# Total Shoulder Arthroplasty

The Delta CTA™ Reverse Shoulder System

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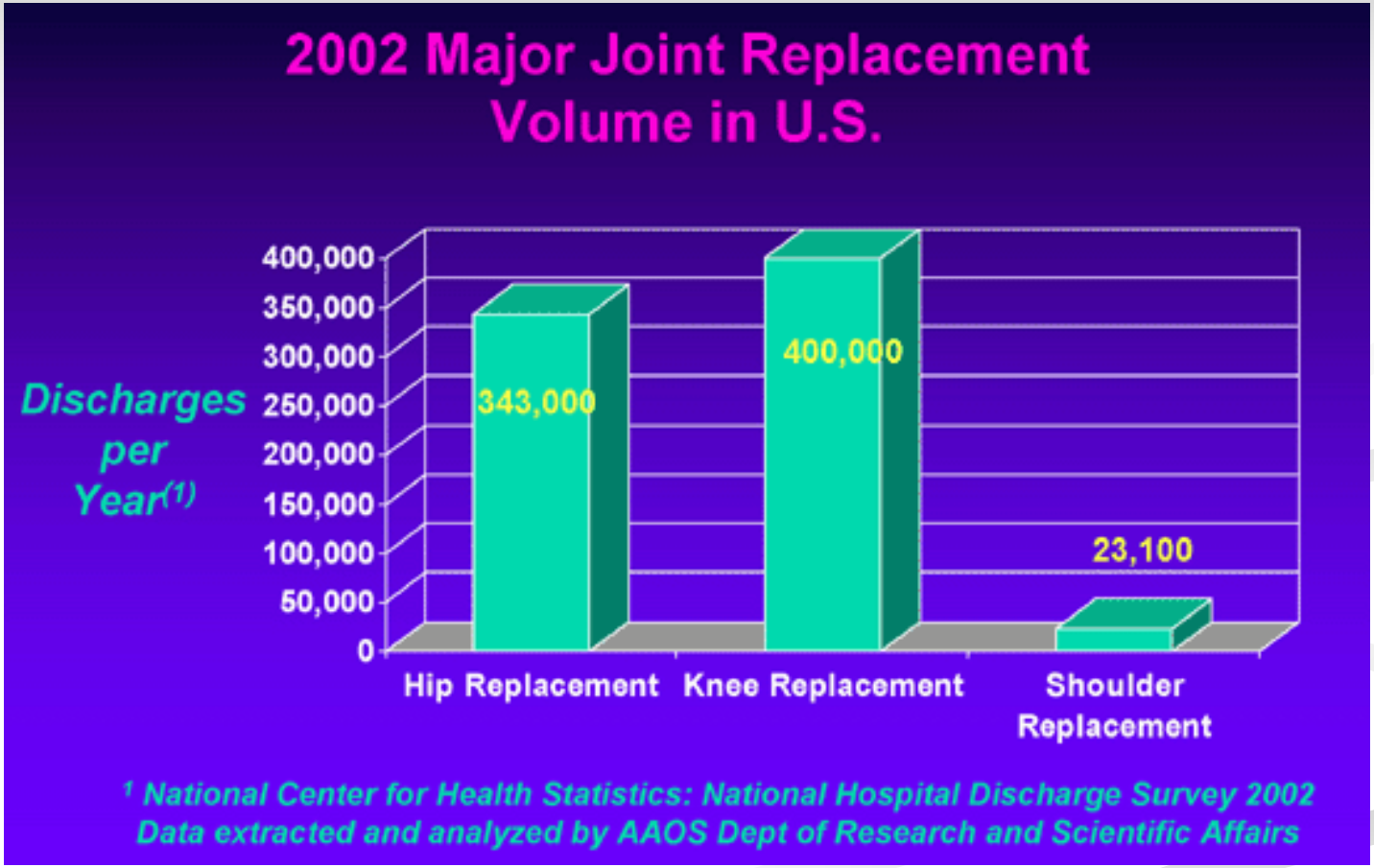
# Inspiration

# Shoulder Arthroplasty

- Over 23,000 shoulder arthroplasties are performed annually[1]
- More than 10,000 are total shoulder arthroplasties
- Currently there is a 5% annual growth of shoulder arthroplasty performed[2]

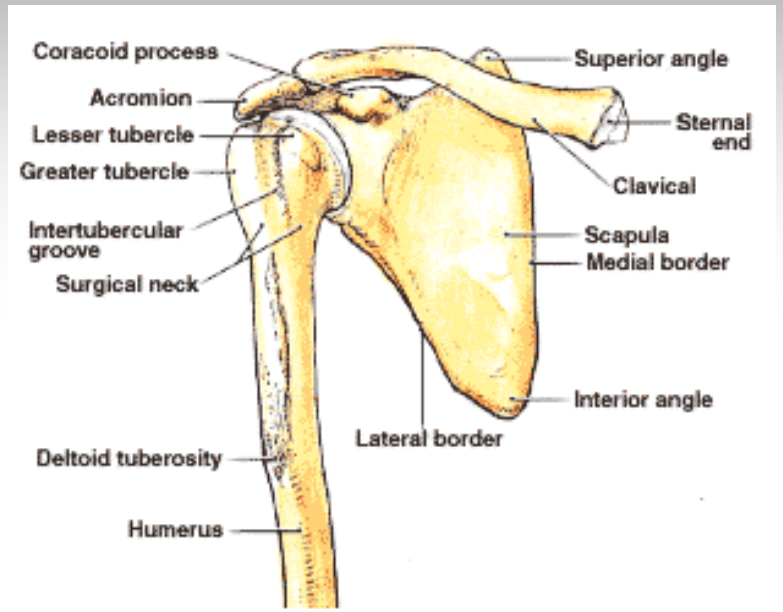
# Shoulder Arthroplasty

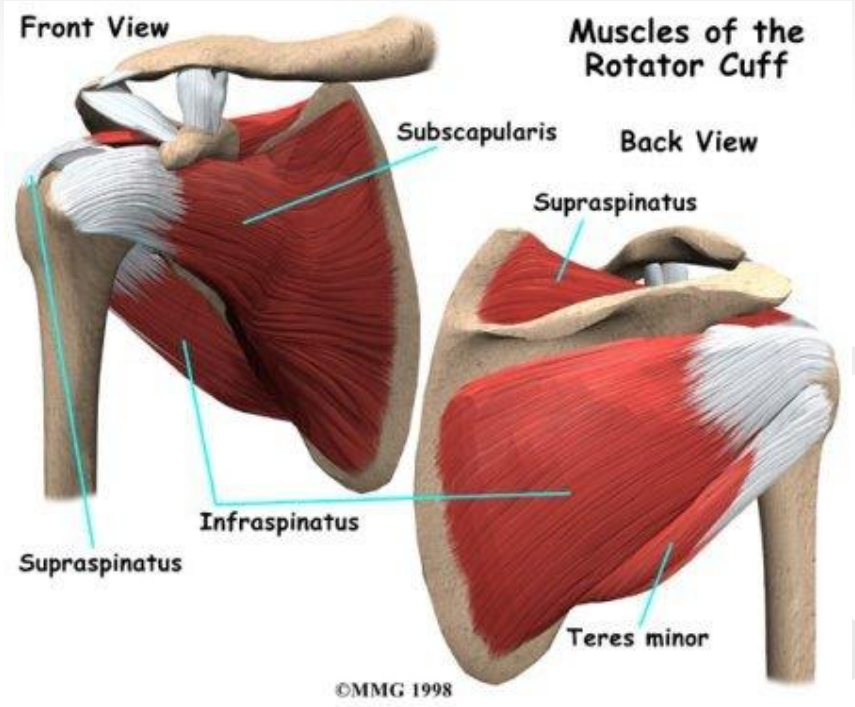


# History

- First shoulder arthroplasty Jules Pean (1893)[3]
- Charles Neer (1955)[4,5]
  - Hemiarthroplasty to treat humeral head osteonecrosis, fracture, and glenohumeral arthritis.
  - Complications leading to pain and decreased function include:
    - Rotator cuff deficiency
    - Abnormal glenoid surface
    - Continued degeneration of glenoid surface
- Solution: Total Shoulder Arthroplasty/ Replacement[6]

