



# **The Management of Lateral Elbow Tendinopathy (LET)**

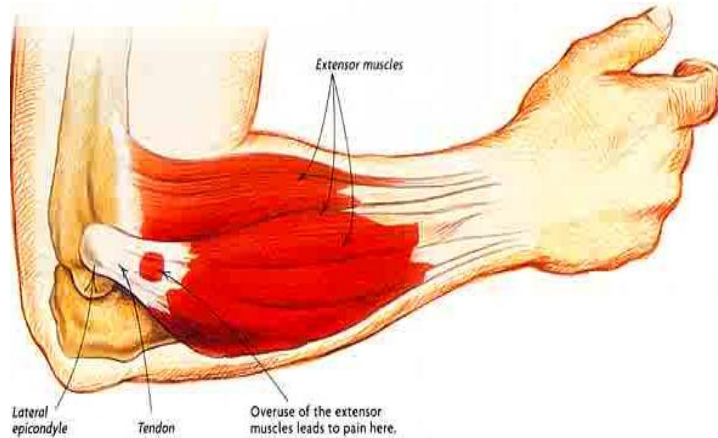
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# What is LET?



- Pathology at the common extensor origin (lateral epicondyle)
- ECRB tendon involved (Also EDC 30%)
- 1-3% with equal prevalence between sexes
- Dominant arm more involved (2:1)
- Peak incidence in the fourth decade
- More prevalent in occupation (70%) as compared to sports



# Treatment Summary (Acute)

## Survey results....

| Treatment                                  | Effectiveness |
|--|---------------|
| Education (rest and activity modification) | 1             |
| Home Exercise Program                      | 2             |
| Stretch                                    | 3             |
| Wrist Brace and Counterforce Brace         | 4             |
| Education (ergonomic adjustments)          | 5             |
| Education (risk factors)                   | 6             |
| Postural Retraining                        | 7             |
| Iontophoresis                              | 8             |

Adapted from MacDermid et al (2010), JHT



# Treatment Summary (Acute)

## Survey results....

| Treatment                   | Effectiveness |
|-----------------------------|---------------|
| Education (pain management) | 9             |
| Education (posture)         | 10            |
| Massage                     | 11            |
| Ice                         | 12            |
| Deep Transverse Friction    | 13            |
| Myofascial Release          | 14            |
| Wrist Brace                 | 15            |
| Ultrasound                  | 20            |

Adapted from MacDermid et al (2010), JHT



# Treatment Summary (Chronic)

## Survey results....

| Treatment                                  | Effectiveness |
|--|---------------|
| Home Exercise Program                      | 1             |
| Stretch                                    | 2             |
| Education (rest and activity modification) | 3             |
| Education (ergonomic modification)         | 4             |
| Strength                                   | 5             |
| Education (risk factors)                   | 6             |
| Postural Retraining                        | 7             |
| Education (Posture)                        | 8             |

Adapted from MacDermid et al (2010), JHT



# Treatment Summary (Chronic)

## Survey results....

| Treatment                          | Effectiveness |
|------------------------------------|---------------|
| Wrist Brace and Counterforce Brace | 9             |
| Massage                            | 10            |
| Education (pain management)        | 11            |
| Ice                                | 12            |
| Deep Transverse Friction           | 13            |
| Heat                               | 14            |
| Other                              | 15            |
| Ultrasound                         | 24            |

Adapted from MacDermid et al (2010), JHT



## Today's talk

- Literature review for LE:  
splints and ecc/ conc exercise
- Best practice guidelines
- What changes we would now make to our practice!



# Orthoses literature review

| Database platform       | Databases used | Year range  | Search Term used  | Articles found |
|-------------------------|----------------|-------------|---|----------------|
| Electronic OVID & EBSCO | Medline        | 1996 - 2010 | Tennis elbow OR lateral epicondy\$ OR humeral epicondy\$ OR radial epicondy\$ OR elbow tendin\$ OR lateral elbow pain<br><br>AND brace OR splint OR bandage OR splint | 29             |
|                         | CINAHL         |             | As above  | 21             |
|                         | Cochrane       |             | As above  | 2              |





# Inclusion/ Exclusion criteria

- Included:
  - RCT's and prospective studies
  - comparing some form of brace to another form of brace or other intervention
- Excluded:
  - Not in English
  - Non- original research
  - Post-operative patients
  - Theoretical studies
  - Dynamic braces
  - Biomechanical papers



