Chapter 26:
Arthritis and Joint Reconstruction

Jeanine Beasley, EdD, OTR, CHT, FAOTA

I. Introduction: Treatment protocols may vary. Those that are presented here are guidelines only and need to be tailored to the patient's specific needs.[1]
   A. Treatment is individualized
   B. Treatment is specific to the deformity
   C. Treatment is specific to the stage of the disease
   D. Postoperative care should be discussed with the surgeon and take into account their philosophy of treatment

II. Rheumatoid Arthritis
   A. Chronic inflammatory systemic autoimmune disorder characterized by synovial inflammation.[2]
      1. Synovial lining develops outgrowths and hyperplasia with the forming a pannus that destroys the joint and soft tissues.[3]
      2. The synovial pannus expresses enzymes that damage cartilage, erode the joint, and contributes to joint deformities[2]
   B. Incidence: varies in the literature but is approximately 1%[4]
   C. Women affected more frequently than men
   D. Onset usually between the ages of 20-60 years
   E. Joint involvement is often symmetrical and bilateral throughout the body
   F. Characterized by remissions and exacerbations[5]
   G. Stages of the disease process[1]
      1. Acute phase: Joint swelling and inflammation with the wrists, PIP, and MP joints most commonly involved
      2. Proliferative phase: synovium begins to invade the soft tissues producing tenosynovitis and limiting joint movement
      3. Destructive phase: synovial erosion causes irreversible changes including capsular distension, cartilage destruction, subchondral erosions, loosening of ligamentous insertions, impairment of tendon function, and joint disorganization
      4. Chronic phase: synovial activity "burnt out" fibrosis replaces inflammation
   H. Pathomechanics of deformities in the hand and wrist.[6]
      1. The fine balance between the muscle and tendon system, which exists in the normal hand is disrupted. This is due to the invasion of the pannus, which secrets enzymes resulting in destruction of the soft tissue structures.
      2. The stability and equilibrium necessary for normal prehension is disrupted; adaptations and modifications in functional use further compound the deformity.
   I. Common patterns of deformity[1]
      1. Ulnar-volar translocation of the carpus on the radius: ligamentous laxity at the wrist allows carpus to slip down the volar slope of the radius
      2. Wrist radial deviation: may be further enhanced by volar displacement of ECU, which then becomes an additional flexor/deviation force (Fig. 1)
      3. Ulnar deviation of digits at MP joints: due to RD of the metacarpals at the wrist, instability at collateral ligaments, EDC decentralization, imbalances in intrinsics, and forces of ADL especially from the thumb during radial pinch.

4. Swan-neck deformity: PIP hyperextension with DIP extension lag, due to MP/PIP synovitis in combination with intrinsic muscle tightness; also due to destruction of PIP volar supporting structures. PIP becomes destabilized and is pulled into hyperextension; the condition is worsened by the forces of the intrinsics at MP joints and FDP at DIP.
5. Boutonniere deformity: PIP flexion contracture with DIP hyperextension occurs due to destruction within the extensor system (central slip and lateral bands) central slip loses ability to extend PIP; lateral bands slide volar and become PIP flexors.
6. Distal ulna dorsal subluxation: instability of the distal ulna due to weakening of the ligamentous structures, resulting in dorsal prominence of the distal ulna.
7. Thumb deformities: Nalebuff [7] classified the thumb deformities:
    a. Type 1: MP flexion with IP hyperextension
    b. Type 2: MP flexion with IP hyperextension and CMC joint flexed and adducted
    c. Type 3: MP hyperextension with IP flexion and CMC joint subluxed, flexed, and adducted
    d. Type 4: CMC flexion and adduction and MP ulnar collateral ligament unstable
    e. Type 5: MP joint hyperextended due to a lax volar plate.
    f. Type 6: Bone loss at any level

III. Degenerative Joint Disease/Osteoarthritis[8,9]

A. Affects more than 20 million Americans, most over the age of 45, and is the most common joint disorder throughout the world
B. Defined as a gradual loss of articular cartilage due to degenerative joint disease and chemical factors
C. Complex biomechanical factors appear to activate chondrocytes to produce degradative enzymes.
D. Deterioration of articular cartilage causes joint destruction and osteophyte formation
E. Primary DJD:[10,11]
    1. Greater numbers in women over 50
    2. DIP and first CMC joints most often involved
    3. Incidence increases with age
F. Secondary DJD[12]
    1. May occur at any age
    2. Etiologic factor can be due to trauma

IV. Psoriatic Arthritis[13]

A. Inflammatory arthritis associated with psoriasis
B. Usually seronegative for rheumatoid factor
B. Inflammation of the skin and joints
D. Skin patches of thick red and scaly skin
E. Nails may be pitted
F. Effects men and women equally

G. Joint involvement may reduce motion of the digits and spine
H. Affects all of the joints in one digit in a ray pattern presenting an asymmetric distribution typical of the condition

V. General Therapeutic Intervention for Arthritis: Conservative Treatment[14]
A. Reduce pain
1. Orthotics for conservative management (based on current literature)
a. Orthotics to DIP joints with OA[15] decreased pain (Fig. 2)
b. Orthotics to CMC joint positioned opposite the deformity decreased pain, increased grip strength, and reduced the need for surgery[16,17,18,19,20] (Fig. 3)
c. Orthotics with RA decreased pain and increased grip strength[21,22](Fig. 4)
d. Silver ring orthoses increased dexterity with RA swan neck deformity[23] (Fig. 5)
e. Patients prefer prefabricated orthoses for swan neck deformity in RA (Oval 8, silver ring orthoses, etc.)[24]
2. Joint protection techniques[25,26]
3. Modalities as appropriate (based on the current literature)
a. OA - heat decreases pain[16]
b. RA - Paraffin baths decrease pain and stiffness[27]
c. RA - Pulsed ultrasound decreases stiffness, swelling, pain, and increased grip strength[28]
d. RA - TENS decreased pain[29]
e. RA - Low-level laser therapy decreased pain[30]
B. Pain free ROM (based on the current literature)
1. AROM exercises[16,31]
2. Isometric strengthening[32,33]
3. General body conditioning[34,35,36]
4. Avoid pinch strengthening[37,38]
C. Increase functional independence (based on the current literature)
1. Assistive equipment[1,14,16,39,40]
2. Energy conservation/work simplification[39,40]
3. Joint protection
a. OA[16,41]
b. RA[42,43]

VI. Pre-operative Therapy[14]
A. Patient education
1. Surgical goals/expectations
2. Introduction to post-op regimen
3. Joint protection
4. The patient needs to understand that they will be an active participant in the postoperative program
B. Objective assessment
C. Functional assessment
D. Pre-op orthosis used as indicated[1]

