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# Physical Therapy and Post Surgical Occupational Therapy in Children with Arthrogryposis

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# Lower Extremities

- Strength is decreased and absent
- Hips: flexed, abducted and externally rotated
- Knees: flexed
- Ankles: plantarflexed or equinovarus position



# Physical Therapists Reduce Lower Extremity Contractures

Establish a stretching program

Hips, knees and feet

Home Education and Training



# Physical Therapy: Maximizing Foot Position

- Clubfeet are common
- Treatment begins as early as possible
- Ponsetti serial casting



# Promote Strength and Mobility

Floor Mobility: wiggle, scoot, roll

Upright mobility: Sitting, Standing

Ambulation

Transfers



# Studies on Ambulation

- Most will be ambulatory before age 5 (Sells and Fassier)
- There is a significant decline in ambulation as patients age and body mass increases

Sells JM, Jaffe KM, Hall JG. Amyoplasia, the most common type of arthrogryposis: the potential for good outcome. *Pediatrics*. 1996 Feb;97(2):225-31. PMID: 8584382

Fassier A, Wicart P, Dubousset J, Seringe R. Arthrogryposis multiplex congenita. Long-term follow-up from birth until skeletal maturity. *J Child Orthop*. 2009 Oct;3(5):383-90. doi: 10.1007/s11832-009-0187-4. Epub 2009 Aug 11. PMID: 19669823; PMCID: PMC2758174.

# Recommend Lower Extremity Orthotics

## AFOs

Most commonly solid with additional foot support

## KAFOs

Knee ankle foot orthosis

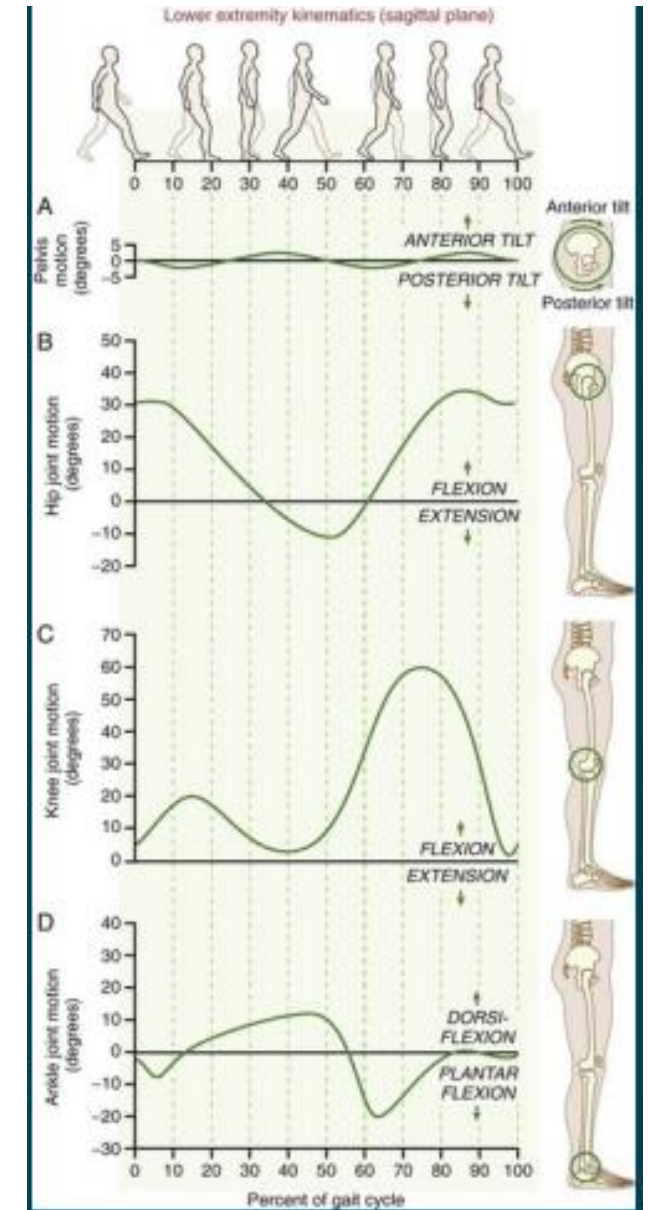




# Study: Benefits of Bracing

- Study by Eriksson used a gait lab to evaluate the gait mechanics
  - KAFOs locked
  - KAFOs unlocked
  - AFOs
- With adequate orthotic support, children with severe weakness and contracture can achieve functional ambulation

