VADEMECUM
Patellofemoral Pain Syndrome (PFPS)

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1. INTRODUCTION
Patellofemoral pain syndrome (PFPS) is an important clinical problem and the most prevalent disorder of the knee. (Sultive et al 2004). It is a common source of anterior knee pain in active individuals between the age of 16-40 years old. Several names has been giving to this disorder such as patellar malalignments, patellofemoral arthralgia, chondromalacia and anterior knee pain. We use PFPS here to describe the type of patients who have pain over the anterior aspect of the knee without other identifiable causative pathology (patella tendonitis or tendinopathy, osteoarthritis, patella subluxation or dislocation, traumatic injuries, plica syndrome, Osgood Schatter syndrome, bursitis). Most patients who have PFPS can be successfully treated once contributed factors are identified during history taking and physical examination. The following provides an update on the best clinical evaluation and treatment of patients with PFPS.

2. DEFINITION
Patellofemoral Pain refers to all disorders associated with discomfort on the anterior aspect of the knee joint and may include a diverse range of injury. It describes a continuum of articular cartilage changes affecting the under surface of the patella (Brukner and Khan 2002). It is characterised by retropatellar pain (behind the kneecap) or peripatellar (around the kneecap) when ascending or descending stairs, squatting or sitting with flexed knees (Heintjes 2007). To understand PFPS we first need to understand the anatomy.

Anatomy and biomechanics
The patellofemoral joint comprises the patella and the femoral trochlea. The patella acts as a lever and also increases the moment arm of the patellofemoral joint, the quadriceps and patellar tendons (Dixit 2007). The patella moves within the patellofemoral groove of the femur. Several forces act on the patella to provide stability and keep it tracking properly (Figure 1, 2). Stability of the patellofemoral joint involves dynamic and static stabilizers (table 1, figure1), which control movement of the patella within the trochlea, referred to as "patellar tracking." Patellar tracking can be altered by imbalances in these stabilizing forces affecting the distribution of forces laterally and medially along the patellofemoral articular surface, the patellar and quadriceps tendons, and the adjacent soft tissues. Pain may result from malfunctioning of any of these forces.

Table 1 Dynamic and static stabilizers of patellar joint

<table>
<thead>
<tr>
<th>Dynamic stabilizers</th>
<th>Static stabilizers</th>
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<tr>
<td>Quadriceps tendon, Patellar tendon, Vastus medialis obliquus (VMO)</td>
<td>Articular capsule, Femoral trochlea, Medial and lateral retinacula, Patellofemoral ligaments.</td>
</tr>
<tr>
<td>Vastus lateralis, Iliotibial band (ITB)</td>
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3. **AETIOLOGY**

According to Heintjes (2007) and Sultive (2004) the aetiology of PFPS is considered as multiple factors and not yet understood. Aetiology, structures causing the pain and treatment methods are all debated in literature, but consensus has not been reached so far (Heintjes 2006). However several opinions suggested that the following may be the cause.

<table>
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<th>Possible causes of patellofemoral pain.</th>
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<tr>
<td>Soft tissue tightness and muscle weakness</td>
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<tr>
<td>(Lower extremities)</td>
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<tr>
<td>Training like distance running, hills, stairs</td>
</tr>
<tr>
<td>Patellar malalignement</td>
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<td>Increasing Q angle</td>
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4. **SIGNS & SYMPTOMS**

- Usually of gradual onset
- Stiffness or pain, or both, on prolonged sitting with the knees flexed often called “Theatre sign”.
- Feeling of knee swelling or fullness, especially over the infrapatellar area.
- Pain with activities that load the patellofemoral joint, such as climbing or descending stairs, squatting, or running.
- Difficulty for the patient to localize pain.
- Patient draw circle with their fingers around the patella “circle sign”.
- “Achy” pain, can be sharp at times.
- Complaint of knee “giving way” as a result of transient inhibition of the quadriceps because of pain or deconditioning but not true patellar instability.
- Other common symptoms “Popping or crepitus”.

5. **EPIDEMIOLOGY**

Of those affected, the condition occurs more frequently in females (Taunton et al, 2002), also athlete of both sex and elderly people. It accounts for 25% to 40% of all knee problems seen in sports medicine centres (Bizzini et al 2003). Incidence rates of 7% and 10% have been reported in young male and female athletes respectively (Houghton 2007).

6. **PATIENT HISTORY**

Before assessing patient with PFPS, it is important to have a thorough general overview of the characteristic of the pain. Patient with PFPS often complain of diffuse and poorly localised pain over anterior aspect of the knee. Pain seems to be from “behind the kneecap “underneath,” or “around” the patella. The clinical history should include a thorough description of

- Pain characteristics (location, character, onset, duration, change with activity or rest, aggravating and alleviating factors, night pain)
- Trauma (acute macrotrauma, repetitive microtrauma, recent/remote)
- Mechanical symptoms (locking or extension block, instability, worse during or after activity)
- Inflammatory symptoms (morning stiffness, swelling)
- Effects of previous treatments and the current level of function of the patient
- Previous injury or knee surgery chronic (inflammatory joint disease or bleeding diathesis, is significant, especially if knee swelling is present.
- Type of activity producing pain (runners, long sitting and kneeling)
7. ASSESSMENT
An extensive search of the literature revealed no single golden standard tests. This is because of the multiple forces affecting the patellofemoral joint. However, the basic assessment have to be performed thoroughly with particular attention to extensor mechanism function. The primary purpose of assessment is to look for possible source of pathology and to assess for correctable factors that can be addressed with rehabilitation. Studies have shown that the following sequence could be used during examination of the lower extremities:

1. **General low extremities Inspection** (for overall impression of lower-limb alignment and possible cause of patellar pain and functional abnormalities)
2. **Palpation** (for tenderness, muscle tone, effusion)
3. **Range of motion** (AROM and PROM in Knee and hip is usually normal)
4. **Resistant test** for weakness of quads especially VMO and hip abd and ext rotators \(\rightarrow\) patellar maltracking, > knee valgus
5. **Flexibility (for tightness)** Poor flexibility in these areas may contribute to stress across the patellofemoral joint
6. **Functional test** (Single leg squat or Step-down) \(\rightarrow\) reduced balance and strength
7. **Clinical tests:** for patellar mobility and position to be performed as a routine:

<table>
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<th>Tests</th>
<th>Assessment</th>
<th>Procedure</th>
<th>Outcome effect</th>
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| Patellar glide (apprehension&tilt) test    | Mobility, pain & lateral structure tightness | Patella Lat Pressure 20-30° flexion | -Displacement of less than 1 quadrant:tight lateral structures;  
                                                                                                    |                                                   |                                                   | -Displacement of more than 3 quadrants: patellar hyper mobility Pain |
| Dixit et al (2007)                         |                                     |                                |                                                   |
| Compression test:                         | “Final step” Retropatellar tenderness | Direct compression of posterior part of patella into trochlea at different knee flexion | Pain |

Note: Cochrane review (2007) the specificity and sensitivity of these tests is debated in literature, but validation studies are absent

8. POLICY
Several studies have shown physical therapy to be effective in treating PFPS. However, according to Dixit et al (2007) and Juhn (1999) there is no singular treatment program that will be effective for all patients. Therefore, definitive treatment should be individualized. It is important to educate patient

<table>
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<th>Goals of treatment</th>
<th>Treatment tools</th>
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<td>Reduce pain and inflammation</td>
<td>Rest, ice, NSAID, reduced loading exercise</td>
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<tr>
<td>Reduce Patellofemoral Joint Reaction Forces joint</td>
<td>Stretching of tight structures and shortened muscles</td>
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| Strengthening of lower extremities and improving alignment | **Exercise Therapy**  
- Open and closed chain  
- Quadriceps strengthening exercises  
1st: isometric contraction, inner range (non weight-bearing) contractions and progressive and straight leg raising, increase resistance, with or without taping (Mc Connell) while retraining VMO |
| Stabilization/balance/proprioceptive exercises hip and knee | Wobble-board, progress to running, jumping, landing, ball throwing on wobble-board |

Other Therapies such as bracing, ultrasound, massage, electro muscular Stimulation, foot orthoses, could be used as adjunctive.
9. WHAT IS PROVEN
There is a lack of consensus in the literature regarding the reliability of therapists in assessing the specific components of the tilt, glide and pronation of the patella, which taping is purported to alter (Whittingham et al 2004). According to Hing (2006) the confirmation of specific diagnose of PFPS is difficult because of a paucity of valid clinical test.

Particular attention should be paid to iliobibial band, hamstring, rectus femoris and gastrocnemius and soleus flexibility (LaBotz 2004).

According to Australian physiotherapy Association 2005 (Evidence based Clinical Statement) exercise therapy (quadriiceps strengthening exercises) is recommended and there is insufficient evidence to support or refute the use of patellar bracing or taping. If successful, taping should immediately reduce pain during aggravating activity by at least 50 %, (Brukner et al 2006). Also other treatments tools such as ultrasound, massage, Electro Muscular Stimulation, foot orthoses, Biofeedback, acupuncture need further trials to clarify their specific effect on PFPS.

According to Cochrane Review (randomised clinical trials level 1 ie high quality articles) Heintjes et al 2007, Van Linschoten et al(2006),MEDLINE, CINAHL, Web for scientific databases for RCT, Australian Physiotherapy Associations (APA)(2005) and our findings, there is strong evidence that exercise therapy (open and closed kinetic chain exercises) might help to reduce knee pain associated PFPS with a treatment frequency/duration/2-3x/weeks for 6 to 12 weeks, but further trials are needed

Multimodal physiotherapy interventions(such exercise McConnell taping, foot orthosis,etc or combination) are effective in the treatment of patellofemoral pain syndrome (Heintjes et al (2003), Bizzini et al (2003), Crossley et al (2001).

10. REFERRED TO
If symptoms persist after 6 to 12 weeks despite an appropriate rehabilitation program, a physiotherapist should refer the patient to an orthopaedist. (LaBotz 2004, Dixit et al 2007)

11. PREVENTION AND INFORMING
- Varying the types of activity that patient participate
- Avoiding excessive worn and inappropriate footwear
- Avoiding unnecessary forces across the knee like cross-leg sitting, prolonged squatting
- Taking care of injuries immediately (first aid, rest)
- If running, choosing an even, clear surface

12. CONCLUSION
Based on the reviewed articles and expert opinions, we concluded that: in patients presenting with PFPS, there is no strong evidence to support the validity and reliability of assessment tools. We suggest that physiotherapists should perform a thorough patient history for differential diagnosis. However a positive outcome on palpation of the patellae, functional tests, patellae mobility or glide test, apprehension and compression test is recommended. Therefore there is no “golden standard rules” for assessing PFPS.

Addition, there is also no strong evidence that clearly indicate that one treatment is seen as the best. Based on this limited evidence we can expect therefore that physiotherapists use a combination of various interventions in respect to individual patient's symptoms and causes.

Further research is needed to come up with the best physiotherapy assessment and treatment tools for PFPS.
13. LITERATURE

Articles: