
Total Elbow Arthroplasty

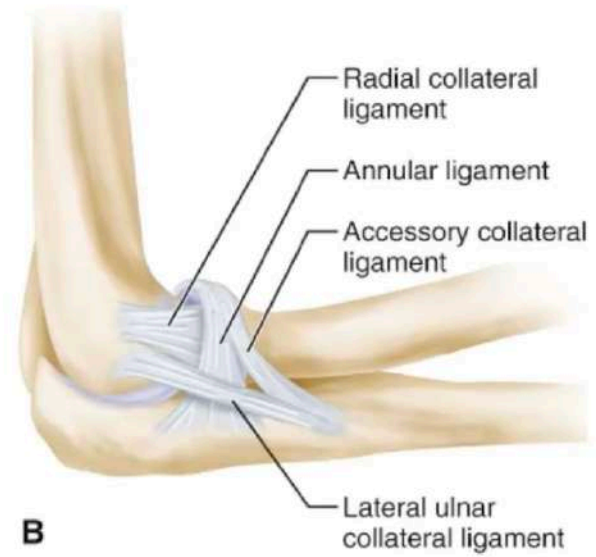
Dr Rahul Upadhyay

Introduction

- Multiple types
- Semi-constrained : most studied implant
- Relatively high complication rate
- Not as durable as hip and knee implants
- High functional demand with excess load is a cause of failure



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Types of Arthroplasty

- Debridement
- Inter-positional
- Implant

Debridement Arthroplasty

- Degenerative painful stiff elbow
- Younger, higher demand patients
- Lateral or combined medial and lateral approach can be used

Interposition (Fascial) Arthroplasty

- Patients having contraindications to implant arthroplasty
- Indication- loss of motion, pain or both

Goals of TER

- Restore functional mechanics of elbow
- Pain relief
- Restoration of motion
- stability

Ideal prosthesis

- PAINLESS
- STABLE
- MOBILE
- DURABLE
- INERT
- RETRIEVABLE
- REPRODUCIBLE

- PRESERVE THE EPICONDYLES
- PRESERVE THE OLECRANON
- HAVE A CARRYING ANGLE
- SACRIFICE AS LITTLE BONE AS POSSIBLE
- STABLE FIXATION ON BONE
- FREE OF MOVING/MULTIPLE PARTS
- LEAVE MINIMAL DEAD SPACE
- GOOD RANGE OF MOVEMENT

Implant Types

- Fully constrained
- Semi-Constrained
- Unconstrained

Rigidity of fixation of humeral to ulnar component

Fully Constrained

- Metal to Metal hinge with PMMA cement fixation
- Rarely used now
- Stanmoore, Dee, Mckee GSB1, Mazas

