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Invited Topical Review

Physiotherapy management of patellar tendinopathy (jumper's knee)

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Introduction

Patellar tendinopathy (jumper's knee) is a clinical diagnosis of pain and dysfunction in the patellar tendon. It most commonly affects jumping athletes from adolescence through to the fourth decade of life. This condition affects health and quality of life by limiting sports and activity participation for recreational athletes and can be career-ending for professional athletes. Once symptoms are aggravated, activities of daily living are affected, including stairs, squats, stand to sit, and prolonged sitting.

Patellar tendinopathy clinically presents as localised pain at the proximal tendon attachment to bone with high-level tendon loading, such as jumping and changing direction. Tendon pain at the superior patellar attachment (quadriceps tendinopathy) and at the tibial attachment occurs less frequently, but the diagnosis and management are similar to jumper's knee. It is commonly clinically diagnosed in conjunction with imaging (ultrasound or magnetic resonance, often to exclude differential diagnoses such as patellofemoral pain), where structural disruptions on the scans represent areas of tendon pathology. Importantly, there is a disconnection between pathology on imaging and pain; it is common to have abnormal tendons on imaging in people with pain-free function.[1] The term tendinopathy will be used in this review to mean painful tendons. The term tendon pathology will be used to indicate abnormal imaging or histopathology without reference to pain.

Treatment of patellar tendinopathy may involve prolonged rehabilitation and can ultimately be ineffective. Management is limited by a poor understanding of how this condition develops, limited knowledge of risk factors and a paucity of time-efficient, effective treatments. Many treatment protocols are derived from evidence about other tendinopathies in the body and applied to the patellar tendon; however, the differences in tendons at a structural and clinical level may invalidate this transfer between tendons. This review discusses the prevalence of patellar tendinopathy, associated and risk factors, assessment techniques and treatment approaches that are based on evidence where possible, supplemented by expert opinion.

Prevalence

Patellar tendinopathy is an overuse injury that typically has a gradual onset of pain. Athletes with mild to moderate symptoms frequently continue to train and compete. Determining the prevalence of overuse injuries such as patellar tendinopathy is difficult because overuse injuries are often not recorded when injuries are defined exclusively by time-loss from competitions and training.[2] The time-loss model only records acute injuries and the most severe overuse injuries, making it difficult to gather an accurate estimate of the prevalence of patellar tendinopathy in the athletic population.

Studies that have specifically examined the prevalence of patellar tendinopathy showed that the type of sport performed affected the prevalence of tendinopathy.[3] The highest prevalence in recreational athletes was in volleyball players (14.4%) and the lowest was in soccer players (2.5%);[3] the prevalence was substantially higher in elite athletes. Tendon pathology on imaging in asymptomatic elite athletes was reported in 22% of athletes, male athletes had twice the prevalence as female athletes, and basketball players had the highest prevalence of pathology (36%) amongst the sports investigated: basketball, netball, cricket and Australian football.[4] It is not only a condition that affects adults; the prevalence of patellar tendinopathy in young basketball players was reported as 7%, but 26% had tendon pathology on imaging without symptoms.[4]

Patellar tendon rupture, however, is rare. The most extensive analysis of tendon rupture reported that only 6% of tendon ruptures across the body occurred in the patellar tendon.[5] The majority of patellar tendon ruptures that do occur are in the older population (mean age 65 years).[5] All those who had a patellar tendon rupture had pathology in the tendon.[6] Because this is a relatively rare injury, it will not be discussed in this review.

Aetiology

The pathoaetiology of tendinopathy is unknown and there are several models that attempt to describe the process.[7–9] Of these,

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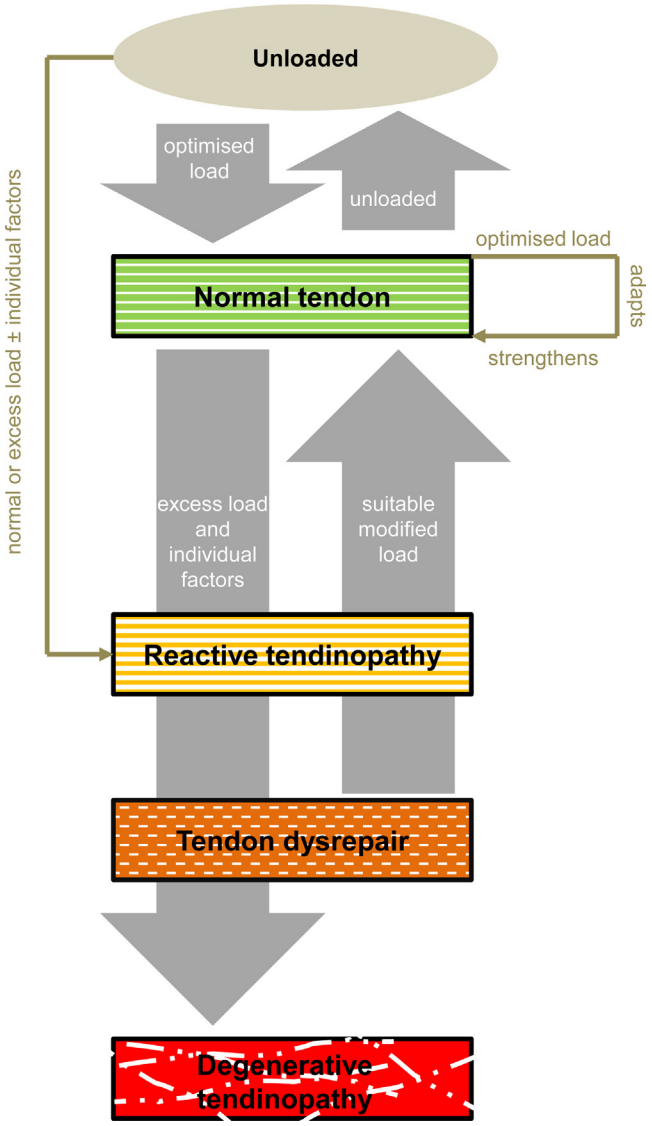

