Common and Uncommon Causes of Knee Pain

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Introduction

The knee serves as an important linkage between the trunk and the ground to enable us to walk and run. It has a large range of motion (from 0-140 degrees) and can allow us to sit on the legs or squat with complete relaxation. Although the knee appears to be confined to flexion extension in the sagittal plane, there are a few degrees but important tibio-femoral rotation, resulting in the “screw home” mechanism. Since most daily activities are carried out with the leg bearing weight on the ground, it is the femur which is rotated relative to the leg, when the upper thigh and body are turned. This would generate a high stress in the knee. Such pivoting of the leg during activities was classically described as the cause of Anterior Cruciate Ligament rupture, but could also cause other injuries.

Patterns of knee pain

Most knee pain are activities related, since the knee is loaded and stressed whenever we are up and about. When a resting pain especially night pain is present, we have to be particularly watchful for unusual causes. This is true especially at either ends of the age spectrum. A systematic history is taken, and systemic symptoms are checked. “Giving way” is frequently described in patellofemoral joint pain but should not be considered as specific. “Locking” is described by patients with meniscal disorders or loose bodies. A “shift” or apprehension occurs when some structures have gone lax and become unstable in the knee. Limping in a child especially reported by an independent observer is usually significant. On physical examination an increase in temperature or an effusion would be significant. Single leg standing, squatting, or single leg hopping are useful for assessment and documentation, but are nonspecific. X-rays are useful but could be misleading especially since osteoarthritic changes are so common that they tend to distract attention from the presenting problem. With present day technology, a lower threshold for MRI studies should be considered.

Anterior Knee Pain

This is the most common form of mechanical knee pain. Different components of the extensor mechanism could be involved. There is a certain predilection for particular structures to be involved according to the age of presentation. The most common cause is an overuse of the knee.

The patella might have an excess tendency to migrate laterally during knee flexion (abnormal tracking). This is aggravated by the increase in tension of the quadriceps muscle during knee flexion. For some children or young adults they might have an increased risk of patella dislocation because of such abnormal tracking. For others the increased abnormal loading on the lateral part of the patellofemoral joint produces cartilage damage and pain in time. On the medial side of the patella, the Medial Plica Syndrome describes the pain caused by compression of femoral condyle by the thickened remnant of the embryonic synovial partition.

However the classical form of Chondromalacia Patellae which affects adolescents and young adults with retro-patellar pain brought on by walking stairs may not be associated with any of such features. It could be very symptomatic and resistant to treatment. Similarly the cause of Osteochondritis Dissecans is still unknown, and may present with chronic anterior knee pain without much signs of inflammation.

Overuse disorders of the knee are common. It is now recognized that intensive athletic activities cause abnormal MRI signal changes[1]. Closer to skeletal maturity, focal periphyseal edema (FOPE) may be observed in MRI and may be symptomatic[2]. Although considered as benign, caution and rest is required. Tendonitis or tendinosis of the patellar tendon (the Jumper's Knee), or the quadriceps tendon are common overuse disorders. Other tendons around the knee might also suffer from tendonitis or tendinosis and will be discussed below. Although most of these structures can usually be palpated, differentiation of the exact location or from other pathologies could be difficult simply by physical examination.

A more severe form of overuse disorder of the patellar tendon in the growing skeleton is traction apophysitis of the patellar tendon, either at the lower pole of the patellar (the Sinding-Larsen Johansson Syndrome) or at the tibial tuberosity (the Osgood Schlatter Syndrome). Recurrent injury and attempted repair result in obvious bony swelling at these sites. Avulsion fracture of the tibial tuberosity may complicate Osgood Schlatter Syndrome. The infrapatellar fat pad might also be inflamed, giving

rise to the Hoffa Syndrome, which tends to affect young females. The fat pad is palpable on either side of the deeper aspect of the patellar tendon.

