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Degenerative tears of the posterior horn of the medial meniscus: correlation between MRI findings and outcome following intra-articular steroid/bupivacaine injection of the knee

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AIM: To evaluate the response of symptomatic degenerative tears of the posterior horn of the medial meniscus to guided intra-articular knee steroid/bupivacaine injection and to correlate clinical outcomes with preprocedural findings at magnetic resonance imaging (MRI).

MATERIALS AND METHODS: Sixty patients who had clinical and MRI evidence of a symptomatic degenerative tear of the posterior horn of the medial meniscus, isolated or accompanied by additional features of degenerative arthritis, who had failed conservative approaches (physiotherapy, non-steroidal anti-inflammatories, and 3 months rest/knee bracing) were included in the study. Patients underwent intra-articular knee steroid/bupivacaine injection and were followed clinically for a minimum of 6 months. Preprocedural MRI findings were correlated with duration of symptoms, clinical response to injection (recorded as complete, partial or no response) and duration of response to injection.

RESULTS: Forty-nine of 60 patients (82%) reported an improvement in symptoms following guided intra-articular knee steroid/bupivacaine injection (complete: 25 patients (42%), partial: 24 (40%) patients). Improvement was sustained in 32 of 60 patients (53%) at follow-up. Thirteen of 18 patients (72%) who had an isolated degenerative tear of the posterior horn of the medial meniscus recorded a complete resolution of symptoms. This was sustained at follow-up in 10 patients (56%).

CONCLUSION: Intra-articular steroid/bupivacaine knee joint injection reduced pain symptoms in the majority of patients (81.7%) with degenerative tears of the posterior horn of the medial meniscus, usually with a sustained response. Preprocedural MRI appearances correlate with response to injection. Patients with isolated tears are more likely to have a favourable outcome.

Introduction

Degenerative tears of the medial meniscus are common and their prevalence increases with age.[1] A large

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population-based study found that almost one-third of adults over the age of 50 have lesions of the medial meniscus.[1] They occur in both symptomatic and asymptomatic knees[1,2] and have been identified in 45% of patients with knee pain, aching, and stiffness on most days and in 26% of patients without.[1] Signs and symptoms of degenerative medial meniscal lesions include medial joint line pain and tenderness, pain at extremes of flexion and extension, instability and over time, quadriceps wasting.[3] Because degenerative meniscal tears commonly accompany knee osteoarthritis, they may be difficult to isolate and to diagnose clinically.[1,4]

There has been much debate in recent years about the best treatment for degenerative meniscal lesions.[5–10] Treatment options include watchful waiting, physiotherapy, medical treatment with acetaminophen and/or non-steroidal anti-inflammatory drugs [NSAIDs], intra-articular injection with corticosteroids or hyaluronic acid, arthroscopic partial meniscectomy, and ultimately total knee replacement.[8,9,11]

The surgical treatment of degenerative meniscal lesions is controversial.[5–9] Based on favourable results from case series and anecdotal evidence, arthroscopic partial meniscectomy is a popular treatment for symptomatic meniscal lesions both with and without associated osteoarthritis[12]; however, randomised control trials have shown that this approach is no better than sham surgery or physical and medical therapy.[13–20] Surgery is not without risk. Knee arthroscopy is associated with a 2–3% risk of an adverse event, including deep vein thrombosis, infection, cardiovascular event, pulmonary embolism, and death within 3 months.[10] In the long term, meniscectomy is noted to accelerate the development of osteoarthritis.[21] Nonetheless, arthroscopic partial meniscectomy remains one of the most commonly performed orthopaedic procedures and rates of this procedure are increasing, particularly in the elderly.[10,12]

In 2017, two sets of guidelines recommended a conservative treatment approach in favour of a surgical one. A consensus panel review by the European Society of Sports Traumatology, Knee Surgery and Arthroscopy (ESSKA) on the management of degenerative meniscus lesions recommended that a non-operative treatment approach (which could include physical therapy, NSAIDs, and/or intra-articular corticosteroid injection) should be the first-line treatment.[8,9] The panel suggested that arthroscopic partial meniscectomy be reserved for patients without radiographic evidence of osteoarthritis who fail 3 months of conservative treatment. In May 2017, a clinical practice guideline on the use of arthroscopic surgery for degenerative knee arthritis and meniscal tears was published in the *British Medical Journal*.[11] The guideline was emphatic in recommending against the use of arthroscopy in almost all patients with degenerative disease. This included patients without radiographic evidence of osteoarthritis, patients with mechanical symptoms, and patients with acute onset of symptoms; groups commonly believed to derive more benefit from arthroscopic debridement.[11] The guideline recommendation is based on the results of a 2016 systematic review, which found that surgery offered no important long-term benefit in terms of either pain or function when compared to conservative management[22].

Although a non-operative treatment approach has been advocated, there is an absence of clear guidelines as to what constitutes best practice in terms of conservative treatment. Physical therapy has repeatedly been shown to be equal to arthroscopic partial meniscectomy in terms of pain and functional improvement[14–18,20]; however, the ESSKA panel offered no definitive recommendations as to what exercise regime should be followed, or as to whether intra-articular steroids should be used.[9]

Intra-articular corticosteroid injections are frequently used in the treatment of knee osteoarthritis and may provide short-term symptomatic relief.[23–25] Meniscal derangement, maceration, extrusion, and tearing commonly accompany other features of knee joint degenerative arthritis, and so, it is often unclear what the steroid is actually treating. There has been very little study focusing on the use of intra-articular steroids in the management of symptomatic degenerative meniscal tears, occurring either in isolation or accompanying degrees of degenerative change.[26]

This study was undertaken to analyse the response to guided intra-articular knee steroid/bupivacaine injection in a group of patients with clinical and MRI evidence of a symptomatic degenerative tear of the posterior horn of the medial meniscus both with and without associated chondral damage. In so doing, the study attempted to identify MRI findings that might be used as predictors of a favourable response to treatment.

Materials and methods

Patients

The study was conducted at a single site dedicated orthopaedic referral centre. Between July 2015 and July 2017, patients with posteromedial knee pain for >3 months with MRI features of a tear of the posterior horn of the medial meniscus who had failed conservative approaches (physiotherapy, oral NSAIDS and rest/bracing for 3 months) were included for study. Patients underwent ultrasound-guided intra-articular steroid/bupivacaine injection. Correlation was made between preprocedural imaging findings and ultimate patient outcome.

Patients were excluded if <50 years of age, if they had a history of trauma, if they had previously undergone knee surgery, if imaging showed features of degenerative arthritis without a meniscal tear, if patients had not undergone a trial of conservative treatments (physiotherapy, oral NSAIDS, and rest/bracing for >3 months) prior to referral or if incomplete clinical follow-up or imaging data were available.

For the purpose of this study, if a patient had a history of gradual onset medial joint line pain in the absence of trauma, with clinical evidence of medial joint line discomfort and an MRI showing evidence of a tear,[27] he or she was considered to have a "symptomatic" tear of the posterior horn of the medial meniscus.

MRI

MRI was performed using a 3 T MRI system (Philips Achieva 3T TX manufactured in Best, North Brabant, Netherlands) with an eight element, phased array receive only coil. Images were acquired in coronal, sagittal and axial planes: coronal short tau inversion recovery (STIR; 3,986 ms repetition time [TR], 30 ms echo time [TE], 190 ms inversion time [TI], 160 [right left (RL)]×158 [anteroposterior (AP)] field of view [FOV], 3 mm section thickness, 1 mm intersection gap, 296×192 matrix), coronal proton density (PD) imaging (3,964 ms TR, 30 ms TE, 160 [FH]×160 [RL] FOV, 3 mm section thickness, 0.3 mm intersection gap, 308×205 matrix), sagittal PD imaging (3,964 ms TR, 30 ms TE, 160 [FH]×160 [RL] FOV, 3 mm section thickness, 0.3 mm intersection gap, 308×205 matrix), and axial PD SPAIR (2,900 ms TR, 30 ms TE, 170 [RL]×170 [AP], 3 mm section thickness, 3 mm intersection gap, 308×224 matrix) were acquired in each case).

The MRI images were read independently by two fellowship-trained musculoskeletal radiologists who were blinded to the clinical outcomes. Discrepancies were resolved in consensus. MRI images were assessed for the presence of a degenerative tear of the posterior horn of the medial meniscus, for the presence or absence of and degree of co-existing meniscal extrusion, for the presence or absence of co-existing medial compartment chondral derangement, and for the presence or absence of other co-existing intra-articular knee abnormality.

Meniscal tear was defined by the identification of linear or globular signal abnormality within the meniscus extending to a surface on more than two consecutive sections.

Meniscal extrusion was graded from 1 to 3 based on the alignment of the outer margin of the body of the medial meniscus to the margin of the medial femoral and tibial condyles. Extrusion of less than one-third of the meniscus was listed as grade 1, between one-third and two-thirds as grade 2, and extrusion of more than two-thirds of the meniscus as grade 3.[27]

Integrity of the medial articular surface cartilage was graded from 1 to 4. Normal articular surface was listed as grade 1, partial thickness chondrosis as grade 2, full-thickness chondrosis as grade 3, and subchondral oedema accompanying full-thickness chondrosis as grade 4.

MRI images were reviewed for the presence or absence of other co-existing pathology. Abnormalities that were considered to be clinically significant and potentially contributing to knee symptomatology, such as lateral or patellofemoral osteoarthritis or lateral meniscal tear, were documented and this information was included in the analysis.

Intra-articular injection technique

Intra-articular injection was performed under ultrasound guidance. Eighty milligrams of methylprednisolone (Depo-medrone, Pfizer, Dublin, Leinster, Ireland) in 2 ml bupivacaine 0.25% (Marcaine Polyamp. AstraZeneca, Luton, Bedfordshire, United Kingdom) was injected into the knee joint using a medial suprapatellar approach. Injection was performed within 2 weeks of the acquired MRI of the knee in each case.

Patient follow-up

Patients were followed clinically for a minimum of 6 months (mean 20.4 months). Response to injection at 2 weeks (complete resolution of symptoms, partial resolution of symptoms, or no response) was recorded. The duration of response was recorded at patient follow-up (minimum 6 months).

Analysis and statistics

The chi-squared test was used to correlate MRI features with the response to intra-articular steroid/bupivacaine injection.

Ethical approval

Institutional ethical approval was granted for this study. Written informed consent for intra-articular injection was obtained from each of the patients prior to undergoing intra-articular injection. Informed verbal consent was obtained from patients for participation in the study. Approval granted by the hospital ethics committee did not require individual written consent for patients' participation in the study.

Results

Study population

Of 348 patients attending with medial joint line discomfort, 60 patients were identified with clinical and imaging evidence of a symptomatic degenerative tear of the posterior horn of the medial meniscus conforming to inclusion and exclusion criteria as defined above.

There were 40 male and 20 female patients with a mean age of 57.9 years (range 50–83 years). The average duration of symptoms was 20 months prior to imaging and therapeutic injection.

MRI findings

Sixty patients were identified with imaging appearances of a degenerative tear of the posterior horn of the medial meniscus conforming to definition as above. Twenty-nine of the 60 patients (48.3%) had grade 1 meniscal extrusion on MRI, 18 patients (30%) had grade 2 extrusion, and 13 (21.7%) had grade 3 extrusion (Table 1). Twenty-four of the 60 patients (40%) had grade 1 medial compartment chondrosis,

Table 1
Tear posterior horn of medial meniscus and grade of accompanying meniscal extrusion correlated with outcome at 2 weeks.

	Complete response *n* (%)	Partial response *n* (%)	No response *n* (%)
G1 Meniscal extrusion (*n*=29)	17 (58.6%)	6 (20.7%)	6 (20.7%)
G2 Meniscal extrusion (*n*=18)	6 (33.3%)	8 (44.4%)	4 (22.2%)
G3 Meniscal extrusion (*n*=13)	2 (15.4%)	10 (76.92%)	1 (7.7%)

11 patients (18.3%) had grade 2 medial compartment chondrosis, seven patients (11.7%) had grade 3 chondrosis and 18 (30%) patients had grade 4 medial compartment chondrosis (Table 2). Twenty-three of the 60 patients (38.3%) had at least one other abnormality identified on knee MRI, which was considered clinically significant and may have contributed to the patients symptoms. Findings included lateral compartment osteoarthritis (*n*=4), patellofemoral chondrosis (*n*=16), lateral meniscus tear (*n*=2) and intra-articular loose body (*n*=2). Eighteen of the 60 patients (30%) in the study group had an isolated tear of the posterior horn of the medial meniscus with no other significant abnormality on MRI (no extrusion, chondrosis or additional abnormality; Table 3).

Clinical outcome

Twenty-five of the 60 patients (42%) reported complete resolution of symptoms 2 weeks after the injection. Twenty-four patients (40%) reported a partial improvement. Thus 49 patients (82%) experienced symptomatic improvement following treatment. The response was sustained for a minimum of 6 months in 32 of 60 patients (53%). Patients who experienced complete resolution of symptoms were more likely to have a sustained response (72% of the complete recovery group versus 33.3% of the partial recovery group). Eleven patients (18.3%) reported no improvement in their symptoms 2 weeks after the injection. No complications were recorded.

Of the 25 patients reporting complete resolution of symptoms, three patients underwent repeat injection for a recurrence of symptoms at 1 year and one patient underwent arthroscopy for a recurrence of similar symptoms at 1 year.

Of the 24 patients reporting a partial resolution of symptoms, six patients underwent repeat injection at 6 months with subsequent resolution of symptoms, one patient had one further injection followed eventually by arthroscopic partial meniscectomy which did not lead to symptomatic relief, one patient found that their knee symptoms further improved following ipsilateral total hip replacement, and one patient is currently awaiting total knee replacement for persistent knee symptoms.

Of 11 patients who had no initial improvement in symptoms following intra-articular corticosteroid injection, one patient underwent a repeat injection with resolution of symptoms and three patients underwent arthroscopic partial meniscectomy. Arthroscopic partial meniscectomy led to complete resolution of symptoms in two of these cases and a partial improvement in one. Of the 11 patients, nine had co-existing pathology (lateral compartment and patellofemoral chondrosis five patients, patellofemoral chondrosis four patients).

Table 2
Tear posterior horn of medial meniscus and presence or absence of accompanying chondrosis correlated with outcome at 2 weeks.

	Complete response *n* (%)	Partial response *n* (%)	No response *n* (%)
No chondrosis *n*=18	13 (72.2%)	2 (11.1%)	3 (16.7%)
Chondrosis *n*=42	12 (28.6%)	22 (52.4%)	8 (19%)

Table 3
Isolated degenerative tear posterior horn medial meniscus correlated with outcome at 2 weeks.

	Complete response *n* (%)	Partial response *n* (%)	No response *n* (%)
Isolated degenerative tear posterior horn medial meniscus (*n*=18)	13 (72.2%)	2 (11.1%)	3 (16.7%)
All else (*n*=42)	12 (28.6%)	22 (52.4%)	8 (19%)

MRI findings correlated with clinical outcome

Meniscal extrusion

Patients with grade 1 meniscal extrusion were more likely to achieve complete resolution of symptoms than those with grade 2 or grade 3 meniscal extrusion. It must be noted, however, that patients with grade 3 extrusion had the lowest proportion of non-responders. Chi-squared analysis showed that grade 1 and grade 3 meniscal extrusion were each statistically significant predictors of outcome (confidence interval 95%). Grade 2 meniscal extrusion was not a significant predictor of outcome (Table 1).

Grade of medial compartment chondrosis

When patients with intra-articular findings not confined to the medial compartment were excluded from the analysis, the presence of medial compartment chondrosis was a statistically significant predictor of negative outcome (i.e., grade 1 medial compartment chondrosis versus grades 2, 3 and 4 medial compartment chondrosis) (confidence interval 95%; Table 2). The presence of chondrosis in any compartment of the knee was found to be a statistically significant predictor of negative outcome (confidence interval 95%).

Isolated degenerative tear of the posterior horn of the medial meniscus

Patients who had an isolated tear of the posterior horn of the medial meniscus were examined as a distinct group. Of these 18 patients, 13 (72.2%) had a complete response to

corticosteroid/local anaesthetic injection. The response was sustained at follow up in 10 (76.9%) of these patients at a minimum of 6 months. Chi-squared analysis showed that an isolated degenerative tear of the posterior horn of the medial meniscus was a statistically significant predictor of favourable outcome (confidence interval 95%; Table 3) (Figs 1–4).

Discussion

There is a growing requirement to identify safe and effective treatments for degenerative tears of the medial meniscus. These tears are common and their prevalence increases with age.[1] Although arthroscopic partial meniscectomy has been a popular treatment, recent clinical guidelines, based on systematic review of arthroscopy versus conservative treatments, recommend against surgery.[11] A 2017 consensus review also recommended a non-operative treatment approach.[8,9] These recommendations, together with the risks inherent in surgery and the fact that rates of degenerative meniscal tears can be expected to increase as life expectancy rises, underline the importance of identifying the best treatment approach.

Randomised control trials have focused, in the main, on physical therapy and arthroscopic partial meniscectomy as a treatment for degenerative meniscal tears.[13–15,17,18,20] The effects of intra-articular steroid injections on outcomes in knee osteoarthritis have been examined in a number of systematic reviews and meta-analyses; however, there is a dearth of research specifically evaluating the use of corticosteroid injections in the management of degenerative meniscal tears.[23–25] Although it is recognised that steroid injections often settle symptoms, no study has previously attempted to correlate treatment response with preprocedural imaging appearances at MRI and attempted to identify features that might be used to predict ultimate outcome.

In concordance with previous studies and the authors' clinical experience, the results of this study suggest that intra-articular steroid/bupivacaine injections are generally effective in providing short-to medium-term symptomatic relief in patients with degenerative tears of the medial meniscus. The results also suggest that in a significant number the treatment response is sustained and obviates the need for further management, specifically surgical interventions.

In correlating pre-treatment MRI findings with outcome, a number of factors proved statistically significant. The absence of chondrosis was associated with a favourable outcome, this was true for those with chondrosis of any compartment (medial, lateral, or patellofemoral) and for those with chondrosis confined to the medial compartment. Those patients (n=18) who had a degenerative tear of the posterior horn of the medial meniscus and no other intra-articular abnormality identified at MRI, responded particularly well to treatment with intra-articular steroid/bupivacaine injection. Although some patients with co-existing chondrosis reported an improvement in their symptoms following injection, they were more likely to report only partial response. Similarly patients with degenerative tears without extrusion more frequently responded to steroid injection and showed a more sustained response. In effect, degenerative tears occurring in the absence of further derangement, chondrosis, meniscal extrusion, and co-existing pathologies responded better. This is not surprising as extrusion and chondrosis are markers of more chronic tearing, both occurring further along the pathway towards ultimate development of osteoarthritis.[28–30]

Several studies have concluded that meniscal preservation is the key to preventing progression of knee degenerative changes. Most authors now conclude that a torn meniscus acting as a faulty shock absorber is better than none. In its absence unopposed impaction forces rapidly lead to development of chondrosis, knee osteoarthritis, and the need for joint replacement surgery.[21] Whether treatment of symptoms of degenerative tears of the medial meniscus by intra-articular steroid/bupivacaine injection can prevent or delay progression of articular degenerative

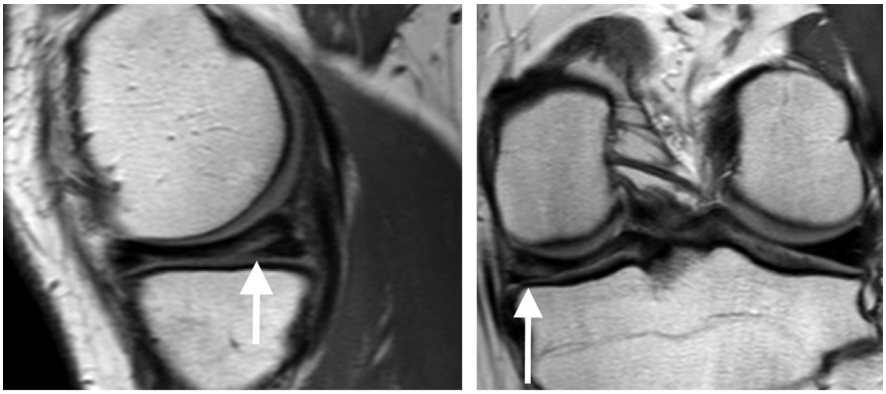

Figure 1 A 63-year-old man presented with a 3-month history of left medial knee pain and no history of trauma. Following injection he experienced a complete resolution of symptoms. This improvement was sustained at follow-up 31 months later. (a) Sagittal and (b) coronal PD-weighted turbo spin echo (TSE) images show an oblique under-surface tear of the posterior horn of the medial meniscus (arrow). The articular cartilage is preserved. Grade 1 extrusion.

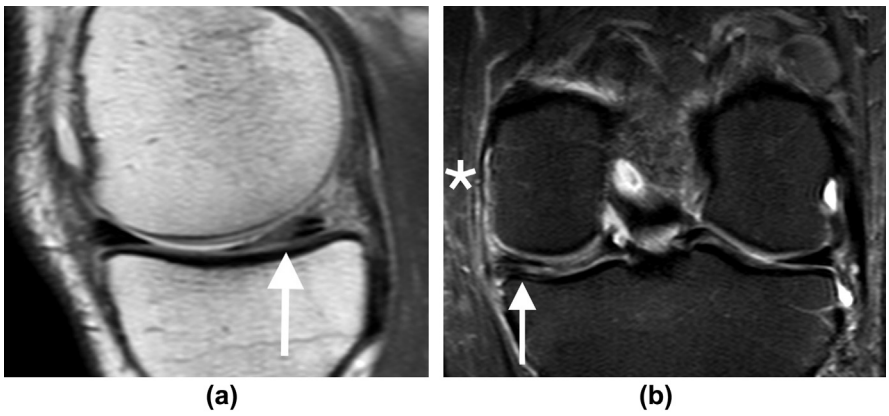

Figure 2 A 68-year-old man presented with a 4-month history of left medial joint line pain and tenderness and no history of trauma. Following injection he experienced a complete resolution of symptoms. This improvement was sustained at follow-up 38 months later. (a) Sagittal PD-weighted TSE and (b) coronal STIR TSE images show a complex tear of the posterior horn of the medial meniscus (arrow) with medial joint line inflammation (asterisk). The articular cartilage is preserved. Grade 1 meniscal extrusion.

change is unclear, and although speculative, certainly requires further longitudinal study. It is recognised that meniscal damage triggers the release of inflammatory mediators that lead to joint line inflammation, local synovitis, and the development of a joint effusion.[31] Injecting steroid is recognised to neutralise inflammatory mediators, and reverse the secondary inflammatory cascade. It is recognised that inflammatory mediators damage cartilage and so neutralising their effects may limit progression of chondrosis and hence the development of osteoarthritis.

A similar mechanism is proposed for knee pain in degenerative meniscal tears. Reactive inflammation triggers local synovitis and irritation of associated joint line neurovascular structures, explaining why medial joint line discomfort is the most reliable clinical feature of the injury.[31] Similarly, injected steroid reversing inflammation reduces pain. This is not due to a direct stabilising effect on the meniscus but due to an effect on the reactive joint line inflammation or synovitis. Calming inflammation consequently leads to reduction in synovitis and secondary pain.

In effect intra-articular steroids appear to be beneficial both in reducing pain derived from meniscal tear and may also reduce some of the complications of meniscal tear, specifically chondrosis. The damaged meniscus appears unaltered by the injection, but in the absence of pain is given time to regain a form of biological and mechanical stability.[28–30] In the absence of pain, normal gait is recovered further promoting recovery and a form of healing.

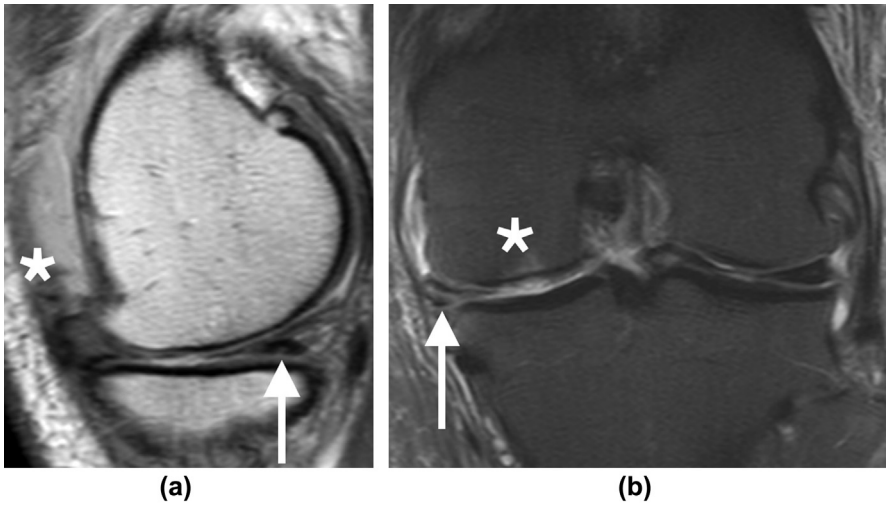

Figure 3 A 76-year-old man presented with a 3-month history of left knee pain in the absence of trauma. Following intra-articular steroid/bupivacaine injection he experienced a partial resolution of symptoms. This improvement was sustained at follow-up 8 months later. (a) Sagittal PD-weighted TSE image shows a degenerative tear of the posterior horn of the medial meniscus (arrow) accompanied by degenerative maceration of the anterior horn with an associated effusion (asterisk). (b) Coronal STIR TSE image shows a degenerative tear of the posterior horn of the medial meniscus (arrow) with grade 4 chondrosis, early reactive marrow change of the medial femoral condyle (asterisk), and grade 2 meniscal extrusion.