VII. Reconstructive Surgical Procedures and Therapeutic Management

* *Treatment protocols may vary; those presented are guidelines only and need to be tailored to the patient's specific needs and the surgeon's philosophy of treatment*

A. MP Synovectomy (RA)
1. Synovitis[6]
   a. Synovial cells become hypertrophic and are stimulated to produce matrix-degrading enzymes that distend and destroy the joint capsule and ligaments
   b. This hyperplastic synovium invades the articular cartilage and subchondral bone
   c. May restrict tendon gliding within flexor sheaths and pulleys causing decreased ROM, crepitus, triggering, and rupture
2. Synovectomy indications[44]
   a. for the infrequent patient with persistent MP synovitis
   b. minimal radiographic changes
   c. minimal if any deformity
   d. intermittent painful synovitis
   e. should have completed 6-9 mo of conservative therapy: medications and orthosis usage
3. MP Joint synovectomy/soft tissue reconstruction arthroplasty surgical procedure[44]
   a. Extensor mechanisms incised along ulnar border; ulnar intrinsics released if indicated
   b. Joint capsules incised; synovium removed
   c. Capsules closed; radial collateral ligaments may be repaired or shortened
   d. Extensor tendons may be centralized
4. Post-op therapy[44]
   a. Gentle AROM 3-4 days after surgery
   b. Protective resting orthotic with the MP joints in comfortable extension between exercises 4-6 weeks
   c. Dynamic MP extension orthosis 5-7 days after surgery to align digits for 4-6 weeks
5. Complications: recurrent synovitis

B. Flexible Implant Resection Arthroplasty: Swanson's Silastic Implants[44,46,47]
1. Basic Concepts
   a. "Bone resection + implant + encapsulation = new joint"
   b. Early guided motion essential
   c. Biodynamics of scar formation
   d. Balance of mobility and stability
2. Metacarpophalangeal Joint Replacement (RA):
   a. Indications:
      i. Pain Reduction
      ii. Restore motion
      iii. Restore more normal joint alignment
      iv. Improve functional use
      v. Systematic review could not recommend a specific postoperative orthotic regime[49,50]

Chapter 26 Figures

Fig. 1. Wrist radial deviation of the metacarpals on the carpals.

Fig. 2. DIP orthosis for OA
(Photo from Biese (Beasley), J. Arthritis. In Cooper C. Fundamentals of Hand Therapy: Clinical Reasoning and Treatment Guidelines for Common Diagnoses of the Upper Extremity. St. Louis, Mo: Elsevier; 2007:348-375, and used with permission).

Fig. 3. CMC orthosis.

Fig. 4. RA orthosis for ulnar deviation of the digits and radial deviation of the metacarpals on the wrist.

vi. Most patients that had IRA reported decreased pain and increased quality of ADL[51]

b. Contraindications
   i. active inflammation
   ii. previous MP infection
   iii. inadequate skin coverage
   iv. inadequate bone stock

c. Surgical procedure
   i. Transverse incision over dorsum of MP joints or dorsal longitudinal incisions between MC heads
   ii. Dorsal hood incised to displace extensor tendons
   iii. Metacarpal head and proximal end of proximal phalanx excised
   iv. Implant inserted as joint spacer
   v. Other reconstructions of soft tissue as indicated: intrinsic release, extensor realignment (recentralization), collateral ligament reconstruction, tenosynovectomy

d. Post-operative therapy[44,46,47]
   i. Dynamic extension orthosis - allows patient to actively flex fingers with active-assisted extension to neutral; worn to retrain and protect healing structures for approximately 6 weeks (Fig. 6)
   *slight radial pull on the digits provides proper neutral alignment opposite that of ulnar deviation
   *index and occasionally the middle digit may require a supinatory force couple to prevent the tendency toward pronation
   ii. Static MP extension resting pan orthosis at night
   *PIP joints placed in slight flexion if there is a tendency toward swan neck deformities
   *PIP joints placed in extension if there are tendencies toward boutonniere deformities
   iii. Active and passive ROM to MPs, PIPs and DIPs
   iv. Dynamic flexion orthosis may be initiated at 3 weeks post-op if limited MP flexion (earlier if OK with physician)
   v. At 6 weeks: limited functional strengthening, avoid ulnar deviating forces (especially lateral pinch)
   vi. Scar management, edema control
   vii. ROM goals: IF 0-45 degrees, MF 0-60 degrees, RF/SF 0-70 degrees

e. Complications[44]
   i. recurrent ulnar deviation
   ii. extension lag
   iii. limited MP flexion
   iv. implant fracture
   v. infection
   vi. silicone synovitis

3. Proximal Interphalangeal Joint Replacement Swanson's design (OA)[44,47,48]
   a. Indications

i. Pain due to destructive arthritis
ii. Instability/subluxation of PIP joints
iii. Stiffness leading to functional loss of PIP joints
iv. May be a component of swan-neck or boutonniere reconstruction

b. Contraindications
i. Infection
ii. Failed attempt at tenolysis

c. Surgical procedure
i. Volar or dorsal access to PIP
ii. Volar plate and collateral ligament may be released
iii. Head of proximal phalanx resected; reaming of proximal and middle phalanges
iv. Implant inserted
v. Capsular closure; extensor tendon reconstructed as indicated to balance tension between central slip and lateral bands in joints with collapse deformity, collateral ligaments reconstructed

d. Post-operative therapy
i. 3-5 days
(a) Digit based dorsal orthosis with the position of the PIP joint dependent upon the preoperative deformity (Fig. 7)
- PIP lateral deviation: orthosis applied laterally to align digit
- PIP boutonniere deformity: orthosis applied in full PIP extension
- PIP swan-neck deformity (seldom done): orthosis applied in 20-30 degrees of PIP flexion
(b) Edema control
(c) Wound care
ii. 1-2 weeks
(a) Postoperative course determined by preoperative deformity
- Boutonniere: orthosis in PIP extension 4-6 weeks
- Swan neck: allow flexion but prevent PIP extension with the dorsal block orthosis as described above
- Lateral deviation: delay motion until joint has good stability (2-6) weeks depending on the repair
- Stiff PIP: initiate AROM the first postoperative week, PROM initiated if flexion goals are not being met (index 45 degrees, middle 60, ring and small 70), and intermittent dynamic flexion orthosis if stiffness evident
(b) Scar management
(c) Avoid any lateral deviation to the PIP joint, may use buddy tapes to align the PIP joint during AROM
iii. 6-12 weeks
(a) Discontinue night orthosis if good joint position.
(b) Graded strengthening
(c) Progressive increase in functional use incorporating joint protection principles

