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Pick Of the Bunch-November 2015

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This paper is not specific to patients with patellofemoral pain, (PFP), but there are some many useful and relevant points that apply to the PFP field, I have decided to include it.

It is a review paper and key points made are:

- Knee abduction is a risk factor for PFP.
- Women have a greater valgus knee force during landing and pivoting.
- Women use less hip flexion in landing and as such have decreased activity in their hip extensors.
- Boys gain hip strength during adolescence, girls do not. This and the points above remind us of some of the reasons that PFP is more prevalent in women.
- In isolation decreased hip abductor and/or external rotator strength are not risk factors for developing PFP. However, we do see these strength deficits in this patient population. I think this reminds us as to the multi-dimensional nature of PFP.
- Decreased eccentric function especially of gluteus maximus may be a key factor in assessing neuromuscular control of landing/squatting and running.

Gluteus Medius

There is conflicting evidence as to whether side lying hip abduction or unilateral supine bridge is better for activity levels of gluteus medius. The reviewers point out that activity levels of gluteus medius are increased 16% with hip internal rotation, (IR). I would argue though that I.R is so undesirable in PFP that it is undesirable to choose an exercise where the hip is put into the very position you want to avoid during functional performance, (for 16%!).

With respect to the single leg bridge the gluteus maximus activation is disappointing and only activates a surprising 35-54%. Simple static gluteal contraction in standing activates 20% more and is certainly easier to get buy-in from the patient and highly unlikely to aggravate their PFP.

Sticking with the weight bearing theme the three following exercises all have similar activation in studies so far;

- Hip hitching
- Lateral step ups
- Single leg squats.

So which should we choose? This is where your clinical reasoning skills come in! Someone with an irritable PFP is unlikely to tolerate single leg squats. However, conversely some patients just don't find that hip hitching targets the gluteal muscles, and in fact will use everything else, eg knee flexion and trunk side flexors to do the exercise. So think specificity, what response are they getting and pain.

Gluteus Maximus

In weight bearing similar levels of activation of gluteus maximus have been found for;

- Single leg squat
- Lateral step ups
- Forward step ups
- Single leg dead lift.

Once again therefore we should use our clinical reasoning. Is this patient realistically going to be able to go away and do a single leg dead lift with good technique? Do they have adequate hamstring length?

Functional

The review discusses exercises such as band walking and lunges and states that there is much less literature on these more functional exercises with respect to gluteal activation. Lunges appear to have greater activation than band walking but there is little difference between forward, back and side lunging. There is no mention of TFL activation, which is a shame, and must be factored in when prescribing exercises with patients with PFP.

Powers demonstrates that forwards lean increases gluteal activity. Do we want to change posture at the stage of the rehab when we are looking at function? I'm not so sure.

Plyometric

This part of the review reminds us that rapid change of direction and multiple hops (ie true plyometric) significantly increases muscle activation than isolated landings.

I think plyometrics are often missed out of the end of rehab of patients with PFP and yet they often partake in sports that require an element of plyometrics. Perhaps it is fear of setting the PFP off again? We mustn't shy away from this and there are many valuable elements, not just gluteal activation. Good technique is paramount. Can they consistently land with the same distance between their feet? Even if their gluteal strength is good if they land with their feet too far apart, it is very difficult not to end up with a valgus moment at the knee. Are they stopping medial collapse, (ie adduction and internal rotation), and especially for women are they using adequate hip flexion to absorb the land?

Limitations with reviewing this field.

Most papers look at isometric function, but in reality eccentric function may be the most important. There is no literature on eccentric gluteus maximus function yet.

There is still conflict as to whether interventions change biomechanics at the knee. As a clinician I never make that presumption! You have to assess functional movement to see if there is carryover, or if in fact the bias needs to be on education and using cues.