Loosening and Breakage

Semi-Constrained

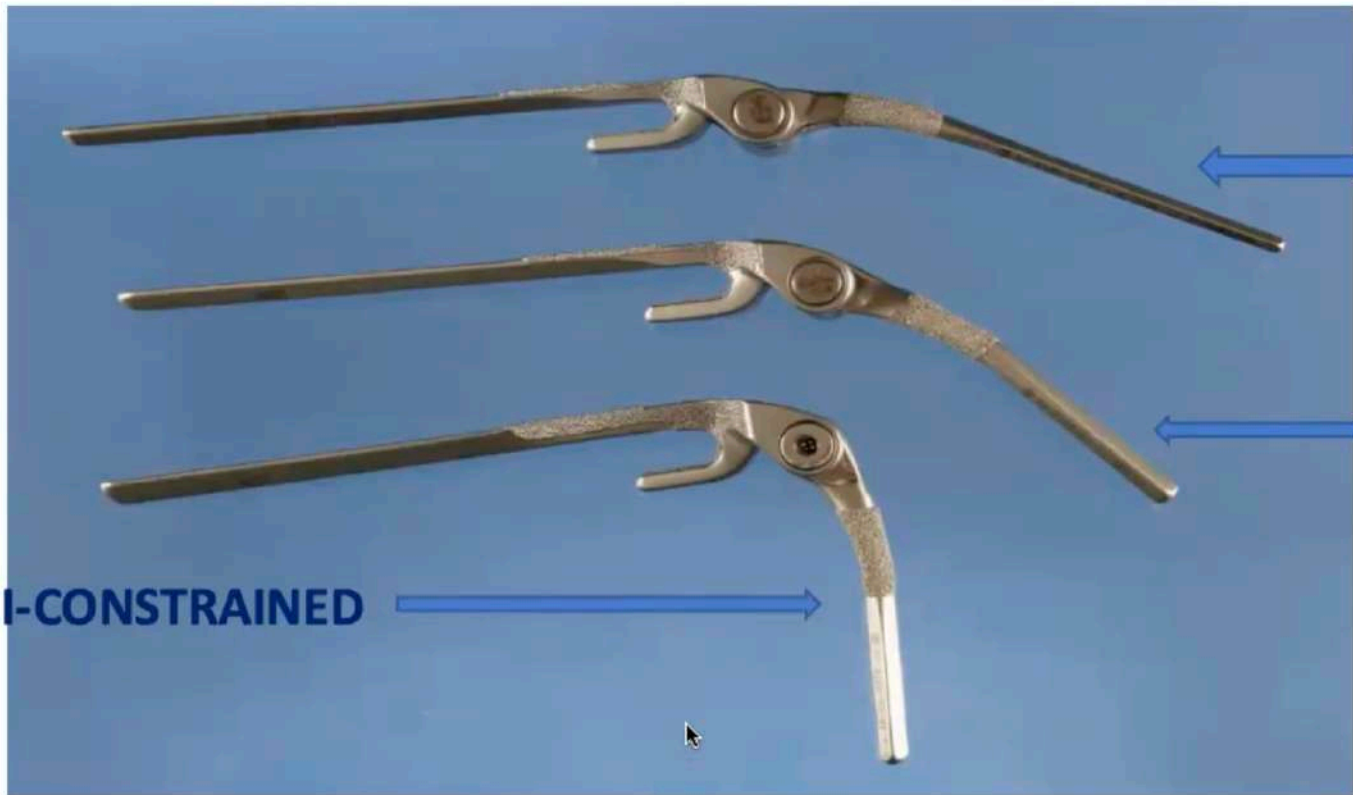
- 2 or 3 part prosthesis
- Metal to high density Polyethylene articulation with locking pin/snap fit design
- Built in Valgus & Varus laxity
- Eg: Conrad, Mayo, Tri-axial, Schlein, AHSC Pritchard-Walker

Side to side dissipation of forces

Un-constrained

- 2 part prosthesis
- Metal to high density polyethylene with snap fit/pin lock
- Stem for humerus resurfacing devices
- Anatomically duplicates articular surface of elbow

Requires normal intact ligaments, anterior capsule & appropriate static alignment



GSB 3

HSS

COONRAD SEMI-CONSTRAINED

Implant Selection

- Capsuloligamentous structure integrity around elbow
- Muscular integrity
- Amount of bone remaining in the elbow joint
- **Resurfacing/unconstrained** : stable joints / good bone stock
- **Semi-constrained** : unconstrained/poor bone stock/ poor musculature

Patient Selection- Indications

- End stage elbow arthritis – most definitive
- End stage RA with bone erosion and joint destruction
- Acute unreconstructable fracture > 60years
- Bilateral elbow ankylosis
- Bony/fibrous ankylosis of elbow in poor positioning
- Loss of bone stock –tumor/trauma
- Hemophilic arthropathy

Contra-Indications

- Sepsis- active or recent
- Poor soft tissue envelope
- Non restorable functions of biceps & triceps
- Poor patient compliance with activity and weight restrictions
- Flaccid paralysis of upper extremity
- Young vigorous patient with post traumatic elbow destruction
- Neuropathic joint
- Ipsilateral shoulder ankylosis

Pre-Op Planning

- AP and LATERAL Radiographs of elbow
- Assess Humeral bow and medullary canal size in lateral view
- Size and angulation of Ulnar medullary canal in both views
- Templates
- Ulnar nerve examination
- Rule out Sepsis (elbow aspiration if any doubt)

Post-Op Imaging

- AP & Lateral view as baseline reference
- Humeral and Ulnar stems should align with long axis of the bone
- Normal articulation of components
- No signs of dislocation

