Some Assembly Required: Joint Replacement
2002 Major Joint Replacement Volume in U.S.

Discharges per Year\(^1\)

- Hip Replacement: 343,000
- Knee Replacement: 400,000
- Shoulder Replacement: 23,100

\(^1\) National Center for Health Statistics: National Hospital Discharge Survey 2002
Data extracted and analyzed by AAOS Dept of Research and Scientific Affairs
Total Hip Arthroplasty

- Alternate bearing surfaces
- MIS
- Hip resurfacing
Total Knee Arthroplasty

- State of the Art
Total Shoulder Arthroplasty

- Reverse total shoulder arthroplasty
Patient Management

- Anaesthesia
- Perioperative pain control
- VTE Prophylaxis
- Perioperative planning and discharge
- Long-term results
Arthroplasty

- Latin arth - joint
- Greek plastica - molding
Total Joint Arthroplasty

- First successful THA 1960
- Many improvements
- Over 800,000 done annually in USA
- Highly successful outcomes
Total Joint Arthroplasty

- Osteoarthritis
- Post-traumatic arthritis
- Osteonecrosis
- Inflammatory arthritis
Indications

- Pain
- Disability
- Health status
- Age
Evaluation

- History
- Physical Examination
- Radiographs
- CT, MRI, bone scan, blood tests
Conservative Treatment

- Heat
- NSAID
- Physical therapy
Expectations

- Excellent pain relief
- Improvements in ADLs
- Increased physical activity

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Preoperative Evaluation

- Medical clearance
- Tests
- Blood donation
- Weight loss
- Dental Evaluation
- Urinary evaluation
- Social planning
Alternate Bearing Surfaces

- THA in younger and higher-demand patients
- Long-term fixation of metal implants
- Long-term failure due to PE wear, osteolysis and aseptic loosening.
- Develop bearing surface that can function at high level and prolong life of well-fixed components
Ceramic THA

- Mid-term study has demonstrated efficacy and safety of a ceramic on ceramic bearing surface compared to the standard ceramic/PE surface.
- No failures or complications related to the bearing surfaces.
Ceramic THA

- Improved wear and biocompatibility with a ceramic/ceramic bearing surface may increase implant longevity.
- Further follow-up is indicated to determine the long-term outcome.
Rehabilitation

- FWB immediately
- Range of motion, strengthening exercises
- Progress as quickly as possible

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Minimal Invasive Surgery

- Single 3-4 inch incision
- Two 2 inch incisions
- Shorter surgery time
- Less blood loss
- Quicker rehabilitation
- Improved functional outcome
Bicycling while drunk increases risk of serious or fatal injury

Only 5% of injured bicyclists wore safety helmets, raising questions about mandatory helmet laws.

by Louis A. Iovino Jr.
ORTHOPEDICS TODAY correspondent

BALTIMORE — Alcohol intoxication significantly increases the risk of serious or fatal bicycling injury among adolescents and adults, according to recent research.

With more people bicycling over the past two decades, injuries have risen significantly, accounting for bicyclists. The researchers determined that BAC levels of ≥0.02 g/dL were associated with a sixfold increased risk of serious injury, while BAC levels ≥0.08 g/dL were associated with a 20-fold increased risk. Only 5% of injured bicyclists with a positive BAC wore helmets compared to 35% of bicyclists without positive BAC levels.

According to Li, alcohol may play an even greater role in bicycling injury than determined by their study since they did not collect data on injuries occurring at night, when 56% of fatal and 32% of serious bicycling injuries happen.

The results of this study reinforce statistics showing low helmet usage. “Safety helmets are strongly recommended for all ages of riders,” Li said. “However, should helmet laws be extended to include adults? It’s a question certainly open for debate.”

Mounting data should, however, influence policymakers’ decisions concerning bicycling helmet laws in this country. “It would be nice if our study could somehow help improve bicycle safety through a helmet campaign, alcohol intervention and sensible public policies,” Li said.

For your information:
Minimal Incision Surgery

- Major marketing ploy
- No differences in
  - blood loss
  - surgery time
  - pain levels
  - functional outcomes
Hip Resurfacing

- Younger more active patients
- Higher expectations
- Proven benefit/cost ratio
- Continuing to push the envelope
Theoretical Advantages of Hip Resurfacing

- Minimal bone resection
- Normal femoral loading
- Maximum proprioceptive feedback
- Restores natural anatomy:
  - offset, leg length
  - anteversion
- Minimal risk of dislocation
- Easier revision
Resurfacing THA

- Largest experience with Birmingham
- Used globally since 1997 with more than 100,000 implanted
- Approved by the FDA in March 2006
- Corin 2000 marketed by Stryker approved in Jun 2007
Typical Candidate

- Patients experiencing hip pain due to OA, RA, DDH or AVN
- Adults under age 60 for whom THA may not be appropriate due to an increased level of physical activity
- Active adults over age 60 may be candidates, depending on their bone quality
Patient Selection Criteria

- Hip resurfacing is most appropriate for physically active patients with good bone quality and adequate femoral and acetabular bone stock.