Eriksson M, Bartonek Å, Pontén E, Gutierrez-Farewik EM. Gait dynamics in the wide spectrum of children with arthrogryposis: a descriptive study. *BMC Musculoskelet Disord.* 2015 Dec 9;16:384. doi: 10.1186/s12891-015-0834-5. PMID: 26821804; PMCID: PMC4731970.



# Determine Best Assistive Device for Ambulation

Forearm crutches

Walkers

- Reverse vs. forward

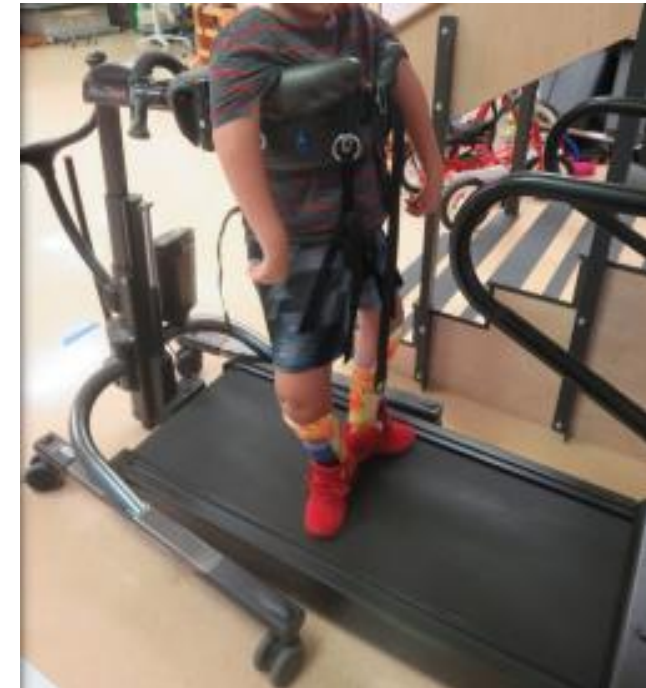


# Gait Training

TRAM: Transfer and Lift Device

Treadmill

- Able to correct gait mechanics in real time



# Pool Therapy



- Therapeutic pool is ideal for stretching
- Weight bearing
- Strengthening
- Adjust depth of water

# Other Physical Therapy Interventions

Three wheeled Bikes



Balance training

- Wii balance board
- Seated balance



# Upper Extremity Surgeries in Arthrogryposis and Post Op Therapy

# Derotational Humeral Osteotomy



# Post-Op Therapy: Derotational Humeral Osteotomy

- **2 weeks post-op**
  - Fabricate Sarmiento Splint
  - Full time wear except bathing
  - Codman's exercises
- **4-6 weeks post-op**
  - Active/ active assisted shoulder movements
- **6-12 weeks**
  - Wean out of splint
  - Gentle shoulder PROM
  - Graded Strengthening





# Post-Op Results: Derotational Humeral Osteotomy



# Posterior Elbow Capsulotomy with Triceps Lengthening

- Triceps tendon is isolated and lengthened
- Arthrotomy along the medial and lateral capsule until elbow flexion is 90 degrees
- Triceps tendon is repaired
- Elbow placed in a hinged elbow flexion brace

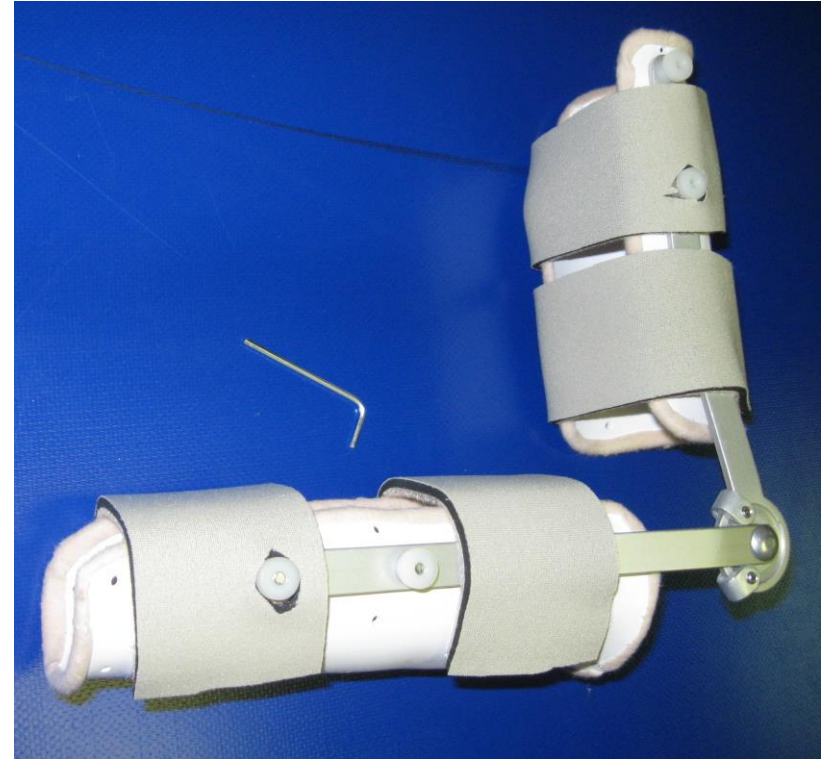


James MA, Millar KL, Manske MC, Van Heest AE. Posterior Elbow Capsulotomy and Triceps Lengthening for Elbow Extension Contracture in Children with Arthrogryposis Multiplex Congenita. *JBJS Essent Surg Tech.* 2020 Feb 13;10(1):e0030.1-8. doi: 10.2106/JBJS.ST.19.00030. PMID: 32368405; PMCID: PMC7161729.

# Post Operative Therapy: Elbow Capsulotomy with Triceps Lengthening

## Post –op Afternoon

- Adjust fit of the hinged elbow brace
- Parent training: gentle PROM exercises within the splint 4-5x/daily
- Keep brace locked in flexion
- Do not force the elbow beyond 90 degrees



# Post Operative Therapy : Elbow Capsulotomy with Triceps Lengthening

## **4 weeks post op**

- Gradually reduce splint wear to night only
- Advance exercises A/AA/PROM
- Fit static elbow extension splint
- Alternate flex / ext splints for night wear

## **8 weeks post-op**

- Adjust splint wear and HEP based on elbow ROM
- If loss of flexion add rubber band traction to hinged brace
- Add triceps strengthening

## **12 weeks post-op**

- Discontinue splinting
- Reassess HEP

# Study: Posterior Elbow Capsulotomy with Triceps Lengthening

- 29 elbows with an elbow extension contracture
- Average follow up 5.4 years
- Arc of motion average 32 degrees pre-op
- Arc of motion average 66 degrees post op
- All children could reach their mouth using passive assistance
- 22 of 23 children could feed themselves independently
- No subsequent tendon transfer was needed

Van Heest A, James MA, Lewica A, Anderson KA. Posterior elbow capsulotomy with triceps lengthening for treatment of elbow extension contracture in children with arthrogryposis. *J Bone Joint Surg Am.* 2008 Jul;90(7):1517-23. doi: 10.2106/JBJS.F.01174. PMID: 18594101.

