Thumb Carpometacarpal (CMC) Arthritis

What’s New?

Amy L. Ladd MD

Professor & Chief, Chase Hand Center
Department of Orthopaedic Surgery
Assistant Dean, Stanford School of Medicine

2014 COA Annual Meeting 1 June 2014
Disclosures

- **Related**
  - Funding
    - NIH RO1 2011-16
    - NIH SBIR 1,2 2005-08, 2009-11
    - OREF/RJOS/DePuy 2010
    - ASSH Resident seed grant 2011
    - Williams Foundation 2009-12
    - Packard Children’s Health Initiative 2008-09
  - Royalties & Stock options- Extremity Medical, Articulinx
  - CORR Guest Editor, Thumb CMC Symposium 2014

- **Unrelated**
  - Royalties - OrthoHelix
  - Stock, stock options - OsteoSpring, Illuminoss
  - RJOS President 2013-14
  - Assistant Dean of Medical Advising
The Paradox of the Thumb

Functional demands require Stability and Mobility
What’s Not New?
What is status quo?

What’s New?
What’s the update?
Genetics - Status quo

- Caucasian female > everyone else
- Post-menopausal
Matrilin-3 (MATN3) gene mutation

- Scaphotrapezial arthritis (STT) > CMC
- Noncollagenous cartilage extracellular matrix protein: Von Willebrand, multiple epiphyseal dysplasia
  - **Eliasson et al J Scand Rheum 2006 - Icelandic population**

Relaxin

- induces matrix metalloprotease (MMPs) in pregnancy and pathology – RA and OA
Various studies:

- Predominantly female, post-menopausal
- Incidence 6:1 up to 12:1
- Surgical rate: 4:1
- Surgical age ~60
Age and sex - **What’s New?**

*Normalizing effect with age*

- Men approach women in incidence of OA
  - 2321 distal radius x-rays
  - 85% both sexes age 71-80
  - Age > 91: 100% women, 93% men

*Becker, Briet, Hageman, Ring: Death, taxes, and trapeziometacarpal arthrosis, CORR 2014*
Laxity - status quo

- Beighton scale ligamentous laxity favors women
- Ehler-Danlos
  - *Gamble, Mochizuki, Rinsky, JHS 1989*

Figure 1. Beighton’s modification of the Carter and Wilkinson scoring system. Give yourself 1 point for each of the manoeuvres you can do, up to a maximum of 9 points.
Stability - status quo

- The anterior oblique ligament (AOL) is the primary stabilizing ligament of the CMC joint
  - Pellegrini, Littler, Bettinger, etc. many studies

Bettinger JHS 1999
Ligaments - What’s New?

Ligament stability is part structure and part proprioception.
Non-arthritic

Dorsal ligament complex

Stout and cellular
Dense, organized collagen

Ladd, Lee, Hagert: JBJS 2012
Zhang, Hagert, van Nortwick, Ladd, JWS 2013
Normal Mechanoreceptors

Richly innervated

- Ruffini fibers – slowly adapting
- Pacini corpuscles – rapidly adapting
- Free nerve endings
Normal

Volar ligament complex
Thin and hypocellular disorganized collagen

Ladd, Lee, Hagert: JBJS 2012
Zhang, Hagert, van Nortwick, Ladd ASSH 2011, JWS 2013
Volar ligaments - proprioception

“Normal” state – few mechanoreceptors
Poorly innervated, hypocellular collagen
Functional demands - *status quo*

- Quasi-evidence of load and vocation/avocation
- Dental hygienists, dentists, surgeons . . . .
- BMI
Functional demands

What’s New?

Trapezium
An irregular surface.
Functional demands - What’s New?

pinch, grasp, and jar opening
CMC contact

pinch

grasp

jar opening

1 mm interbone distance contours
Mild arthritis
Preliminary results
Asymptomatic & Early OA

Younger (age ~ 25): male = female

Older (age ~54) : male = female

Younger ≠ Older

• Motion arcs

• Curvature
  • greater concave (radial-ulnar), less concave (volar-dorsal)

• Significant shape differences metacarpal & trapezium in OA

Halilaj, Moore, Laidlaw, Got, Weiss, Ladd, Crisco, J Biomech accepted
Inherent differences in morphology and motion are NOT due to sex differences

Halilaj, Moore, Laidlaw, Got, Weiss, Ladd, Crisco, J Biomech accepted
Comprehensive function

start of grasp
Status quo

How does it wear out?
Assumption: abnormal loading causes arthritis
What’s New?