# Anatomy




**S**upraspinatus

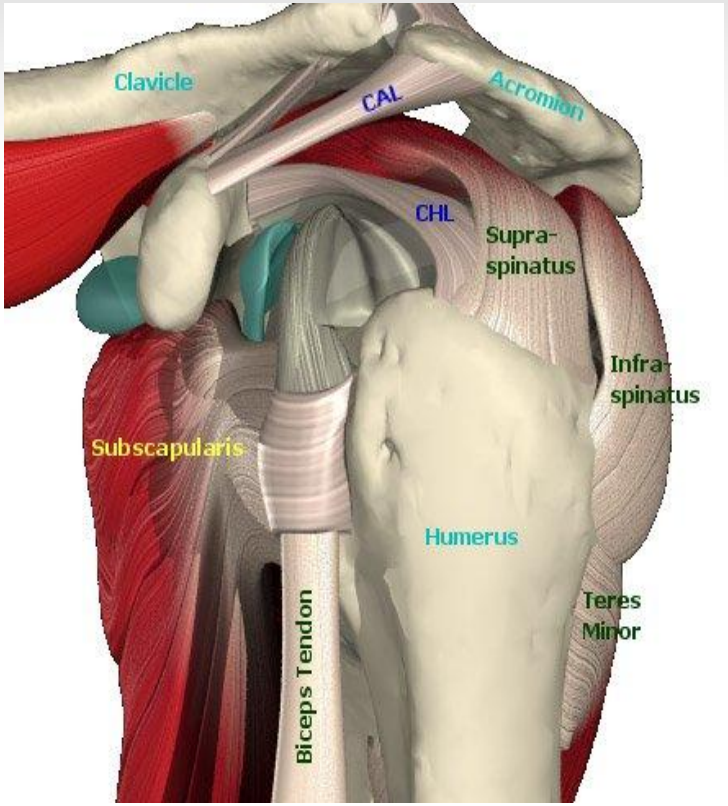
**I**nfraspinatus

**T**eres minor

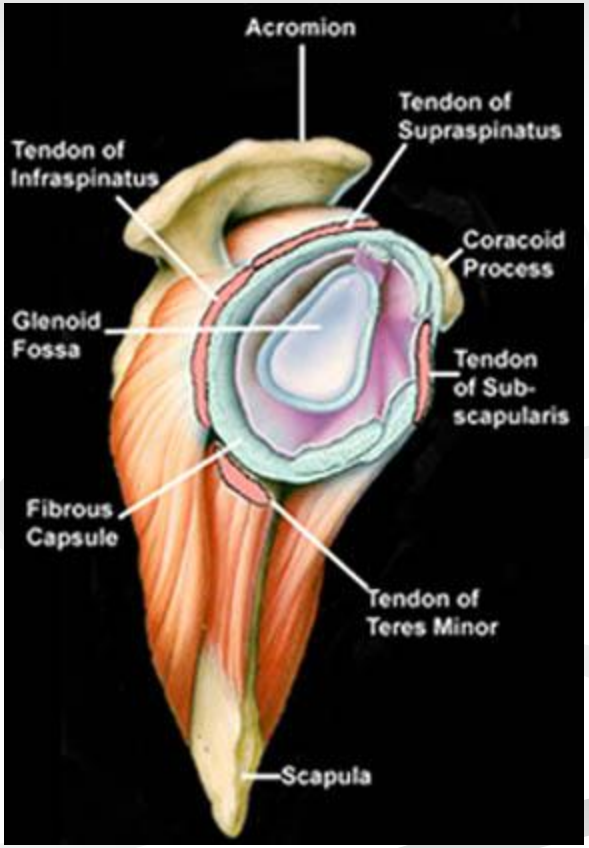
**S**ubscapularis

http://www.Shoulder1.com

# Anatomy

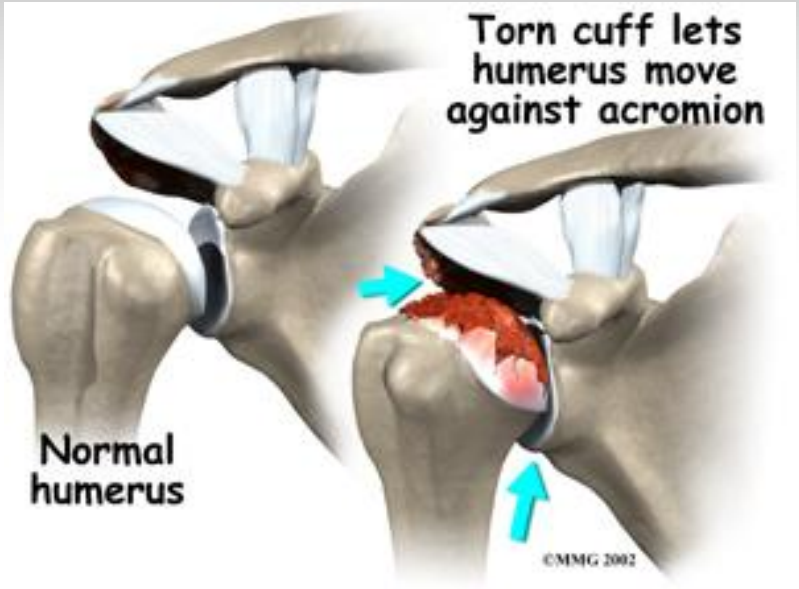


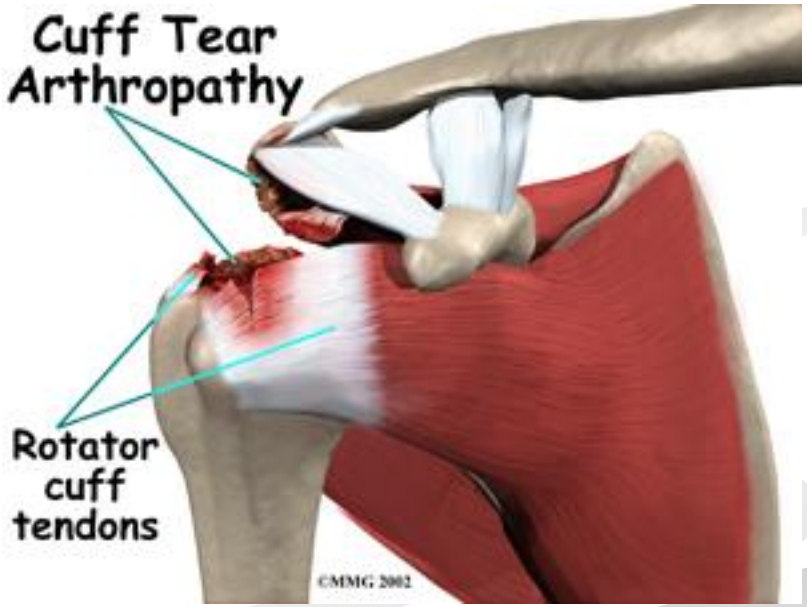

http://www.shoulderdoc.co.uk




http://www.nismat.org/orthocor/exam/shoulder.html

# Anatomy



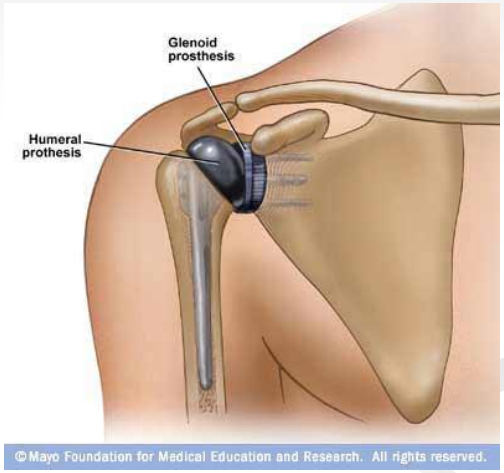




http://www.jointreplacement.com

# Types of Shoulder Arthroplasty

http://orthoinfo.aaos.org/fact

Hemiarthroplasty




Total arthroplasty


Reverse arthroplasty

www.umm.edu/orthopadic/rsr.html

# Total Shoulder Arthroplasty (TSA)

- Primary Indications[7]
  - Osteoarthritis
  - Rheumatoid Arthritis
  - Post Traumatic Arthritis
  - Osteonecrosis
  - Infections
  - Fracture