e. Complications[44]
i. infection

ii. dislocation
iii. implant fracture

C. Ascension Implants: PyroCarbon, two-component total joint replacement (protocol from Ascension Orthopedics, Austin, Texas)[52]
1. Ascension MCP Post-operative Therapy Protocol (Rheumatoid Arthritis)
a. Post-operative dressing: wrist in 10-15 degrees of dorsiflexion and slight ulnar deviation, MP joints in full extension, PIP joints in 5-10 degrees of flexion (more flexion if swan neck deformities are evident)
b. 4 days post surgery: plaster orthosis applied that places the MP joints in full extension and slight radial deviation, wrist as above, and allows full PIP/DIP AROM
c. 4 days to 3 weeks post surgery: elevation, massage, and PIP/DIP joint AROM and PROM (no MP motion at this time)
d. 3 weeks post surgery:
i. Dynamic MP extension orthosis with MP joints in slight radial deviation (Fig. 8) applied for day wear (wrist in 0-10 degrees of extension and slight ulnar deviation)
ii. De-rotational slings to correct digit supination or pronation
iii. Distal radial pull outriggers to correct ulnar drift
iv. Static night orthosis: MP extension and radial alignment, wrist in 0-10 degrees of extension with slight ulnar deviation, thumb in resting position, and PIP/DIP joints in comfortable flexion
v. Optional third orthosis if PIP stiffness: MP joints in extension allowing full PIP motion (forearm based MP extension block orthosis)
vi. Hourly daytime AROM exercises initiated in the dynamic orthosis: MP flexion to 45 degrees, gentle opposition to each digit tip with the thumb, radial finger walking, PIP/DIP flexion and extension
e. 4 weeks post surgery: continue orthosis wear, monitor proper joint position in the orthoses, complete the above exercises, and allow pick up of small light objects in the dynamic orthosis
f. 6 weeks post surgery: continue orthosis wear, and above exercises, increase MP flexion to 60 degrees in the dynamic orthosis, resume light ADL only while wearing the dynamic orthosis, gradually increase light activity out of the dynamic orthosis only under the supervision of the therapist
g. 12 weeks post surgery: therapy as required, increase ADL outside of the dynamic orthosis, do not flex MP joints beyond 60 degrees for 1 year, static night orthosis at least for one year and beyond to maintain digit alignment and extension. The goal is 60 degrees of MP flexion and extension to 0 degrees.
2. Ascension MCP Post-operative Therapy Protocol: Osteoarthritis and trauma patients (protocol from Ascension Orthopedics, Austin, Texas)[52]
a. Post-operative dressing: same as above for RA
b. 2 days post surgery: same as 4 days post surgery for RA above
c. 1 week post surgery:
1. Fabricate dynamic orthosis as stated above for RA

Chapter 26 Figures

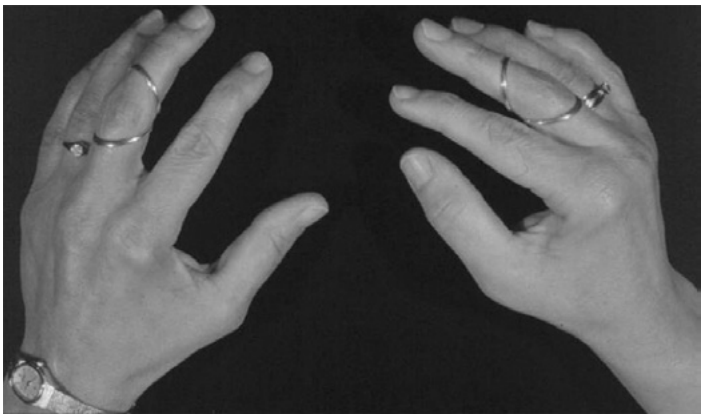

Fig. 5. Silver Ring Splints® for a Swan neck deformity.

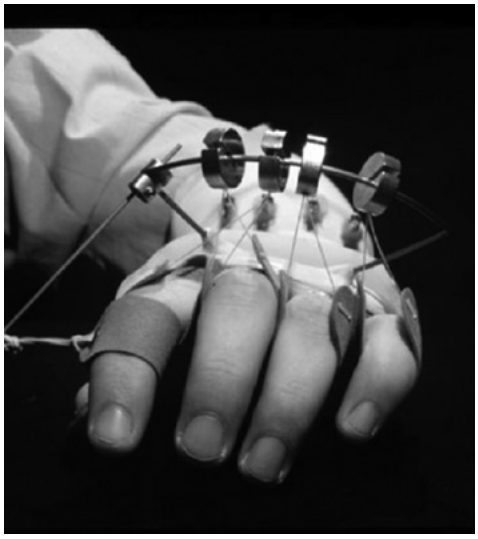

Fig. 6. Dynamic MP extension orthosis
(Photo from Biese (Beasley) J & Goudzwaard P. Postoperative management of metacarpophalangeal implant resection arthroplasty. Orthopaedic Physical Therapy Clinics of North America. 2001; 10:(4): 595-616 and used with permission).

Fig. 7. Digit based dorsal PIP extension orthosis.

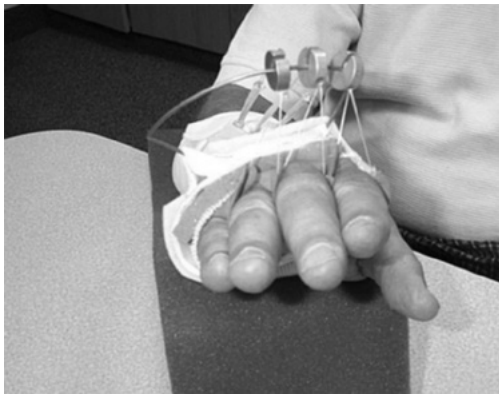

Fig. 8. MP extension orthosis with radial pull to align digits away from ulnar deviation.

2. Buddy system to adjacent finger may be allowed for ROM of central digits with static orthosis at night and between exercises
3. Limit hourly (daytime) MP AROM to 60 degrees for the first two postoperative weeks
4. Gentle opposition to each digit tip with the thumb and PIP/DIP flexion and extension

d. 4 weeks post surgery
1. Continue orthoses and buddy taping
2. Begin light ADL outside of the orthosis
3. Increase MP flexion to 90 degrees
4. Dynamic MP flexion orthosis and PROM if 60 degrees not obtained

e. 6 weeks post surgery: progress to full ADL as tolerated

3. Ascension PIP post-operative therapy protocol: Degenerative or traumatic arthritis (protocol from Ascension Orthopedics, Austin, Texas)[53,54]
a. 4-7 days post surgery:
1. Avoid hyperextension: Mild PIP flexion deformity (5-10°) is preferred.
2. Short arc motion (SAM) if the central slip (CS) integrity is compromised or lag evident. Avoid deviation and rotation. (Defined: "extend and hold"- PIP passively extended by the patient and held for 10 sec.)
3. Dorsal Static PIP resting orthosis in 15-20° of flexion and DIP included if lag.
4. Volar exercise orthosis to 30°if SAM.
5. If good CS integrity DIP and PIP blocking and gentle active composite flexion. Exercises completed in resting orthosis with distal strap released, 5X daily 5-10 reps
6. "Extend and hold" if ext. lag

b. 2 weeks post surgery
1. If minimal extension lags, aim for 70-90° degrees of flexion by the end of week 2.
2. If SAM DIP blocking allowed week 1-2, with PIP flexion in exercise orthosis (30-45°).
3. If ext. lag develops, static ext. orthosis full time for 3 weeks allowing DIP motion.