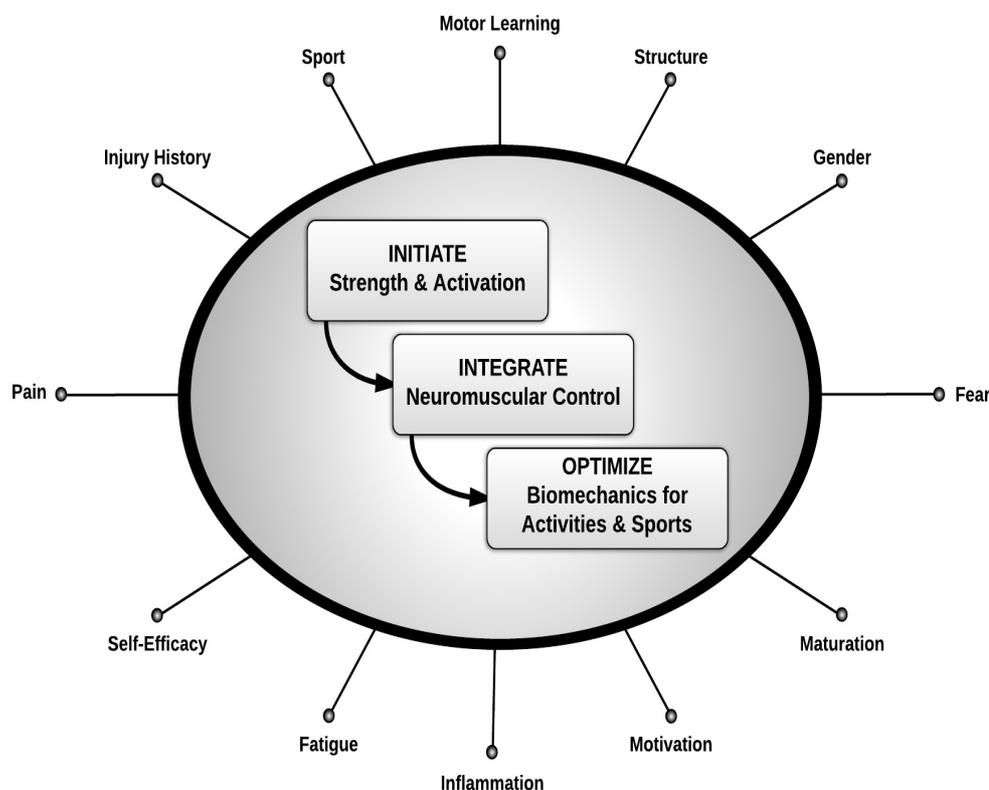
Practical Application

I feel that the authors are unusually mindful of the clinical reality that clinicians face. They come up with some useful accessible tips to apply the proximal work:

- Vary the base of support, e.g. width and use of cushions/bosu.
- Make tasks sport specific where possible, and involve upper extremity perturbation E.g. catching and throwing whilst doing a gluteal exercise.
- Bands are used as examples of exercises in this paper. However, I am always cautious that if another person is required to hold the band, that for many this will decrease adherence.
- Fatigue. This is important and can be a help or a hindrance. I would suggest giving thought to the time of day someone performs their exercises and the relative order of exercises relative to training sessions, and other exercises.

Theoretical Framework for Hip-focused neuromuscular exercises to modify lower extremity valgus.

I love this model! It is very unusual in a review paper of strength exercises to see such consideration for all the many other factors that will impact on outcome. I congratulate the authors for this, and they have kindly given me permission to include the model here:



Jacquith BP, Parikh SN Predictors of Recurrent Patellar Instability in Children and Adolescents after First-time Dislocation. *J Pediatr Orthop*. 2015 Oct 21 ahead of Print.

I have included this paper as I think it gives us really useful information that has not previously been available with such clarity. I think its is also an opportunity to look at the main contributing factors to patellofemoral instability.

In a nutshell:

This paper was a retrospective study of 266 knees in 250 patients. Patient records were looked at to see if predictors can be made of who are most likely to re-dislocate after primary patella dislocation.

Children had a significantly higher risk if they had;

- Under age 14 at first dislocation..
- History of contralateral dislocation.
- Trochlea dysplasia. (Any type).
- Skeletal Immaturity, (ie physis in distal femur and proximal tibia still partially or fully open).
- Long patella tendon (as measured with Caton-Deschamps on x ray).

If a child has all of the last four risk factors then they are 88% likely to have a recurrent dislocation. For the cohort as a whole the recurrence rate was 34.7%. This demonstrates the need to understand the risk factors, in order to help guide patients and be appropriate with prognosis.

Furthermore, 97% of recurrences were within 3 years so if someone ha gone longer than this without re-dislocating, then statistically they are likely to be able to manage. The mean age at initial dislocation of those who re-dislocated was 12.9 years, whereas those that did not re-dislocate had a mean age of 13.8. This shows the importance of age 14 as a milestone in this field.

Other points of note:

16.5% received early surgical treatment. Why might this happen?

- Osteochondral defect fracture, (this occurs at the time of injury).
- High risk factors and previous successful surgery on the contralateral side.
- Meniscal tear.

Some extra tips from me!

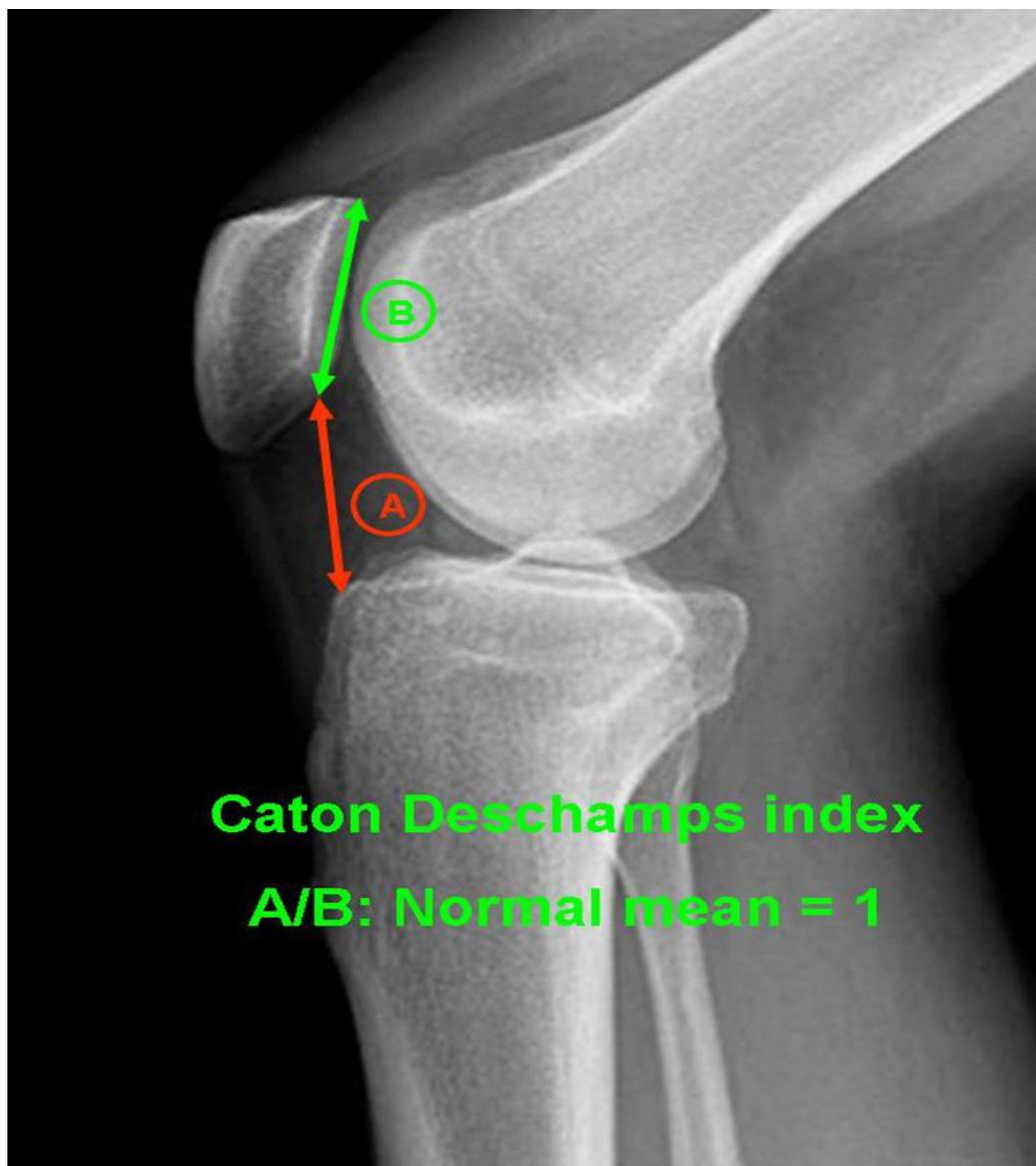
Some clarity of trochlea dysplasia. Trochlea dysplasia varies and like most things is on a spectrum. You will have everything form a slightly shallow trochlea, (I describe this to patients that their groove is more like a saucer than a soup bowl), to the worst end of the spectrum where the trochlea becomes domed. Many patients aren't dislocators but report feeling a sense of slipping. We need

to offer these patients excellent dynamic stability, and remove all unwanted movement from the limb.

The patella tendon length is important, as it will create a patella alta if it is long. The relevance of this is that it will take the patella longer into knee flexion to reach the trochlea and the stability offered by the trochlea. With these patients it is particularly important that they have good dynamic stability between 0 and 40 degrees of knee flexion.

You can get a flavour for patella length by putting a finger on the tibial tuberosity, one on the distal patella, and one on the proximal patella. The length of the tendon should be approximately the same length as the patella. In patella alta the tendon appears obviously longer.

To clarify regarding the Caton Deschamps this image shows us the measurement on x-ray:



Peng H-T, Song C-Y. Predictors of treatment response to strengthening and stretching exercises for patellofemoral pain: An examination of patellar alignment. *The Knee*. 2015 Article In Press but available Online

In a nutshell:

This paper is trying to find a way of subgrouping the vast population that have the diagnostic label of PFP. They have taken just one parameter, patellar tilt angle difference. This quite simply is the change in patella tilt from a relaxed limb to a static quadriceps contraction, (SQC). The tilt was measured on CT. The intervention was 8 weeks of progressive leg press training, and static stretching of the quadriceps, hamstrings, calf and 'ITB'. Those who had a reduction in their patella tilt with a SQC before the treatment had a statistically greater reduction in their pain as measured on a VAS.

What should I take away from this?

There are many different treatments aimed at treating PFP but we can view these as local to the patella or more global.

This study suggests that looking at patella tilt can help us predict who are good candidates for more 'local' treatment. It is a shame that this paper introduced stretching into the equation but even with quadriceps and 'ITB' stretching they can alter patella position.

It therefore suggests you should look at whether the tilt improves with a SQC at their initial consultation. If it does, they are a good candidate for quads strength and possibly the stretches given in this paper too.

Now most of our patients have not had a CT nor would we want the radiation/cost for each patient with PFP.

Although not as accurate you can look at tilt by placing a finger on either side of the patella. Lateral tilt will reveal that your finger laterally will be closer to the plinth.

