Rehabilitation after upper limb joint arthroplasty

Polina Yeung
Physiotherapist
LOHAS Physiotherapy Centre
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Indications for joint arthroplasty

- Osteoarthritis (OA)
- Rheumatoid arthritis (RA)
- Avascular Necrosis (AVN)
- Congenital dislocation of the hip joint (CDH)
- Hip dysplasia (human)
- Traumatized and malaligned joint
- Severe joint stiffness
Regions for arthroplasty in upper limb

- Shoulder
- Elbow
- Wrist
- Finger
  - MCP, PIPJ, 1st CMCJ
Shoulder joint arthroplasty

- Total Shoulder Replacement,
- Stemmed Hemiarthroplasty
- Resurfacing Hemiarthroplasty
- Reverse Total Shoulder Replacement
Elbow joint arthroplasty

- Elbow joint replacement
- Radial head replacement
Wrist joint arthroplasty

- Total joint replacement
- Ulnar head replacement
Finger joint arthroplasty
Silastic joint replacement for MCPJ/PIPJ (act as dynamic spacer)

- Used since 1970s
- Rom: flexion 60°, ext lag 20°

Swanson

- Introduced in 1998
- Preformed 30° flexion, hinged design,
- Greater range of flexion: 72° (Delaney R. 2005)
- Ext lag: 20°

Neuflex
PIP JOINT ARTHROPLASTY

A. Incision Site
B. Exposure & Lysis of FDS & FDP Tendons
C. Exposure of PIP Joint & Clean up Osteophytes

D. Osteotomy of Head of Proximal Phalanx
E. Creation of Canal with Rasp for Distal & Proximal Phalanx
E. Insertion of Prosthesis into PIP Joint
Silastic joint replacement

- ROM loss, recurrence of ulnar drift in long term FU (Goldfarb CA, Stern PJ. 2004)
- Implant fracture
- Bone reaction around the implant
- **Cook SD**, et al. 1999. Long-term follow-up of pyrolytic carbon metacarpophalangeal implants. Demonstrate that pyrolytic carbon is a biologically and biomechanically compatible, wear-resistant, and durable material for arthroplasty of the metacarpophalangeal joint.

Minamikawa Cement-less surface finger implant
(Self Locking Finger Joint, SLF)
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(Self Locking Finger Joint, SLF)

Characteristics:
* Joint anchor (stem)
* Cement-less
* Proximal titanium head and distal polyethylene socket
* Allow simultaneous replacement of both MP and PIP
* ROM : 25-70 in MP
  20-65 in PIP
Goals of Rehabilitation for joint arthroplasty

- Control the swelling and pain after operation
- Provide appropriate exercise program
  - to improve the joint mobility
  - To prevent dislocation of prosthesis
  - To strengthen the weakened muscle around the joint
  - To improve the functional use of limb
- Educate in joint protection
Swelling and pain control
Ultrasound

* Physiotherapeutic US: 0.75-3 MHz
* Suggested Therapeutic effects:
  * Promote Soft tissue healing-thermal effect, enhance fibroblast activity
  * Remodelling stage: increase the extensibility of collagen fibres and scar tissue
Design specific exercise program
Tendon gliding ex

There are three ways of making a fist:

- Straight
- Hook
- Straight
- Fist
NMES for flexor and extensor gliding
Hand strengthening exercise
Strengthening exercise for wrist
EMG Biofeedback Training
Shoulder stabilization exercise
Hydrotherapy
BTE Primus Training
Post-operative rehabilitation cases sharing
Case 1

- F/67
- Dx: RA with multiple MPJs subluxation and swan neck deformities, left side more severe
Case 1

Operation: May 08

- Volar plate release, intrinsic release
- MCPJs arthroplasty (Minamikawa for M/F & R/F, Neuflex for I/F & L/F)
- Centralization of extensor tendon
- K-wire into PP to create an extension block for PIPJs
- Thumb MPJ fusion at 20 flexion
Case 1: post op 1wk

* Dynamic splint: for correct tract of extensor gliding
* Allow MCPJ flexion 30 at 1\textsuperscript{st} week /60 at 2\textsuperscript{nd} week/
  90 at 3\textsuperscript{rd} week
MPJ Arthroplasty