How does it wear out?
Different wear patterns - different loading?

Three (3) types of degeneration

36 specimens
- 27 Female (75%)
- 9 male (25%)
- age 64 (33-76)

Intra-rater/Inter-rater reliability 0.97/0.95

Retained saddle – 47%

- Retains concavo-convex surface
- Partial eburnation
- Few osteophytes

Dish shape – 33%

A mortar and pestle

• Full eburnation
• Rimming osteophytes

Cirque – 19%

- Volar eroded concave facet
- Retained convexity dorsally
- - half a saddle
How best to diagnose & treat CMC arthritis?

- **X-rays**
- **Non-surgical treatment**
  - **Surgical options**
    - **Osteotomy**
      - **Fusion**
      - **Trapeziectomy**
    - **Implant**
X-rays - **Status quo**

*The Eaton-Littler remains the most commonly used classification*

Based on Kellgren and Lawrence – 1957 *(Ann Rheum Dis)*

- Hand, wrist, spine, hip, and knee
- Eaton & Littler – 1973 *(JBJS Am)*: CMC joint
- Eaton & Littler – 1987 *(Hand Clin)*: CMC and scaphotrapezial joint
X-rays - **What’s New?**

The Eaton-Littler is a poor indicator of clinical disease, not reproducible, and does not (currently) correlate to treatment options and indications.

But x-rays.

May have better correlation to clinical picture than we think
Stage 0 - no evidence of any arthritis.
Stage 1 - minimal joint narrowing (compared to adjacent joints), minimal contour changes, no debris, minimal or no subluxation.

(joint widening, < 1/3 subluxation – synovitis)
- joint narrowing, debris less than 2 mm, subchondral sclerosis, contour changes, +/- joint subluxation

- (≥1/3 subluxation, debris < 2mm volar or dorsal)
Marked narrowing or no joint space remaining, contour changes, +/- subluxation of joint, debris/osteophytes > 2 mm
(>1/3 subluxation, debris >2mm volar or dorsal, slight joint narrowing)
Subluxation: no correlation arthritis

Stage 3 + additional joints, including pantrapezial arthritis (advanced changes, subluxation, osteophyte rimming, sclerosis, cysts, other joints)
Flexor carpi radialis (FCR) tendinitis is most frequently related to:

- A) DeQuervains tenosynovitis
- B) Scapholunate advanced collapse
- C) Scaphoid fracture
- D) Scaphotrapezial arthrosis
- E) Carpal tunnel syndrome
Flexor carpi radialis (FCR) tendinitis is most frequently related to:

- A) DeQuervains tenosynovitis
- B) Scapholunate advanced collapse
- C) Scaphoid fracture
- D) Scaphotrapezial arthrosis
- E) Carpal tunnel syndrome


Status quo

Treatment
Treatment - Nonoperative

Splinting *(Swigart)*

- Pain relief and improved function *(Silva)*

Injections

Adaptive devices
Status quo

Trapeziectomy
Trapeziectomy

Number #1 surgical procedure in upper limb
Provides predictable pain relief

- Any variation you like: LRTI, anchovy, hematoma, etc
- AOL probably not what is reconstructed
A 65-year-old woman with a painful CMC joint has marked hyperextension that of the MP joint. In addition to trapezial excision and tendon interposition arthroplasty, an adjunctive procedure is:

A. Open carpal tunnel release
B. Thumb IP joint arthrodesis
C. Thumb MCP joint arthrodesis
D. EPB tenotomy
E. Volar capsulodesis of MCP joint of the thumb
A 65-year-old woman with a painful CMC joint has marked hyperextension that of the MP joint. In addition to trapezial excision and tendon interposition arthroplasty, an adjunctive procedure is:

A. Open carpal tunnel release
B. Thumb IP joint arthrodesis
C. Thumb MCP joint arthrodesis
D. EPB tenotomy
E. Volar capsulodesis of MCP joint of the thumb
What’s New?

Implants
Current state of CMC implants

Lessons to be learned from the big joints (ABJS 2012)

- Treatment stuck in the 1950s

Can we do better than this?
The thumb needs a strong base
SUMMARY

The Puzzle of the CMC Joint
What’s New?

- Sex differences < age differences
- Unknown, but important role of genetics
- Functional anatomy & proprioception – much to learn
- Younger patients’ increasing desire for strength
- Better implants with better science
Thank you