Figure 1. Continuum model of tendinopathy.

the continuum model of tendinopathy has the most overt clinical correlation.[7] The continuum model places tendon pathology in three somewhat interchangeable stages: reactive tendinopathy, tendon dysrepair and degenerative tendinopathy (Figure 1). Many patellar tendons have a combination of pathology state (reactive on degenerative pathology). A degenerative patellar tendon with a circumscribed degenerative area is thought to have insufficient structure to bear load resulting in overload in the normal area of the tendon, leading to a reactive tendinopathy in this area.

The capacity for tendon pathology to move forward and back along the continuum was demonstrated in the patellar tendons of basketball players.[10] Players were imaged with ultrasound each month during the season and those with reactive tendinopathy and tendon dysrepair both progressed (to degenerative tendinopathy) and regressed (to normal tendon) through the season.[10] Whilst it is known that pathology on imaging does not necessarily indicate painful patellar tendinopathy, certain changes (ie, the presence of large hypoechoic regions on ultrasound) may increase the risk of developing patellar tendinopathy.[11]

It is also unknown at what age a patellar tendon is susceptible to pathology, but it does occur in young athletes.[4] Studies have shown that tendon tissue is inert and does not renew after the age of 17, suggesting that once tendon is formed in puberty its structure is relatively stable.[12] An early age of onset of patellar tendinopathy is supported by data that shows only two players developing it after the age of 16 in a school for talented volleyball players.[13]

The aetiology of pain appears somewhat independent of underlying tendon pathology. Pain is frequently associated with pathological tendons, however tendon pain in apparently normal tendons has been demonstrated.[14] Overload is reported as the key factor associated with pain onset.[15] Overload is defined as activity above what the tendon has adapted to at that point in time, and can occur by a sudden and substantial increase in the volume of jumping or a return from injury/holiday without gradually ramping back into a regular schedule. The use of energy storage and release loads in jumping and change of direction is typically characteristic of overload causing patellar tendinopathy pain. Non-energy-storage loading or non-jumping activity (eg, cycling or swimming) and repetitive low loading (in runners) rarely aggravate the patellar tendon; other pathologies are generally suspected in these cases.

Risk and associated factors

Several studies have examined intrinsic and extrinsic risk and associated factors for both pathology and patellar tendinopathy (Table 1). Risk factors for pathology and risk factors for pain are likely to be different and will be distinguished in this section. Biomechanical studies of painful tendons will not be discussed, as altered mechanics may be an outcome of having a painful patellar tendon, however, they would certainly be considered as part of a management paradigm.

Extrinsic factors

An increase in training volume and frequency has been associated with the onset of patellar tendinopathy in several studies.[16,17] Clinically, this is the most common factor that triggers patellar tendinopathy. Other factors, such as change in surface density and shock absorption, may have an effect as well. Although harder surfaces can increase patellar tendinopathy symptoms,[8] they are less likely to be an issue nowadays as most indoor sport is now played on standard sprung wooden floors. Surface density and amount of shock absorption in both the shoes and the surface should still be considered, as athletes may be vulnerable when

Table 1
Risk and associated factors for patellar tendinopathy.

Study	Factor	Risk factor or associated factor	Patellar tendinopathy or tendon pathology	Comment
Visnes[16] Cook[25]	Gender	Both	Both	Men at higher risk
Malliaras[26]	Waist circumference	Associated	Pathology	Increased waist circumference associated with increased pathology
Cook[4]	Imaging abnormality	Risk	Tendinopathy	Adolescents only
Cook[20]	Hamstring length	Associated	Pathology	Less extensible hamstrings associated with pathology
Witvrouw[19]	Hamstring length	Risk	Tendinopathy	Less extensible hamstrings increase risk of patellar tendinopathy
Witvrouw[19]	Quadriceps length	Risk	Tendinopathy	Stiffer quadriceps increase risk of patellar tendinopathy
Malliaras[26]	Dorsiflexion	Associated	Pathology	Reduced dorsiflexion associated with increased pathology
Edwards[22]	Altered landing strategies	Associated	Pathology	Less knee bend at landing, altered hip strategies associated with pathology
Lian[63]	Jumping ability	Both	Tendinopathy	Better jumping ability associated with patellar tendinopathy
Culvenor[27]	Fat pad size	Associated	Tendinopathy	Increased fat pad size associated with patellar tendinopathy
Gaida[15] Jannsen[64]	Loading	Associated	Tendinopathy	Excess loading associated with patellar tendinopathy