# Relevant Literature - Orthoses

| Author, year             | Design                            | Group  | Splinting duration                                     | Measurements                     | Outcome measures  | Outcomes   |
|--------------------------|-----------------------------------|--|--|----------------------------------|---|--|
| Altan et al 2008         | Random design<br>No control group | 50 patients<br><br>1) Rehband Lat epi bandage<br><br>2) Rehband Wrist splint<br>15-20 degrees DF | 6 weeks  | Baseline<br>2 weeks<br>6 weeks   | VAS at rest/ movement<br><br>Sensitivity Algometer score<br><br>Grip strength (JAMAR)<br><br>Subjective evaluation of response to treatment                   | Grp 1- weeks 2 improvement pain rating, weeks 6 all parameters were improved<br>Gr2- 2 weeks all measures except algometric sensitivity improved. Week 6 all groups improved<br>Results: Grp 2 reported less resting pain at 2 weeks otherwise similar |
| Van de Streek et al 2004 | Random<br>No control              | 43 patients<br><br>1) Forearm band<br>2) Thamert forearm / hand splint                           | 6 weeks  | Baseline<br>6 weeks              | PRFEQ<br><br>Max grip strength /<br><br>VAS   | Both groups showed improvement for grip strength and PRFEQ. No statistically significant differences between groups  |
| Struijs et al 2004       | Randomised<br>Clinical Trial      | 180 patients<br><br>• PT (u/s friction massage + ex)<br>• CFB only<br>• Combination              | 6 weeks intervention<br><br>9 sessions of treatment PT | Baseline<br>26 weeks<br>52 weeks | 3X pt rated success scales<br><br>PFF questionnaire<br><br>Inconvenience during ADL's scale<br><br>Pain free and Max Grip Strength<br><br>Pressure Pain at LE | Grp A- sig pain reduction + satisfaction<br><br>Grp B- sig change in ability in ADL's and less inconven<br>Other results insignificant.<br><br>Grp C- superior to brace only for the short term<br><br>No stat sig dif at 26 or 52 weeks               |
| Oznur et al 2008         | RCT blinded                       | 58 patients<br>1) Brace + ex<br>2) u/s + ex + HP<br>3) LLT + ex + HP                             | 2 weeks  | Baseline<br>2 weeks<br>6 weeks   | Grip strength<br>VAS  | Brace has shorter beneficial effect than LLLT and U/s in reducing pain. LLLT is more effective than brace or U/s in improving grip strength  |

PRFEQ = Patient rated forearm Evaluationh Questionnaire  
CFB+ counter force brace  
LLLT\_ low level laser therapy  
U/s = ultrasound  
HP- Hot pack



## Best 4 References: Orthoses

- **The Short-term Efficacy of Laser, Brace, and Ultrasound Treatment in Lateral Epicondylitis: A Prospective, randomized, Controlled Trial.** *Oznur et al. Journal of Hand therapy January-March 2008 pages 63- 68*
- **Conservative Treatment of Lateral Epicondylitis: Brace Versus Physical Therapy or a combination of Both- A RCT.** *Struijs et al. Am J Sports Med 2004; 32; 462.*
- **Conservative treatment of lateral epicondylitis: comparison of two different orthotic devices.** *L Altan et al. Clinical Rheumatology (2008) 27: 1015-1019*
- **The effect of a forearm/ hand splint compared with an elbow band as a treatment for lateral epicondylitis.**  
*Van De Streek et al. Prosthetics and Orthotic International 28(2): 183-9, 2004 Aug*



## The Proximal Forearm Strap (PFS)



- Circumferential non-articular strap positioned over the proximal forearm with pressure overlying the common extensor origin
- **Also known as:**  
tennis elbow / counterforce / forearm brace



## Wrist Splint

- Reduce extensor muscle activity and maximal grip force





# Struijs et al 2004

| Study Characteristics  | Outcome Measures                           |                                       | Results  | Problems with study  |
|--|--|---------------------------------------|--|--|
| <p>Randomised<br/>No Control Group</p> <p>3 groups:</p> <p>Grp A) PT<br/>Grp B) CFB only<br/>Grp C) CFB + PT</p> <p>6 wks intervention<br/>9 PT sessions</p> | <p>3 X patient rated scales of success</p> | <p>Base-line<br/>2 wks<br/>56 wks</p> | <p>Grp A- sig pain reduction + sat</p> <p>Grp B- sig change in ability in ADL's and less inconvenience</p> <p>Other results insig</p> <p>Grp C- superior to brace only for the short term</p> <p>No stat sig dif at 26 or 52 weeks</p> | <p>Other treatments in follow up (20%)</p> <p>Anyone who deteriorated was removed from study</p> <p>Outcome measures</p> <p>No Control Grp</p> <p>No gender data</p> <p>Ex compliance?</p> |

- **Conservative Treatment of Lateral Epicondylitis:**
- **Brace Versus Physical Therapy or a combination of Both- A RCT.**
- *Struijs et al. Am J Sports Med 2004; 32; 462.*



## Oznur et al 2008

| Study Characteristics  | Outcome Measures                           |                                      | Results   | Problems with Study  |
|--|--|--------------------------------------|---|--|
| <p>Prospective RCT<br/>Assessor blinded<br/>(49F, 9M)</p> <p>3 groups:</p> <ol style="list-style-type: none"> <li>1. Brace only (20)</li> <li>2. Ultrasound and hot pack (19)</li> <li>3. LLLT and hot pack (20)</li> </ol> <p>2 weeks bracing</p> | <p>6 point scale of global improvement</p> | <p>Base-line<br/>2 wks<br/>6 wks</p> | <p>VAS -improved in all groups after treatment but deteriorated for the brace group after they ceased using it (as did 6 pt scale)</p> <p>All treatments well tolerated and no one deteriorated</p> | <p>Small study</p> <p>No long term follow up</p> <p>No ADL's evaluation</p> <p>Inclusion of exercises- could have contributed to results</p> |

**The Short-term Efficacy of Laser, Brace, and Ultrasound Treatment in Lateral Epicondylitis: A Prospective RCT. Oznur et al 2008 Turkey**



## Altan et al 2008

| Study Characteristics   | Outcome Measures   |  | Results  | Problems with Study     |
|---|--|--|--|-------------------------|
| <p>Random design</p> <p>50 patients<br/>(7 M, 43F)</p> <p>1) Rehband Lat epi bandage</p> <p>2) Rehband Wrist splint 15-20 degrees DF</p> <p>6 wks splinting</p> | <p>VAS at rest/movement</p> <p>Sensitivity Algometer score (LE)</p> <p>Grip strength (position not specified)</p> <p>Subj eval of response to Rx</p> | <p>Base-line</p> <p>2 wks</p> <p>6 wks</p> | <p>Grp 1- week 2 improvement pain rating, week 6 all parameters were improved</p> <p>Gr2- 2 weeks all measures except algometric sensitivity were improved. Wk 6 all measures improved</p> <p>2 weeks Grp 2 reported less resting pain. Otherwise ISQ.</p> | <p>No control group</p> |

**Conservative treatment of lateral epicondylitis: comparison of two different orthotic devices. L Altan et al Clin Rheumatol (2008) 27: 1015-1019.**





## Van de Streek et al 2004

| Study Characteristics   | Outcome Measures   |                               | Results   | Problems with Study   |
|---|--|-------------------------------|---|---|
| <p>Random<br/>43 pts</p> <p>1) CFB (20)</p> <p>2) Thamert forearm / hand splint (23)</p> <p>6 weeks splinting</p> | <p>PRFEQ</p> <p>Max Grip Strength (JAMAR)</p> <p>VAS - rest and gripping</p> | <p>Base-line</p> <p>6 wks</p> | <p>Both groups showed improvement for grip strength and PRFEQ over time.</p> <p>No statistically significant differences between groups</p> | <p>No control</p> <p>&lt; 20% scores missing on PRFEQ</p> <p>6 people didn't complete full splinting period</p> |

**The effect for forearm/hand splint compared with elbow band as a treatment for lateral epicondylitis. Van de Street et al. *Prosthetics and Orthotics International* 28: 2, 183-189.**



# Systematic Reviews

- **‘Orthotic devices for the treatment of tennis elbow’**  
*Cochrane review 2008 by Struijs et al*
- **The efficacy of splinting for Lateral Epicondylitis: A Systemic Review.** *Borkholder et al. Journal of Hand Therapy April- June 2004 pages 181-199*



## Systematic review

- Short follow up
- Lacked sample and power analyses
- Sample size
- Subject allocation
- reliability and validity of outcome measures
- Limited info re stat techniques used
- Splint physical characteristics
- handedness and functional capacity



## Summary

- CFB could help the ‘wait it out’ approach
  - » inexpensive + convenient Struijs et al
- CFB + PT is more effective at 6 weeks than PT alone Struijs et al
- long term no difference between brace +/- or PT Struijs et al
- CFB no better than u/s or laser Oznur et al
- CFB only works whilst worn Oznur et al
- No sig difference between wrist and CFB Altan et al
- CFB vs CFB/wrist splint combo no sig dif Van de Streek et al



## Exercise literature review

| Database platform       | Databases used | Year range  | Search Term used  | Articles found |
|-------------------------|----------------|-------------|---|----------------|
| Electronic OVID & EBSCO | Medline        | 1996 - 2010 | Tennis elbow or lateral epicondylitis or humeral epicondylitis or radial epicondylitis or elbow tendinitis or lateral elbow pain<br><br>Eccentric or concentric exercises | 4              |
|                         | EMBASE         |             |   | 6              |
|                         | CINAHL         |             |   | 4              |
|                         | Cochrane       |             |   | 12             |

### Included:

Randomised clinical trials and prospective studies if they compared some form of eccentric or concentric training to other interventions in the treatment of LE.

### Excluded:

Not written in English or did not contain original research



## Best references

- Svernlov B, Adolfsson L. Non-operative treatment regime including eccentric training for lateral humeral epicondylalgia. *Scand J Med Sci Sports* 2001;11:328 – 334.
- Stasinopoulos D, Stasinopoulos I. Comparison of effects of cyriax physiotherapy, a supervised exercise programme and polarized polychromatic non-coherent light (biopton light) for the treatment of lateral epicondylitis. *Clin Rehabil* 2006; 20:12 – 23.
- Croisier JL, Foidart-Dessalle M, Tinant F, Crielaard J, Forthomme B. An isokinetic eccentric programme for the management of chronic lateral epicondylar tendinopathy. *Br J Sports Med* 2007;41:269 – 275.
- Martinez-Silvestrini JA, Newcomer KL, Gay RE, Schaefer MP, Kortebein P, Arendt KW. Chronic lateral epicondylitis: Comparative effectiveness of a home exercise program including stretching alone versus stretching supplemented with eccentric or concentric strengthening. *J Hand Ther* 2005;18:411 – 419.
- Nagrle AV, Herd CR, Ganvir S, Ramteke G. Cyriax physiotherapy versus phonophoresis with supervised exercise in subjects with lateral epicondylalgia: a randomized clinical trial. *Journal of Manipulative Therapy*. 2009; 17:3:171 - 178.