3. 3-4 weeks post surgery
1. Scar Massage and edema control
2. If SAM increase flexion orthosis to 45-60°
3. If good CS integrity and limited flexion begin active hook
4. At four weeks aim for -10° ext. dorsal orthosis progressed to -10°

d. 6 weeks post surgery
1. Resting orthosis discontinued at 7th week if no ext. lag evident
2. Exercise orthosis with SAM usually d/c 5-6 weeks
3. If good CS integrity full active flexion.
4. If stiff DIP passive flexion
5. If alignment issues or flexion is poor- buddy taping

4. Silicone vs. PyroCarbon PIP outcomes[55]
a. Similar results in patient satisfaction, ROM, and pain reduction
b. Complications increased with the likelihood of coronal plane deformity

D. Thumb Carpometacarpal Arthroplasty (OA) Surgery[44]
1. Indications and contraindications
   a. Currently no evidence that one surgery is superior to another[56]
   b. Localized pain and crepitation during passive circumduction with axial compression of the thumb (Watson's grind test)[1]
   c. Persistent pain of the CMC joint that is non-responsive to conservative management[57]
   d. Not indicated in vocations that require high power pinch[58]
2. Surgical options -Procedure (varies depending on type of reconstruction)[44,57]
   a. Interpositional structure
      i. Implant or spacer
      ii. Tendon - APL or FCR (LRTI)
      iii. Ligamentous reinforcement if indicated
      iv. Tendon interpositional arthroplasty may be stabilized with K wire
3. Post-operative Therapy (also varies widely)[58]
   a. Early phase (0-3 weeks)
      i. Immobilization in thumb spica cast or thermoplastic forearm based thumb spica orthosis (Fig. 9)
      ii. ROM to uninvolved digits and proximal joints
   b. Intermediate phase (3-6 weeks)
      i. Protective cast/orthosis removed; K-wire removed between 3 and 6 weeks
      ii. Depending on type of surgical procedure and preferences of the physician, thumb AROM may be initiated at 3 weeks, or both AROM/PROM initiated at 6 weeks
      iii. Thumb palmer abduction (in orthosis and in AROM) important as preoperative adduction deformities often-evident[7,14]
      iv. Orthosis continued between exercises in most cases
      v. May progress to a hand based thumb spica orthosis if approved by the physician (Fig. 3)
   c. Late phase (6-12 weeks)
      i. Light functional use progressively increased, incorporating joint protection principles
      ii. Progressive grip strengthening, as tolerated, generally initiated at 8 week
      iii. Avoid painful pinch strengthening exercises to avoid unnecessary stress on the repair[7]
      iv. Goal is pain-free, stable joint for prehension
4. Complications:
      i. Irritation of the superficial branch of the radial nerve[14]
      ii. CRPS[14]
      iii. CMC subluxation especially when the MP hyperextension is not treated[7]

E. Arthrodesis[14,44]
1. Indications and contraindications
   a. Debilitating deformity
   b. Mutilans deformity
   c. Functional limitations due to instability and/or pain
   d. Contraindication: fusions at adjacent joints limiting ADL
2. Goals of surgery

a. Relieve pain
b. Provide stability
c. Correct deformity

3. Joints commonly treated by arthrodesis
a. Wrist
b. Thumb MP joint
c. PIP joints
d. DIP joints
e. Thumb CMC joint
f. Thumb IP joint

4. Post-operative therapy
a. Orthosis protection of fused joint until healed (at least 6 weeks)
b. Edema control
c. Scar management
d. ROM to non-involved joints

5. Complications:
a. Nonunion
b. CRPS
c. irritation of the superficial branch of the radial nerve for thumb CMC

F. Soft Tissue Reconstruction[44,60]

1. Tendon Rupture
a. Common sites: extensor tendons in zones V, VI, and VII due to "fraying" of EDC on rough bone surface at ulnar styloid; EPL at Lister's tubercle.
b. Considerations for rheumatoid patient
i. Altered biomechanics due to imbalance between extrinsic and intrinsics
ii. Effect of immobilization on rheumatoid joints
iii. Tendon integrity
c. Common reconstructive procedures
i. End-to-end anatomists
ii. Suture of distal stump to adjacent tendon
iii. Tendon transfer

Refer to chapters on extensor tendons and tendon transfers for post-operative management

2. Tendon Reconstruction for Swan-Neck Deformity[44,61]
a. Indications
i. Deformity may initiate with extrinsic/intrinsic imbalance
ii. Deteriorated joints involved; weakened or destroyed volar plate
iii. Periarticular inflammation stimulates adhesions to soft tissue
b. Surgical intervention - multiple options for reconstructive procedures
i. Tendon transfers
ii Tenodesis of PIP joint using local tendons or tendon graft
iii. Dermadesis
iv. Flexor tendon tenodesis
v. Lateral band mobilization
c. Proximal imbalances must be addressed before digital-level reconstruction

Chapter 26 Figures

Fig. 9. Thumb spica forearm based orthosis.

d. May be done in conjunction with MP implant arthroplasty in patients with RA
c. Post-operative management: will vary depending on specific reconstructive procedure
i. Digital-based gutter orthosis maintaining PIP in 30-40 degrees flexion
ii. AROM (flexion) initiated from 1 week to 3 weeks post-op; generally completed with dorsal orthosis in place blocking extension
iii. PROM if indicated
iv. Goal is functional flexion and extension
v. Goal is to preserve 20-30 degree flexion contracture of PIP joint to prevent recurrence of deformity
vi. Day orthosis usually discontinued at 6-8 weeks with use of night orthosis continuing as needed at least for 3 months
vii. Some patients may want to consider custom Silver Ring® orthoses or Oval 8® orthoses for long-term management to help prevent PIP hyperextension

