

The many sources of knee pain in osteoarthritis

The knee is a complex joint and pain can arise from many structures. Understanding this greatly aids in accurate diagnoses and effective treatment, and also explains why arthroscopy has limited utility

DR DAN BATES

Is it really a surprise that arthroscopes don't work for knee osteoarthritis? In short, yes and no.

Yes because this really isn't consistent with my experience of the procedure. As I am sure many of you have done, I have referred patients for knee scopes who have had good, even great, outcomes. Thus the *BMJ*'s recent review of arthroscopic surgery for knee pain doesn't really ring true.

On the other hand, no it really isn't a surprise knee arthroscopes aren't as effective as we thought for those with knee osteoarthritis. The reasons for this are to do with both anatomy and the multi-faceted nature of the pain experience.

Knee osteoarthritis is a whole joint disease, and as cartilage is aneural it is unlikely the primary pain driver. Surrounding synovium, ligaments, subchondral bone, periosteum and capsule are all richly innervated and likely sources of pain in osteoarthritis. Additionally, neural mechanisms driving peripheral and central sensitisation have been implicated in osteoarthritis, and clearly pain can also be modulated by social and psychological factors.

To add to the complexity, an interesting study by of patients with osteoarthritis found that 32% had pain arising from an extra-articular or extra-synovial source¹. For the purpose of this article I will use the term "extra-articular" to encompass both extra-articular and extra-synovial sources of pain. These patients tended to have

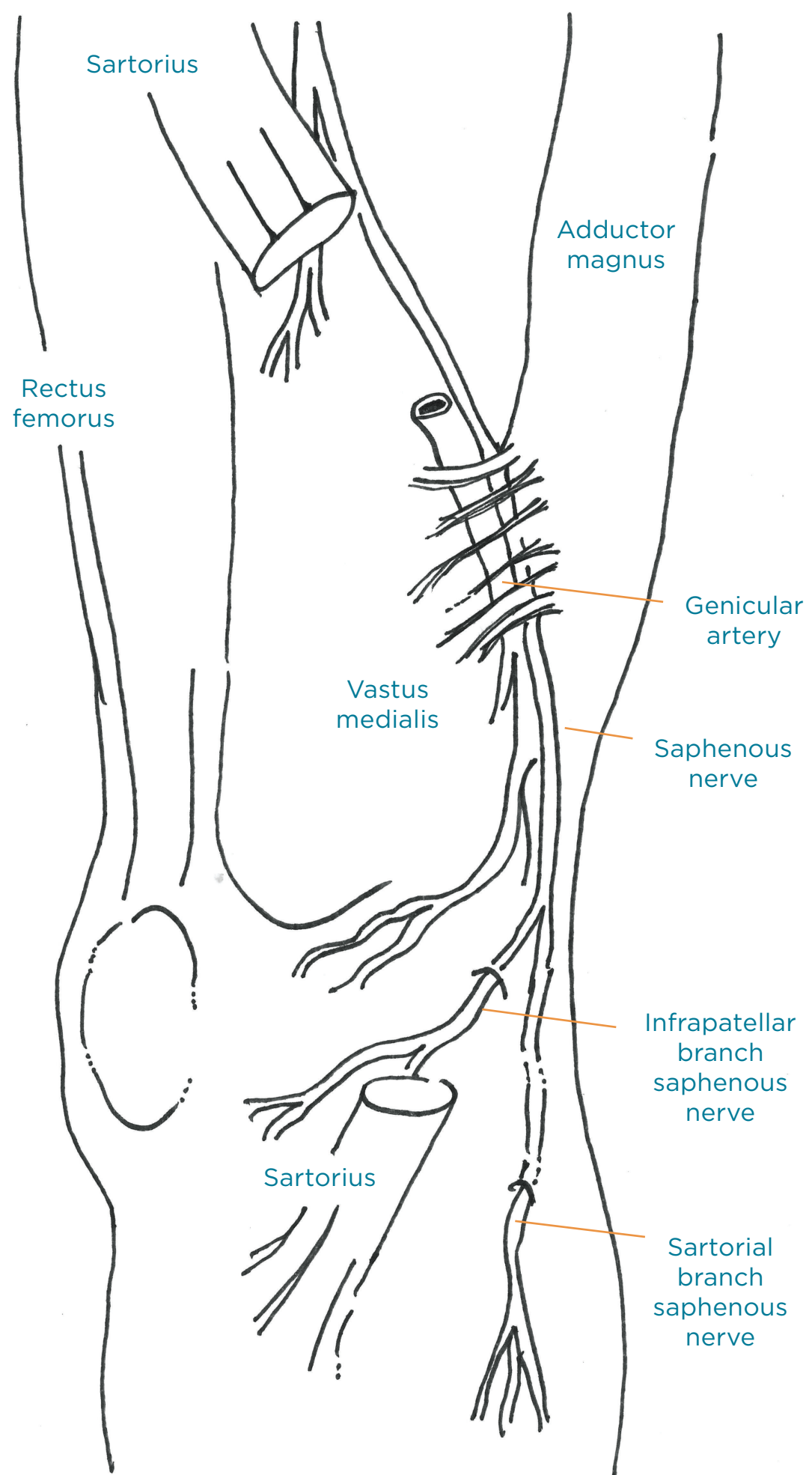
more diffuse pain, and be older, with higher grades of disease. A cross-sectional study³, supported these findings, suggesting that 36% of patients with knee osteoarthritis had at least one "non-articular" source of pain. So if these studies are correct, and about 30% of patients with osteoarthritis have extra-articular sources of pain, this may go some way to explaining why knee arthroscopy on average is unsuccessful, and why 13% to 38% of patients still have pain 12 months post joint replacement.