Patellofemoral joint pain is a common presentation for osteoarthritis of the knee. The clinical pattern is typical with mechanical type of exertional pain, antalgic gait, bow leg (or knock knee), loss of extension or flexion, difficulty getting up from sitting, and aggravation by climbing stairs. However the cause of pain is often multifactorial and incidental causes should be looked for, since they might be controlled with simple means. For example, there could be concomitant meniscal disorders, loose bodies or even osteochondral fragments causing locking or mild haemarthrosis, or "synovitis". There could also be tendonitis or bursitis. Such culprits are manageable with non-operative means or minimal invasive surgery and function could be restored. However for the older individual one has to evaluate them carefully for the possibility of PMR or Elderly Onset Rheumatoid Arthritis (EORA). These will be elaborated below. Very rarely, osteonecrosis may mimic osteoarthritis but the pain is more acute and intense and an explicit tender point may be localized on the femoral condyle.

Classical bursitis of the knee such as the Housemaid's knee or Clergyman's knee is uncommon these days perhaps because of better work environment and precautionary measures. Occasionally direct contusion to the patella may result in a haematoma of the pre-patellar bursa. However the retro-patellar tendon bursitis could be confused with the fat-pad syndrome. Bursitis related to other tendons is deep seated, and could be difficult to be differentiated from tendonitis or may occur together, and present with symptoms on the sides or at the back of the knee.

Posterior knee pain

This is not common, but if presented among active adults could represent some form of tendonitis afflicting the gastrocnemius origins, the hamstrings, or the popliteus tendon[3], which is the main structure responsible for the screw home movement. Bursitis may arise but the semi-membranosus cyst is usually a painless swelling in an older child or a young adult.

Among older adults, posterior knee pain should be assessed cautiously. Although a Baker's cyst is commonly seen in osteoarthritis, it is usually not very symptomatic. Therefore any significant degree of pain, any associated leg or thigh pain or swelling, may represent neurovascular compression by the cyst[4]. This could lead to venous thrombosis with ominous consequences. The diagnosis could be difficult in obese

patients or when there is stiffness or deformity of the knee. Primary venous malformations or arteriovenous malformation are rare but have also been reported among young individuals and frequently being misdiagnosed.

Other forms of knee pain

The Pes Anserinus Syndrome is an overuse tendonitis and causes pain on the medial aspect of the upper tibia. Pain on the lateral aspect of the knee could be caused by tightness of the iliotibial tract (the Iliotibial Band syndrome) or tendonitis or bursitis of the biceps femoris tendon. Meniscal disorders are usually localized at the joint line. Collateral ligament pain is commonly localized at the femoral or tibial insertions, and as they sweep over the femoral condyle during flexion extension they may cause pain with osteophytes at the cartilage margin or being obstructed giving rise to "locking" as well.

Non-mechanical pain should be considered if the pattern is vague or not in proportion with physical signs. Occasionally crystal arthropathies take on a more subtle or indolent course presenting with recurrent pain and swelling of the knee. For knees with excessive "swelling" of some chronicity, tumour or tumour like disorders such as synovial chondromatosis or pigmented villonodular synovitis (PVNS) have to be considered[5]. Chondromatosis may give rise to opacified bodies in plain X-rays but sometimes these are few and being mistaken as osteophytes or sesamoid bones. Very rarely a Charcot Joint presents with chronic swelling and opacified bodies in the knee.

One should bear in mind that Polymyalgia Rheumatica (PMR) and Elderly Onset Rheumatoid Arthritis (EORA) are frequently overlooked among older patients[6]. PMR has an ominous association with Giant Cell Arteritis (or Temporal Arteritis) which may cause irreversible blindness. Knee pain was a common presenting symptom in PMR, although the classical involvement is more centrally located pain affecting the girdles, neck and is associated with muscle weakness. The two conditions may overlap with their presentation and the diagnosis of EORA was also frequently delayed.

Conclusion

When people are encouraged to adopt a more active life style and to engage in more outdoor and sports activities, more overuse disorders of the knee will occur, as well as direct injuries. Older individuals are also becoming more active as well as living longer. They are equally likely to suffer from overuse disorders in their aging knees.

There would also be a cumulative higher incidence of inflammatory arthritis occurring as they live longer. A more vigilant clinical approach should be adopted for knee pain, which includes careful and systematic examination of the knee and regular and diligent review of the patient. Given the varied presentation of the different causes of knee pain, a more frequent use of MRI or other diagnostic imaging to assist with diagnosis should be adopted.

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