- Such patients will generally be under the age of 65.

- OA

- Strong Heavy Male

- Women < 50 years

- Men < 60 years

- High Expectation

- High activity level
Indications

- Primary osteoarthritis.
- Post traumatic OA.
- Secondary OA, e.g. DDH, SCFE, Perthes’ disease.
- AVN of the femoral head if remaining bone stock is adequate.
- Inflammatory arthritis if bone quality is adequate.
- Any patient with a deformity of the femur or hardware that would prevent insertion of a stemmed femoral component.
- Patients with a high risk of dislocation.
Conventional THA
Resurfacing THA
Key Benefits

- Large head size
- Alternate bearing surface
- Bone conservation
Bone Conservation

- Revises to a primary
- If patients need revision surgery, they don’t get a revision implant
- The revision procedure would be the same THA they would otherwise have received
Postoperative Therapy

- Rehabilitation protocol similar to THA patients
- Weight bearing as tolerated
- Motion and strengthening exercises and gradual progression to normal activities.
Table HT37: Resurfacing Hip systems requiring revision

<table>
<thead>
<tr>
<th>Resurfacing Head</th>
<th>Resurfacing Cup</th>
<th>Number Revised</th>
<th>Total Number</th>
<th>% Revised</th>
<th>Observed ‘component’ years</th>
<th>Revisions per 100 observed ‘component’ years</th>
<th>Exact 95%CI</th>
</tr>
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<tbody>
<tr>
<td>ASR</td>
<td>ASR</td>
<td>31</td>
<td>753</td>
<td>4.1</td>
<td>1042</td>
<td>3.0</td>
<td>(2.02, 4.22)</td>
</tr>
<tr>
<td>Adept</td>
<td>Adept</td>
<td>0</td>
<td>144</td>
<td>0.0</td>
<td>82</td>
<td>0.0</td>
<td>(0.00, 4.47)</td>
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<tr>
<td>BHR</td>
<td>BHR</td>
<td>166</td>
<td>6773</td>
<td>2.5</td>
<td>19585</td>
<td>0.8</td>
<td>(0.72, 0.99)</td>
</tr>
<tr>
<td>Bionik</td>
<td>Bionik</td>
<td>1</td>
<td>42</td>
<td>2.4</td>
<td>28</td>
<td>3.5</td>
<td>(0.09, 19.72)</td>
</tr>
<tr>
<td>Conserve</td>
<td>Conserve Plus</td>
<td>0</td>
<td>7</td>
<td>0.0</td>
<td>7</td>
<td>0.0</td>
<td>(0.00, 53.17)</td>
</tr>
<tr>
<td>Conserve Plus</td>
<td>Conserve Plus</td>
<td>4</td>
<td>59</td>
<td>6.8</td>
<td>134</td>
<td>3.0</td>
<td>(0.81, 7.63)</td>
</tr>
<tr>
<td>Cormet</td>
<td>Cormet</td>
<td>8</td>
<td>181</td>
<td>4.4</td>
<td>579</td>
<td>1.4</td>
<td>(0.60, 2.72)</td>
</tr>
<tr>
<td>Cormet 2000 (HAP)</td>
<td>Cormet</td>
<td>8</td>
<td>95</td>
<td>8.4</td>
<td>288</td>
<td>2.8</td>
<td>(1.20, 5.48)</td>
</tr>
<tr>
<td>Cormet (Bi-Coated)</td>
<td>Cormet</td>
<td>1</td>
<td>130</td>
<td>0.8</td>
<td>132</td>
<td>0.8</td>
<td>(0.02, 4.21)</td>
</tr>
<tr>
<td>Durom</td>
<td>Durom</td>
<td>25</td>
<td>564</td>
<td>4.4</td>
<td>927</td>
<td>2.7</td>
<td>(1.75, 3.98)</td>
</tr>
<tr>
<td>Icon</td>
<td>Icon</td>
<td>1</td>
<td>51</td>
<td>2.0</td>
<td>50</td>
<td>2.0</td>
<td>(0.05, 11.10)</td>
</tr>
<tr>
<td>Mitch TRH</td>
<td>Mitch TRH</td>
<td>0</td>
<td>94</td>
<td>0.0</td>
<td>25</td>
<td>0.0</td>
<td>(0.00, 14.77)</td>
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<tr>
<td>Recap</td>
<td>Recap</td>
<td>2</td>
<td>50</td>
<td>4.0</td>
<td>81</td>
<td>2.5</td>
<td>(0.30, 8.92)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>247</strong></td>
<td><strong>8943</strong></td>
<td><strong>2.8</strong></td>
<td></td>
<td><strong>22961</strong></td>
<td><strong>1.1</strong></td>
<td>(0.95, 1.22)</td>
</tr>
</tbody>
</table>
Resurfacing THA