Clearly, knee pain in osteoarthritis is not simple, and we should stop thinking simply about it.

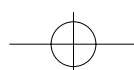
EXTRA-ARTICULAR SOURCES OF PAIN

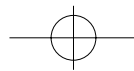
Knee osteoarthritis most commonly presents as somatic pain with inflammatory features. It is generalised or medial in location and described as annoying, hurting, or nagging. The pain is worse in the morning, usually for less than 30 to 60 minutes, and associated with stiffness that improves with activity. Rest is not the patients' friend, generally worsening the pain and transiently increasing stiffness³.

It is helpful to view pain using the Pain Pie. The concept behind the Pain Pie is that pain is comprised of multiple features. To successfully manage the patient's pain all the features of the pain need to be addressed. In the context of knee osteoarthritis, the patient's Pain Pie looks like that shown in Figure 1.



Anatomical position of the infrapatellar branch of the saphenous nerve





The pain of knee osteoarthritis is generally aggravated with squatting, going up and down stairs and twisting. For those with patellofemoral joint involvement, long periods of sitting, such as in the cinema or on long car drives, and kneeling are unpleasant.

ATYPICAL KNEE PAIN

Pain that doesn't fit with this presentation indicates something else is going on. A burning sensation, paraesthesia, and numbness indicate a neuropathic component. Severe pain out of proportion to the presentation raises the possibility of peripheral or central sensitisation, and of extra-articular sources of pain. The presence of night pain that wakes the patient, pain on impact, such as immediate pain on standing, and pain on bony palpation, raises the possibility of bone oedema and requires exclusion of red flag diagnoses.

Diffuse pain with minimal findings on examination and investigation should raise thoughts of L3 or L4 radicular pain or pain referred from the hip. By taking the time to confirm or exclude any of these other pain features, the Pain Pie can then be used to create a more detailed picture of the patient's pain elements. The presence of additional pain findings open up additional treatment options.

This greatly assists diagnoses and management decisions. See Figure 2.

Finally, focal pain raises the suspicion of an extra-articular diagnosis. Identifying and treating sources of extra-articular pain can sometimes reduce pain to a level where further intervention is not needed. In addition, extra-articular sources of pain may not respond to intra-articular treatment techniques such as arthroscopy, joint replacement or injection therapies.

Anterior extra-articular sources of pain include patellar tendinopathy, fat pad impingement, pre-patellar bursitis and quadriceps tendinopathy. Medial extra-articular sources include pes anserine bursitis, infra-patellar branch of the saphenous nerve neuropathy, and arthroscopy port pain.

Lateral differentials include iliotibial band friction syndrome, distal hamstring bursitis and popliteus tendinopathy. Posteriorly, popliteus tendinopathy and rarely popliteal artery aneurysms can be considered.

ILIOTIBIAL BAND FRICTION SYNDROME

Iliotibial band friction syndrome (ITB) presents as a gradual onset of lateral knee pain in the region of the lateral epicondyle. It is commonly brought on with movement of the knee through 30 degrees of flexion, and is relieved by keeping the knee straight. On examination, the patient has focal tenderness over the lateral epicondyle that reproduces their normal pain.

In Ober's test, the patient is lying on their side, with the unaffected side down and the unaffected hip and knee at a 90-degree angle. If the iliotibial band is tight, the patient will have difficulty adducting the leg beyond the midline and may experience pain at the lateral knee.

Treatment is a combination of addressing the patient trigger, such as increased walking load or walking on a camber, physiotherapy with a focus on pelvic strength, and soft tissue release of the iliotibial band and tensor fasciae latae. Anti-inflammatories or a steroid injection can be considered as a means of breaking the pain cycle and facilitating rehabilitation. If all fails, tenotomy of the ITB has been shown to be effective.

FAT PAD IMPINGEMENT

The infra-patellar fat pad or Hoffa's fat pad, is intra-capsular but extra-synovial. Impingement of the infrapatellar fat pad between the femur and tibia produces anteroinferior knee pain or burning. The patient may stand with hyperextended knees, and on palpation the fat pad may be firm, tender and enlarged. The pain can be reproduced with medial and lateral pressure to the fat pad, at 30 to 60 degrees and then in full extension. Overpressure into extension of the knee will also reproduce the patients' pain.

Diagnosis can once again be difficult. MRI may be useful in some circumstances but fat pad oedema has been shown to be present in both those with and without pain. Injection of local anaesthetic to the fat pad and re-examination can be useful, and the addition of cortisone can result in a good therapeutic effect. Rehabilitation combining taping, quadriceps strength training, particularly at end range, and gait retraining to avoid hyperextension, are all important. If conservative measures are unsuccessful, arthroscopic debridement is reported as an effective technique.

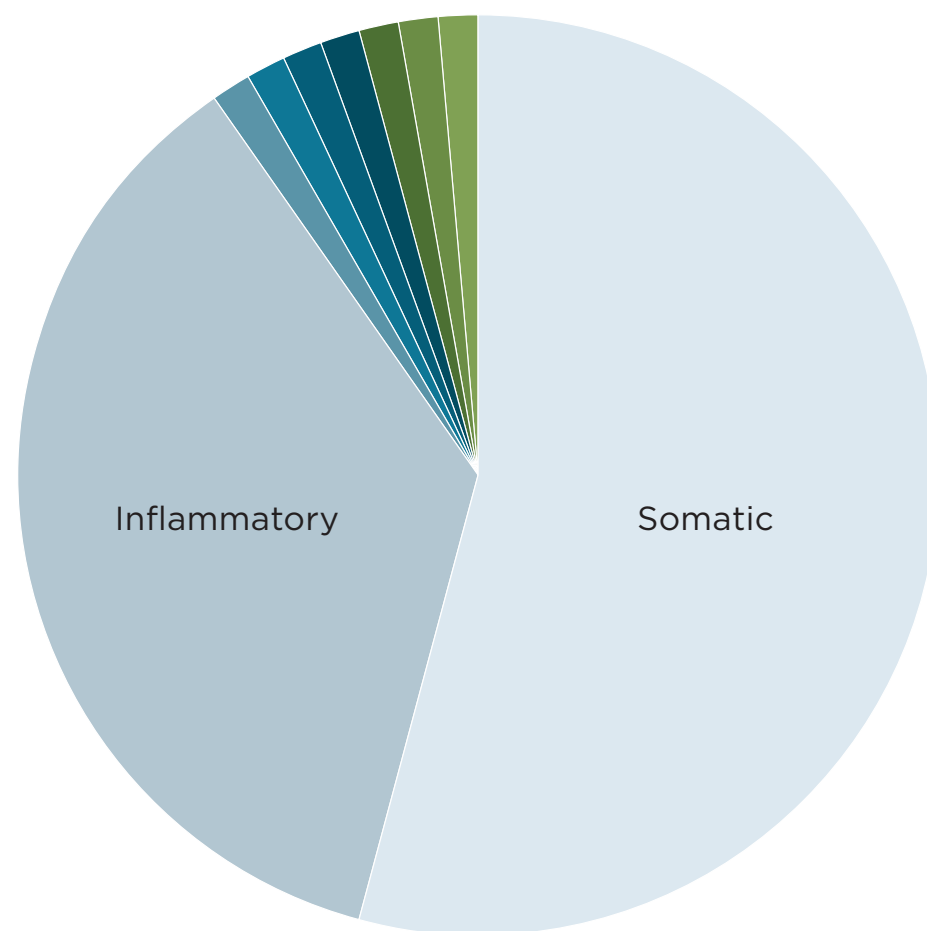


Figure 1: The Pain Pie for osteoarthritis

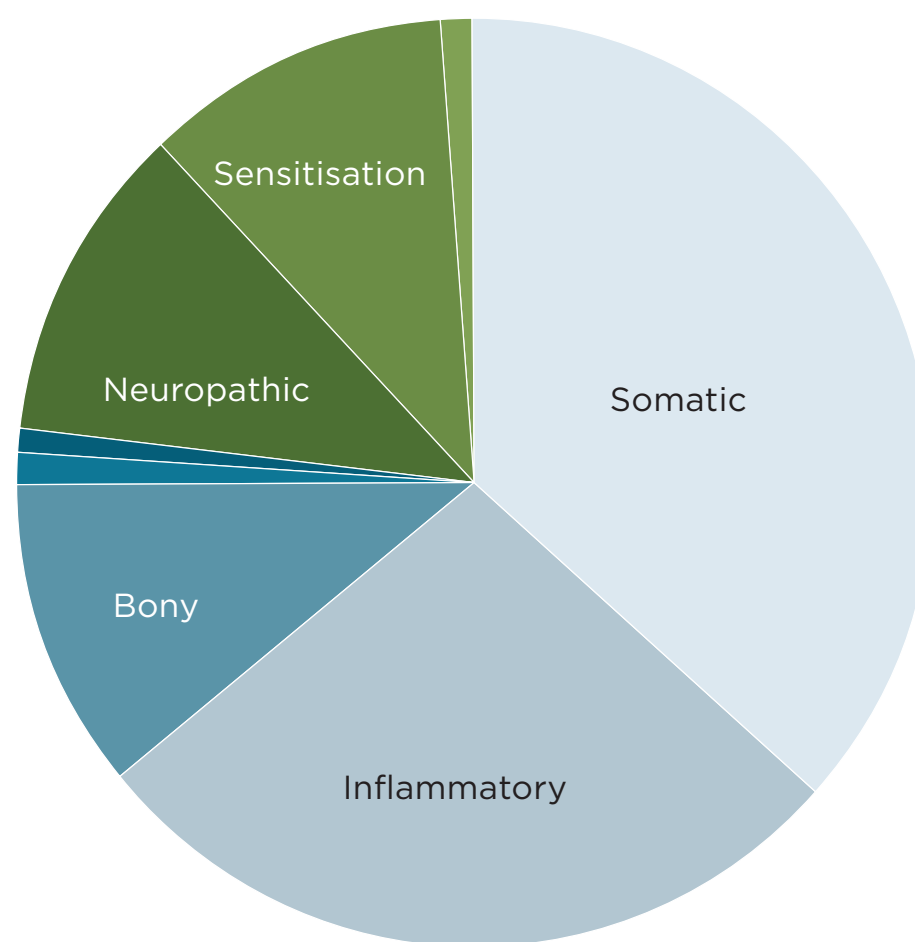


Figure 2: The Pain Pie for osteoarthritis with somatic, inflammatory, bony and neuropathic features in the setting of central or peripheral sensitisation

PES ANSERINE BURSITIS

The pes anserine bursa lies between the tibia and the conjoint tendon of sartorius, semitendinosus and gracillius. It presents as medial knee pain on climbing or descending stairs, with occasional local oedema. Once again, pain on palpation is part of the diagnostic criteria, and resolution of symptoms with injection of local anaesthetic assists with the diagnosis. Pes anserine bursitis is present

in about 20% of those with osteoarthritis and is more common in higher grades of disease and in females. Obesity, gout and diabetes are all risk factors for its development. Management is with a combination of anti-inflammatories, rehabilitation and, if needed, local cortisone injection.

PATELLAR TENDINOPATHY

Patellar tendinopathy is commonly seen in younger,

jumping athletes, and produces anterior knee pain particularly under eccentric load, such as a single leg squat. When asked to localise the pain, the patient will commonly pinpoint it with a single finger to the proximal pole of the patellar tendon. This finding, in the setting of a sudden increase in exercise or jumping load and pain on a single leg squat, significantly raises clinical suspicion.

Ultrasound of the patella tendon can be helpful in identifying thickening,

neovascularisation, and hypoechoic areas. These findings do not indicate a void in the tendon but rather protein deposition that appears black on ultrasound. It is wise to avoid calling them tears as this can unnecessarily alarm the patient. Management is centred on load management – doing not too little and not too much – and a strength program. Avoid cortisone in tendons as, although there is often an initial decrease in pain, it makes the problem worse at six months. Other adjuvant options include shockwave therapy, possibly platelet rich plasma, although this remains controversial, and if all else fails, a surgical stripping of the posterior surface of the tendon.

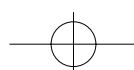
POPLITEUS TENDINOPATHY

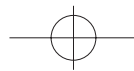
Popliteus tendinopathy is a less common cause of lateral knee pain. It presents as focal tenderness over the lateral joint line that reproduces the patient's pain. Infrequently it is associated with a click as the tendon flicks across an osteophyte. Anecdotally, it radiates pain down the lateral calf, which can be reproduced on palpation. Beyond osteophytes, friction against a joint replacement, minor trauma, and overuse due to running have been described as causes. Diagnosis is difficult, but guided sheath injection has been shown to be an effective diagnostic technique. When combined with cortisone, this approach may be therapeutic. Rehabilitation is difficult but the focus is on end-of-range quadriceps strength and control. This has been a successful approach within our treatment facility.

INFRAPATELLAR BRANCH OF THE SAPHENOUS NERVE

The infrapatellar branch of the saphenous nerve supplies the inferomedial aspect of the knee. Irritation or damage to this nerve causes pain in a similar distribution to a number of potential diagnoses: medial compartment degenerative disease, MCL injury, medial meniscal injury, and pes anserine bursitis.

Given its anatomical position, the infrapatellar branch of the saphenous nerve can be damaged by direct trauma, medial joint line osteophytes, and during total knee replacement, knee arthroscopy or hamstring harvest for ACL grafting. It can present as severe medial knee pain out of proportion to the





apparent injury/presentation, with occasional radiation to the medial calf. Commonly, patients will have neuropathic features of burning and occasionally paraesthesia.

On examination, patients may walk with a stiff leg to avoid movement of the nerve across the medial joint line as they are hypersensitive to touch over the medial and inferior aspect of the joint with a focal area of tenderness over the medial tibial plateau that reproduces the pain.

Importantly, the infrapatellar branch of the saphenous nerve can be seen in conjunction with any of its differentials mentioned above. Pain brought on by sleeping with legs together always raises the possibility of irritation of this nerve. Nerve block under ultrasound guidance with 1.5ml of lignocaine and cortisone is diagnostic, and at times therapeutic. For those with a positive block but no therapeutic effect, surgical excision and radiofrequency ablation of the nerve are effective treatment options.

For those patients with post arthroscopy pain, the infrapatellar branch of the

saphenous nerve can be an injury incurred during placement of the medial port with subsequent neuroma formation. The key question is whether their pain is different to their presurgical pain, and whether palpation of the medial port reproduces their pain. Diagnosis and treatment are then similar to the above.

Beyond the above differentials, pre-patellar bursitis, distal hamstring bursitis and tendinopathy, quadriceps tendinopathy, and more esoteric diagnoses such as popliteal artery aneurysms, can all be considered as extra-articular sources of pain. All of these can be successfully treated.

DISCRIMINATING BETWEEN INTRA-ARTICULAR AND EXTRA-ARTICULAR SOURCES OF PAIN

We commonly think about knees as being simple, but really they're not. Thinking of them as a complex structure with multiple sources of pain automatically increases the differentials you think through. Most extra-



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articular causes of pain can be brought to mind by being alert to presentations that don't fit the normal pattern of osteoarthritis, pain that is out of proportion to the expected, and by simply palpating the knee as a part of a normal examination.

If an extra-articular source of pain is suspected, an injection of 1% lignocaine into the joint and reassessment at 15 to 30 minutes for relief of pain is useful. If there is no pain relief, or is it only partial, injection of local anaesthetic over the suspect extra-articular structure at the time or at a later date can help confirm your diagnosis. If good pain relief is then achieved, proceed with treating the extra-articular source of the pain. This will generally result in improvements for those patients and minimise the failure of purely intra-articular treatment modalities.

Dr Dan Bates is a sports medicine practitioner at Lakeside Sports Medicine Centre and Metro Pain Group, Melbourne, Victoria. B.Sc (Hons), B.Med

Is there an extra-articular component?

- Pain doesn't fit the normal pattern for osteoporosis
- Pain is out of proportion to what is expected
- Focal tenderness on palpation

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Further reading

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