Post Operative Care:
- static forearm splint: (for 12 weeks of night use)
  - wrist is maintained in 20 deg of extension (if possible);
  - MP joints are placed in near full extension and slight radial deviation;
- dorsal splint with dynamic outrigger (modified Madden protocol);
  - same position as the static forearm splint;
  - patients should perform 10 repetitions q 2 hrs for a total arc of motion
- active and passive extension and flexion of the IP joints are performed
  for ten repetitions q 2 hours;
- at 4 weeks the dynamic splint is discontinued;
- patients need to avoid key pinch for the first 12 weeks postop;
- at two weeks, the patient is encouraged to begin "radial walking" (active
  finger radial deviation);
- at six weeks the patient is given soft putty for hand strengthening;
Case 1: post-op 4wk

- Off k-wire of PIPJ, start PIPJs mob
- Change to thumb spica
- Active mob of finger MCPJs and IPJs
Case 1: post-op 8 wks

* Ulnar drift corrected
* MCPJ: 20-75 degree
* PIPJ: 30-60 degree
Case 1: functional improvement
Case 2: F/53

* OA right M/F & R/F PIPJ
* Pain, deformity
* Work in supermarket with frequent lifting
Case 2: Pyrocarbon implant for PIPJ arthroplasty in Jan 07
Post-op reh

* Early active free PIPJ mob
* Swelling control
* Scar management
* Emphasis extensor and flexor gliding ex
* Graded grip and extensor strengthening ex at 6 weeks
* Advice to avoid heavy hook grip lifting
Case 2: post-op 11 months

- Early sign of implant loosening on x-ray, proximal implant dorsal tilting
- Pain over M/F PIPJ
- Rom: 10-70
- Radial collateral laxity
- M/F PIPJ ulnar deviated
- Keep working in supermarket with frequent lifting
Case 2: revision operation in May08

- Minamikawa implant:
- Post-op reh similar as last operation
Post-op 3 wks
* Resume work at 10 weeks
Education

* Education on Joint protection
* Activity modification
* Exercise therapy
Joint Protection

- Aims at reducing load on joint structure, which probably lead to less pressure on pain receptors, less irritation of synovium and reduction of inflammation, prevention of deformity and better function.

BY:
- Alter work methods
- Balancing rest and activity
- Using assistive devices
- Correct use of walking aids
Joint protection principles

* Avoid or minimize activities which reinforce deformity formation, like activities with strong grip e.g. stirring, wringing, cutting, open a jar lid, operating stiff handles

* Joint pain and stiffness should be respected as a warning sign

* Distribute loads over a number of joint systems

* Avoid one-sided, prolonged loading e.g. prolonged carrying a heavy case

* Use assistive device as necessary

* Seek the right balance of rest and physical activity
Alter work methods
Assistive devices
Hand and wrist Exercise

Contracture prophylaxis
Mobilization exercise
Strengthening exercise
Mobilisation exercise

Realistic goals:

- Wrist Functional ROM: 20 ext, 25-40 flexion
- Stable and non-painful wrist is more crucial in function
- Fingers: I/F and thumb for precision, ulnar 3 fingers for power grip which require more flexion range
Practice tips in details

- [http://medicalcenter.osu.edu/patientcare/patient_education/index.cfm?maincontent=maincategory.cfm&categoryID=55.0#170.0](http://medicalcenter.osu.edu/patientcare/patient_education/index.cfm?maincontent=maincategory.cfm&categoryID=55.0#170.0)

**Working in the Kitchen**

- Use your larger joints instead of smaller joints for lifting, pulling, pushing, or carrying items.

- Turn the faucets on with your palms of your hands instead of your fingers. Some faucets have longer handles and these may be easier for you to use.

- Use a belt or towel to loop the handle of the refrigerator. You can put your arm through the loop to pull the door open with your elbow, shoulder and body instead of your fingers and wrist.

- Wash dishes or wipe counters with a large sponge. This way you can keep your hand open and use pressure from your arm to clean.

- Use lightweight utensils, pans and dishes made of aluminum or plastic instead of heavier metal or ceramic.
Splintage for RA wrist and hand
Case 3

* F/60
* Chronic ulnar R wrist pain for years
* DX: R DRUJ arthritis
* OT: synovectomy and partial ulnar head replacement done
Partial ulnar head replacement - Eclypse implant
Partial ulnar head replacement - Eclypse implant

The Eclypse partial ulnar head implant is a hemiarthroplasty designed to replace a badly damaged ulnar head in the context of a symptomatic dysfunctional DRUJ, with normal or repairable soft tissue stabilizing structures, namely, the distal radioulnar and ulnocarpal ligaments. Unlike total ulnar head implants, Eclypse attempts only to replace the portion of the ulnar head that articulates with the radius, leaving the ulnar styloid and basistyloid fovea intact and retaining the ligaments that stabilize the joint.
Post op 8 weeks
Case 4