# Svernlov & Adolfsson (2001)

| Study Characteristics   | Outcome Measures  |                                       | Results   | Problems   |
|---|---|---------------------------------------|---|--|
| <p>Randomised pilot study</p> <p><b>2 groups:</b></p> <ol style="list-style-type: none"> <li>1. Stretching (15)</li> <li>2. Eccentric exercises (15)</li> </ol> <p>Both groups = forearm bands during activity and wrist supports nightly</p> | <p>Pain</p> <p><b>Tests used:</b></p> <p>VAS</p> <p>Grip assessment</p> | <p>Initial</p> <p>3, 6, 12 months</p> | <p>Superior results in eccentric group at 12 months</p> | <p>? Natural progression of symptoms with time, and also effect of forearm band, wrist supports and warm up and static stretching in the eccentric group.</p> <p>Small sample size.</p> <p>No control group.</p> |

**Non-operative treatment regime including eccentric training for lateral humeral epicondylalgia.** Scand Jnrl of Med & Sc in Sports



# Martinex-Silvestrini et al (2005)

| Study Characteristics   | Outcome Measures   |                                | Results   | Problems  |
|---|--|--------------------------------|---|---|
| <p>Controlled study</p> <p><b>3 groups:</b></p> <ol style="list-style-type: none"> <li>1. Control group Stretching (26)</li> <li>2. Stretching and eccentric exercises (27)</li> <li>3. Stretching and concentric exercises (28)</li> </ol> | <p>Strength<br/>Pain<br/>Function</p> <p><b>Tests used:</b><br/>Pain free grip assessment<br/>PRFEQ<br/>DASH<br/>Short-form 36<br/>VAS</p> | <p>Initial<br/>6<br/>weeks</p> | <p>No statistical difference between 3 groups (all groups improved)</p> | <p>Relied on self recording (log)</p> <p>Patients were allowed to use counterforce brace if they wanted to</p> <p>Difficult to exclude benefits of icing, stretches</p> |

**Chronic Lateral Epicondylitis: Comparative Effectiveness Of A Home Exercise Program Including Stretching Alone Versus Stretching Supplemented With Eccentric Or Concentric Strengthening.** Jrnal of HT





## Croisier J et al (2007)

| Study Characteristics   | Outcome Measures   |  | Results   | Problems  |
|---|--|--|---|---|
| <p>Non-RCT.<br/>Matched grouping.</p> <p><b>2 groups:</b><br/>1. Control group (46)<br/>2. Eccentric group (46)</p> | <p>Change in disability status during occupational, spare time and sports activity.</p> <p><b>Tests used:</b><br/>VAS, Jamar Disability qu<br/>Ultrasound exam</p> | <p>Initial<br/>4 wks<br/>7 wks<br/>9 wks</p> | <p>In the eccentric group:<br/>Decrease pain, increase strength, positive change on U/S, reduced disability</p> | <p>Disability questionnaire not included in paper.<br/>Study over a short period of time.<br/>The researchers selected which patients went in which group – non-randomised.</p> |

An isokinetic eccentric programme for the management of chronic lateral epicondylar tendinopathy. British Journal of Sports Medicine.



# Stasinopoulos & Stasinopoulos (2005)

| Study Characteristics   | Outcome Measures   |   | Results   | Problems  |
|---|--|---|---|---|
| <p>Non R.C.T.<br/> <b>3 groups:</b><br/>           1. Cyriax physiotherapy (25)<br/>           2. Exercise program (25)<br/>           3. Polarized polychromatic non-coherent light (25)</p> | <p>Pain and function</p> <p><b>Tests used:</b><br/>           VAS for pain and function<br/>           Pain free grip strength</p> | <p>0, week<br/>           4, week<br/>           8, week<br/>           16 and week<br/>           28</p> | <p>Supervised exercise program produced the greatest effect at all points of Ax</p> | <p>Not a randomised trial.<br/>           Pts may be receiving treatment or analgesic medication independent of this trial. Query the effects of stretching on the eccentric group.</p> |

Comparison of effects of Cyriax physiotherapy, a supervised exercise programme and polarized polychromatic non-coherent light (Biopton light) for the treatment of lateral epicondylitis. Clinical Rehabilitation.



## Nagrале et al (2009)

| Study Characteristics  | Outcome Measures  |                            | Results  | Problems   |
|--|---|----------------------------|--|--|
| <p>RCT</p> <p><b>2 groups:</b></p> <p>1. Cyriax physiotherapy (30)</p> <p>2. Control group = Phonophoresis with supervised exercise &amp; static stretching program (30)</p> | <p>Pain, grip strength and function</p> <p><b>Tests used:</b></p> <p>VAS</p> <p>Pain-free grip strength</p> <p>TEFS</p> | <p>0, wk 2, wk 4, wk 8</p> | <p>Cyriax physiotherapy produced the greatest effect at all points of Ax</p> | <p>All pts were provided with education re: ergonomics and activity modification (? If the pts would have improved with time)</p> <p>? Long-term effects</p> |

**Cyriax Physiotherapy versus Phonophoresis with Supervised exercise in subjects with lateral epicondylalgia: A Randomised Clinical Trial.** The Journal of Manual & Manipulative Therapy.



## In summary

- Eccentric training was effective
- Not clear whether painful or pain-free eccentric training is better
- Clinic-based exercises may be superior than home based exercises
- Need large RCT, with blinded Ax and extended follow-up periods.



# Relevant Literature

| Author, year               | Design                 | Group (sample size)  | Training protocol                      | Progress       | Pain during exercise | Length of study, follow-up (weeks) | Outcomes  | Difference at longest follow-up |
|----------------------------|------------------------|--|--|----------------|----------------------|------------------------------------|---|---------------------------------|
| Svernlöv, 2001             | Randomised pilot study | 1.Stretching (n = 15)<br>2.Eccentric training, stretching (n = 15)                       | 3 sets of 5 slowly twice daily         | Load           | No                   | 12, 52                             | VAS (pain), subjective change, maximum grip                         | Yes                             |
| Martinez-Silvestrini, 2005 | RCT                    | 1.Stretching (n = 28)<br>2.Concentric training (n = 26)<br>3.Eccentric training (n = 27) | 3 sets of 10 slowly once daily         | Load           | No                   | 0, 6                               | VAS (pain), pain free grip strength, patient satisfaction, function | No                              |
| Croisier, 2007             | Non- RCT               | 1.Physiotherapy (n = 46)<br>2.Eccentric training, physiotherapy (n =46)                  | 3 sets of 15 slowly three times weekly | Load and speed | No                   | 0, 4, 7, 9                         | VAS (pain), isokinetic strength, disability                         | Yes                             |
| Stasinopoulos 2005         | Non-RCT                | 1.Cyriax (n = 25)<br>2.PPNL (n = 25)<br>3.Eccentric training (n = 25)                    | 3 sets of 10 slowly three times weekly | Load           | Yes                  | 4, 28                              | VAS (pain, function), pain free grip strength                       | Yes                             |
| Nagrale, 2009              | RCT                    | 1.Cyriax (n =30 )<br>2.Phonophoresis with exercise (n = 30)                              | 3 times per week                       | Load           | Yes                  | 4                                  | VAS, pain free grip strength, tennis elbow function scale           | Yes                             |

PPNL = Polarized polychromatic non-coherent light  
Cyriax = deep transverse friction massage with Mill's manipulation



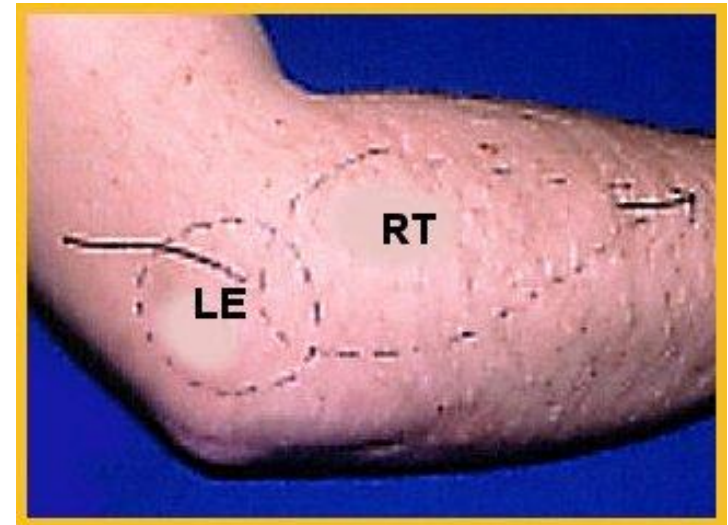
# Assessments



# Examination

## Presenting History:

- Patient's age
- Mechanism (sport / a/vocational)
- Aggravating Factors
- ?Symptom Duration (acute / chronic)
- Nature and Location of pain  
(?RTS ie. PIN)





# Examination

## Clinical:

- Pain on palpation of LE
- Grip Strength (PFG and Max)
- AROM (elbow and wrist)
- Resisted MF extension  
*(Maudsley's Test)*
- Resisted Wrist extension
- Cozen's Test
- Mills Sign
- Hand Shake Test







# Grip Strength Position

## Elbow Extension or Flexion

Normally  $G_{sE} > G_{sF}$  (*Kumar et al, 2008*)

In LET  $G_{sE} < G_{sF}$  ( $G_{sF}$  29% stronger)

$G_{sF}$  affected vs unaffected (69%)

$G_{sE}$  affected vs unaffected (50%)

## Therefore...

LET if 10% difference of  $G_{sF}$  to  $G_{sE}$

Sensitive (78%) and

Specific (90%)

(*Dorf et al, 2007*)





# Cozen's Test



**Psychometric  
properties?**

No studies found

Patient makes a fist, pronates and extends the wrist with RD (while examiner resists motion)



# Mill's Test



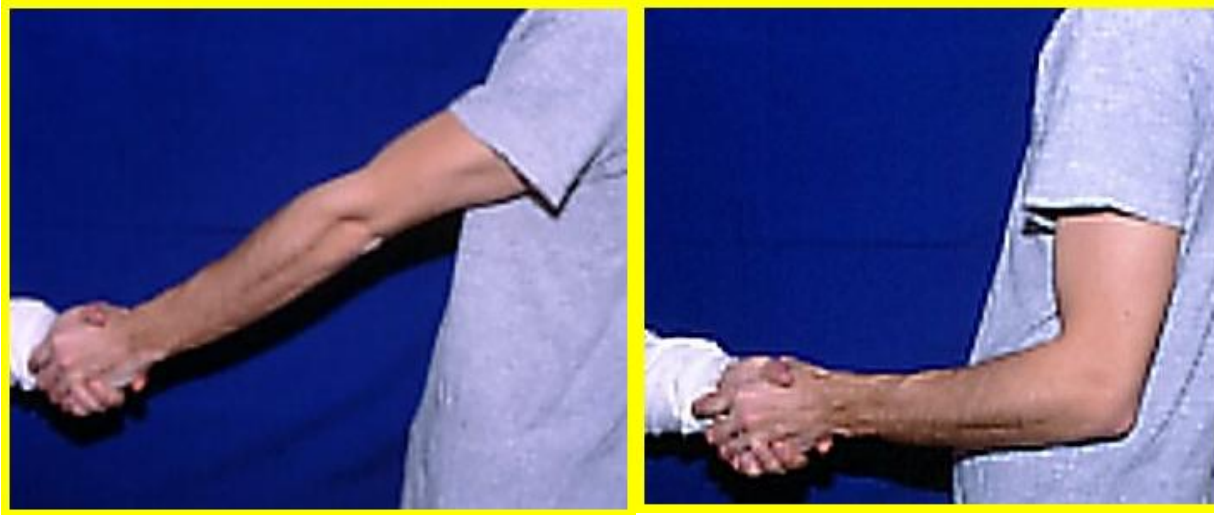
**Psychometric properties?**

No studies found

Elbow fully extended, forearm pronated and wrist flexed (*actively* by patient or *passively* by examiner)



# Hand Shake Test



**Psychometric  
properties?**

No studies found

Firm handshake with elbow extended and supinate  
against examiner resistance (repeat with elbow flexed)

*(Kraushaar & Nirschl, 1999)*



# Patient Rated TE Evaluation

Formerly the PRFE

Modelled off the PRWHE / PREE instruments

Self report scale of pain and function

Reliability: ICC 0.96

Validity (to DASH): 0.74

Sensitivity (ES): 1.0

*(Newcomer et al, 2005)*



# Diagnostic Tests and OMs

Survey results....

| Test                                | Frequency (%) |
|-------------------------------------|---------------|
| Palpation of common extensor origin | 89            |
| Grip with elbow flexed              | 80            |
| Resisted MF extension               | 76            |
| Pain NRS                            | 71            |
| Pain Free Grip (PFG)                | 59            |
| Patient Self report                 | 24            |
| Manual Muscle Testing               | 9             |

*(MacDermid et al, 2010)*

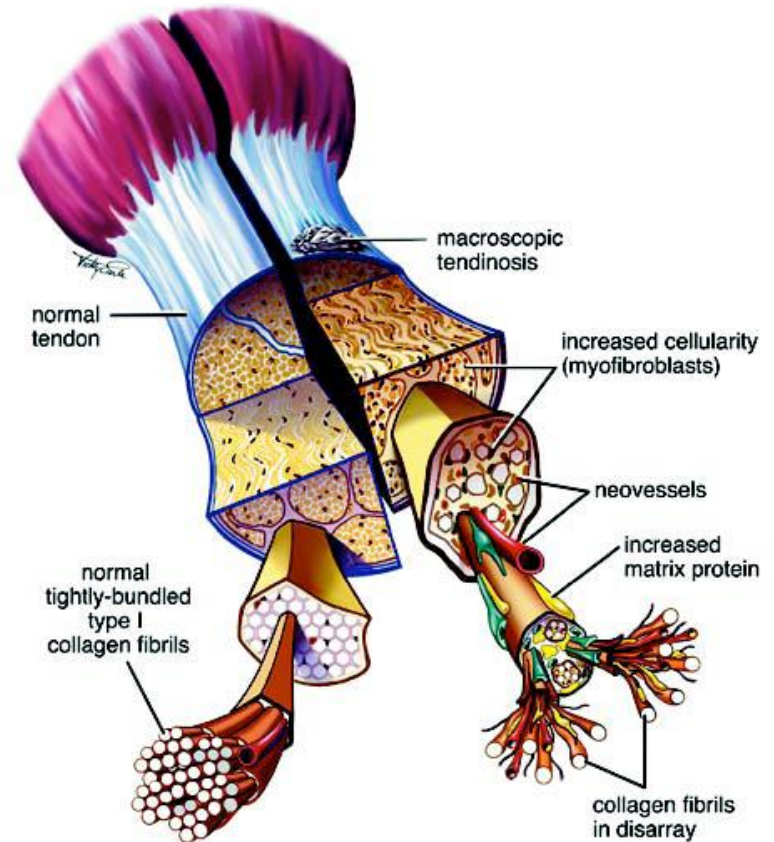


# Inflammatory or Degenerative?

## Pathology = Tendinosis

- Degenerative condition
- No evidence of inflammation
- Failed Tendon Healing =  
Angiofibroblastic Proliferation

*(Nirschl, 1999)*





# Previous Model of Tendinosis

## 1: Peritendinous inflammation

- Interventions to relieve inflammation

## 2: Angiofibroblastic Degeneration

- Interventions to facilitate healing and decrease pain; pain not due to inflammation

## 3: Further Degeneration / Rupture

- Surgery may be necessary

## 4: Fibrosis and Calcification

- Surgery indicated

*(Kraushaar & Nirschl, 1999) (Fedorczyk, 2002)*





# New model of Tendinopathy

## Normal Tendon

### 1: Reactive Tendinopathy

- Non inflammatory proliferative response in cell and matrix
- Collagen integrity maintained and no change in NV structures
- Tendon thickens

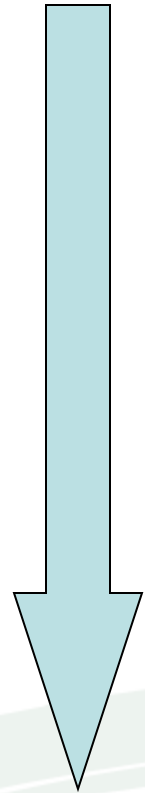
### 2: Tendon Dysrepair (Failed Healing)

- Breakdown of matrix and collagen
- Evidence of NV ingrowth
- Swollen tendon

### 3: Degenerative Tendinopathy

- Disordered matrix filled with NV vessels
- Little collagen and heterogeneous matrix
- Largely irreversible

(Cook & Purdham, 2009)





# Main Points

- Stimulus for movement along continuum is **load** (add / remove)
- Degenerative stage irreversible, eg. ex-elite athletes (*Kujala et al, 2005*), but can achieve improved pain and function through treatment
- Staging based on demographic presentation (not clinical)  
Younger (sports) = Reactive      Older (work / overuse) = Degenerative
- Standardised intervention to all cases of LET not appropriate.
- ?Dissociation between pathology and pain



# What about Pain?

Main feature clinicians seek to change and main progress marker for treatment success

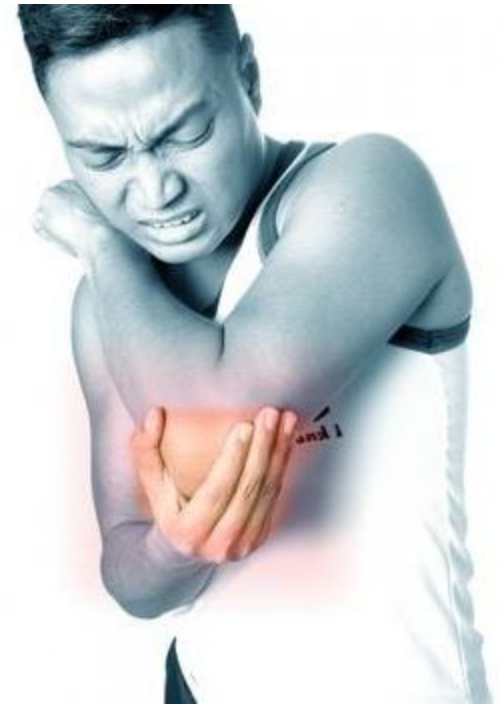
## Not....

- Inflammation
- Collagen microtears  
(97% ruptures in degenerative stage)

## Probably.....

- Vascular factors
- Biochemical factors

More likely with later tendinopathy stages but may be asymptomatic (eg. 2/3 of ruptures are asymptomatic)





# Treatment Modalities

Immobilisation, Ultrasound, Splinting (proximal brace and/or wrist brace), Laser, Education, Transverse Friction Massage, Electrotherapy, Oral NSAIDS, Topical NSAIDS, CSIs, Mobilisation, Botox, Extracorporeal Shock Wave Therapy, Ice, Stretching, Strengthening, Phonophoresis, Iontophoresis, Wait and See, Activity Modification, Elbow Joint Mobilisation, Cervical Spine mobilisation, Acupuncture, Myofascial Release, Ergonomic Adjustments, Autologous Blood Injection (ABI), GTN, etc, etc, etc....





# Rehabilitation

To provide **pain relief** and **functional recovery**

Cook & Purdham (2008) propose 2 distinct rehab groups.....

## 1) **Reactive (+ early dysrepair)**

Unloading & non-curative modalities

## 2) **Degenerative (+ late dysrepair)**

Progressive Reloading and curative modalities



# Reactive Group

## Rehab Principles

- Reduce pain
- Unload tendon (Load management)
- Facilitate tendon adaptation (inhibit reactivity of tenocytes)



# Reactive Group

## REDUCE PAIN

### **NSAIDs:**

*“Topical (and oral) NSAIDS may provide short term relief of pain although topical NSAIDS may be associated with fewer adverse effects.”*

(Cochrane review, Green et al, 2001)

- Retards tendon repair (*Ferry et al, 2007*)
- Ibuprofen preferred (no detrimental effect)

### **Corticosteroid Injections:**

*“Injection may be more effective than oral NSAID in the short term...”*

(Cochrane review, Green et al, 2001)

- Slows cell proliferation and collagen synthesis (not ideal in degenerative)



# Reactive Group

## **Iontophoresis:**

Dexamethasone Sodium Phosphate (4mg/1ml)

Dosage:

40mA minutes (4.0mA x 10 minutes) 2.5ml over painful area of LE

6 sessions (at 1-3 day intervals).

## Results:

RCT, 199 pts (inc Medial Elbow Tendinopathy)

Significant 2 days post Rx ,but Not Significant 1 month post Rx (pain)

*(Nirschl et al, 2003)*





# Reactive Group

## TENDON UNLOADING

### Education (inc. *Relative Rest & Activity Modification*):

- Unload (reduce load) – alter frequency, intensity, duration and type of load (**stress shielding**)
- Postural advice

### Splinting:

- Counterforce Brace and Wrist Brace (PRN)



# Degenerative Group

## Rehab Principles

- Reduce Pain
- Progressive reloading of muscle-tendon unit
- Facilitate tendon healing (collagen synthesis)
- Restore strength, endurance and flexibility



# Degenerative Group

## STRENGTHENING

- Commence once pain / irritability under control (?no resting pain)
- Improves tendon structure and pain (?4-6 weeks - ?100 days)
- Improves collagen production, alignment and cross linkage formation as well as matrix restructuring (in turn increases tensile strength)

2 factors to increase tendon strength:

- 1) High **Load** and
- 2) **Time** under tension (load)

*(Malliaras et al, 2008)*



# Degenerative Group

## Contraction Modes

| Contraction Type  | Load Capacity | When           | Advantages           | Disadvantages     |
|-------------------|---------------|----------------|----------------------|-------------------|
| Isometric         | High          | If too painful | Useful to start      | Not functional    |
| Eccentric         | Medium        | If not weak    | Hard to teach        | Not functional    |
| Concentric        | Low           | If weak        | Easy to Teach        | Not functional    |
| <b>Conc / Ecc</b> | Low           | Mostly         | <b>Easy to teach</b> | <b>Functional</b> |

### Test for weakness?

- Observe for wasting
- Test endurance (10 reps with 1.0kg dumbbell)

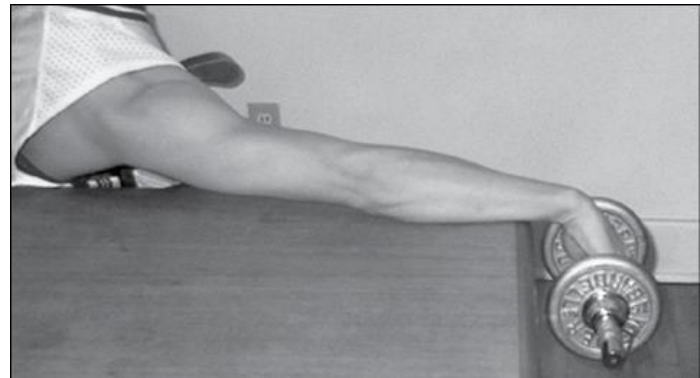


# Degenerative Group

## CONCENTRIC / ECCENTRIC LOADING

### Parameters:

- **Painfree** (not Painful) exercise
- Elbow **Flexed, then Extended**
- **Dumbbell** over Theraband
- **Slow** performance (6-10s per cycle)
- **Low repetitions** (8-10)
- **Increase load** (weight) NOT Speed
- Once per day to **3 times per week**
- **Supervised** over Unsupervised





# Degenerative Group

## Static Stretching:

- Prevents adaptive shortening of MTU
- Improves muscle length-tension relationship – ie. stronger and more load effective



## Parameters:

- Either group (reactive or degenerative) depending on MTU tightness
- 15-20 seconds, x 3-4 reps daily (*Solveborn, 1997*)
- 60-90 secs, x 3-4 repetitions daily (*McHugh & Cosgrave, 2010*)



# Degenerative Group

## POSSIBLE STRENGTHENING PROGRAMME

- Static Stretches 60-90 secs, 2 reps
- Isometric, 60-90 secs (elbow flexed +/- extended)
- Pronation / Supination (10 reps)
- Concentric / Eccentric (10 reps with elbow flexed +/- extended)
- Static Stretches 60-90 secs, 2 reps

**Performed once every 2 days**

Progress load if completing full set painfree



# Degenerative Group

## **Prolotherapy (Proliferative Injection Therapy):**

- *Autologous Blood Injection (ABI)*

Thought to trigger inflammatory cascade and healing by either:

- i) ?mediators in the blood itself or
- ii) the injection itself

No difference between ABI and Saline (*de Vos et al, 2010*)

- *High Volume Injections (HVI)* – 20-30mls saline

Developing Evidence





# Summary

- Poor evidence base for treatments (expert consensus reliance)
- Changing model of tendinopathy
  - treatment should reflect pathological stage
- Classification based on presentation (not clinical)
- Majority of clinical presentations in degenerative state
- Splinting and Exercise (strengthening) supported through research (weakly) and expert survey



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