

DESCRIBED EUGENE WOLF 2006
DOUBLE PULLEY TECHNIQUE BURKHART 2009
KNOTTLESS TECHNIQUE 2017
90% GOOD/EXC RESULTS 20 PTS
outcomes after remplissage in pts with ant instability and subcritical glenoid bone loss

- 22 articles; 694 pts; mean age 28; 3yr f/u;
- Recurrence rates 0-20%
- Ext rotation [at 90 deg abd] loss: -11----1 deg
- Ext rot loss [in adduction]: -8-----4.5 deg
- Return to sport 60-100%
- Rts at preinjury level 42-100%
- Markedly reduced odds of recurrence vs bankart reconstruction alone
GLENOID BONE LOSS
LATARJET
LATARJET RESULTS

• GILLES WALCH MD

90-100% STABILITY FOR BONE LOSS
NOT BONE, BUT MUSCULAR SLING

>30% HILL SACHS + LATERJET = FAIL
RE-DEFINING “CRITICAL” BONE LOSS IN 2019

- 20-25% TRADITIONALLY USED FOR INC RECURRENCE FOR GLENOID BONE LOSS

- 13.5% GB LOSS: WORSE OUTCOMES WOSI, SANE. CONSIDERED “FAILURE”

- BIPOLAR COMBINED HILL SACHS FX NOW REALIZED AS CRITICAL

- CONCEPT OF "ON TRACK", "OFF TRACK" LESIONS
WHY IT MATTERS

- Failure means decreased productivity
- Possible sport career ender
- Failure means re-operation
- Instability episodes cause permanent irreversible damage
- Cost / time off
- Deconditioning
- Partial or full permanent disability
- Need to get it right the **FIRST** time
BIPOLAR BONE LOSS

• FROM ENGAGING HILL SACHS TO: ON –TRACK/ OFF- TRACK LESIONS  ITOI AND ASSOC

• SUB-CRITICAL GLENOID AND HILL SACHS LESIONS IN COMBINATION

• ABD/EXT R CONTACT AREA = 83% GLENOID WIDTH
ON TRACK / OFF TRACK
NEED TO MEASURE BONE LOSS ON BOTH SIDES. 3D CT
ARTHROSCOPIC MEASUREMENTS
"On track” or “off track”

CALCULATION

1. Measure the diameter (D) of the inferior glenoid, either by arthroscopy or from 3D CT scan.

2. Determine the width of the anterior glenoid bone loss (d).

3. Calculate the width of the glenoid track (GT) by the following formula: GT = 0.83 D – d.

4. Calculate the width of the HSI, which is the width of the Hill-Sachs lesion (HS) plus the width of the bone bridge (BB) between the rotator cuff attachments and the lateral aspect of the Hill-Sachs lesion: HSI = HS + BB.

5. If HSI > GT, the HS is off track, or engaging. If HSI < GT, the HS is on track, or non-engaging.
How to Determine Whether Hill-Sachs Lesion Is “On Track” or “Off Track

1. Measure the diameter (D) of the inferior glenoid, either by arthroscopy or from 3D CT scan.
2. Determine the width of the anterior glenoid bone loss (d).
3. Calculate the width of the glenoid track (GT) by the following formula:
   \[ GT = 0.83 \times \frac{D}{d} \]
4. Calculate the width of the HSI, which is the width of the Hill-Sachs lesion (HS) plus the width of the bone bridge (BB) between the rotator cuff attachments and lateral aspect of the HS:
   \[ HSI = \frac{1}{4} (HS + BB) \]
5. If HSI > GT, the HS is off track, or engaging. If HSI < GT, the HS is on track, or non-engaging.
## TABLE 2

<table>
<thead>
<tr>
<th>GROUP</th>
<th>RECOMMENDED TREATMENT</th>
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<tbody>
<tr>
<td>1. &lt;25%GL. + ON TRACK HS</td>
<td>Arthroscopic Bankart repair</td>
</tr>
<tr>
<td>2. &lt;25%GL. + OFF TRACK HS</td>
<td>Arthroscopic Bankart repair plus remplissage</td>
</tr>
<tr>
<td>3. &gt;25%GL. + ON TRACK HS</td>
<td>Latarjet procedure</td>
</tr>
<tr>
<td>4. &gt;25%GL. + OFF TRACK HS</td>
<td>Latarjet procedure with or without humeral-sided procedure (humeral bone graft or remplissage), depending on engagement of Hill-Sachs lesion after Latarjet procedure</td>
</tr>
</tbody>
</table>
THANK YOU
NEW CONCEPTS:
ARTHROSCOPIC LATARJET
OUTCOMES OPEN VS ARTHROSCOPIC LATARJET