Post-Op Care

- Overnight elevation : elbow above the shoulder
- Drains and compression removed day after
- Passive elbow flexion and extension as tolerated
- Cuff and Collar immobilization
- Start movement as allowed under supervision of Occupational therapist
- **No active extension till 3 months** (allow triceps to heal)
- Avoid lifting > 2.2 kg (5 pounds) for 3 months
- Later **lifting is restricted to 4.5kgs (10 pounds)**

Rating system of Morrey

- X-RAY

- PAIN

- MOTION

GOOD RESULT

1. NO RADIOGRAPHIC CHANGE AT BONE CEMENT INTERFACE
2. NO PAIN
3. >90 DEGREE FLEXION
4. >60 DEGREE SUPINATION/PRONATION

FAIR RESULT

1. >1MM WIDENING AT BONE-CEMENT INTERFACE
2. MILD PAIN
3. 50-90 FLEXION AND EXTENSION
4. 40 DEGREE ROTATIONS

POOR RESULT

1. >2MM WIDENING
2. SIGNIFICANT PAIN
3. <50 DEGREE ROM

Mayo Elbow Performance Score

Pain (45 Points)

- None (45 Points)
- Mild (30 points)
- Moderate (15 Points)
- Severe (0 Points)

Range of Motion (20 Points)

- Arc > 100 Degrees (20 Points)
- Arc 50 to 100 Degrees (15 Points)
- Arc < 50 degrees (5 points)

Stability (10 points)

- Stable (10 points)
- Moderately unstable (5 points)
- Grossly unstable (0 points)

Function (25 points)

- Able to comb hair (5 points)
- Able to feed oneself (5 points)
- Able to perform personal hygiene tasks (5 points)
- Able to put on shirt (5 points)
- Able to put on shoes (5 points)

Maximal total = 100 points.

Outcomes classification: 90-100 = excellent, 75-89 = good, 60-74 = fair, <60 = poor.

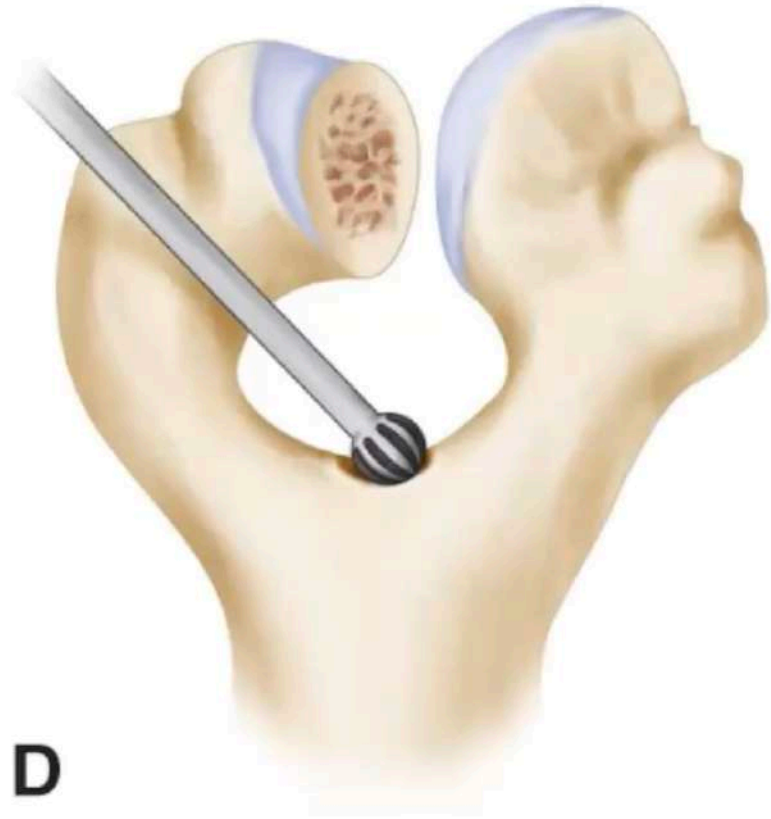
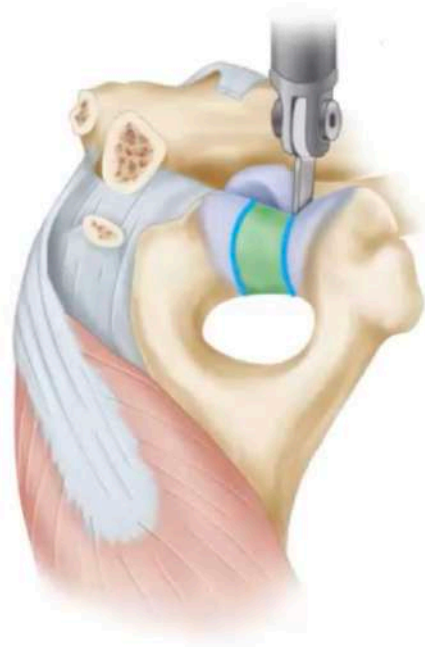
Coonrod Morrey Prosthesis