G. SLAC and SNAC wrists[62,63]
1. SLAC: Scapholunate advanced collapse - scaphoid has collapsed and the proximal pole subluxes dorsoradially. Surgical indications based on the stage of the disease
a. Stage 1: arthritis localized to the radial styloid and the distal pole of the scaphoid. Surgical treatment option: radial styloid excision
b. Stage 2: arthritis involves entire radioscahpoid joint and the STT joint. Surgical treatment options include proximal row carpectomy or scaphoid excision and four-bone fusion.
c. Stage 3: arthritis at entire radioscaphoid joint and metacarpal joint involving the lunocaptiate joint. Surgical treatment options include scaphoid excision and intercarpal fusion
2. SNAC: Scaphoid Nonunion Advanced Collapse - abnormal force transmission across the proximal scaphoid and lunate resulting in progressive degenerative arthritis. Surgical options based on the stage of the disease
a. Stage I: arthritis at distal pole of the scaphoid and radial styloid. Surgical treatment option is possible excision of the distal pole of the scaphoid and radial styloidectomy.
b. Stage II: arthritis involves the entire radiaoscaphoid joint. Surgical treatment option is scaphoid excision, four-bone fusion, or proximal row carpectomy
c. Stage III: arthritis involves both the radioscaphoid and lunocaptiate joint. Surgical treatment option is scaphoid excision and intercarpal fusion
3. Postoperative Therapy
a. SL ligament repair or reconstruction and pin fixation[64]
i. Thumb spica cast for 8+ weeks
ii. Progress to a removable thermoplastic orthosis
iii. AROM initiated after 8+ weeks avoiding stress to the healing ligaments including dart throwers pattern which may provide less stress to the healing ligament
iv. 12 weeks begin gentle strengthening
b. Limited intercarpal fusion[64]
i. Cast or orthosis for up to 12 weeks until bony consolidation occurs
ii. AROM delayed until sufficient fusion reported by surgeon
iii. Strengthening delayed until boney union achieved
c. Four-Bone Arthrodesis[65]

i. Cast 8-10 weeks
ii. Thumb spica orthosis and gentle ROM when radiographs show sufficient healing for the next 4 weeks
iii. Wean from orthosis when bony fusion able to tolerate resistive activity per surgeon and begin gentle strengthening

d. Proximal row carpectomy[65]
i. Contraindicated if degeneration present and involves the capitate or lunate facet of the radius.
ii. Casted in 0-10 degrees of wrist extension 0-4 weeks
iii. 4-6 weeks thermoplastic wrist orthosis fabricated and removed for gentle wrist AROM
iv. 6-8 weeks wean from orthosis- joint mobilizations are not appropriate
v. 4-6 months: heavy labor wait 6 months

4. Complications: Less successful with heavy laborer, previous scaphoid surgery, or chronic Non-union > 5 years[66]

H. DRUJ arthritis: Can be post-traumatic or inflammatory in origin
1. Conservative management
a. The ulna articulates with a hammock-like structure made up of ligaments and cartilage the triangulofibrocartilage complex (TFCC)
b. When the arthritic process affects the TFCC, pain with forearm pronation and supination can result as well as ulnar wrist instability[67]
c. Conservative orthoses that provide support to the distal ulna may be helpful in decreasing pain both before and after surgery[68,69]

2. Postoperative management. A variety of surgical treatments are aimed at relieving pain and restoring function.[67] The challenge to the surgeon is to provide a balance between stability and mobility in these cases. Some of the procedures include: distal ulnar resection and Sauve-Kapandji, which are outlined below. In cases where these surgeries may fail the patient may be a candidate for a partial or full wrist arthrodesis (see section E), hemiresection interpostion arthroplasty,[67] or a total wrist arthroplasty (see section I).
a. Darrach Procedure/distal ulna resection: resection of 2-3 cm of the distal ulna
1. Indications: ulna abuts against the central portion of the TFCC
2. May or may not include stabilization of the ulnar stump with tethering to a distally based flap[67]
3. An orthosis that places the forearm in supination for at least 2 weeks to unload the ulnar sided structures and then progressing to a forearm neutral orthosis during the third week has been recommended.[68] It is important to check with the surgeon for this postoperative course.
4. If there has been stabilization of the distal ulna with tethering, a longer period of immobilization may be recommended by the surgeon.
5. AROM when initiated should progress gradually avoiding forceful full pronation to protect distal ulna stability.
6. Complications: proximal instability of the ulna in pronation, ulnar impingement against the radius, ulnar translation of the carpus, cosmetic deformity, subluxation or snapping tendons, and tendon rupture. Also irritation of the dorsal cutaneous branch of the ulnar nerve

b. Sauve-Kapandji: fusion of the DRUJ and creation of a pseudarthrosis of the distal ulna proximal to the fusion[67]
   1. Indications: ulna abuts against central portion of the TFCC, avoids ulnar translation of the carpus and the TFCC and ECU remain stabilized avoiding many of the problems associated with distal ulna resection.
   2. Postoperative care includes a period of immobilization until fusion of the DRUJ is evident. This may include a Muster cast for 6 weeks.[68]
   3. Complications: instability of the proximal ulna

I. Total Wrist[44,47]
   1. Indications: Pancarpal arthritis and relatively normal bone stock, severe bilateral disease affecting both elbows and shoulders.
   2. A variety of implants are available
   3. Postoperative care
      a. 0-4 weeks volar wrist orthosis
      b. gentle wrist AROM may begin as early as 2 weeks post if implant is stable and confirmation by the surgeon
      c. 4-8 weeks; orthosis and gentle AROM continue, may use light grip activities without resistance
      d. 8-10 weeks: gentle strengthening, orthosis for heavy activities, 10 pound lifting restrictions for life
   4. Complications: infections implant loosening, tendon rupture, pain, implant failure

VIII. Conclusion
   A. The patient is an active participant in the preoperative and/or postoperative program
   B. Treatment is specific to the condition, stage of the disease process, and the deformity
   C. Treatment is individualized
   D. Postoperative protocols will vary by physician, site, implant, surgery, preoperative deformity, and individual needs of the patient