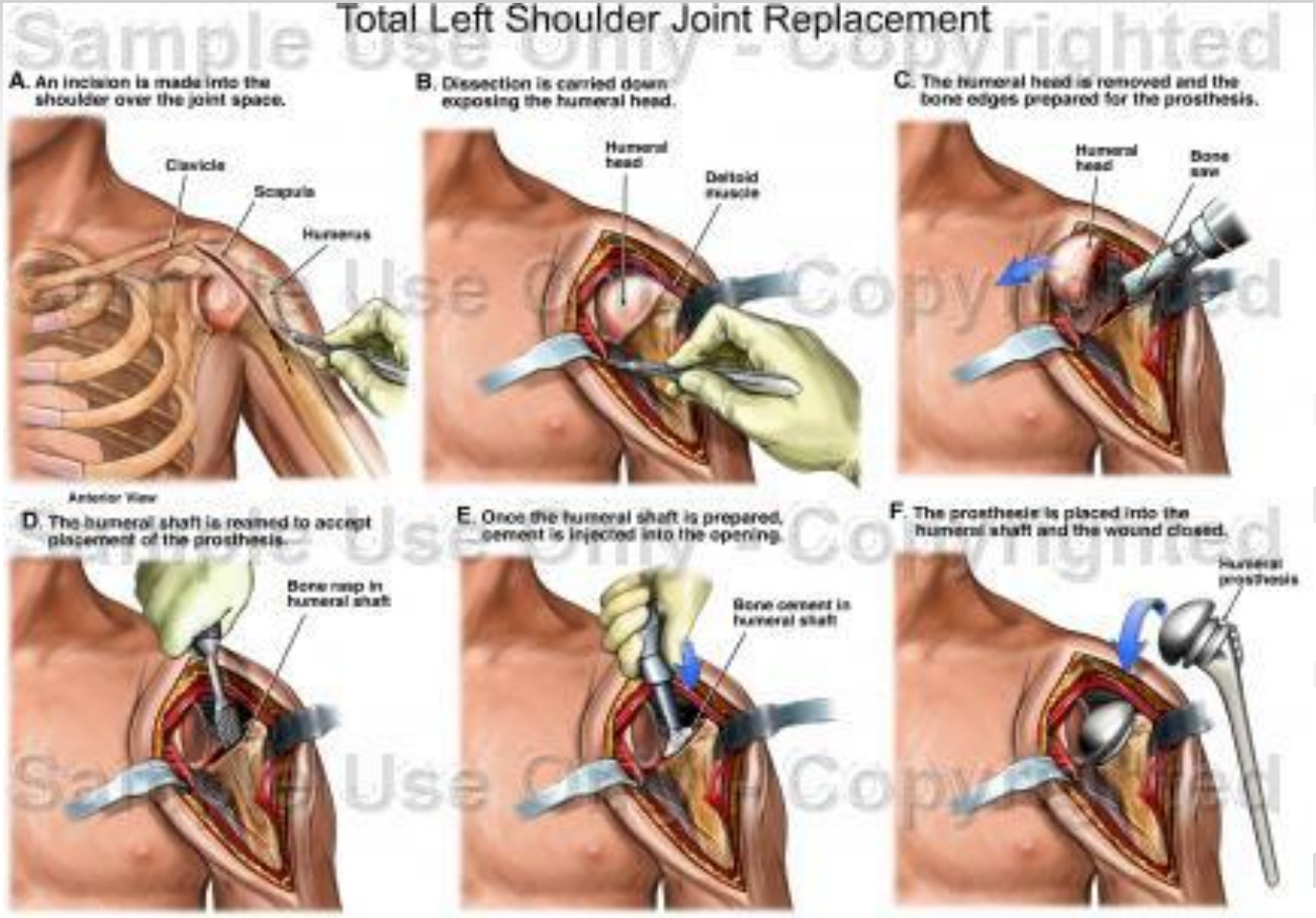
# Total Shoulder Arthroplasty

- Secondary Indications[7]
  - Defect arthroplasty
  - Decentering of prosthetic head leading to impingement
  - Dislocation of prosthetic head
  - Periprosthetic infection
  - Inflammatory response- ultrahigh molecular weight polyethylene particles from previous arthroplasty

# Total Shoulder Arthroplasty

- Contraindications[7]
  - Loss of deltoid and rotator cuff musculature
  - Severe brachial plexus injury
  - Chronic infection
  - Chronic osteomyelitis
  - Substantial bone loss- especially at the glenoid

# Total Shoulder Arthroplasty

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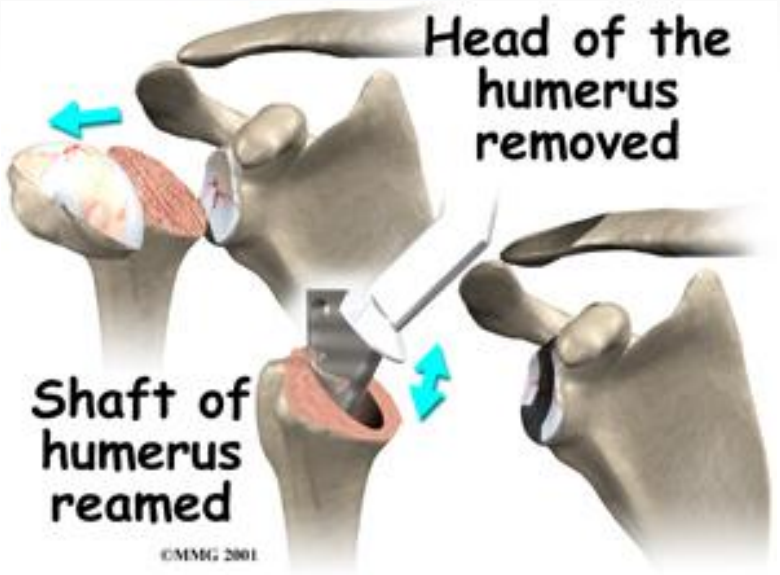
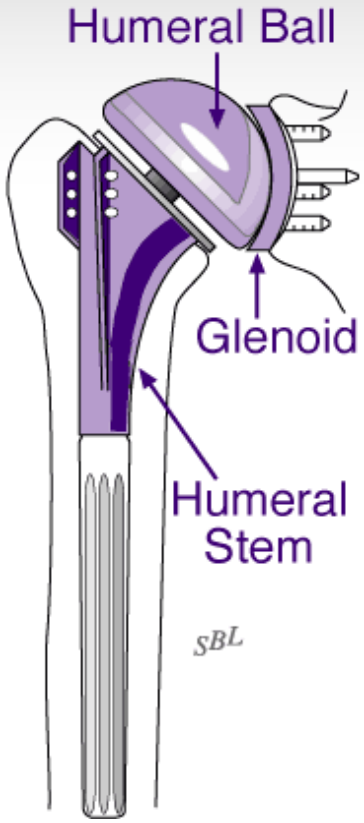
# Total Shoulder Arthroplasty





http://www.orthop.washington.edu/uw/shoulderreplacement

# Total Shoulder Arthroplasty



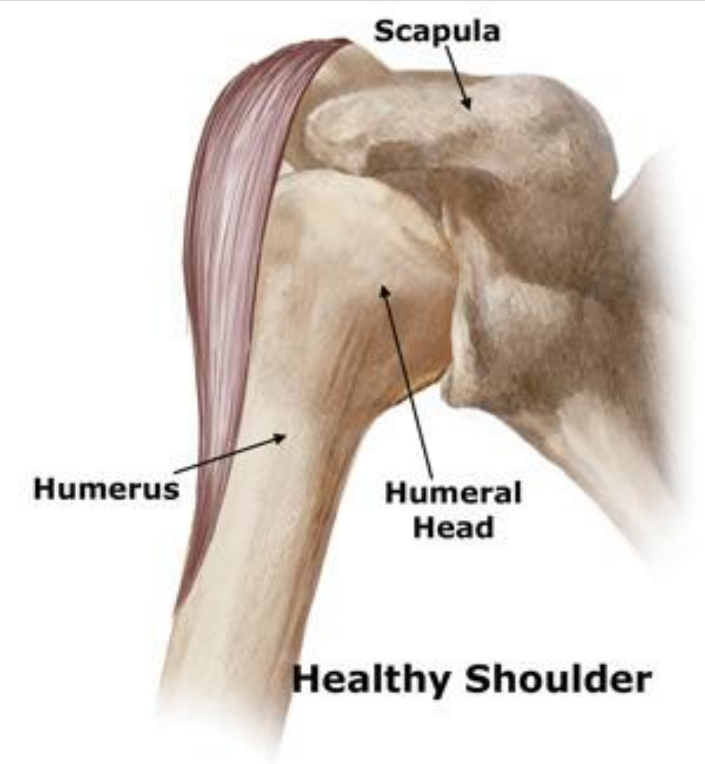


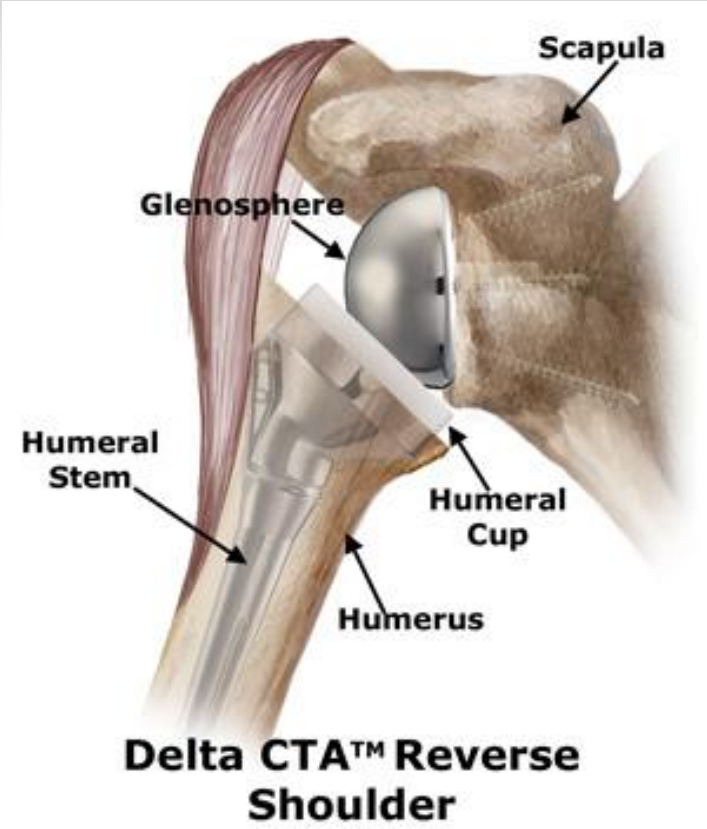
http://www.orthop.washington.edu/uw/shoulderreplacement

# Reverse Total Shoulder Arthroplasty

The Delta CTA™ Reverse Shoulder System

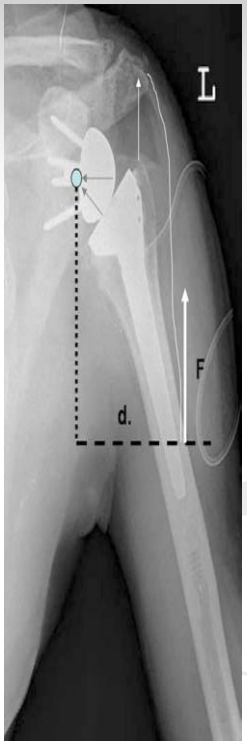
# Reverse Total Shoulder Arthroplasty



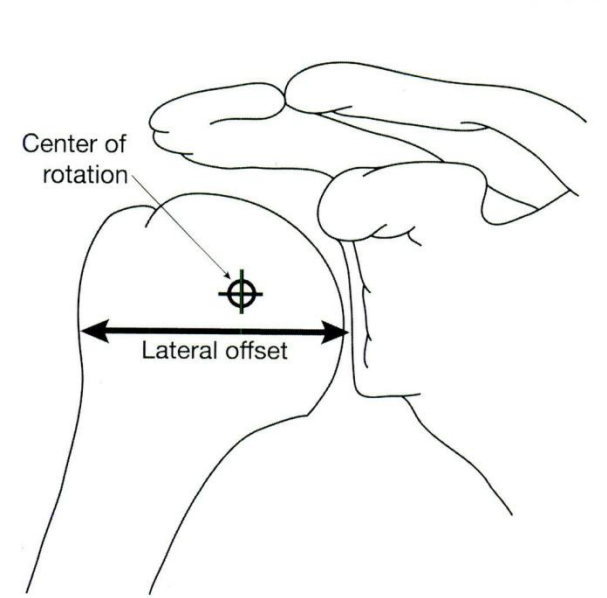
# Reverse Total Shoulder Arthroplasty

- Indications[8]
  - The reverse design is used in patients without an intact rotator cuff.
  - The reverse design medializes the center of rotation of the GH joint, allowing the deltoid to function with a longer lever arm.




http://orthoinfo.aaos.org/fact/thr_report.cfm?thread_id=291&topcategory=Shoulder

# Reverse Arthroplasty



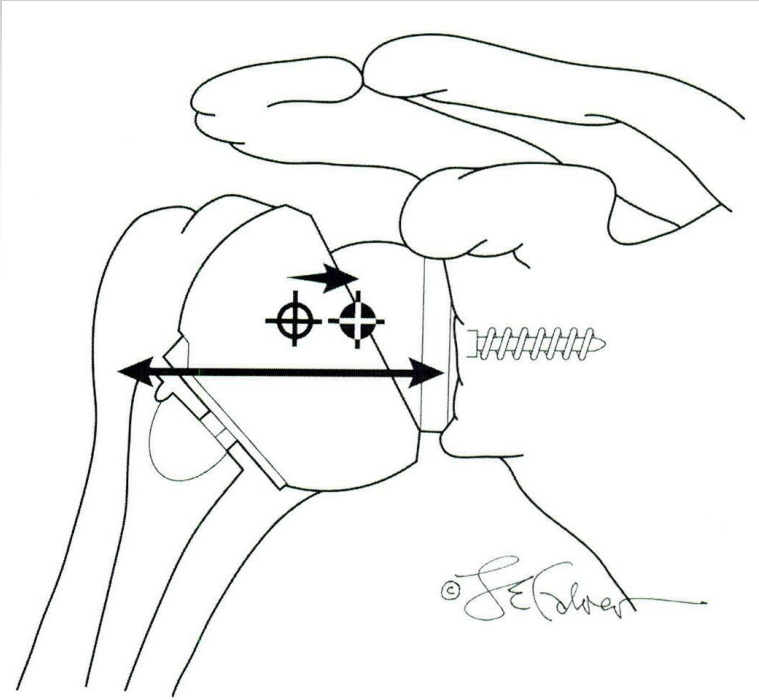



Fig. 4-C

A drawing of the Reverse Shoulder Prosthesis implanted in a shoulder, demonstrating how the device causes the center of rotation and lateral offset to shift medially with respect to the anatomic shoulder but to a smaller degree than with the Delta-III prosthesis. (Reprinted with permission of Lewis E. Calver.)

http://www.ejbjs.org/cgi/content/abstract/87/8/1697

# Overall TSA Complications

- Pain[9]
- Infection[10]
- Component loosening[11]
- Fractures[12]
- Inflammatory reactions[13,22]
- Impingement of components-notching[14]

# TSA Outcomes

- Review and meta-analysis[15]
  - McMaster University, Canada
  - Compared 2 year post-operative outcomes between hemiarthroplasty and TSA in patients with shoulder osteoarthritis
  - Studies 1966-2004
  - Major orthopedic meetings 1995-2003
    - 112 patients (50 hemi, 62 TSA)
      - Pain scores favored TSA
      - Greater increased forward flexion (13 degrees) with TSA

# TSA Outcomes

- Two-year Results After Exchange Shoulder Arthroplasty Using Inverse Implants[16,17,18]

TABLE

**Shoulder Function and Analgesic Intake (n=21)**

| | Preoperatively | Postoperatively |
|---|---|---|
| Abduction/adduction (NPM) | 40-0-15 | 85-0-40 |
| Extension / Flexion (NPM) | 35-0-20 | 90-0-35 |
| Internal/external rotation from 0° abduction (NPM) | 30-0-10 | 80-0-20 |
| Hand to neck (%) | 4.8 | 76.2 |
| Hand to back (%) | 14.3 | 85.7 |
| Analgesics (%) | | |
| Regularly | 80.9 | 0.0 |
| Sporadically | 19.1 | 14.3 |

*Abbreviation: NPM=neutral position method.*

(Katzer 2004)