• 8 STUDIES UP TO 2019
• ARTHR HAD LOWER INITIAL POST OP PAIN. EQUAL BY 1 MO
• NO DIFF IN SCREW ANGLES
• ARTHROSCOPIC TOOK LONGER 112 VS 93 MIN
• COMPLICATION RATES EQUAL
• ARTHRO HAD HIGH LEARNING CURVE
PREVENTATIVE EXERCISES

- Goal is to prevent repetitive injury, not to necessarily improve performance
- Must focus on trouble areas
  - Proper Shoulder/Spinal ROM
  - Scapular Positioning/Stability
  - Balanced Strength
  - Proprioception
PREVENTION

• PROPER CONDITIONING
• TECHNIQUE/THROWING MECHANICS
• RECOVERY TIME
• GOOD SHOULDER GIRDLE FXN
• PROPER STRETCH
• UPPER BACK AND TORSO STRENGTH
• NUMBER OF PITCHES AND TYPES
• CORRECTING GIRD
SHOULDER PREVENT PROGRAM
Rehab of the Thrower’s Shoulder
Phase I

Acute Phase

- Goals = re-establish ROM, decrease pain and inflammation, and begin low level strengthening along with stretching
- Postural assessment and examination to determine improper mechanics.
  - Thrower typically demonstrates protracted/depressed shoulder position with possible IR ROM deficits.
  - Could be due to true stiffness or biomechanical deficits
- Low level isometrics progressing to manual rhythmic stabilization (varied positions progressing with improved strength)
Phase 2

Strengthening Phase

- Maintain ROM, cessate pain, and normalize/improve postural biomechanics
- Initiation of “Thrower’s Ten” strengthening program
- Addition of low level plyometrics (two handed) and low level overhead strengthening exercises.
- Continuation of entire chain strengthening (core, LE, etc.)
Phase 3

Advanced Strengthening and Plyometric Phase

- Criteria for progression into Phase 3: >4-/5 strength, symmetrical ROM (Total Arc and FLEX/ABD), adequate muscular control with basic strengthening and minimal pain.

- Progressed plyometrics, “advanced thrower’s ten”, and continued emphasis on pertinent musculature strengthening.
  - Rhythmic stability in positions mimicking throwing
  - Progressed overhead strengthening exercises.
  - One handed plyometrics.
Phase IV

Return to Play Phase

- Completion of “Phase IV Assessment” to identify readiness for initiation of throwing program.
  - Assessment used in conjunction with physical examination and overall progress through rehab protocol/timeline.
  - Various functional assessments testing strength, mobility, and tolerance to closed chain loading to assist in decision for athlete to return to throwing.
Phase IV Assessment

Assessment Criteria

- **Pain level**
  - Must have 0/10 pain with functional exercises/activities to progress to throwing.

- **Range of Motion**
  - Symmetrical bilaterally, Total Arc within ~10 degrees of contralateral side.
  - Adequate posterior capsule mobility.

- **Strength (MMT)**
  - At least >4/5 strength in all planes (including ER/IR at 90 abd)

- **Y-Balance Test**
  - ≤4cm difference compared to contralateral
Phase IV Assessment

Assessment Criteria

- **Davies UE Stability Test**
  - >16 repetitions (75% of standard 21 reps) compared to contralateral

- **UE Depth Drop (RTP only at discretion of therapist)**
  - ≥9 reps with proper form and control

- **Standing ER Endurance Test**
  - >75% reps in 30 seconds compared to contralateral

- **90/90 Internal Rotation Plyometric Ball Toss**
  - >75% duration (sec) maintaining form compared to contralateral

- **Biodex Testing**
  - ER/IR strength testing at 90 abd position
    - >60% ER:IR ratio at 60°/sec, 180°/sec, and 300°/sec
Y balance test

Y Balance Test Kit

Starting Position YBT-UQ

Medial YBT-UQ reach

Inferolateral YBT-UQ reach

Superolateral YBT-UQ reach
Return to Play

Return to Play Criteria

- Introduction of throwing program following Phase IV assessment and physical examination with consideration of overall progress.
  - Progression from flat ground throwing to mound throwing for pitchers
    - Initially fastballs only, with gradual increase in % effort.
  - Constant monitoring/modifying mechanics using video software if needed.
    - Should be able to maintain mechanics >90% of trials.