# Tendon Transfer Surgeries to Gain Elbow Flexion

Steindler flexorplasty

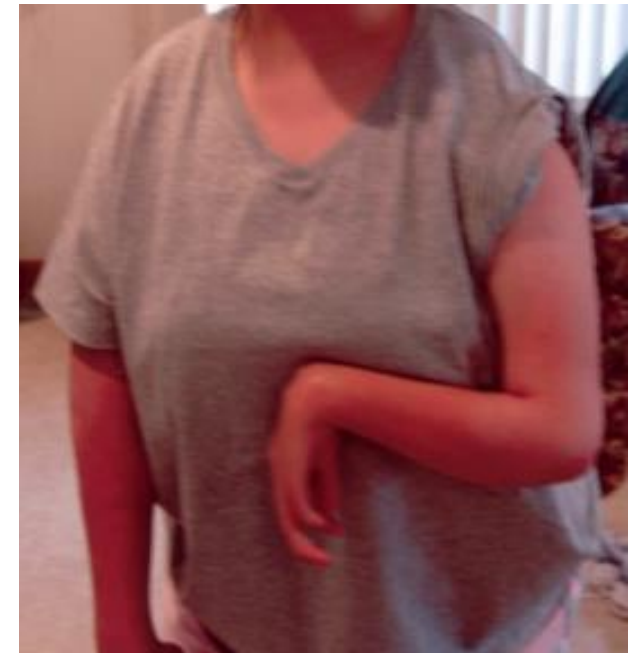
Triceps to biceps

Long head triceps to biceps

Latissimus dorsi to biceps

Pectoralis major to biceps

Long term can produce elbow flexion contractures



# Radial Head Excision

## Indications

- severe loss of motion
- painful dislocation

Performed near skeletal maturity

Goal is pain relief and improved motion



# Post Op Therapy: Radial Head Excision

## Immediate Post-op

- Bulky dressing
- Early gentle AROM elbow, forearm and wrist

## 10 days post-op

- Begin AA/PROM
- Supination splints – part time day wear

## 4 weeks – 12 weeks post-op

- Progress A/PROM
- Add light resistance activities
- Discontinue splinting at 12 weeks

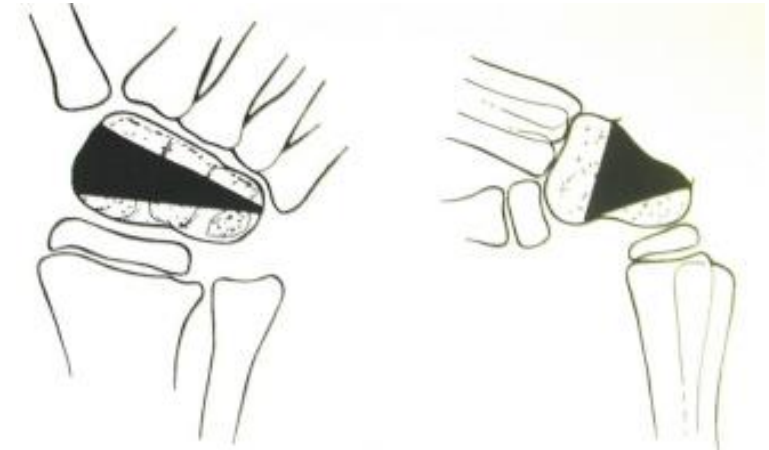




# Wrist: Dorsal Carpal Wedge Osteotomy

Wedge osteotomy – radially and dorsally  
Radio-carpal joint is not violated

ECU to ECR transfer for balance with cross pins



Van Heest AE, Rodriguez R. Dorsal carpal wedge osteotomy in the arthrogryptic wrist. J Hand Surg Am. 2013 Feb;38(2):265-70. doi: 10.1016/j.jhsa.2012.10.034. Epub 2012 Dec 23. PMID: 23267756.

# Post Op Therapy: Dorsal Carpal Wedge Osteotomy with ECU to ECR Transfer

Short arm cast 4 – 6 weeks with pin removal

Wrist splint for 1-2 months for protection and night

A/PROM fingers and thumb

Gradually add wrist AROM



# Finger: Syndactyly Release

## Surgical Release of the Skin and Underlying Soft Tissue



# Post Op Therapy: Finger Syndactyly Release

## 2 weeks post op

- Soft dressings removed
- Fit with an elastomere spacer to maintain web space
- Finger A/ AAROM
- Grasp / release activities
- Scar massage