References

1. Beasley, J. Therapist's examination and conservative management of the arthritis of the upper extremity. In Skirven TM, Osterman AL, Fedorczyk JM, Amadio PC, eds. Rehabilitation of the Hand and Upper Extremity, 6th ed. Philadelphia, PA: Elsevier: 2011:1330-1344.
2. Scott DL, Kingsley GH. Inflammatory Arthritis in Clinical Practice. London, England: Springer; 2008.
3. Oegema TR, Lewis JL, Mikecz k, Gal I. Osteoarthritis and Rheumatoid Arthritis. In Einhorn TA, O'keefe RJ, Buckwalter JA, eds. Orthopaedic Basic Science, 3rd edition. Rosemondt, IL: American Academy of Orthopaedic Surgeons; 2007:395-413
4. Lawrence RC, Felson DT, Helmick CG, Arnold LM, Choi H, Deyo RA, et al. Estimates of the prevalence of arthritis and other rheumatic conditions in the United States. Part II. Arthritis Rheum. 2008;58:26-35.
5. Waldburger JM, Firestein GS. Rheumatoid arthritis: B. Epidemiology, pathology, and pathogenesis. In Klippel, JH, ed. Primer on the Rheumatic Diseases, 13th edition. New York, NY: Springer; 2008:122-132.
6. Alter SA, Feldon P, Terrono AL. Pathomechanics of deformities in the arthritic hand and wrist. In Skirven TM, Osterman AL, Fedorczyk JM, Amadio PC, eds. Rehabilitation of the Hand and Upper Extremity, 6th ed. Philadelphia, PA: Elsevier: 2011:1321-1329.
7. Terrono L, Nalebuff EA, Philips C. The Rheumatoid thumb. In Skirven TM, Osterman AL, Fedorczyk JM, Amadio PC, eds. Rehabilitation of the Hand and Upper Extremity, 6th ed. Philadelphia, PA: Elsevier: 2011: 1344-1355.
8. Mankin, HJ, Grodzinsky, AJ, Buckwalter. Articular cartilage and osteoarthritis. In Einhorn TA, O'keefe RJ, Buckwalter JA, eds. Orthopaedic Basic Science, 3rd edition. Rosemondt, IL: American Academy of Orthopaedic Surgeons; 2007:161-174.
9. Erggelet C, Mandelbaum BR. Principles of Cartilage Repair. Wurzburg, Germany: Springer, 2008.
10. Kalichman, L., Hernández-Molina, G. Hand Osteoarthritis: An Epidemiological Perspective. Seminars in Arthritis and Rheumatism. 2010; 39:6:465-476 doi:10.1016/j.semarthrit.2009.03.001.
11. Wilder FV, Barrett JP, Farina EJ. Joint-specific prevalence of osteoarthritis of the hand. Osteoarthritis Cartilage. 2006; 14:953-957.
12. Brinker MR, O'Conner, DP. Basic Sciences. In: Miller MD, and Brinker MR, eds. Review of Orthopaedics, 3rd edition. Philadelphia, PA: WB Saunders; 2008: 1-114.
13. Gladman DD. Psoriatic arthritis: Clinical features. In Klippel, JH, ed. Primer on the Rheumatic Diseases, 13th edition. New York, NY: Springer; 2008:170-177.
14. Biese (Beasley), J. Arthritis. In Cooper C. Fundamentals of Hand Therapy: Clinical Reasoning and Treatment Guidelines for Common Diagnoses of the Upper Extremity. St. Louis, Mo: Elsevier; 2007:348-375.
15. Ikeda M, Ishii T, Kobayashi Y, Mochida J, Saito I, Oka Y. Custom-made splint treatment for osteoarthritis of the distal interphalangeal joints; J Hand Surg. 2010; 35:(4):589-93.
16. Valdes K, Marik T. A systemic review of conservative interventions for osteoarthritis of the hand. Journal of Hand Therapy. 2010; 23:4:334-349.
17. Weiss S, LaStayo PL, Mills A, Bramlet D. Splinting the degenerative basal joint: Custom-made or prefabricated neoprene? Journal of Hand Therapy. 2004; 17:401-406.
18. Weiss S, LaStayo PL, Mills A, Bramlet D. Prospective analysis of splinting the first carpometacarpal joint: an objective, subjective, and radiographic assessment. Journal of Hand Therapy. 2000; 13:218-226.
19. Rannou F, Dimet J, Boutron I, Baron G, Fayad F, Macé Y, Beaudreuil J, Richette P, Ravaud P, Revel M, Poiraudeau S. Splint for base-of-thumb osteoarthritis: a randomized trial. Annals of Internal Medicine. 2009;19:150:(10): 661-9.

References

20. Berggren M, Joost-Davidson A, Lindstrand J, Nylander G, Povlsen B. Reduction in the need for operation after conservative treatment of osteoarthritis of the first carpometacarpal joint: a seven year prospective study. Scand J Plast Reconstr Hand Surg. 2002; 35:415-7.
21. Steultjens EEMJ, Dekker JJ, Bouter LM, Schaardenburg DD, Kuyk MAMAH, Van den Ende ECHM. Occupational therapy for rheumatoid arthritis. Cochrane Database of Systematic Reviews. 2004; 1 doi: 10.1002/14651858.CD003114.pub2.
22. Egan M, Brosseau L, Farmer M, Ouimet MA, Rees S, Tugwell P, Wells GA. Splints and Orthosis for treating rheumatoid arthritis. Cochrane Database of Systematic Reviews. 2001; 4. Art. No.: CD004018. doi: 10.1002/14651858.CD004018.
23. Spicka C, Macleod C, Adams J, Metcalf C. Effect of silver ring splint on hand dexterity and grip strength in patients with rheumatoid arthritis: an observational pilot study. Hand Therapy. 2009; 14: (2): 53-7.
24. tar Schegget M; Knipping A. A study comparing use and effects of custom-made versus prefabricated splints for swan neck deformity in patients with rheumatoid arthritis. British Journal of Hand Therapy. 2000; 5(4): 101-7.
25. Cordery JC. Joint protection: A responsibility of the occupational therapist. American Journal of Occupational Therapy. 1965; 19:285-294.
26. Cordery, J, Rocchi M. Joint protection and fatigue management. In: Melvin J, Jensen G (eds.) Rheumatologic Rehabilitation, (Volume1). Assessment and Management, American Occupational Therapy Association. Bethesda, MD; 1998:279-322.
27. Welch V, Brosseau L, Casimiro L, Judd M, Shea B, Tugwell P, Wells GA. Thermotherapy for treating rheumatoid arthritis. Cochrane Database of Systematic Reviews. 2002; 2. Art. No.: CD002826. doi: 10.1002/14651858.CD002826.
28. Casimiro L, Brosseau L, Welch V, Milne S, Judd M, Wells GA, Tugwell P, Shea B. Therapeutic ultrasound for the treatment of rheumatoid arthritis. Cochrane Database of Systematic Reviews. 2002; 3. Art. No.: CD003787. doi: 10.1002/14651858.CD003787.
29. Brosseau L, Yonge KA, Welch V, Marchand S, Judd M, Wells GA, Tugwell P. Transcutaneous electrical nerve stimulation (TENS) for the treatment of rheumatoid arthritis in the hand. Cochrane Database of Systematic Reviews. 2003; 2. Art. No.: CD004377. doi: 10.1002/14651858.CD004377.
30. Brosseau L, Welch V, Wells GA, de Bie R, Gam A, Harman K, Morin M, Shea B, Tugwell P. Low level laser therapy (Classes I, II and III) for treating rheumatoid arthritis. Cochrane Database of Systematic Reviews. 2005; 4. Art. No.: CD002049. doi: 10.1002/14651858.CD002049.pub2.
31. Rogers MW, Wilder FV. Exercise and hand osteoarthritis symptomatology: A controlled crossover trial. Journal of Hand Therapy. 2009; 22:10-18.
32. Semble EL, Loeser RF, Wise CM. Therapeutic exercise for rheumatoid arthritis and osteoarthritis. Seminars in Arthritis and Rheumatism.1990; 20,1, 32-40.
33. Rogers MW, Wilder FV. The effects of strength training among persons with hand osteoarthritis: a two-year follow up study. Journal of Hand Therapy. 2007; 20:244-50.
34. Hurkmans E, van der Giesen FJ, Vliet Vlieland TPM, Schoones J, Van den Ende ECHM. Dynamic exercise programs (aerobic capacity and/or muscle strength training) in patients with rheumatoid arthritis. Cochrane Database of Systematic Reviews. 2009; 4. Art. No.: CD006853. doi: 10.1002/14651858.CD006853.pub2.
35. Beardmore TD, Rehabilitation of patients with rheumatic diseases. In J. H. Klippel, JH, eds. Primer on the Rheumatic Diseases, 13th edition. New York, NY: Springer; 2008: 599-608.