- Return to play can take place following satisfactory completion of throwing program and improvements in strength to 5/5 in all planes and >90% on functional testing.
  - Recommended timeframe for RTP:
    - Plication procedure: 6-8mo
    - SLAP Repair: 4-6mo
    - RTC repair: 6mo
BFR
BFR PURPOSE
LOW LOAD RESISTANCE COMBINED WITH BFR

• JAPAN 1960s KAATSU TRAINING
• POST INJURY, POST OPERATIVE
• METABOLITE ACCUMULATION (LACTATE) STIMULATES SERUM GH
• GH $\rightarrow$ IGF-1 $\rightarrow$ ANABOLIC MUSCLE GROWTH
• EARLY HYPERTROPHY
• LATE INCREASE IN STRENGTH
• LOW INTENSITY BFR AEROBIC TRAINING INCREASE IN CARDIO ENDURANCE VO2
• NON – BFR LIMB AND PROXIMAL CORE MUSCLE HYPERTROPHIC RESPONSE
BIOLOGICS

• AUTOLOGOUS GROWTH FACTORS (PRP)

• CELLULAR AGENTS (STEM CELL THERAPY)

• TISSUE THERAPY (SCAFFOLDS)
# Tendon Healing Timeline

## Tendon Healing Phases

- **Inflammatory**
  - Time: 48h

- **Reparative (Proliferation)**
  - Time: 1-4 months

- **Remodelling (Consolidation)**
  - Time: 4-12 months

- **Remodelling (Maturation)**
  - Time: >12 months

## Applications

<table>
<thead>
<tr>
<th>Gene Therapy</th>
<th>Growth Factors</th>
<th>Stem Cells</th>
<th>Natural Biomaterials</th>
</tr>
</thead>
<tbody>
<tr>
<td>bFGF, BMP12-14 (GDF5-7), PDGF, IGF, TGFβ, CTGF, VEGF</td>
<td>BMP2/Smad8, BMP12/TGFβ1 other cDNAs in vivo/ex vivo</td>
<td>bone marrow MSC, adipose MSC, ESC-derived MSC, tendon-derived cells</td>
<td>collagen-based scaffolds, aligned collagen threads, SIS, decellularized tendon grafts, dermis grafts</td>
</tr>
</tbody>
</table>

## Outcome Results

- **Proliferation**
- **Scar Mass**
- **Collagen I and III Healing Process**

- **Tenocytegenesis**
- **Authentic Matrix Production**
- **Histological Integrity**

- **Improved Histology and Biomechanics**
- **Augmented Rate of Tendon Healing**
- **Increased Maturation**
- **Reduced Ectopic Bone Formation**
- **Tendon Strength 20-60%**

## Remaining Questions

- **Time Point, Dose, Alone or in Combination**
- **Long-Term Effects**
- **Biomechanics**
- **Functional Quality**

- **Selection of Gene(s)**
- **Delivery Method**
- **Regulatory Elements**
- **Time of Administration**

- **Cell Amount, Time Point, Stem Cell Fate and Quality**
- **Combination with Growth Factors and/or Biomaterials**
- **Material Properties, Biomechanics, Long-Term Functional Quality and Performance**
BIOLOGICS IN SHOULDER REPAIR

MUCH ATTENTION HAS BEEN GIVEN TO OPTIMIZING:

• **IMPLANT DESIGN**

• **SUTURE CONFIGURATION**

• **SUTURE MATERIAL**

• **BIOLOGICAL AUGMENTATION MAY ENHANCE LOCAL HEALING**
• PLATELETS
• MULTIPLE GROWTH FACTORS
• WBCs

• GROWTH FACTORS (ANGIOGENESIS, MITOGENIC, FIBROGENIC TENDON TO BONE)
• ESSENTIAL PROTEINS RELEASED AT INJURY SITE DURING INFLAMMATORY STAGE - ANABOLIC RESPONSE
• IMPROVE AND ACCELERATE TISSUE REPAIR AND RESTORATION
RCR + PRP
SUMMARY OF ALL STUDIES TO DATE

• COST 600-1200

• NO DIFFERENCE WITH OR W/O PRP: CONSTANT, UCLA, SIMPLE SHOULDER TEST, ASES

• FAILURE RATE DECR IN PRP GROUP SMALL/MED

• NO DIFF IN MASSIVE

• SHORT TERM REDUCTION IN PAIN

• *ROUTINE USE of PRP NOT WARRANTED BASED ON CURRENT AVAILABLE EVIDENCE*
INSERTION SITE PREPARATION
IMPROVE LOCAL ENVIRONMENT

