Patellofemoral Pain

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KEYWORDS

• Patellofemoral pain • Runner • Risk factors • Diagnosis • Management

KEY POINTS

- Patellofemoral pain (PFP) is a common condition, especially among runners.
- A variety of risk factors for PFP have been identified and may be loosely categorized by local joint abnormalities, aberrations in lower extremity biomechanics, and training errors.
- Proper diagnosis and management of PFP mandate close inspection and targeted intervention according to the individual's risk factor profile.
- Management strategies for PFP include quadriceps strengthening, stretching key muscle groups (quadriceps, hamstrings, and gastrocnemius), patellar taping, patellar bracing, hip strengthening, foot orthoses, gait re-education, and training modification.

INTRODUCTION

Patellofemoral pain (PFP) is characterized by anterior knee pain of insidious onset that is exacerbated under conditions of increased patellofemoral joint stress. It is commonly observed in runners and may arise in the setting of a variety of risk factors. PFP does not seem to be self-limited but rather can persist chronically if those factors contributing to its development are not properly recognized and addressed. Here, the epidemiology, risk factors, diagnosis, and management of PFP are reviewed.

DISCUSSION

Epidemiology

PFP accounts for up to 25% of knee injuries that present to sports medicine clinics.[1] PFP seems to be particularly common among runners, representing one of, if not the

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most, common running-related musculoskeletal injury, particularly among longer-distance runners.[2–6]

PFP demonstrates a clear predilection for women with prevalence[5,7,8] and incidence[9] rates that are 2 to 3 times greater for women than men. This prevalence and incidence rate are thought to reflect specific anatomic and biomechanical variations in women that predispose to PFP. Women, for example, exhibit lower cartilage thickness and greater peak cartilage stress during stair-walking.[10–12] Disparities in lower extremity strength as well as both static and dynamic alignment have also been purported as contributing factors.[13] Comparative studies of lower extremity strength demonstrate greater hip abduction and external rotation strength in men when compared with women.[14] Meanwhile, increased Q-angle, as well as dynamic knee valgus angle and hip internal rotation angle, has also been reported in women compared with men.[15] Each of these variables has been independently implicated as risk factors for PFP and are discussed in greater detail in subsequent sections.

Traditionally, PFP has been considered an affliction of younger patients. Interestingly, a recent investigation of injury patterns in masters runners demonstrated similar rates of PFP between those older and younger than 40 years of age.[16] This trend may reflect greater involvement of older athletes in sport, and the increasingly recognized chronic nature of PFP. Certainly more current studies evaluating the incidence and prevalence of PFP across a wide age range are warranted.

Cause of Patellofemoral Pain

The precise pathogenesis of PFP remains poorly understood; however, the pain of PFP seems to represent the end result of increased stress at the patellofemoral joint.[12] The cause of exaggerated joint strain is a point of particular contention. Classically, aberrant patellar alignment and tracking were thought to signify the primary precipitant of patellofemoral stress and PFP. Nevertheless, it has become increasingly clear that patellofemoral malalignment, while representing one risk factor, cannot solely account for the development of PFP. Indeed, clinical and radiographic malalignment is observed in a mere subset of individuals presenting with PFP. Contrariwise, many with evidence of abnormalities in patellar position never develop symptoms of PFP.

Remedying this incongruity, Dye[17] proposed his “theory of tissue homeostasis.” He suggested that alterations in tissue homeostasis may occur under any circumstance that supersedes the so-called envelope of function or load acceptance capacity of the joint. According to his model, gross structural abnormalities and repetitive overload alike may challenge the envelope of function, exceeding the force across the joint that can be safely tolerated and ultimately result in disruption to the osseous and periosseous tissues. Among the tissues thought to cause pain in PFP are the subchondral bone (by way of disrupted articular cartilage), medial and lateral retinacula, and infrapatellar fat pad.[18]

Risk Factors

PFP is thought to be multifactorial, with a variety of risk factors that may contribute to its inception. Although the significance of these risk factors in isolation is debatable, it is more likely the culmination of multiple predisposing conditions that challenges the load-bearing tolerance of the joint and results in symptoms. In order to develop a framework for the diagnosis of PFP, then, it is critical to first understand these underlying risk factors, which may be categorized broadly as local joint impairments, deficits in lower extremity biomechanics, and training errors (**Table 1**). Moreover, recognition of these factors allows for a more targeted approach to treatment and may help prevent recurrence.