# Exploring Patellofemoral Pain Mini Series

## Session Two: Myth Busting in Patellofemoral Pain - Feel Confident with Your Practice

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# Myth Busting In Patellofemoral Pain- Feel Confident with Your Practice.


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## Learning Outcomes

- Confidently discuss the vmo anatomy, recruitment and current theories on dysfunction.
- Discuss the infrapatellar fat pad and all its weird and wonderful features.
- Discuss current theories on tape in the treatment of PFP.

# Questions I regularly get asked:

- Is the VMO a separate entity?
- Should I use adduction, eg ball between knees?
- Does the VMO work throughout the whole of the range?
- Any others you would like to have answered?...

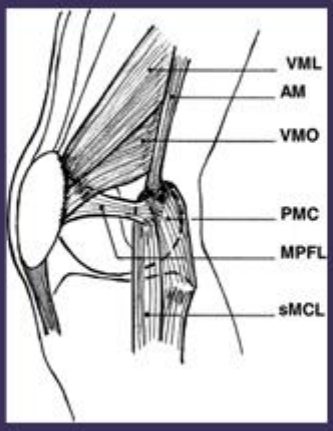
# Questions we need to explore:

- How does vmo impact on fine patella positioning?
- Lets look at anatomy and biomechanics to help.
- Let's underpin our rehab with science.

## Is the VMO a separate entity?

- Is the VMO a separate anatomical entity from the VML?
- Peeler(2005) says no.
- Ono (2005) argue:
  - Can distinguish between proximal and distal n. distribution.
  - Fascial plane exists between VMO and VML
  - Slight difference in fibre orientation
  - VMO part originates adductor magnus, VML adductor longus.

## Diagram of VMO and VML




- Look at the VMO originating lower off adductor magnus, and the VML off adductor longus.

## Surface marking-use adductors as landmarks

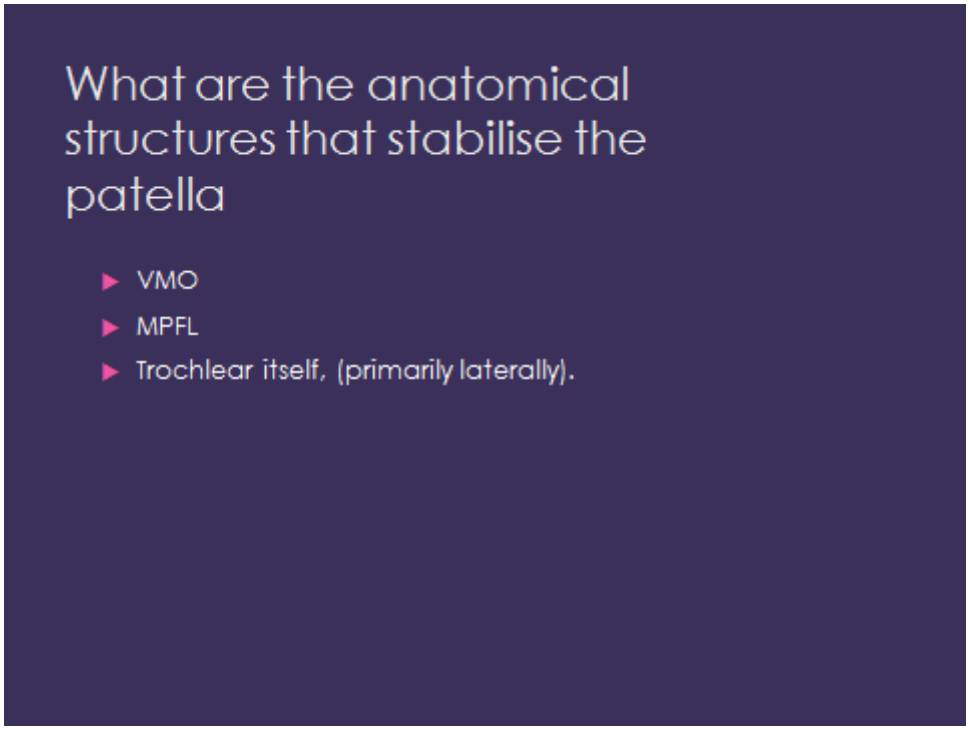

- Note how much superior the adductor longus is compared to adductor magnus.

## Biomechanics

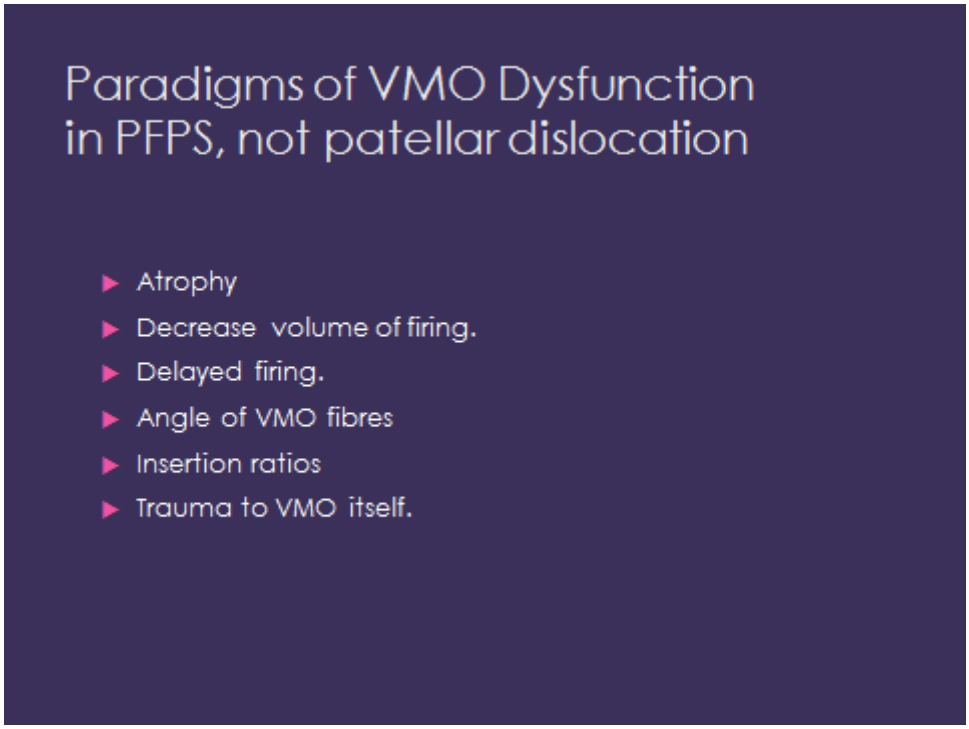
- Patella enters trochlear at 10 degrees F.
- Patella alta means it won't enter until 20-30 degrees.
- >30 degrees patella should be in depths of trochlear. Instability less common here and role of VMO and MPFL diminish.
- Therefore although the VMO does fire throughout range, its ability to alter PFJ contact pressures much more powerful in 0-30 F

- Patella alta is due to a long patella tendon. Although formally assessed on MRI the ratio of patella lendon length to patella length should be approximately 1:1 and you can get a feel for that by placing your fingers on either end of the patella, and also the tibial tuberosity.

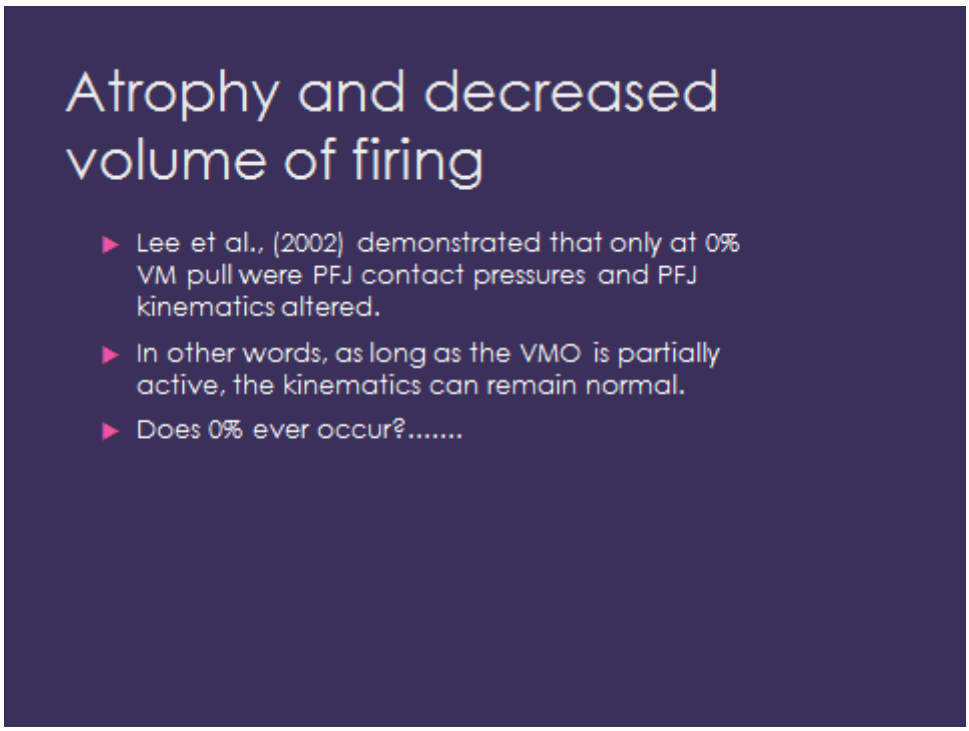

- If the bobsleigh enters the luge on the correct path then it is more likely to track correctly trough the whole range.



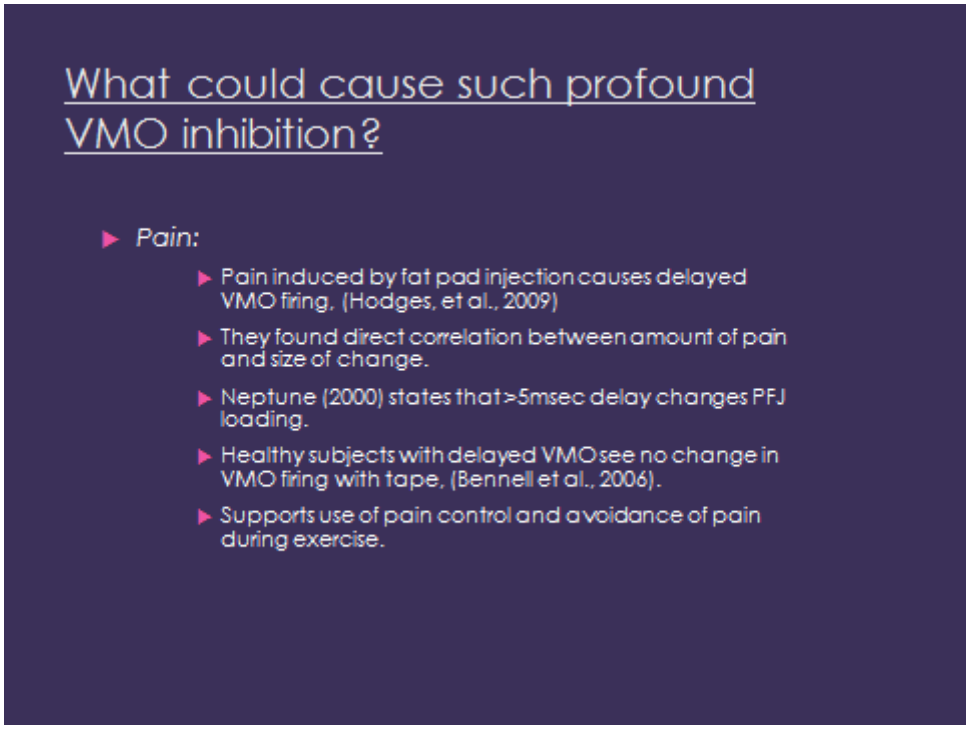

- If the MPFL is injured or the trochlea is shallow or with a flattened lateral inclination then the role of the VMO in stability is increased.



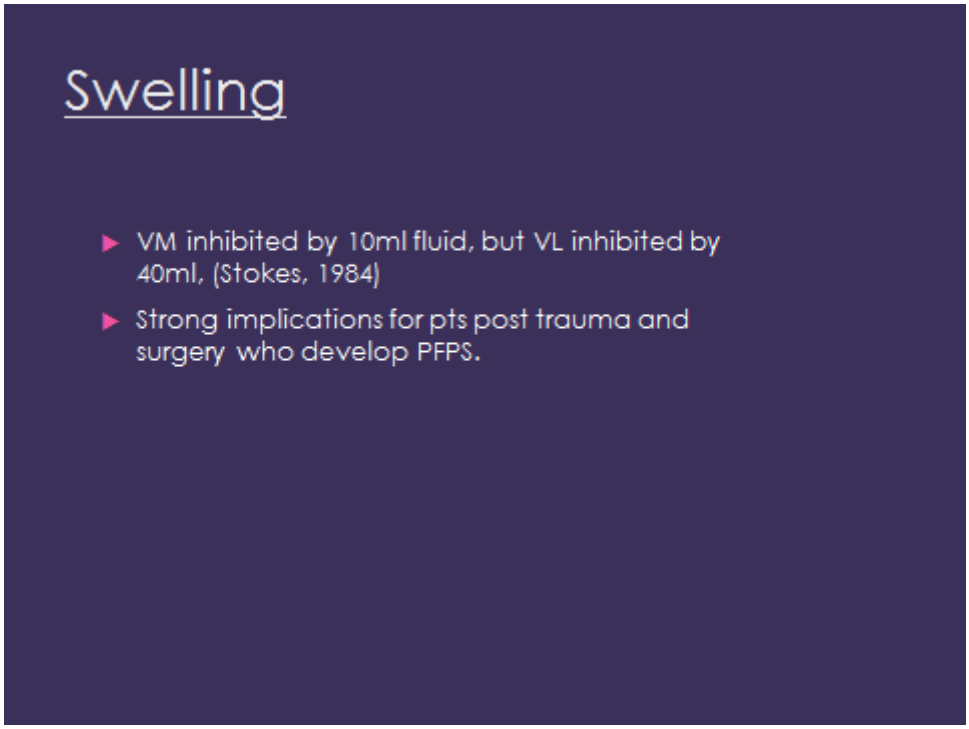

- There are many paradigms suggested over several decades with respect to the vmo. The volume of literature is not reflective of the importance of the vmo but simply the early interest in this field. Much of the early literature is now discounted.



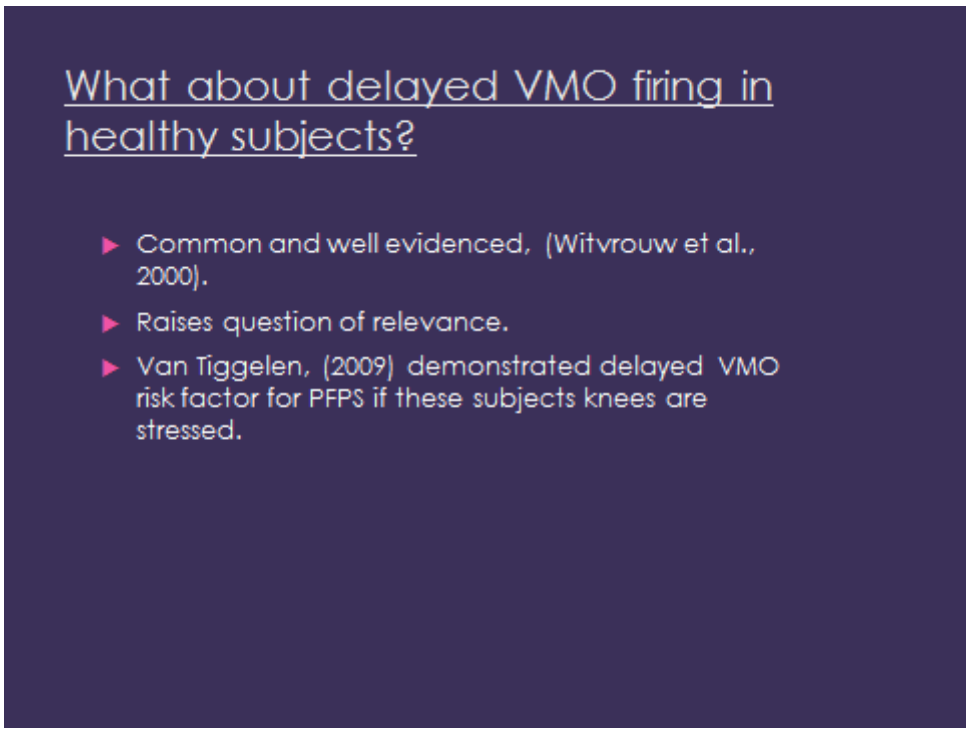

- Although only accurate with EMG, clinically the VMO can appear sluggish when the patient is asked to do a static quads contraction.




- Look out for the mention of a lot of pain in the history eg fall onto the knee or surgery.
- Consider times of day for exercises if pain varies throughout the day. Consider timing with analgesia and consider icing pre exercise for pain relief.




- Early but very valuable piece of research. Even a straight forwards arthroscopy is likely to create a small effusion and this can inhibit the vmo. Combined with other risk factors already there this may cause PFP.




- i.e. recruits with the most vmo delay were the first to develop PFP. Ie when combined with the pack, the running, boots etc the vmo delay becomes relevant.

## Fibre angle-The VMO work I am involved in:

- VMO fibre angle varies, 40-69° , mean 56.6° (Engelina et al., 2012).
- VMO fibre angle correlates with increasing activity, (Tegner score), (Benjafield et al., 2014)
- VMO fibre angle increases with training, (Khoshkoo et al., 2016)
- Maybe this is what we are achieving with our 'strength' work?
- This work is ongoing. Watch this space!

- In addition further unpublished work of ours shows:

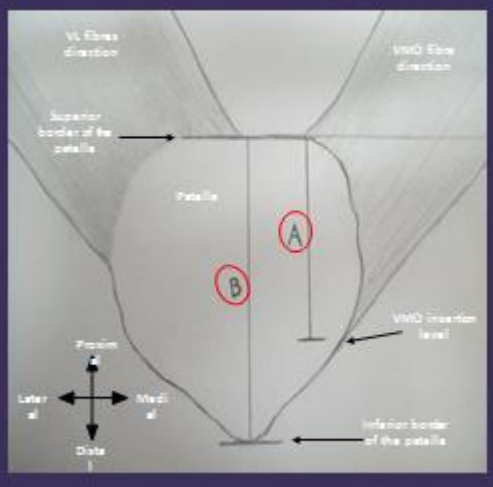
  1.Closed kinetic chain vs open have the same result.

  2. Closed chain with muscle stim had bigger architecture changes.

  3. The effect can be maintained with x2 exs x2 a week.

## Insertion ratio.

- VMO insertion ratio varies, 38.5-95.8%, mean 57.8% (Engelina et al., 2012).
- Hypothesis that some people have anatomically more favourable vmo than others.
- More proximal attachment in dislocators, (Koskinen and Kujala, 1992).

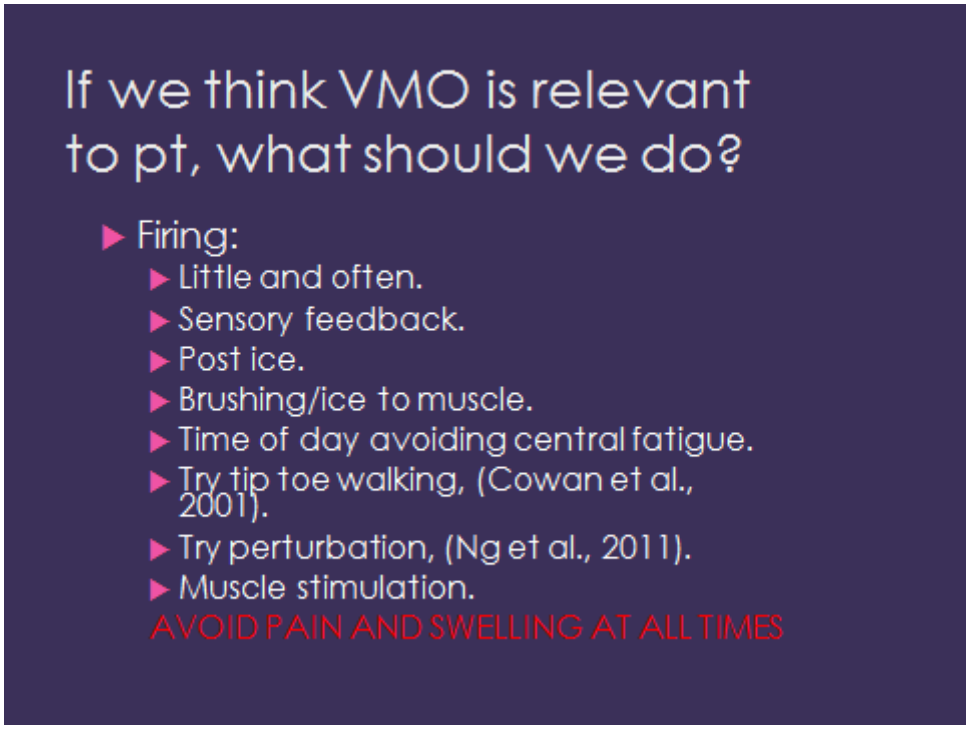


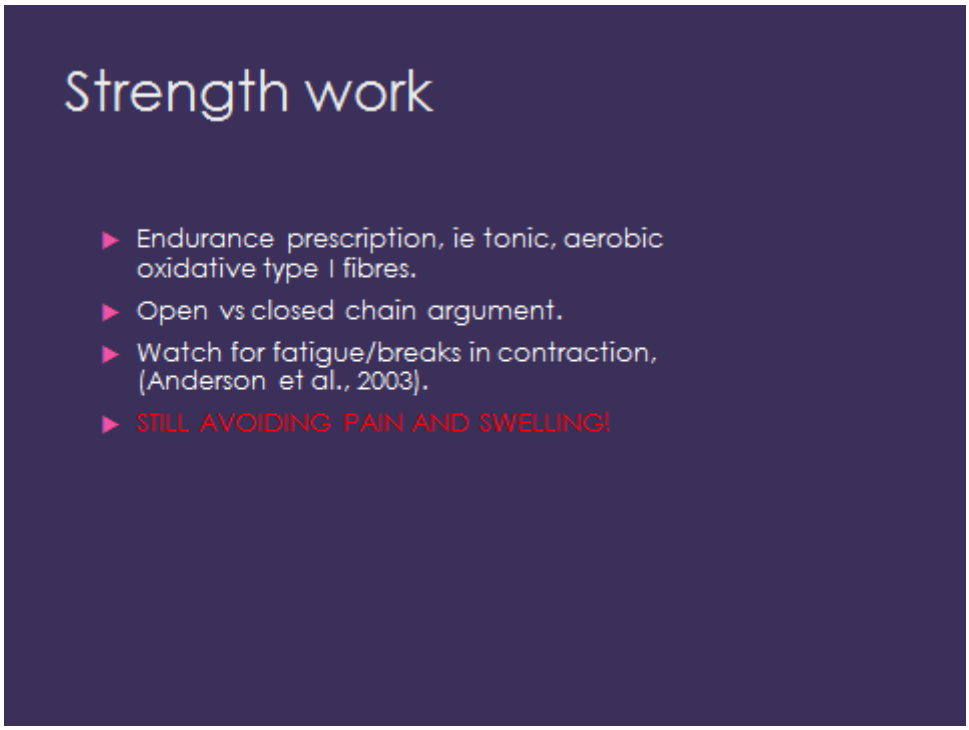

- Osteoarcheologists look at evidence of amount of muscle pull to ascertain how active ancient civilizations were.

## VMO summary infographic

## VMO trauma

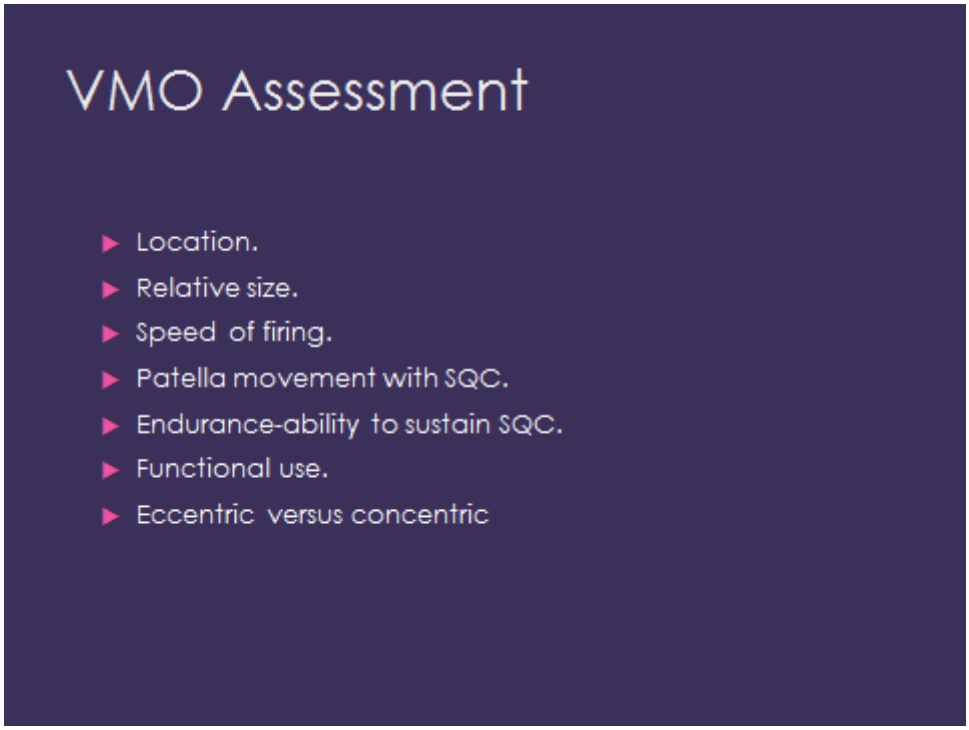
- Can occur on a spectrum
- If dislocation has occurred may get avulsion of VMO from adductor magnus and/or patella.
- Refer on if suspected




- Endurance is the ultimate goal but if atrophy considerable you should start with hypertrophy prescription.