## 4-6 weeks post op

- Web space splint at night an additional 2 weeks
- Grip strengthening / fine motor / spherical grasp activities

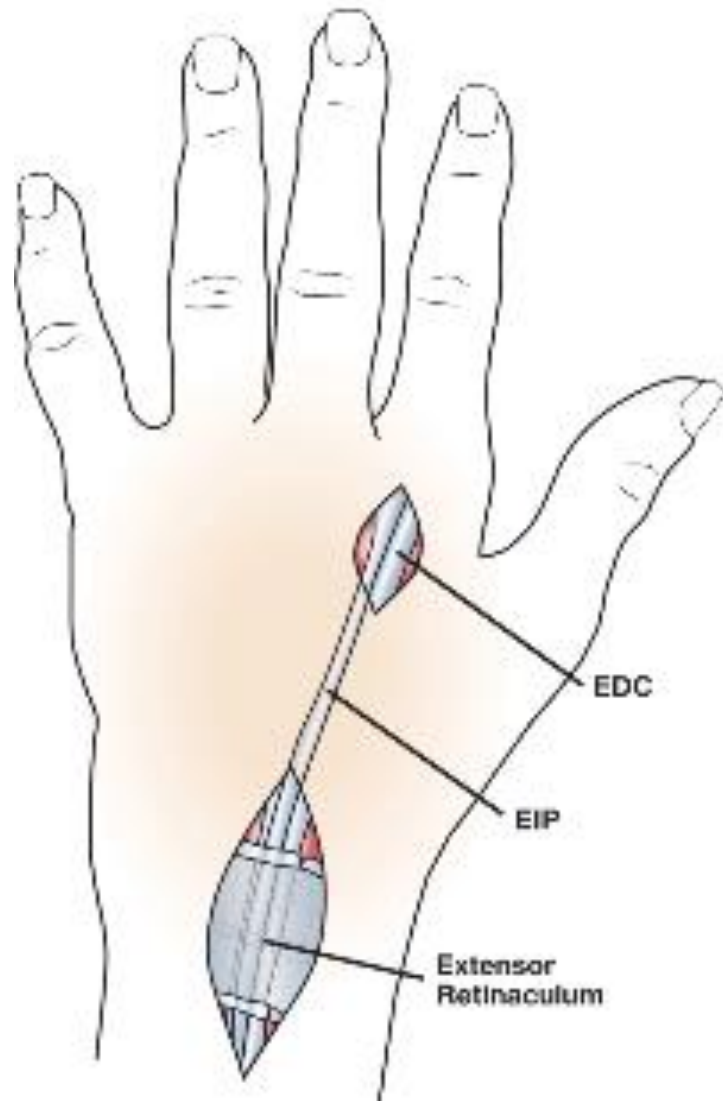
# Thumb Webbing

## First Web Release



# Tendon Transfer for Thumb Extension

## EIP to EPB (or EPL)



# Post Op Therapy: Tendon Transfer for Thumb Extension EIP to EPB (or EPL)

## **4 weeks post op**

- Cast removal, fit forearm based thumb abduction splint
- AROM wrist/fingers and thumb
- No forced thumb flexion

## **6 weeks post op**

- Add gentle AA/PROM thumb extension
- Wean out of splint at home

## **8-12 weeks post op**

- Day splint protection only
- Night splint to maintain web space up to 6 months
- Progress strengthening

# Thank you for your attention!





# References

- James MA, Millar KL, Manske MC, Van Heest AE. Posterior Elbow Capsulotomy and Triceps Lengthening for Elbow Extension Contracture in Children with Arthrogryposis Multiplex Congenita. *JBJS Essent Surg Tech*. 2020 Feb 13;10(1):e0030.1-8. doi: 10.2106/JBJS.ST.19.00030. PMID: 32368405; PMCID: PMC7161729.
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- Ann Van Heest : Arthrogryposis Presentation 2017 University of Minnesota
- Mary Beck OTR/L: Treatment recommendations from the Paley Institute [Homepage - Paley Orthopedic & Spine Institute \(paleyinstitute.org\)](http://paleyinstitute.org)

