Complications of Tommy John Surgery
My tough complication and how I handled it

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Complications of TJ Surgery
I, John Conway MD, have relevant financial relationships to be discussed, directly or indirectly, referred to or illustrated with or without recognition within the presentation as follows:

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Complications
Approach
Graft harvest
Tunnel creation
Fixation
Adverse Occurrences

Approach
Medial ante-brachial cutaneous nerve injury
Up to 6 branches crossing the surgical site
Laceration
Sensory neuroma
Motor nerve injury in “safe zone”
Martin Gruber anastomosis
Many variations in local neuro-anatomy
Neural structures reported crossing within the “safe zone”
Dissection anterior or posterior to the “safe zone”
Flexor tendon origin injury

Graft Harvest
Palmaris longus tendon
Painful, hard scar at the wrist
Palmar sensory nerve injury and or neuroma
Median nerve injury
Gracilis tendon
Hematoma
Sensory nerve injury and or neuroma
Medial thigh pain

Tunnel Creation
Incorrectly placed, non-isometric tunnels
Twist drill verses Bur methods
Twist drills: Drill guides protect tissues when using twist drills and twist drills create consistent diameter, low heat tunnels
Burr: Sometimes more easily positioned for tunnel creation and allow variation in tunnel size based on graft size
**Tunnel Creation**

- Inadvertent ulnar nerve injury
- Retraction for drilling
- Twist drill nerve injury
- Suture nerve injury
- Bone bridge
- Narrow bridge increases fracture risk
- Intra-operative fracture
- Early and late post-operative fracture
- Distal single tunnel creation
- Posterior wall fracture
- Radius ulna articulation penetration

**Adverse Outcomes**

- **Ulnar nerve – early late**
  - Submuscular transposition
    - 21% UN complication, 13% required second surgery
  - Subcutaneous transposition
    - 1-9% UN complication, most transient
    - Fascia band restraints may increase risk for late UN complication
  - No transposition
    - 1-9% UN complication, most transient
    - 5% UN complication reported even with repair only

- **Flexor tendon**
  - Post-operative fibrosis or incomplete healing
  - Unrecognized associated conjoined flexor tendon injury

- **Graft failure**
  - Many factors
  - Tunnel placement
  - Graft tensioning
  - Elbow angle at fixation
  - Rehabilitation

**Fixation**

- **Suture complications**
  - Painful suture knot on proximal medial epicondyle
  - Suture cut through bone tunnels

- **Screw complications**
  - Graft size / tunnel size / screw size mismatch
  - Graft trauma
  - Tunnel fracture
    - Intra-operative
    - Post-operative

- **Adverse Outcomes**

  - **ME fracture**
    - TJ method (Schwartz et al AJR 2008)
    - Proximal screw method
  - Heterotopic ossification
    - Intra-ligamentous
    - Posterior capsular
    - Flexion loss
  - Joint contracture, Motion loss
  - Infection
  - Persistent elbow pain
  - Deep vein thrombus and pulmonary emboli
Avoiding Complications

Comprehensive evaluation
Avoid missed associated conditions
Protect the UN
Know the anatomy
Know your method
Get your tunnels right
Right location, wide bone bridges
Remove all bone from the tunnels and the surrounding soft tissues
Tension the graft at 60-70 degrees but then watch the graft through a full arc of motion before you get final fixation
Don't use fascia slings to keep the UN anterior

Avoiding Complications

Be sure that you are harvesting the tendon that you think you are harvesting
For the palmaris longus tendon
Always confirm the presence of the palmaris longus in pre-op holding for every MUCL reconstruction to be done with a palmaris longus tendon. Always use at least two incisions for harvest with the most proximal incision far enough proximal to see muscle on the tendon. Palpate the brachial radialis then palpate the palmaris longus. And be sure to move each finger to confirm that you are not looking at a finger flexor.
For the Gracilis tendon
Avoid crossing infra-patellar saphenous nerve injury
Confirm the location of both the gracilis tendon and the semitendinosus tendon before you mobilize the gracilis
Release all connecting bands under direct visualization

What to do if:

Persistent medial elbow pain over MUCL at 4 months postop
History Examination, rule out associated conditions (ulnar nerve, median nerve, conjoined tendon, posterior impingement, olecranon stress fracture, prominent knot)
Get x-rays to rule out tunnel stress fracture, heterotopic ossification
Hold throwing for 4-6 weeks
Continue return to throw rehabilitation
Treat associated conditions (i.e. Ulnar nerve glide and release exercise, etc.)
Most will be pain free by 5-6 months