BED ABRASION-CRIMSON DUVET
MICROFRACTURE

THINK BIOLOGY
Marrow stimulation at the footprint of arthroscopic surface-holding repair advances cuff repair integrity

**Multiple Channeling Improves the Structural Integrity of Rotator Cuff Repair**

Chels Hyuncheol Jo, MD, Ji Sun Shin, BS, In Woong Park, MD.
Hyang Kim, PhD, and Seung Yeon Lee, MS.
Investigation performed at the Department of Orthopedic Surgery, SMG-SNU Boramae Medical Center, Seoul National University College of Medicine, Seoul, Korea.

**Efficacy of Marrow-Stimulating Technique in Arthroscopic Rotator Cuff Repair: A Prospective Randomized Study**

Giuseppe Milano, M.D., Maristella F. Saccomanno, M.D., Silvia Careri, M.D., Giuseppe Taccardo, M.D., Rocco De Vitis, M.D., and Carlo Fabbriani, M.D.
STEM CELLS  TISSUE HEALING

• Stem cells provide functions that assist the healing process such as:
  
  • – Reduce inflammation
  – Secrete growth factors FOR ADJACENT CELLS
  – Encourage cell migration
  – Differentiate into terminal cells – Coordinate tissue repair

MSCs ISOLATED FROM :

• BONE MARROW
• ADIPOSE TISSUE
• UMBILICAL CORD BLOOD
WHERE SHOULD MSC BE HARVESTED

PROX HUMERUS

ILIAC CREST
• Matched Case-Control Study
• 45 patients BMAC + RCR
• 45 matched control RCR
• MSCs drawn from ASIS and placed at tendon interface • 87% healing (BM-MSC) vs. 44 % (Non BM-MSC)

• 10 years follow-up
• Control group 4x as likely to have “poor outcome”
SCAFFOLDS
ALLOGRAFT, XENOGRRAFT, SYNTHETIC

MAY BE USEFUL IN WORST CASE SCENARIO
ROUTINE USE MAY BE QUESTIONED DUE TO

COST
LACK OF CONSISTENT LITERATURE
UNCLEAR BIOLOGIC BENEFIT
STEM CELL THERAPY
THEORY

• MINIMALLY INVASIVE HARVEST UNDIFFERENTIATED CELLS
• REGENERATE TISSUE THAT LOOKS AND BEHAVES LIKE NML
• CELLS SEPARATED FROM OTHERS AND CONCENTRATED
PROBLEM

• MULTIBILLION-DOLLAR SECTOR OF HEALTH CARE WITH LITTLE REGULATORY CONTROL
• PATIENTS GROWING DEMAND FOR NON SURGICAL OPTIONS
• ASKED BY PTS TO CONSIDER UNPROVEN TX
• GOOD RANDOMIZED CONTROLLED TRIALS ALMOST NON EXISTENT
• STEM CELL PROVIDERS AND INDUSTRY DO NOT WANT TO RISK PUBLIC OPINION ON IMPACT OF SC
• CLAIM OF PROPRIETARY DATA LACK OF OVERSITE ALLOW CLAIMS TO GO UNCHECKED
• COST SC TREATMENT FOR DJD WELL ABOVE TKA REIMBURSEMENT
Decreasing Shoulder Instability Recovery Time with Stress Ultrasound

Measuring Shoulder Instability and Avoiding Surgery

Shoulder instability recovery time is a big deal because procedures to stabilize the shoulder typically cause major life disruption. What if there were a better way? What if by accurately measuring the amount of instability using ultrasound and then using your own platelets or stem cells we were able to help stabilize the shoulder without surgery?

When the shoulder becomes unstable, it’s important to be able to accurately measure the extent of the damage in order to properly treat the problem. It’s very difficult if not impossible to...
*DISCLAIMER: Like all medical procedures, Regenexx® Procedures have a success and failure rate. Patient reviews and testimonials on this site should not be interpreted as a statement on the effectiveness of our treatments for anyone else.
The combination of poor quality science, unclear funding models, unrealistic hopes’ and unscrupulous private clinics threatens regenerative medicine’s social license to operate.

REC: Better science, funding models, governance, and better public and patients engagement.
Thank you