- Quality of life issues.
- Conservative approach.
- No bridges burned.
- Careful patient selection.
- Meticulous surgical technique.
TKA State-of-the Art

- Posterior cruciate retention
- Posterior cruciate sacrificing
- Both achieve 95%+ success at 10 yrs
- Metal/PE articulation
Reverse TSA

- What is it?
- Why use it?
- Who uses it?
- When should it be used?
- Where can it get you?
Shoulder Biomechanics

- Arm elevation means that the deltoid must counteract the effect of arm weight.
- The center of rotation is located in the humeral head.

Arm weight = 5 kg
Shoulder Biomechanics

- A stable fulcrum is created by the RC
- COR creates ideal moment for deltoid to elevate arm
- RC contributes to abduction >90°
Problem

- Massive rotator cuff tears
- Instability
- Glenohumeral arthritis
Pathology

- Weakness
- Instability
- Incongruous joint surfaces
- Bone loss
Treatment Objectives

- Restore stability to GH joint
- Provide smooth articulating surfaces
- Replace bone loss
- Optimize remaining cuff muscles, restoring rotational strength
Reverse TSA

- Kessel, Kölbl, Fenlin, Gerard, Liverpool, Neer
  & Averill
Reverse TSA

- Kessel, Kölbl, Fenlin, Gerard, Liverpool, Neer & Averill
Reverse TSA

- No reliable surgical solution to restore anatomy prior to reverse TSA
- Unconstrained arthroplasty may resurface arthritic humeral head but instability will remain
- Prosthetic design with increased constraint can potentially help instability
Reverse TSA

- Semi-constrained
- Provides stable fulcrum
- Multiple options for center of rotation
- Ability to maintain anatomic center of rotation
- Fixed angle central lag screw for fixation
- 4 locking 5.0mm peripheral screws
Indications

- Glenohumeral OA with massive cuff tear.
- Failed cuff repairs with static instability.
- Massive irreparable rotator cuff tear.
- Post-traumatic arthritis w/wo static instability.
- Malunited and nonunited fractures.
- Primary fracture treatment in the elderly.
- No other satisfactory option available.
Indications

- Failed hemiarthroplasty.
- Prosthetic instability.
- Rotator cuff insufficiency.
- Glenoid bone reconstruction.
- Rheumatoid shoulder.
- Neoplasm.

- No other satisfactory option available.
Surgical Lessons

- Place glenoid baseplate low and tilt inferiorly.
- Inferior capsular release important.
- Bone graft on glenoid behind baseplate for wear.
Postoperative Protocol

- Much less intense than conventional TSA.
- Sling for 4-6 weeks depending on indication.
- Passive pendulums and Codmans followed by AAROM.
- After sling, often ADLs and no formal PT.
Clinical Results

- Pain significantly less.
- ASES, Constant scores increased.
- Patient satisfaction high.

Complications

- Must separate primary and revision cases.
- Overall 16% complication rate.
- Revision rate 3X primary rate.
- Rates similar to conventional TSA.
- Humble learning curve.
Complications

- Instability
- Infection
- Postoperative fracture
Survivorship

- Survivorship 98% at 7 years with RSP.
- Survivorship 91% at 10 years with Delta III.
Patient Management

- Anaesthesia
- Perioperative pain control
- VTE Prophylaxis
- Long-term results

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Anaesthesia

- General
- Regional
- Blocks - sciatic, femoral, lumbar plexus, interscalene
Pain Management

- Multimodal pain management
- Anaesthesia blocks
- Cox 2 NSAIDs
- Long acting narcotics
Venous Thromboembolism

- All THA and TKA need prophylaxis
- Guidelines recommend LMWH, warfarin, or anti-Xa agents.
- Minimum 2 weeks
- Consider extended prophylaxis (4 weeks) in patients with increased risk factors
Long-term results

- Cost-benefit ratio high
- Quality of life issues
- THA 85% doing well at 20 years
- TKA 90% doing well at 20 years
- TSA >90% doing well at 20 years