- Semi-constrained total elbow arthroplasty
- High molecular weight polyethylene bushing with titanium Ulnar and Humeral components
- Designed with 7 degree of Rotary and side to side laxity
- Humeral and Ulnar stems match the shape of medullary canal
- The Triangular Humeral stem is flattened near the base at the inferior flatter and wider portion of the medullary canal of the humerus

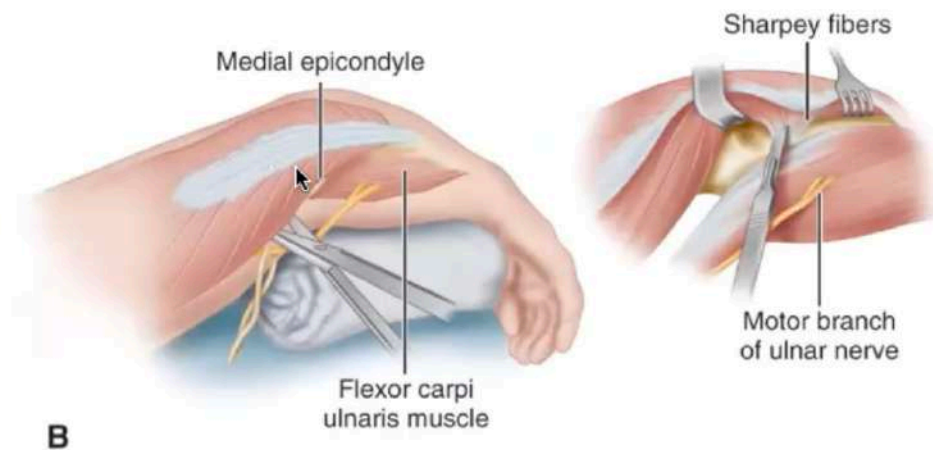
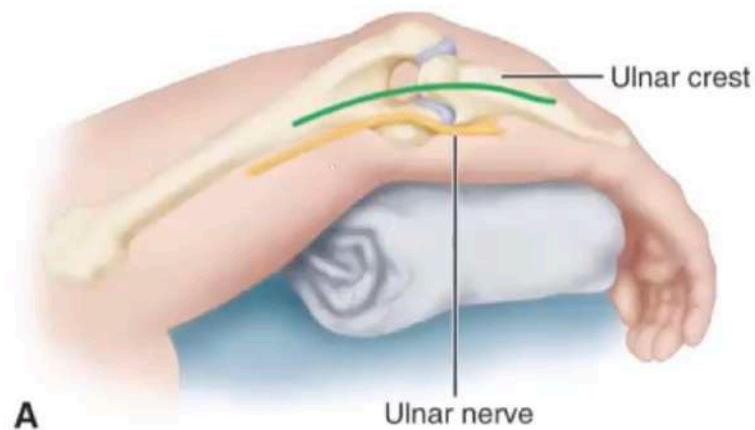
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- Large medullary stem- Rigid Fixation
 - Its long stem, contour & distal anterior flange increase resistance to torque
 - Careful bone removal from intercondylar area- good fix
 - Inserted with elbow fully flexed
 - Components can be inserted separately and joined later
 - Right and Left trial components available



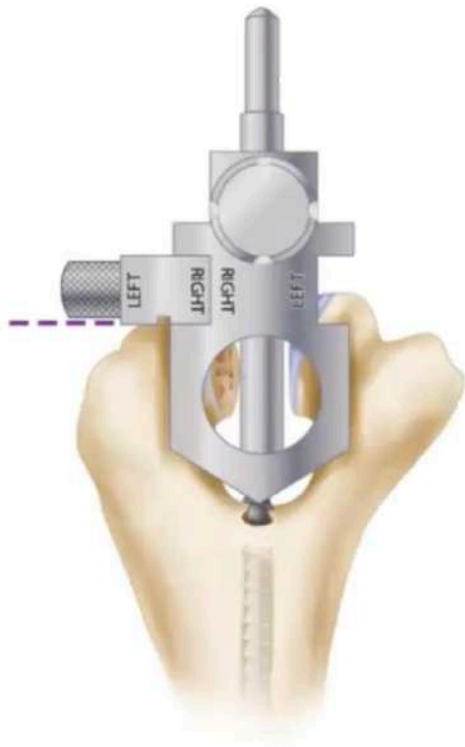
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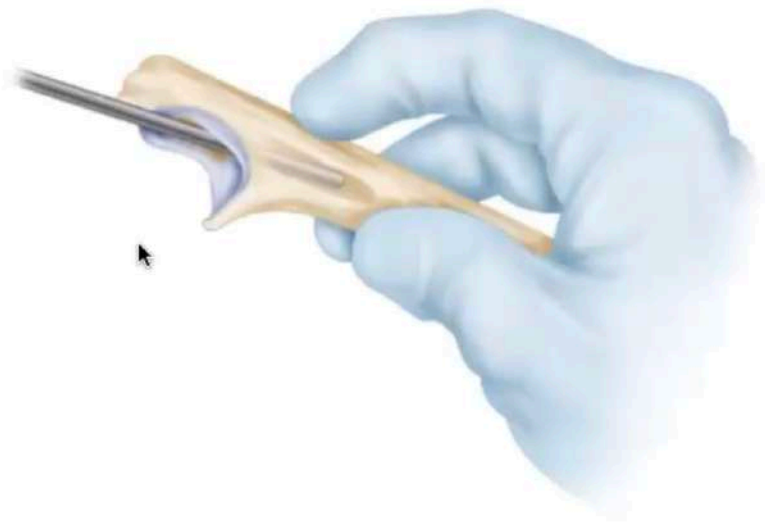


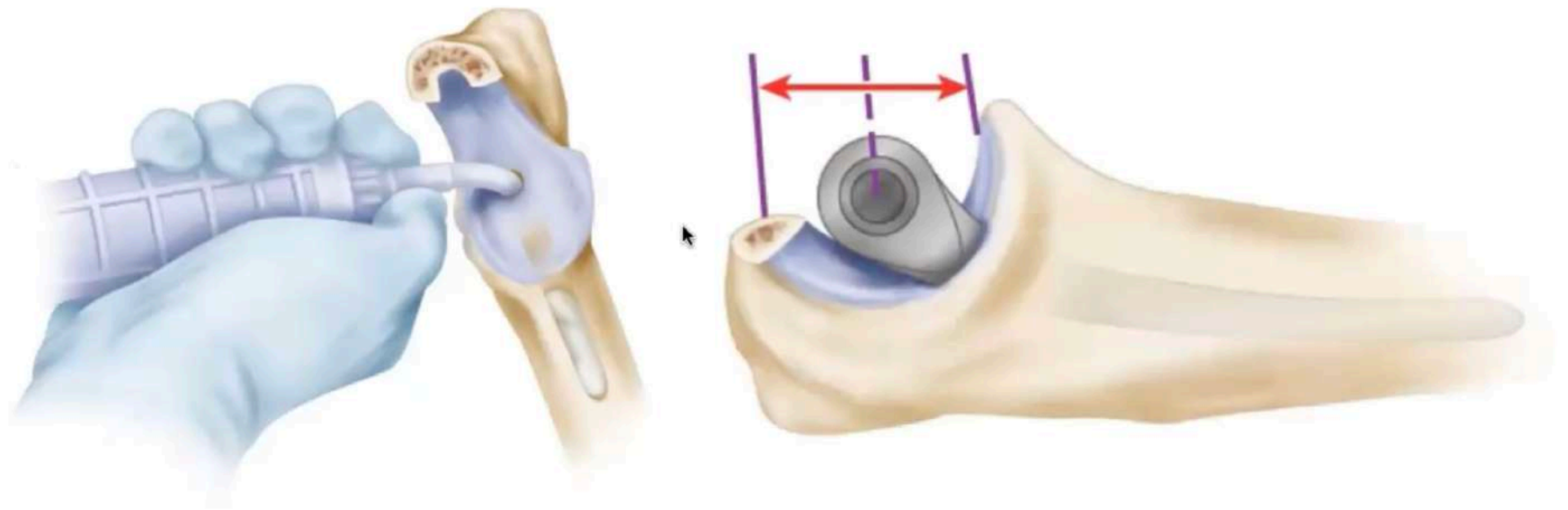
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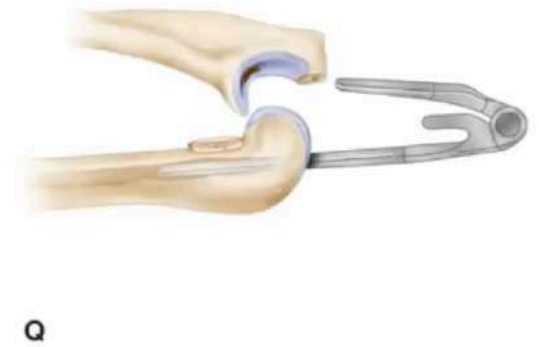
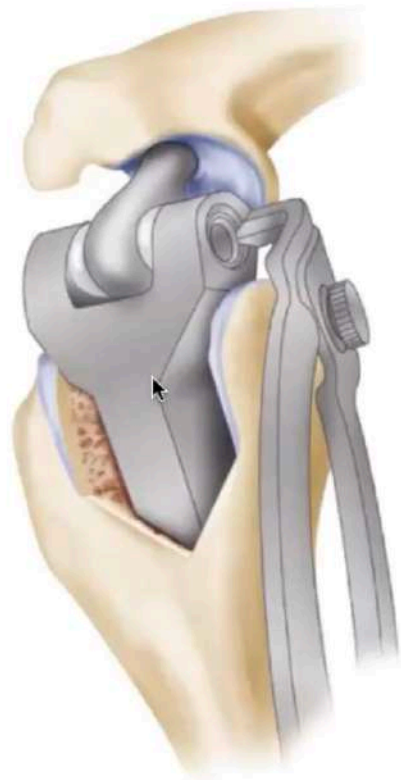


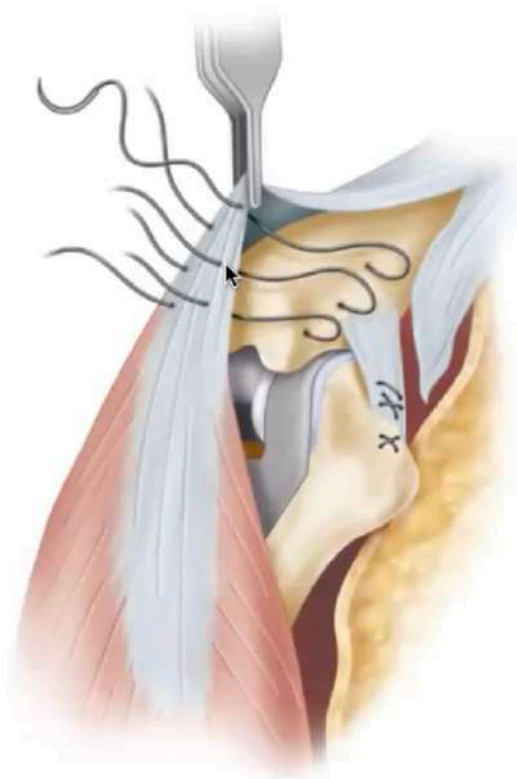


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Failed TER

- INSTABILITY – M.C
- POLYETHYLENE PROBLEMS
- OSTEOLYSIS
- LOOSENING
- INFECTION
- FRACTURES
- HETEROTOPIC OSSIFICATION

RARELY REQUIRING SURGERY

Nerve paresthesias

Wound problems

Fracture, humerus

Fracture, ulna

USUALLY REQUIRING SURGERY

Nerve entrapment[†]

Triceps problems

Ankylosis[†]

USUALLY REQUIRING REVISION

Loosening (semiconstrained)