- F/50
- RA with bil shoulder pain and stiffness
  - OT: Resurfacing Hemiarthroplasty done
Resurfacing Hemiarthroplasty

- Resurfacing hemiarthroplasty involves replacing just the joint surface of the humeral head with a cap-like prosthesis without a stem. With its bone preserving advantage, it offers an alternative to the standard stemmed shoulder replacement.
- The glenoid still has an intact cartilage surface
- There has been no fresh fracture of the humeral neck or head
- There is a desire to preserve humeral bone
- For patients who are young or very active, avoids the risks of component wear and loosening
- Easier to convert to total shoulder replacement, if necessary at a later time.
**Post op education: Do's and Don'ts**

* Sling for 2-4 weeks
* Don't use the arm to push yourself up in bed or from a chair
* Do follow the program of home exercises prescribed for you. You may need to do the exercises 2 to 3 times a day for a month or more.
* Don't overdo it! If your shoulder pain was severe before the surgery, the experience of pain-free motion may lull you into thinking that you can do more than is prescribed. Early overuse of the shoulder may result in severe limitations in motion.
* Don’t lift anything heavier than a glass of water for the first 2 to 4 weeks after surgery.
* Don't participate in contact sports or do any repetitive heavy lifting after your shoulder replacement.
* Do avoid placing your arm in any extreme position, such as straight out to the side or behind your body for the first 6 weeks after surgery.
Treatment Algorithm for progressing the Rehabilitation Program for a Patient that has had a Total Shoulder Arthroplasty.

Phase I – Immediate Post Surgical Phase

Meets Criteria for progression to phase II:
- Tolerates PROM program
- Has achieved at least 90° PROM forward flexion and elevation in the scapular plane.
- Has achieved at least 45° PROM ER in plane of scapula
- Has achieved at least 70° PROM IR in plane of scapula measured at 30° of abduction

No,
continues with
Phase I activities

Yes

Phase II – Early Strengthening Phase
(Not to begin before 4-6 Weeks post-surgery to allow for appropriate soft tissue healing)

Meets Criteria for progression to phase III:
- Tolerates P/AAROM, isometric program
- Has achieved at least 140° PROM forward flexion and elevation in the scapular plane.
- Has achieved at least 60° PROM ER in plane of scapula
- Has achieved at least 70° PROM IR in plane of scapula measured at 30° of abduction
- Able to actively elevate shoulder against gravity with good mechanics to 100°.

Typically patients who have had a TSA secondary to RA or RC arthropathy may not progress to higher phases of rehab. (Proceed to discharge from therapy upon reaching stable status.)

No,
continues with
Phase II activities

Yes

Phase III – Moderate strengthening
(Not to begin before 6 Weeks post surgery for patients with healthy rotator cuff, to allow for appropriate soft tissue healing and to ensure adequate ROM. Those with repaired cuff not to begin before 10-12 weeks):

Meets Criteria for progression to phase IV:
- Tolerates AA, AROM/strengthening
- Has achieved at least 140° AROM forward flexion and elevation in the scapular plane supine.
- Has achieved at least 60° AROM ER in plane of scapula supine
- Has achieved at least 70° AROM IR in plane of scapula supine in 30° of abduction
- Be able to actively elevate shoulder against gravity with good mechanics to least 120°

Typically patients who have had a TSA for a fracture will be able to complete at least the first 3 phases of rehabilitation. (Proceed to discharge from therapy upon teaching a stable status.)

No,
continues with
Phase III activities

Yes

Phase IV – Advanced strengthening phase
(Not to begin before 12 Weeks post surgery, to allow for appropriate soft tissue healing and to ensure adequate ROM, and initial strength):

Meets Criteria for discharge from skilled therapy:
- Patient able to maintain non-painful AROM
- Maximized functional use of upper extremity
- Maximized muscular strength, power, and endurance
- Patient has returned to advanced functional activities

Typically patients who have had a TSA for OA or osteonecrosis will be able to complete all 4 phases of rehabilitation

No,
continues with
Phase IV activities

Total Shoulder Arthroplasty/Hemiarthroplasty Protocol
Discharge from therapy with home program

Yes
Post op 8 weeks
Case 5

* >80 old lady
* # distal humerus due to fall
Total elbow replacement
* Post op week 3
* ROM 0-90
* in-patient physio
Thank You