# Overall TSA Outcomes

- Good short-term efficacy
  - Decreased Pain
  - Increased ROM
  - Generally considered better than hemiarthroplasty[19,21]
- Long-term efficacy inconclusive
  - Osteoarthritis does progress and glenoid degeneration and prosthetic loosening following total shoulder replacement may affect the 5 and 10 year outcomes.[20,22,23]
  - X-rays reveal micro-fissures of the peri-glenoid region suggesting bone fracturing under the glenoid cap.[17]

# Journal Article

- Quality of Life Outcomes Following Hemiarthroplasty or Total Shoulder Arthroplasty in Patients with Osteoarthritis[21]
  - 42 patients with osteoarthritis randomized at time of surgery
  - Outcomes measured at 3,6,12,18 and 24 months
    - Constant Score
    - Pain scales- McGill and VAS
    - WOOS Index
    - Global health measure
    - American Shoulder and Elbow Surgeons form

# Journal Article

**TABLE III Two-Year WOOS Scores Following Hemiarthroplasty and Total Shoulder Arthroplasty**

| | Hemiarthroplasty* | Total Shoulder Arthroplasty* | P Value |
|---|---|---|---|
| Total quality of life | 81.5 ± 24.1 | 90.6 ± 13.2 | 0.18 |
| Domain | | | |
| Physical symptoms | 82.7 ± 23.5 | 91.9 ± 12.8 | 0.17 |
| Sports/recreation/work | 75.2 ± 28.9 | 86.1 ± 20.8 | 0.21 |
| Lifestyle | 82.5 ± 25.4 | 89.7 ± 13.8 | 0.31 |
| Emotions | 87.1 ± 23.7 | 97.0 ± 4.6 | 0.11 |

*The values are given, in points, as the mean and one standard deviation.

(Lo, et al. 2005)

# Journal Article

**TABLE V Two-Year Secondary Outcome Scores Following Hemiarthroplasty and Total Shoulder Arthroplasty**

| Evaluation Tool | Hemiarthroplasty* | Total Shoulder Arthroplasty* | P Value |
|---|---|---|---|
| McGill pain questionnaire | 2.7 ± 6.8 | 0.9 ± 1.4 | 0.27 |
| McGill pain visual analogue scale | 13.9 ± 27.4 | 6.1 ± 13.5 | 0.28 |
| Short Form-36 (SF-36) mental component scale | 57.4 ± 10.9 | 58.4 ± 9.1 | 0.78 |
| Short Form-36 (SF-36) physical component scale | 42.9 ± 10.9 | 42.1 ± 13.2 | 0.84 |
| Range of motion | 26.8 ± 9.3 | 29.2 ± 8.3 | 0.40 |
| American Shoulder and Elbow Surgeons (ASES) evaluation form | 83.1 ± 25.6 | 91.1 ± 14.3 | 0.25 |
| Constant score | 67.1 ± 19.6 | 70.8 ± 17.2 | 0.55 |
| University of California at Los Angeles (UCLA) shoulder rating scale | 24.2 ± 5.0 | 26.7 ± 3.8 | 0.10 |

*The values are given, in points, as the mean and one standard deviation.

(Lo, et al. 2005)

# Journal Article

- Conclusions
  - Both TSA and hemiarthroplasty improve disease specific and quality of life measurements
  - No significant measurement differences between the two groups


# Thank You!

# TSA Rehabilitation[24,25]

- Precautions
  - First 48 hours (until cleared by surgeon)
    - Arm in sling
    - Limited active use of arm (e.g. eating) as comfortable
    - No external rotation past neutral
    - No active internal rotation
    - No driving

# TSA Rehabilitation

- 2 days *unless specified by surgeon
  - PROM
    - Pendulum exercises
    - External rotation to the **neutral only** unless stated otherwise
      Until scapular insertion heals
    - Forward flexion to 90 degrees
  - AROM exercises begin immediately after surgery*
    - Full ROM to elbow, wrist and hand
    - Scapular exercises
    - Forward flexion to 90 degrees to pain tolerance

# TSA Rehabilitation

- 3 weeks
  - Begin pulley and t-band exercises as tolerated
  - May lift nothing heavier than coffee cup
  - Begin aerobic exercise
  - Goal:
    - Forward flexion to 90 degrees
    - External rotation to neutral
    - Scapular awareness

# TSA Rehabilitation

- 6 weeks
  - Increase external rotation beyond neutral as tolerated
  - No limit to active forward flexion.
  - Active assisted internal rotation as tolerated
  - Wall walks
  - Active elbow flexion and extension
  - Scapular strengthening exercises
  - Goal:
    - elevation to 120 degrees, external rotation to 25 degrees

# TSA Rehabilitation

- After 12 weeks
  - Continue range of motion exercises and strengthening exercises to full movement as tolerated.
  - Continue strengthening of all rotator cuff muscles.
- Full recovery 12 to 18 months

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