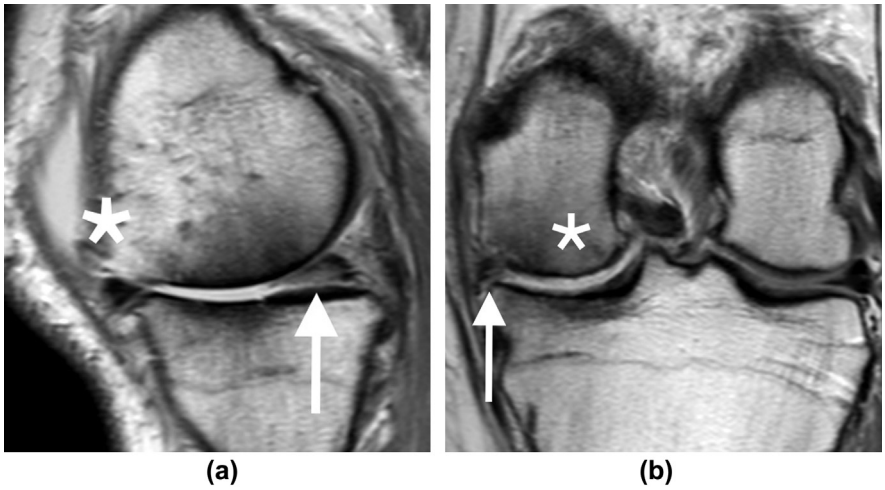

Figure 4 A 70-year-old male presented with a 1-year history of left knee pain. Following intra-articular steroid/bupivacaine injection he experienced a partial improvement in symptoms. The improvement was transient and lasted 2 months. (a) Sagittal PDW TSE image shows an under-surface oblique tear of the posterior horn of the medial meniscus (arrow) with effusion, osteophyte (asterisk), chondrosis of the articular surfaces, and reactive marrow change. (b) Coronal PD-weighted TSE image shows degenerative tear posterior horn of medial meniscus with grade 2 extrusion of the posterior horn of the medial meniscus (arrow) with extensive grade 4 chondrosis of the articular surfaces with reactive marrow change (asterisk).

Although *in vitro* studies have demonstrated chondrotoxic effects of steroid, it is speculated that the reduction in the inflammatory cascade and its direct effect on cartilage may outweigh these *in vitro* effects.[31] Recognising the above, treatment of pain and inflammation may have a beneficial impact delaying progression of degenerative change.

Intra-articular corticosteroid injections are generally considered to be safe, reported complications are rare. No adverse events were recorded in the current study. Nevertheless, concerns have been raised about the possibility of chondrotoxicity related to intra-articular corticosteroid.[32,33] Systematic review of the available evidence suggests a time and dose dependent effect on articular cartilage, with positive effects from the use of low doses over short durations and detrimental effects when higher doses are used for prolonged durations. It supports the use of intra-articular corticosteroid administration but cautions that the lowest efficacious dose should be used.[34] No study has systematically evaluated use of differing steroid doses, and the decision to inject 80 mg in this study was based on existing literature and a local sense that higher dose is more efficacious; however, it is accepted that a smaller dose might have proved just as effective.[35] Similarly although dexamethasone is aqueous and non-particulate, and therefore, not commonly associated with the steroid flare phenomenon, the particulate nature and esterified form of Depo-Medrol (steroid bound to polyglycol to create crystalloid solution with particles up to 100 nm in size) allows for a prolonged action, potentially producing a more prolonged response to injection.[36]

Aspiration immediately prior to intra-articular corticosteroid/local anaesthetic injection has been shown to improve outcomes in terms of short-term pain relief.[37] The fact that aspiration was not undertaken prior to injection might explain why some patients did not respond as well as others. The present study used 80 mg Depo-Medrol rather than 40mg based on a local sense that higher dose is more efficacious and obviates the need for simultaneous aspiration, although this has not been scientifically proven.

Concerns have been raised about potential chondrotoxic effects of local anaesthetic agents. A recent systematic review identified likely time, dose, and type effects of local anaesthetics on chondrocytes and cartilage. Although adverse effects have not been demonstrated following the intra-articular administration of 0.25% bupivacaine, judicious use is recommended.[36,38]

The results of the present study are limited by the size of the study population, by non-randomised retrospective study design, and by lack of a control study population. Nevertheless, to the authors' knowledge, the present study represents the first attempting to correlate response of intra-articular knee joint steroid injection (as treatment for degenerative tears of the posterior horn of the medial meniscus) with preprocedural imaging appearances. Despite recognising limitations, the results suggest that in the majority of patients with degenerative tears of the posterior horn of the medial meniscus, intra-articular injection of the knee with steroid and bupivacaine produces beneficial effects. MRI is useful both to identify degenerative tears and also to triage affected patients into groups more and less likely to respond to minimally invasive therapy. In such a way, preprocedural MRI appears to allow prediction of likely outcome following guided intra-articular steroid bupivacaine therapy.

Conflict of interest

The authors declare no conflict of interest.

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