References

36. Ettinger WH, Burns R, Messier SP, et al. A randomized control trial comparing aerobic exercise and resistance exercise with a health education program in older adults. Journal of American Medical Association. 1997; 277, 25-31.
37. Minor MA, Hewitt JE, Webel RR, et al. Efficacy of physical conditioning exercise in patients with rheumatoid arthritis and osteoarthritis. Arthritis & Rheum. 32: 1396-1405.
38. Wessel J. The effectiveness of hand exercises for persons with rheumatoid arthritis: a systematic review. Journal of Hand Therapy. 2004;17:2:174-180.
39. Tuntland H, Kjeken I, Nordheim LV, Falzon L, Jamtvedt G, Hagen KB. Assistive technology for rheumatoid arthritis. Cochrane Database of Systematic Reviews. 2009; 4. Art. No.: CD006729. doi: 10.1002/14651858.CD006729.pub2.
40. Nordenskiold U. Evaluation of assistive devises after a course in joint protection. International Journal of Technology Assessment in Health Care. 1994;10:2: 293-304.
41. Zhang W, M Doherty M, Leeb B F, Alekseeva L, Arden NK , Bijlsma JW, Dinçer F, Dziedzic K, Häuselmann H J, Herrero Beaumont G, Kaklamanis P, Lohmander S, Maheu E, Martín Mola E, Pavelka K, Punzi L, Reiter S, Sautner J, Smolen J, Verbruggen G, and Zimmerman Górska I. EULAR evidence based recommendations for the management of hand osteoarthritis: Report of a Task Force of the EULAR Standing Committee for International Clinical Studies Including Therapeutics (ESCISIT) Ann Rheum Dis. 2007; 66(3): 377–388. Published online 2006 October 17. doi: 10.1136/ard.2006.062091.
42. Freeman K, Hammond A, Lincoln NB. Use of cognitive behavioral arthritis education programs in newly diagnosed rheumatoid arthritis. Clinical Rehabilitation. 2002; 16:828-836.
43. Hammond A, Freeman K. The long term outcomes from a randomized controlled trial of an educational behavioral joint protection programme for people with rheumatoid arthritis. Clin Rehabil. 2004;18, 520–528.
44. Feldon P. Terrono AL, Nalebuff EA, Millender LH. Rheumatoid Arthritis and other connective tissue diseases. In Green DP, Hotchkiss RN, Pederson WC, Wolfe SW, eds. Green's Operative Hand Surgery. 5th ed. Philadelphia, PA: Elsevier; 2005: 2049-2136.
45. Birch A, Gwilliam L. The Rheumatoid hand: A surgical approach. In Salter M, Chesire L, eds. Hand Therapy. Woburn, MA: Butterworth Heinemann; 2000:281-292.
46. Biese (Beasley) J & Goudzwaard P. Postoperative management of metacarpophalangeal implant resection arthroplasty. Orthopaedic Physical Therapy Clinics of North America. 2001;10:(4): 595-616.
47. Lubahn J, Wolfe T, Feldscher SB. Joint replacement in the hand and wrist: Surgery and Therapy. In Skirven TM, Osterman AL, Fedorczyk JM, Amadio PC, eds. Rehabilitation of the Hand and Upper Extremity, 6th ed. Philadelphia, PA: Elsevier: 2011:1376-1398.
48. Swanson AB, deGroot Swanson G, Leonard J, and Boozer (Beasley) J. Postoperative Rehabilitation Programs in Flexible Implant Arthroplasty of the Digits. In Hunter JM, Schneider LH, Mackin EJ, Callahan AD, et al. (Eds.) Rehabilitation of the Hand and Upper Extremity. 3rd Edition. St. Louis: C.V. Mosby, 1990: 912-928.
49. Massy-Westropp N, Johnston RV, Hill CL. Post-operative therapy for metacarpophalangeal arthroplasty. Cochrane Database of Systematic Reviews. 2008; 1. Art. No.: CD003522. doi: 10.1002/14651858.CD003522.pub2.
50. Massy-Westropp, N. Postoperative therapy after metacarpophalangeal arthroplasty Journal of Hand Therapy. 2003; 16, 4,311-319.
51. Massy-Westropp, N. Metacarpophalangeal arthroplasty from the patient's perspective. Journal of Hand Therapy. 2003; 16:4:313-319.