Instability (unconstrained)

Infection

Fracture and loosening[†]

INSTABILITY

- Instability occurs in the form of **dislocation or subluxation**
- Most common complication reported for **unconstrained prostheses**
- reported to occur in between 9% and 15% of total knee arthroplasties

INTRA-OP PRECAUTIONS

- Appropriate tensioning of the medial and lateral collateral ligament complexes
- preservation of the anterior capsule and triceps



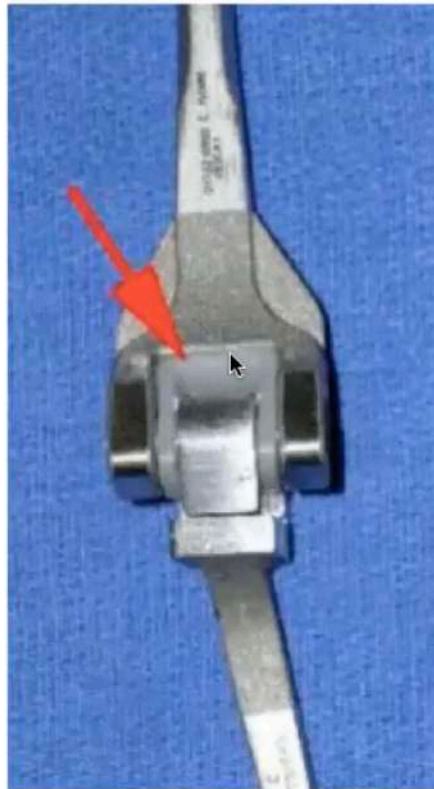
- Instability in SEMI-CONSTRAINED TEA is usually caused by

wear of the polyethylene bushings or disengagement of the linkage pin.

- Proper prosthesis alignment is crucial in linked arthroplasty.
- **Malalignment** can cause abnormal forces to be generated across the joint which can lead to early **hardware failure**.

**Wear of bushing
causes:**

- .Synovitis**
- .Foreign body reaction**
- .loosening**



> 7 degree



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- Certain factors are associated with the development of bushing wear. They are
 - younger patient age,
 - male sex,
 - Post traumatic arthritis,
 - Pre operative elbow deformity,
 - Supra condylar nonunion,
 - high activity levels

Osteolysis & Metallosis



Aseptic loosening

- Failure of bond between implant and bone in absence of infection.
- Most common cause of long term implant failure

RISK FACTORS:

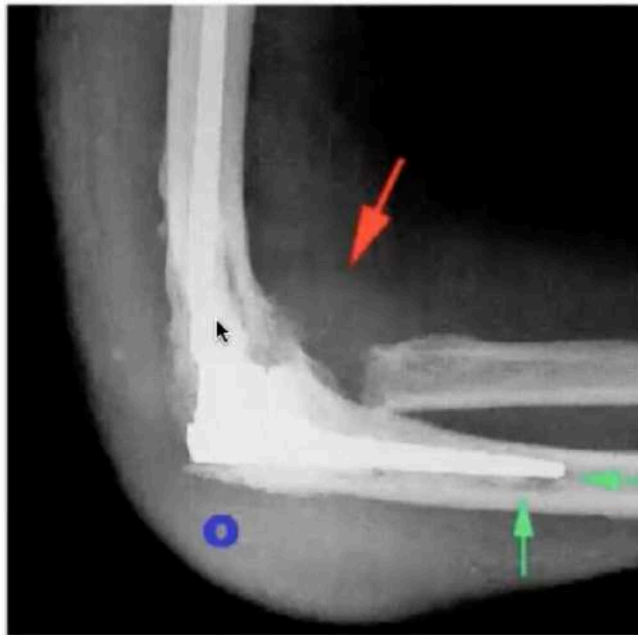
patients who continue to use their elbow in
strenuous activities and heavy lifting

constrained, linked prosthesis types.

Infection

- More frequent than knee or hip
- Paucity of soft tissue coverage
- M.C: **Staph. Aureus**

Infected total elbow arthroplasty. There is a large joint effusion (red arrow), distended olecranon bursa (O), and irregular interface widening about the ulnar stem (green arrow).



Peri-prosthetic fractures

Mayo classification of periprosthetic fractures after elbow arthroplasty

6-22%