Persistent medial elbow pain over MUCL at 6 months postop
Get MRI with thin sections, Gad contrast and UCL alignment sequences
Consider US directed PRP injection if you believe the pain is ligament pain
Then hold for 8 weeks and re-evaluated.
Return to throw if pain free
Consider revision surgery if not pain free

Persistent medial elbow pain not over the MUCL at 4-6 months postop
History Examination, make the diagnosis
UN neuropathy
Median nerve neuropathy
Conjoined tendinopathy
Posterior impingement
Olecranon stress fracture
Prominent suture knot
Treat the problem
Late presentation postop ulnar nerve neuropathy

History Examination, rule out TOS
EMG/NCV to specifically evaluate TOS and UN with above segment / below segment UN NCV and comparison contralateral above segment / below segment UN NCV plus short segment NCV
Treat with night splint and ulnar nerve neuro-glide and release exercises if electrodiagnostic tests show minor findings
Treat with UN transposition (or revision UN transposition) utilizing subcutaneous pocket stabilization (and extended nerve mobilization from the Arcade of Struthers proximally through the deep flexor pronator retinaculum distally) if electrodiagnostic tests show major findings or the thrower fails to improve with rehabilitation.
NO crossing fascia slings!

Sublime tubercle bone bridge fracture (intra-operative)

Convert from two-point distal tunnel fixation to a one-point distal tunnel fixation method distally and then Dock proximally
Distal One-Point fixation options
Distal docking – drill diverging tunnels and tie over a lateral ulna bone bridge
Distal button (Endobutton, ZipLoop, TightRope, etc.)
Distal screw or screw and button – screw alone probably not the best option since the integrity of the sublime tubercle bone has been compromised
Graft management
Palmaris longus tendon – fold to create 3 or 4 bundle graft
Gracilis tendon – 2 bundle graft is sufficient
Distal Single Tunnel
Guide pin centered on medial ulna ridge and directed distal and posterior to the radius ulna articulation
Tunnel size dependent on fixation method but avoid graft-tunnel-screw size mismatch to prevent graft trauma

Sublime tubercle bone bridge fracture (post-operative)

Evaluate with X-rays, MRI, CT as needed
Consider custom molded removable splint and sling immobilization with bone growth stimulator for 4 weeks and reevaluate

Medial epicondyle fracture (intra-operative)

Most likely the result of superficial non-isometric tunnel placement, tunnels too large for the epicondyle or use of an interference screw
May be able to convert to a button fixation method, drill across the distal humerus and tie the sutures over a button on the lateral epicondyle
Manage the epicondyle fracture based on comminution

Medial epicondyle fracture (post-operative)

Most likely the result of superficial non-isometric tunnel placement, tunnels too large for the epicondyle or use of an interference screw
Evaluate with X-rays, MRI, CT as needed
Consider custom molded removable splint and sling immobilization with bone growth stimulator for 4 weeks and reevaluated
May be amenable to cannulated screw fixation but beware graft trauma

Screws break

Convert to button single tunnel fixation
The tension isn’t right in the graft after tunnel and graft placement

Reevaluate the choices for tunnel location
Two-point ulna tunnels should be centered on the medial ulna ridge
One-point ulna tunnel should be directly on the medial ulna ridge
Medial epicondyle tunnel should be anterior distal and within the deeper fibers of the ligament
May be possible to shift tunnels to more isometric location and then contour a small piece of bone from the medial ulna cortex slide into the tunnel and maintain the graft in an appropriate location
The graft should be tensioned at 60-70 degrees of flexion as this will allow for the greatest accommodation of non-isometric tunnel position – but be sure that the graft will not be overly tight in either flexion or extension or the graft will fail on motion recovery post-op

Joint contracture

Consider causes: delayed or ineffective rehabilitation, hemarthrosis and organizing intra-articular arthrosis, occult median nerve or ulnar nerve peri-neural fibrosis and painful neural tether, improperly placed or tensioned graft
Evaluate with X-rays, MRI with contrast and UCL sequences, CT, EMG/NCV
Treat based on cause of motion loss
Arthrosis – arthroscopy and debridement at 3-6 months
Peri-neural fibrosis – nerve decompression or transposition if fails to improve with nerve glide and release rehabilitation
Posterior medial capsule heterotopic ossification – typically only limits flexion and should be excised at 3 months post-op

My Tough Complication #1
Ulna Bridge Fracture

My Tough Complication #2
Posterior Capsule Heterotopic Ossification and Joint Contracture

Thank you