- 'VMO bias' relates to sensory input eg Look at the muscle, touch the muscle, visualize etc.
- Reverse step downs bring in an eccentric component that is so often missing in stair descent when PFP is present.



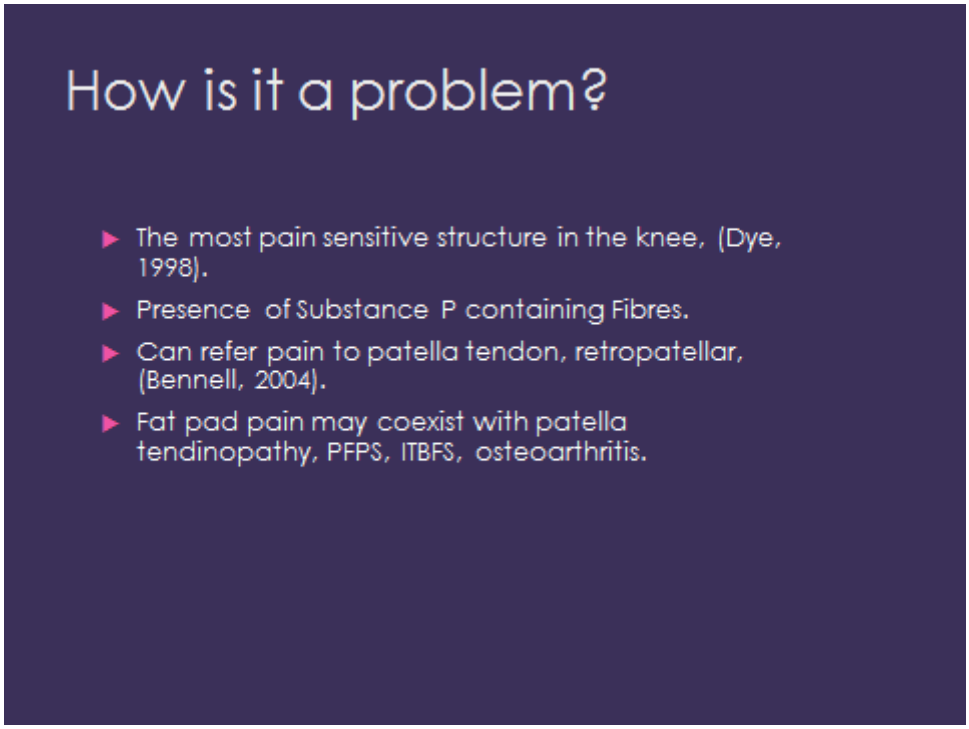

- Location-of particular interest is how distal does the VMO seem or is it very painful and vertical?
- NB Lateral movement of patella during a static quads contraction may implicate tight lateral structures or trochlea dysplasia.

# Myth 2

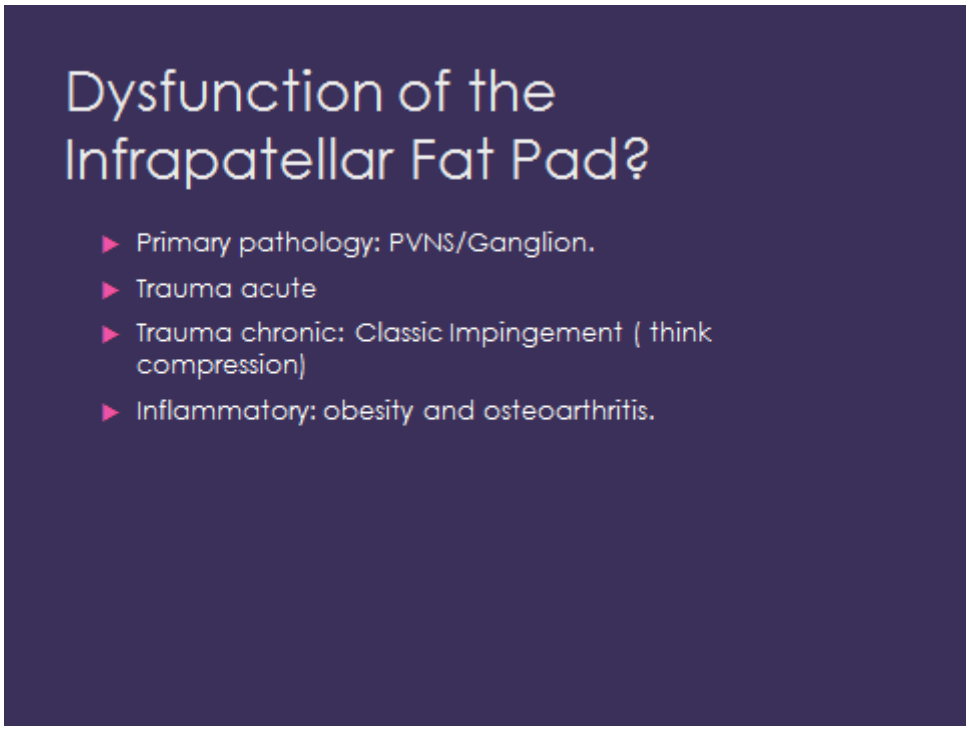
- The infrapatellar Hoffa's fat pad is there to act as a cushion at the front of the knee.

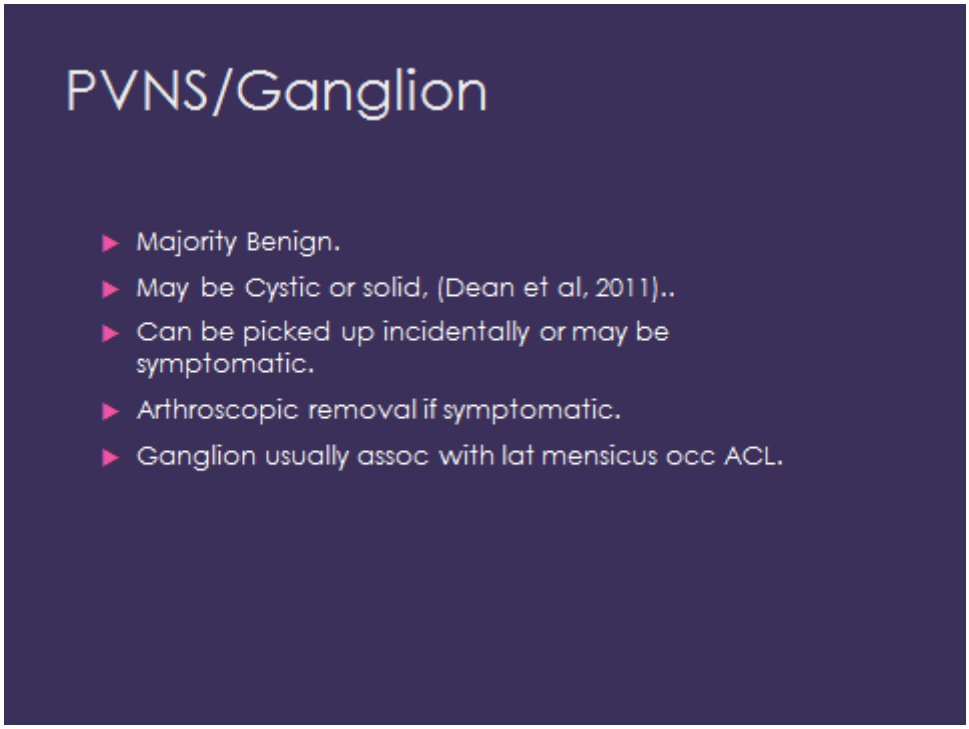
# Where & What is the Fat Pad?

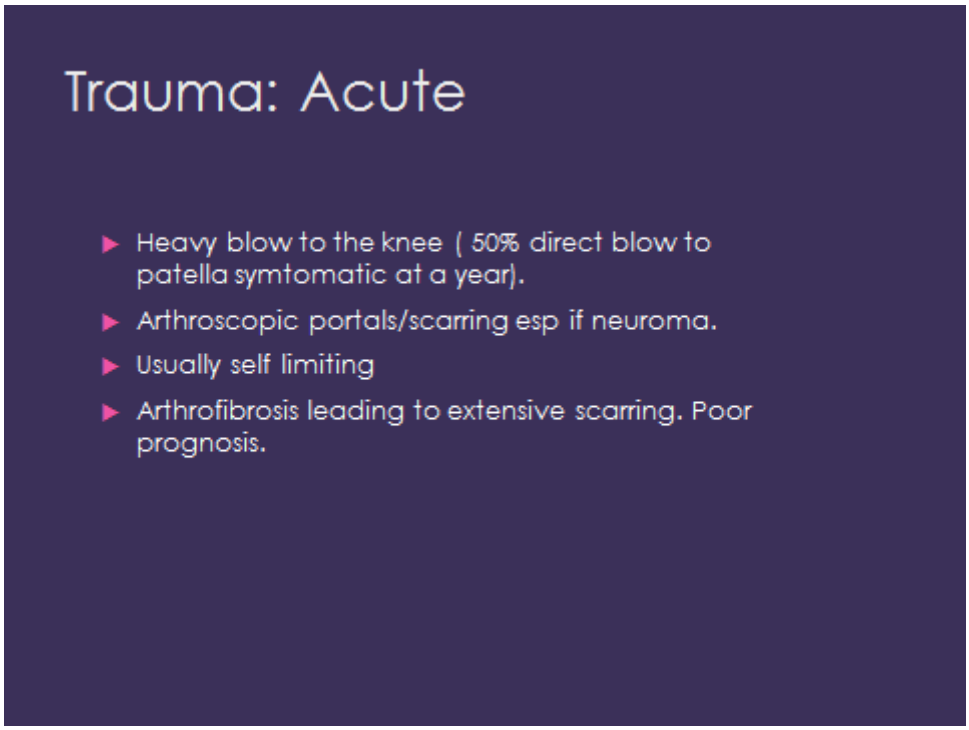
- Infrapatellar(Hoffa): extrasynovial & intracapsular.
- Lies behind patella tendon, and deep infrapatellar bursa, with tibia behind, attaching to anterior menisci, inferior pole patella and tibial periosteum
- Fibrous scaffold packed with dense fat.
- ? Helps distribute synovial fluid, cushion of exposed articular surface, ?Store of reparative cells.




- Fat pad pin may coexist with PFP as risk factors similar.






- Gross scarring in the fat pad can cause patella infera.

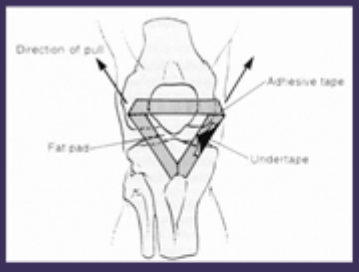
## Management of acute trauma

- Ice massage.
- Massage to arthroscopy portals.
- PF mobs multidirectional.
- Offload with small heel raise if very sore.
- Consider taping to off load fat pad.

- Massage arthroscopy portals as a preventative measure.
- PF mobilisations are helpful as the fat pad attaches to the patella and hence moving the patella mobilises the patella.

## Tape to off load fat pad- care PFJ contact pressures

- Aiming to take compression off fat pad.
- Allows 'window' for fat pad to settle.
- Care-may increase PFJ contact.
- Not in patella alta!



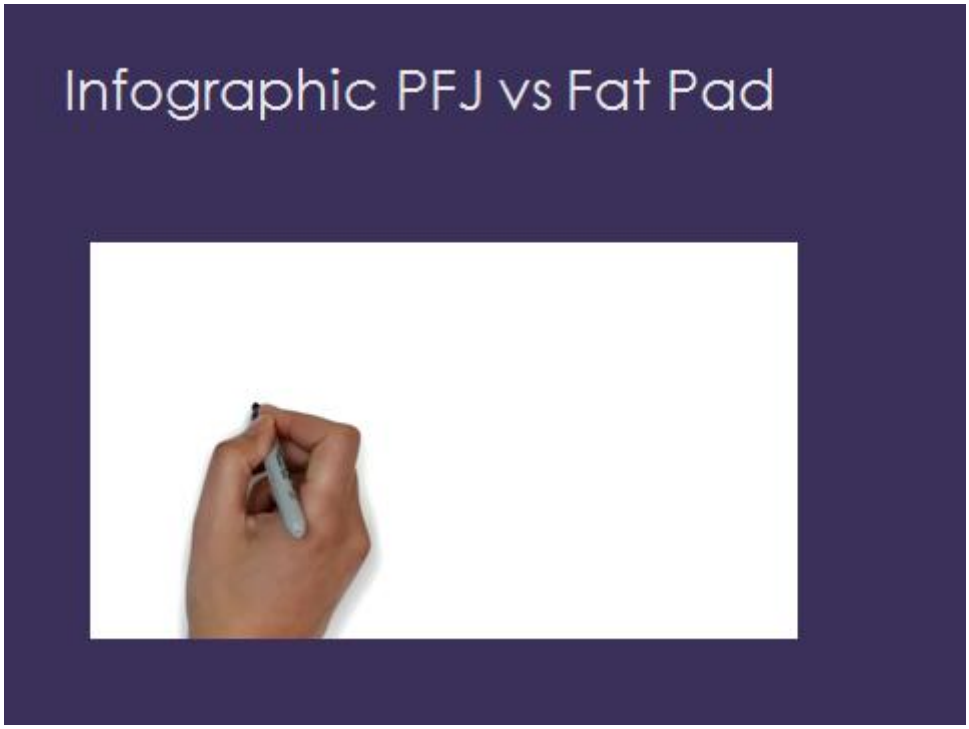
## Chronic compression?

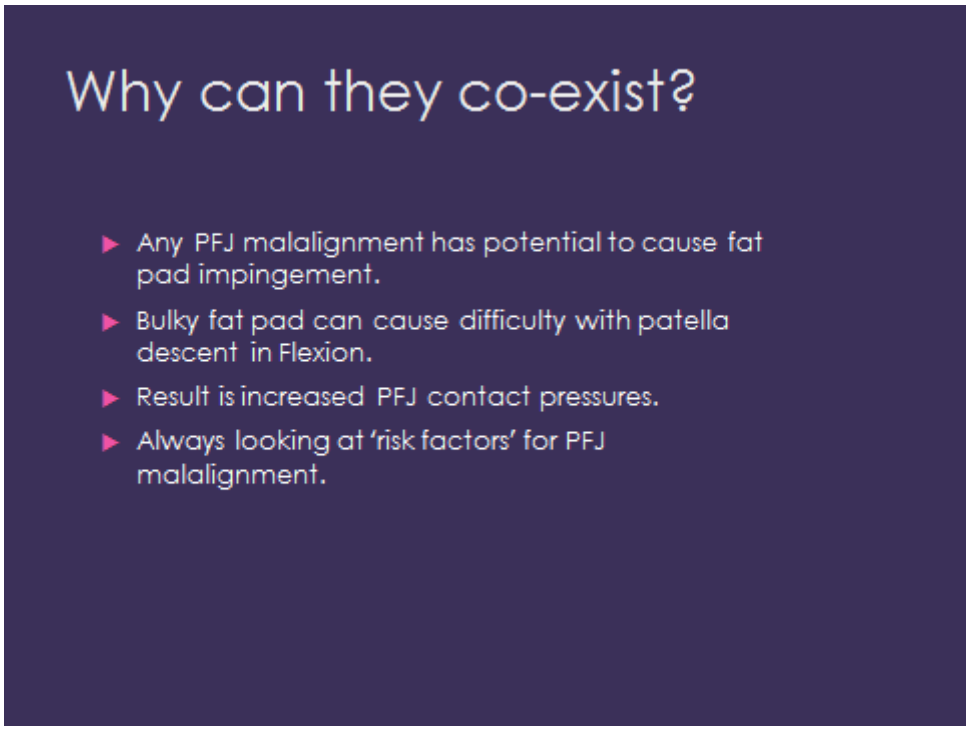
- Initial impingement lead to swelling: vicious cycle!
- Need to establish cause
- Can get tricky as to whether pain from PFJ or fat pad, or both.
- Even if fat pad cause of pain, underlying PFJ biomechanics must be sorted out

## Differentiate PFJ and fat pad

| PFJ | Fat Pad |
|---|---|
| Localised tenderness unusual. | Locally tender |
| Stairs/squats/sit to stand usually bad | Stand/walking usually bad |
| Worse in flexion. | Worse in extension |
| Likes to stand in extension/hyperextension | Likes to stand in flexion |
| Dislikes heels | Heels can relieve pain |
| Rarely swollen. | Fat pad usually swollen |

- Prolonged pain on standing is very unusual in PFP and therefore it is a very useful clue as to fat pad pain.




- Bulky fat pad may restrict movement of the patella towards the foot in flexion and increase PF pressure and hence cause cinema sign.

## Anteversion

- Nyland, (2004) demonstrated less firing of Gmed and VM in antevertors.
- Don't want long rotational decceleration gait.
- This implicates Gmax eccentric function.
- ?Those that have self corrected, ie anteverted but foot straight worse for fat pad.

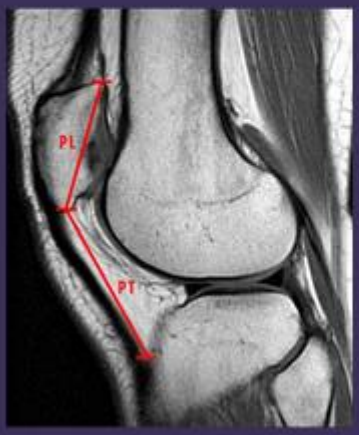
## Proximal tibial torsion, ie large TTG

- Increased Q angle.
- Increased lateral PFJ contact pressure.
- Increased impingement of lateral fat pad.
- Issue remains throughout range

- TT = tibial tuberosity
- TG=Trochela groove.

# Patella alta

- Patella takes longer to enter trochlea.
- 0-40 patella less stable
- Rx targets that range




# Functional Tibial ER

- Often not ER in standing.
- Becomes apparent in wb or NWB knee flexion, eg step standing.
- Implicates tight ITB complex, (Azhar, Amis, 2009) biceps femoris and or lateral gastroc.
- Must address this before doing any wb strength.

## Multidirectional Instability

- Often high Beighton score.
- Patella often hypermobile but not dislocating.
- High volume microtrauma to fat pad.
- Knee often appears very puffy but no effusion.

## Multidirectional hypermobility-treatment.

- Stable limb. Aim to remove all unwanted movement.
- Often very flexible foot & good candidate for orthotic.
- Strength-Quads hypertrophy.
- Tape/brace

- Difficult for PFJ to absorb any further movement if the patella is already very mobile.

## Impingement-hyperextension

- Common in hypermobile pts.
- Often stand with knees locked back.
- Often accelerate through terminal extension with poor control.

- Note reduced inferopatellar space.
- Are they aware they hyperextend? Can they correct in single stance?

## Treatment of Hyperextendors

- Heel raise.
- Tape vertically in popliteal fossa.
- Theraband from behind terminal extension.
- Isometrics at 10-30 degrees.

- Apply tape when knee is slightly flexed.

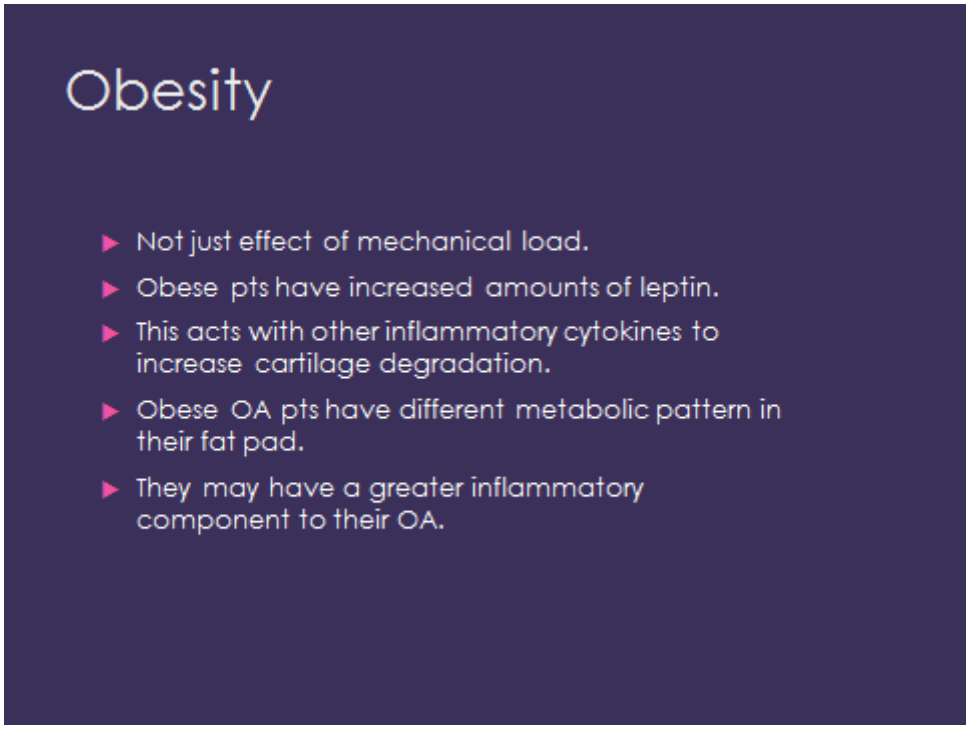
## Tibiofemoral Instability

- Increase in AP or rotational movement may catch or ?compress Hoffa fat pad.
- Treatment: address underlying passive and/or dynamic instability.

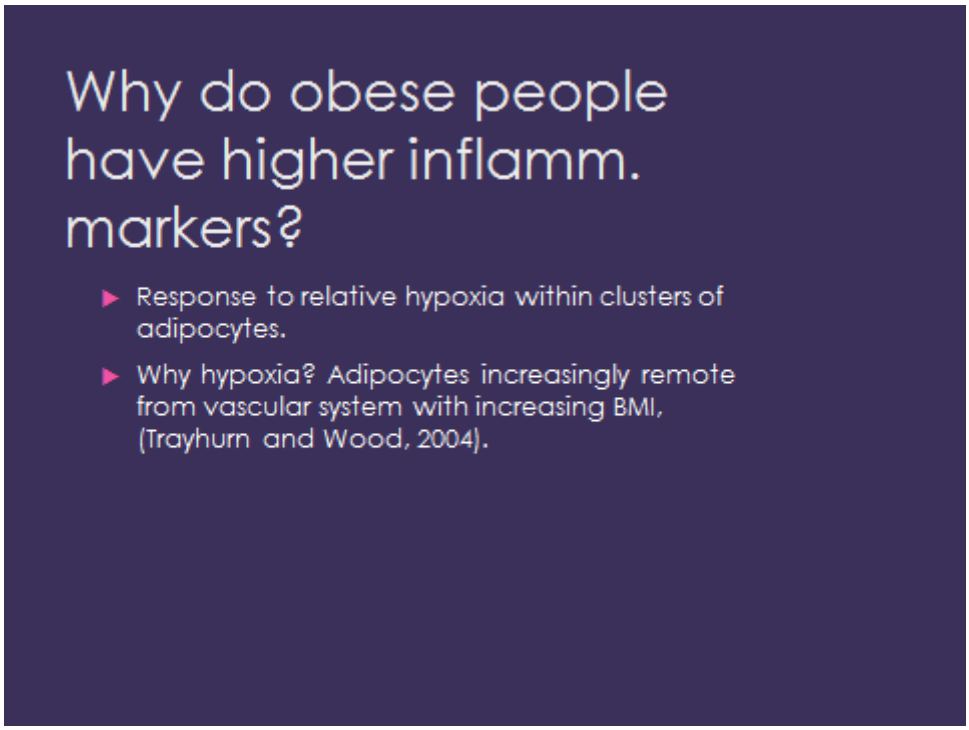
- EG ACL or PCL rupture

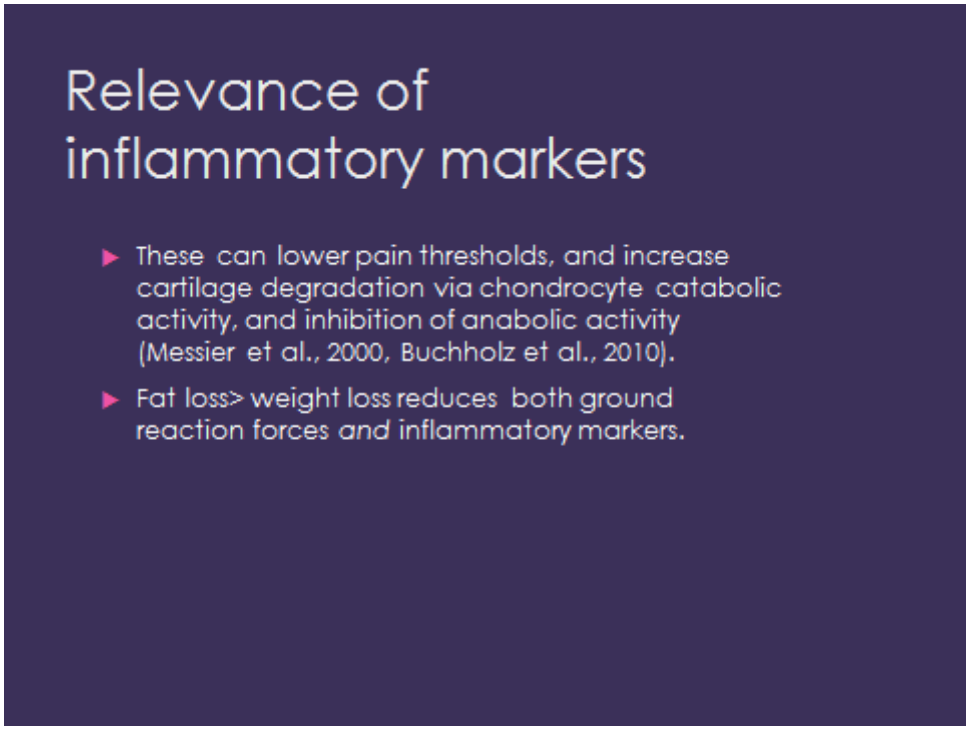
## Other Treatments in the Literature

- Steroid and alcohol ablation-mixed results.
- Resection-good results but rarely required
- Arthroscopic denervation of the inferior pole of the patella have also been shown to be effective treatments for refractory infrapatellar pain.
- FFD post ACL; good results freeing intermeniscal ligament

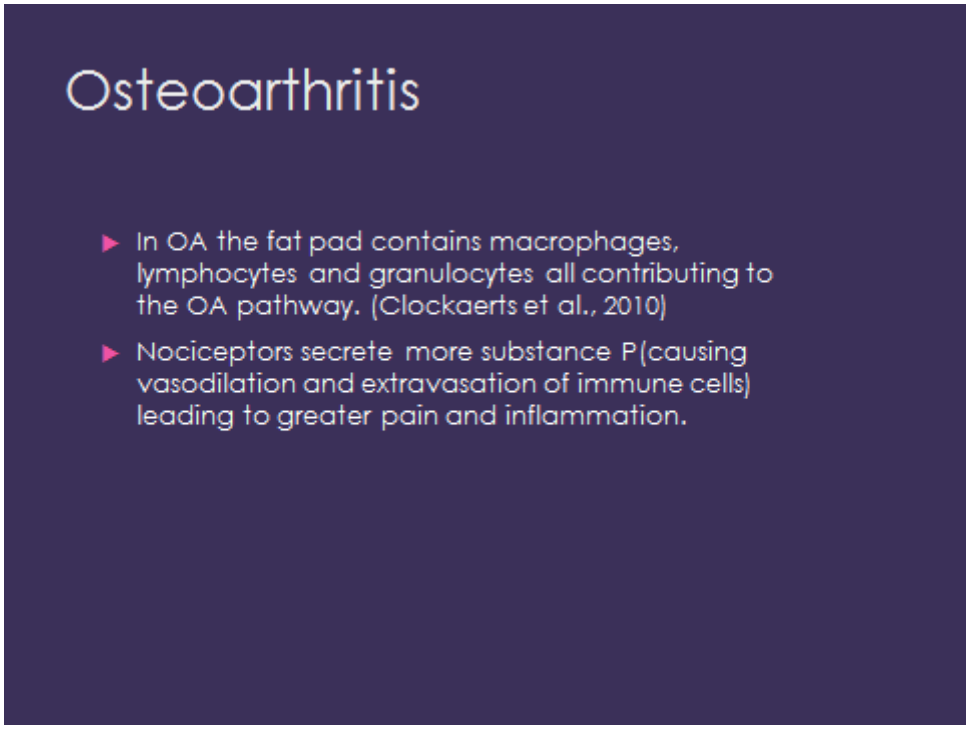


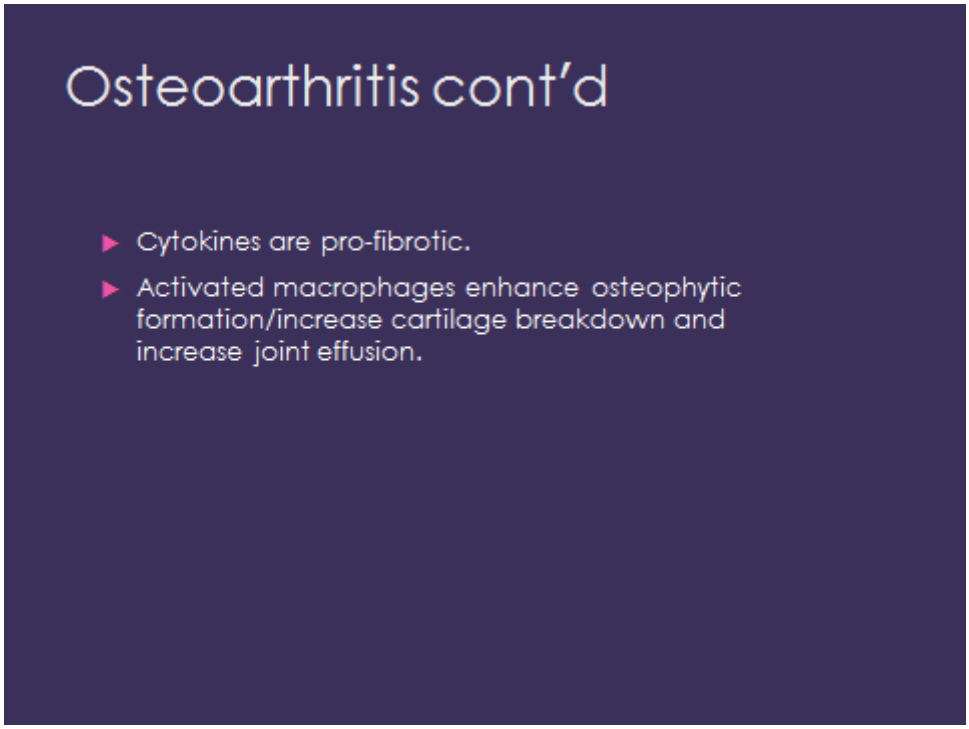

- CV medicine has been looking at this for years with respect to systemic inflammation as a risk factor for stroke or cardiac event.



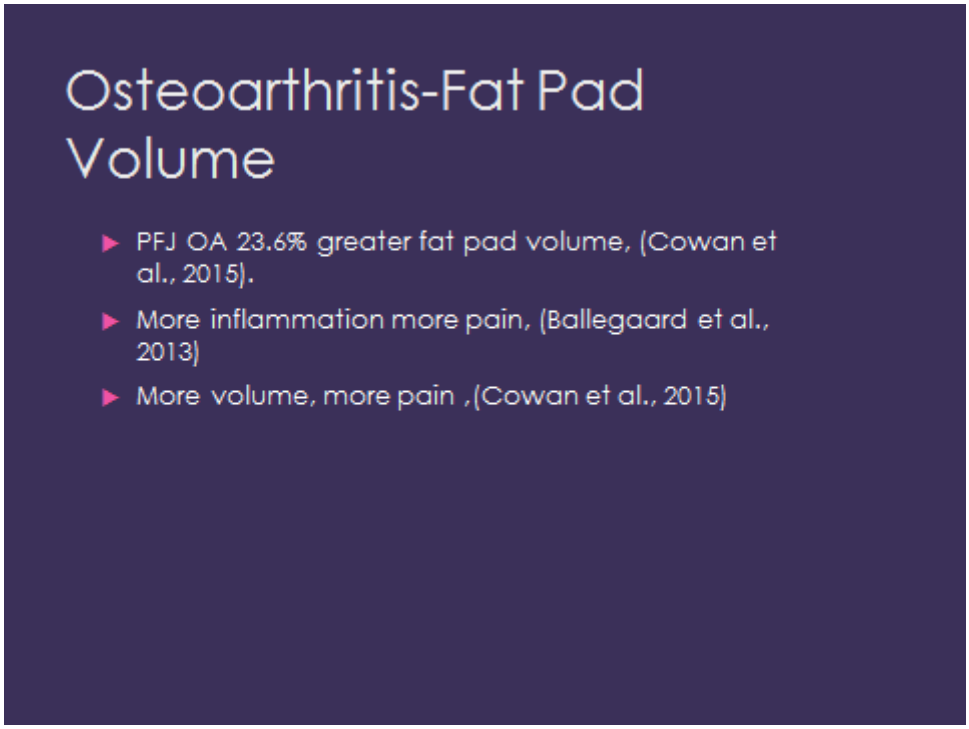



- Overall a pattern of cartilage degradation is encouraged.
- The good news message for patients is that fat loss decreases both the load and the inflammation.






- Cytokines encourage the joint to become stiff and swollen.



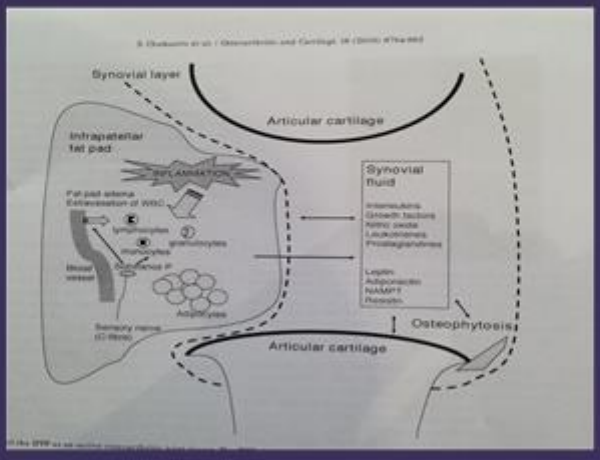

- Anecdotally patients with very painful OA knees are often swollen in the fat pad. Whereas some patients with knee OA have terrible xrays but have quite a calm looking joint with little soft swelling. Perhaps this latter group have little or no fat pad involvement.

## Osteoarthritis vs Fat Pad Inflammation-which came first?

- OA joint upsetting fat pad or
- Fat pad increaseing inflammatory pathway OA?
- Or Both simulatanous ie no causal relationship


- The literature is not yet sophisticated enough to inform us of whether the fat pad drives OA inflammation or vice versa or both.

## Osteoarthritis vs Fat Pad- Overview




- This shows the immunological inter-relationship between the fat pad and the joint.

## Osteoarthritis & Fat Pad-What To Do!!

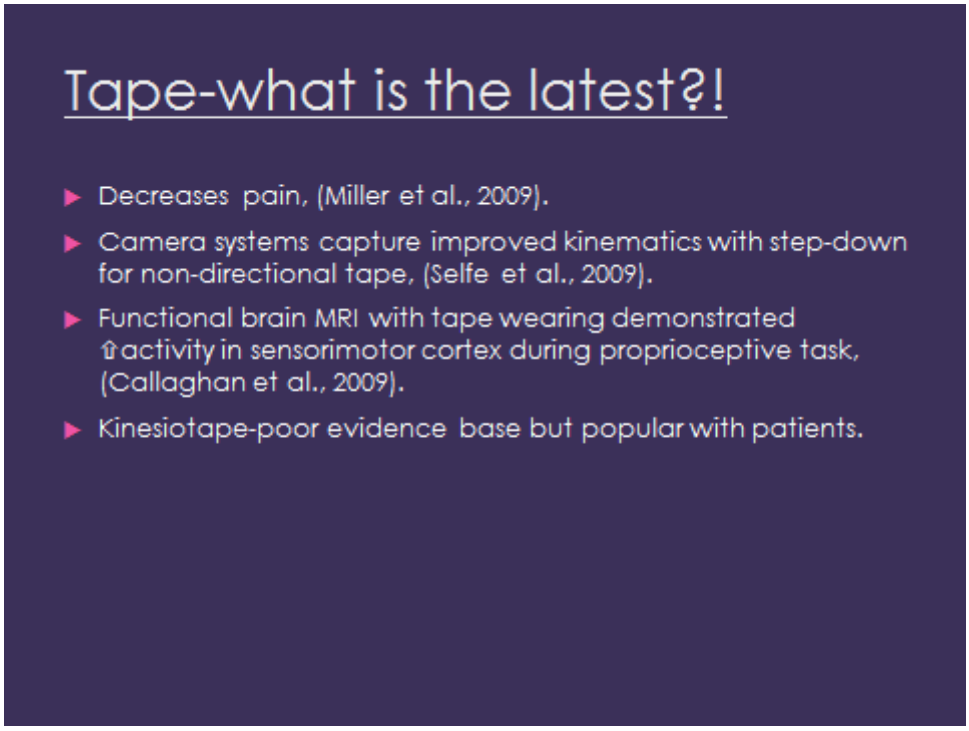
- Field in infancy-no answers in literature.
- Ice massage.
- Greater argument for fat loss
- Off load a much as possible
- Avoid winding up inflamm cycle, ie pacing/shock absorbacncy
- ?Compression
- ?Incr role of NSAID
- ?Incr role of steroid

- Care with suggesting a steroid injection if a TKR is an imminent possibility as steroid within 6 months can increase the risk of infection after surgery.

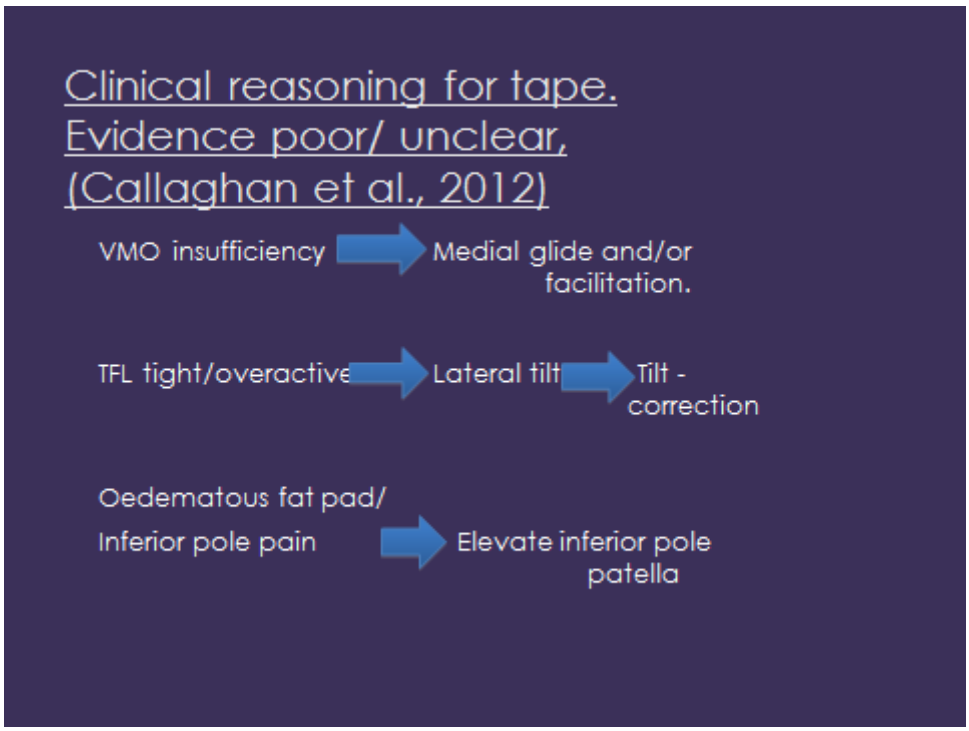
## Myth 3-To tape or not to tape?

- What are we achieving?
- Is there any evidence?
- What tape?
- What technique?
- Hmmmmm.....


- Lots of questions and poor evidence means we have to look to our clinical reasoning for our answers.




- Decreasing pain not only helps the patient but wins their confidence in you!



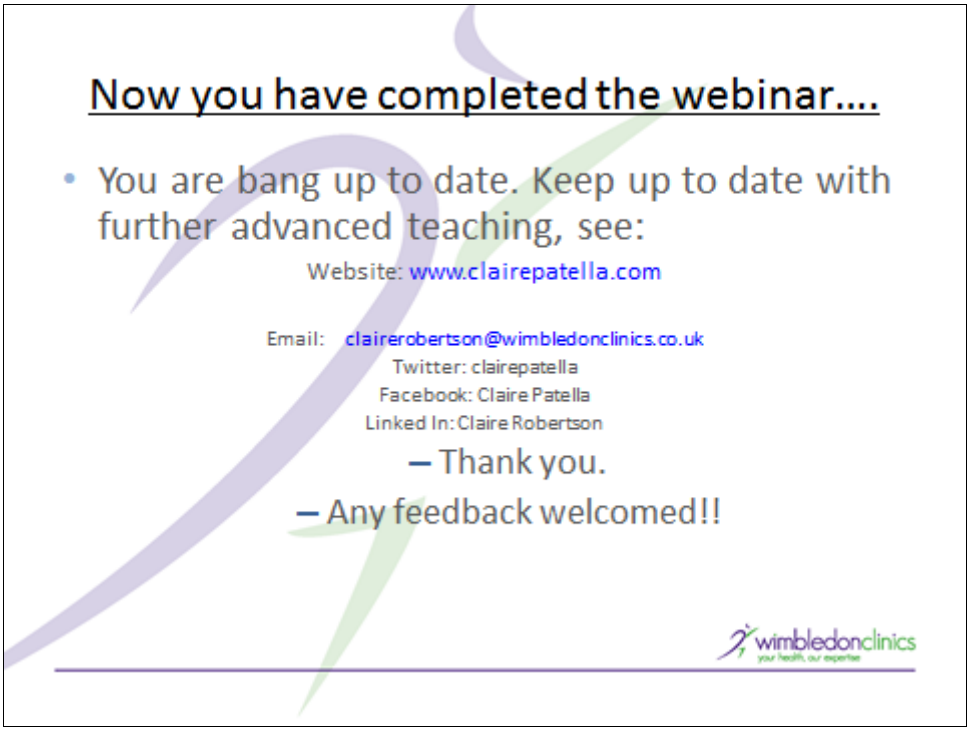

- As evidence is unclear I have made this flow diagram based on clinical reasoning.

## McConnel Taping-medial glide-could add in tilt, and/or inferior pole elevation.

- If there is some fat pad involvement too you can apply this to the superior half of the patella.

## Conclusions

- VMO separate anatomical entity but can't be selectively recruited.
- Swelling and pain important in Hx with vmo.
- Fat pad very pain sensitive.
- Fat pad involvement immunological, not just structural.
- Tape may help through proprioception and pain alteration.




- If you would like the references from this talk please just email me.