References

52. Ascension® PyroCarbon PyroCarbon MCP Total Joint Post-operative therapy. Ascension Orthopedics Inc., Austin, Texas, 2010 http://www.ascensionortho.com/Assets/PDF/PyroCarbon-MCP/AscensionMCP_Therapy-RevC.pdf
53. Ascension® PyroCarbon PIP Post-operative therapy protocol for dorsal approach. Ascension Orthopedics Inc., Austin, Texas, 2010 www.ascensionortho.com.
54. Beckenbaugh RD. Ascension® PIP PyroCarbon total joint post-operative therapy guidelines. Ascension Orthopedics Inc., Austin, Texas, 2010. http.//www.ascensionortho.com. Accessed Jan 8, 2011.
55. Branam BR, Tuttle HG, Stern, PJ, Levin L. Resurfacing arthroplasty versus silicone arthroplasty for proximal interphalangeal joint osteoarthritis. Journal of Hand Surgery. 2007; 32A:775-788.
56. Wajon A, Carr E, Edmunds I, Ada L. Surgery for thumb (trapeziometacarpal joint) osteoarthritis. Cochrane Database of Systematic Reviews. 2009; 4. Art. No.: CD004631. doi: 10.1002/14651858.CD004631.pub3.
57. Badia, A. Management of the Osteoarthric thumb carpometacarpal joint. In Skirven TM, Osterman AL, Fedorczyk JM, Amadio PC, eds. Rehabilitation of the Hand and Upper Extremity, 6th ed. Philadelphia, PA: Elsevier: 2011: 1356-1365.
58. Bielefelc, TM, Neumann DA. Therapist's management of the thumb carpometacarpal joint with osteoarthritis. In Skirven TM, Osterman AL, Fedorczyk JM, Amadio PC, eds. Rehabilitation of the Hand and Upper Extremity, 6th ed. Philadelphia, PA: Elsevier: 2011: 1366-1375.
59. Buckwalter, JA, Ballard, T. Operative treatment of arthritis. In Klippel, JH, ed. Primer on the Rheumatic Diseases, 13th edition. New York, NY: Springer; 2008:651-663.
60. Lubahn J, Wolfe T, Feldscher SB. Surgical treatment and rehabilitation of tendon ruptures and imbalances in the Rheumatoid hand. In Skirven TM, Osterman AL, Fedorczyk JM, Amadio PC, eds. Rehabilitation of the Hand and Upper Extremity, 6th ed. Philadelphia, PA: Elsevier: 2011: 1399-1407.
61. Nalebuff EA. Rheumatoid Swan Neck Deformity. Hand Clinics. Vol 5. 1989: 203-214.
62. Garcia-Elias M. Carpal Instability. In Skirven TM, Osterman AL, Fedorczyk JM, Amadio PC, eds. Rehabilitation of the Hand and Upper Extremity, 6th ed. Philadelphia, PA: Elsevier: 2011: 1002-1012.
63. Cooney WP. The Wrist: Diagnosis and Operative Treatment Diagnosis and Operative Treatment, 2nd ed. Philadelphia, PA:Lippincott Williams & Wilkins, 2010.
64. Skirven TM. Rehabilitation for carpal ligament injury and instability. In Skirven TM, Osterman AL, Fedorczyk JM, Amadio PC, eds. Rehabilitation of the Hand and Upper Extremity, 6th ed. Philadelphia, PA: Elsevier: 2011:1013-1023.
65. Bednar K. Feldscjer SB, Seftchick J. Wrist Reconstruction: Salvage procedures. In Skirven TM, Osterman AL, Fedorczyk JM, Amadio PC, eds. Rehabilitation of the Hand and Upper Extremity, 6th ed. Philadelphia, PA: Elsevier: 1024-1033.
66. Amadio PC, Moran SL. Fractures of the carpal bones. In Green DP, Hotchkiss RN, Pederson WC, Wolfe SW, eds. Green's Operative Hand Surgery. 5th ed. Philadelphia, PA: Elsevier; 2005:711-768.
67. Bednar JM. The distal radioulnar joint: Acute injuries and chronic injuries. In Skirven TM, Osterman AL, Fedorczyk JM, Amadio PC, eds. Rehabilitation of the Hand and Upper Extremity, 6th ed. Philadelphia, PA: Elsevier: 963-974.

References

68. Lee M, LaStayo PC. Ulnar wrist pain and impairment: A therapist algorithmic approach to the triangular fibrocartilge complex. In Skirven TM, Osterman AL, Fedorczyk JM, Amadio PC, eds. Rehabilitation of the Hand and Upper Extremity, 6th ed. Philadelphia, PA: Elsevier: 975-987.
69. Beasley J. Soft orthoses: Indications and techniques. In Skirven TM, Osterman AL, Fedorczyk JM, Amadio PC, eds. Rehabilitation of the Hand and Upper Extremity, 6th ed. Philadelphia, PA: Elsevier: 1610-1619.

Multiple Choice Questions

1. Orthoses play an important role in treating a patient after MP Arthroplasty. One of the following statements is not true.
   A. Part time dynamic flexion orthosis is used if flexion is limited
   B. The dynamic extension orthosis provides a slight radial pull as needed on the digits for proper joint alignment.
   C. The dynamic extension orthosis provides passive flexion and active-assisted extension.
   D. The dynamic extension orthosis at rest should place the digits in 0 degrees of extension

2. An extension resting pan orthosis is often used at night. All of the following can be an indication for a thumb carpometacarpal arthroplasty except:
   A. Loss of sensation in the median nerve distribution
   B. Persistent pain at the CMC, which does not respond to conservative management
   C. Watson's grind test
   D. Radiographic evidence of arthritic changes

3. PIP hyperextension with DIP extension lag is a common deformity seen in rheumatoid arthritis. The name of this deformity is:
   A. Boutonniere deformity
   B. Schwanoma
   C. Trigger finger
   D. Swan-neck deformity

4. Primary degenerative joint disease occurs in greater numbers in women over 50. Secondary degenerative joint disease occurs:
   A. In men over 50
   B. At any age
   C. In women over 50
   D. In both men and women over 50

5. In Rheumatoid arthritis the synovial cells:
   A. Become hypotrophic and produce degrading enzymes
   B. Become hypertrophic and produces degrading enzymes
   C. Become hypertrophic increasing joint mobility
   D. Become hypotrophic decreasing joint mobility

6. Surgical indications for MP Implant Resection Arthroplasty include all but one of the following:
   A. Cosmesis
   B. Pain reduction
   C. Joint alignment
   D. Joint motion

Multiple Choice Questions

7. One contraindication for MP Implant Resection Arthroplasty is:
   A. Inactive inflammation
   B. Implants at proximal or distal joints
   C. Fusions at proximal or distal joints
   D. Inadequate bone stock

8. Complications of MP Implant Resection Arthroplasty include all but one of the following:
   A. Ulnar deviation
   B. Extension lag
   C. Radial deviation
   D. Infection

9. A SNAC wrist is an abbreviation for:
   A. Scaphoid nonunion advanced collapse
   B. Scaphoid navicular added collapse
   C. Scaphoid necrosis associated complications
   D. Scaphoid necrosis advanced collapse

10. The Sauve-Kapandji procedure includes:
   A. Removal of the proximal carpal row
   B. Fusion of the DRUJ and creation of a pseudoarthrosis of the distal ulna proximal to the fusion
   C. Fusion of the radius to the proximal carpal row
   D. 2-3 cm resection of the distal ulna

11. Following surgery for Rheumatoid arthritis and utilizing the Ascension PyroCarbon MP Implants, the dynamic MP extension orthosis is applied:
   A. 1 weeks post surgery
   B. 2 weeks post surgery
   C. 2-5 days post surgery
   D. 3 weeks post surgery

12. One characteristic symptom of Psoriatic arthritis can include:
   A. Symmetrical joint involvement
   B. Women effected more than men
   C. Positive rheumatoid factor
   D. Nail pitting

13. Patients that have swan-neck deformities report a preference in the literature for:
   A. Custom fabricated orthoses
   B. PROM exercises
   C. Prefabricated orthoses (Oval-8, Silver Ring Splints)
   D. Not wearing orthoses

Multiple Choice Questions

Multiple Choice Question Answer Key
Chapter 26

1-C, 2-A, 3-D, 4-B, 5-B, 6-A, 7-D,
8-C, 9-A, 10-B, 11-D, 12-D, 13-C