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SCIENTIFIC ARTICLE

Bony changes of the tibia secondary to pes anserine bursitis mimicking neoplasm

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Abstract

Objective To describe the radiological features of pes anserine bursitis with intramedullary extension and cortical scalloping and to determine the prevalence of these bony changes among patients with pes anserine bursitis.

Materials and methods Reports of knee magnetic resonance imaging (MRI) examinations performed at our institution between July 2007 and June 2017 in patients with pes anserine bursitis were retrospectively reviewed, and a total of 542 cases showing MR evidence of pes anserine bursitis were identified. From these, cases of pes anserine bursitis with intramedullary extension and cortical scalloping were identified. Two experienced musculoskeletal radiologists evaluated the MRI by consensus. The medical records of these patients were also reviewed.

Results Eight patients were diagnosed with pes anserine bursitis with bony changes (prevalence, 1.47% [8 out of 542]), over the study period. All of these patients had a history of chronic knee pain. Seven patients also underwent radiography at the time of diagnosis; these images demonstrated variable appearances depending on the depth of the cortical scalloping and intramedullary extension. On MRI, all patients demonstrated a mass-like fluid extension around the pes anserine bursa and into the bone. None of the patients underwent biopsy; diagnosis was based on MRI features alone.

Conclusion Pes anserine bursitis with intramedullary extension is an unusual presentation of bursitis that may simulate a neoplasm clinically and radiologically. To avoid misdiagnosis, radiologists should be aware of the occurrence of osseous changes in the tibia confluent with pes anserine bursitis.

Keywords Pes anserine bursitis · Medullary involvement · Tibial cortical scalloping

Introduction

The pes anserine bursa is located in the medial aspect of the tibia approximately 2 to 3 inches (5.08 to 7.62 cm) below the knee joint. The bursa is surrounded by the medial collateral ligament, the medial tibial condyle, and the pes anserine tendons, which are formed by tendons of the sartorius, gracilis, and semitendinosus muscles. The pes anserine tendons are flexors and secondary internal rotators of the knee that protect the knee against valgus and rotatory stress. Excessive valgus or rotatory stress causes increased friction and contusion of the bursa, leading to inflammation of the anserine bursa [1, 2]. This inflammation, which is known as pes anserine bursitis, is one cause of medial knee pain. Pes anserine bursitis is usually caused by overuse (particularly in runners), degenerative joint disease, or rheumatoid arthritis [1, 3, 4]. The prevalence of pes anserine bursitis in patients with symptomatic osteoarthritis is 20% [5]. Clinically, this condition may mimic a medial meniscus tear or tibial collateral ligament injury [1].

On imaging studies, pes anserine bursitis demonstrates a characteristic appearance of fluid collection along the medial joint adjacent to the pes anserine tendons. Rarely, pes anserine bursitis occurs with intramedullary extension and scalloping of the medial tibial surface, which may mimic a neoplasm on imaging studies, which is the basis of our paper. In such cases, misdiagnosis of this condition can lead to overtreatment.

There is currently a lack of information regarding the prevalence and imaging appearance of intramedullary extension of pes anserine bursitis. In this study, we therefore sought to more fully describe the radiological features of pes anserine bursitis with intramedullary extension and bony changes.

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Materials and methods

This study was planned as a retrospective chart review and was approved by the Institutional Review Board. We performed a retrospective review with Encore (documentation query tool for the basic searching of text documents, with results sorted by relevance based on the search criteria) to identify reports of knee magnetic resonance imaging (MRI) studies performed at our institution between July 2007 and June 2017 in patients with pes anserine bursitis. Among 2,348 MRI reports from 2,107 patients, a total of 542 MR images showing evidence of pes anserine bursitis were identified. Two experienced musculoskeletal radiologists evaluated the MRI by consensus using criteria described previously [6–8]. These cases were then searched to identify cases of pes anserine bursitis with bony changes; patients were included if they demonstrated any scalloping on or adjacent to the medial tibia or any cortical defect on the medial tibia. Patients without pes anserine bursitis or those with pes anserine bursitis but without confluent tibial changes were excluded (Fig. 1). Patients who met the inclusion criteria were then sampled for evaluation. MRI examinations were performed on 3-T and 1-T systems using the standard knee protocol, consisting of coronal and sagittal fat-saturated fast spin echo (FSE) proton density–weighted sequences, a sagittal non-fat-saturated FSE intermediate-weighted sequence, a coronal non-fat-saturated FSE T1-weighted sequence, an axial fat-saturated FSE T2-weighted sequence, and a three-dimensional fat-saturated FSE or gradient echo (GRE) sequence.

Cases involving bony changes due to pes anserine bursitis were then subdivided into two groups according to the depth of the bony changes: superficial (defined as an appearance demonstrating the presence of cortical scalloping without intramedullary extension) or deep (defined as the appearance of bony changes with intramedullary extension). Medical records were reviewed for information about patient age, sex, location of the lesion, clinical and laboratory (C-reactive protein [CRP] level and erythrocyte sedimentation rate [ESR]) findings at presentation, the presence of any other musculoskeletal disease or trauma, other imaging studies performed during the study period, treatment, and biopsy results.

Results

The prevalence of pes anserine bursitis with bony changes among all cases of pes anserine bursitis at our institution was 1.47% (8 out of 542). The 8 patients with pes anserine bursitis with bony changes included 5 women and 3 men with a mean age of 68.7 years (range, 39–88 years). Four of the bursitis

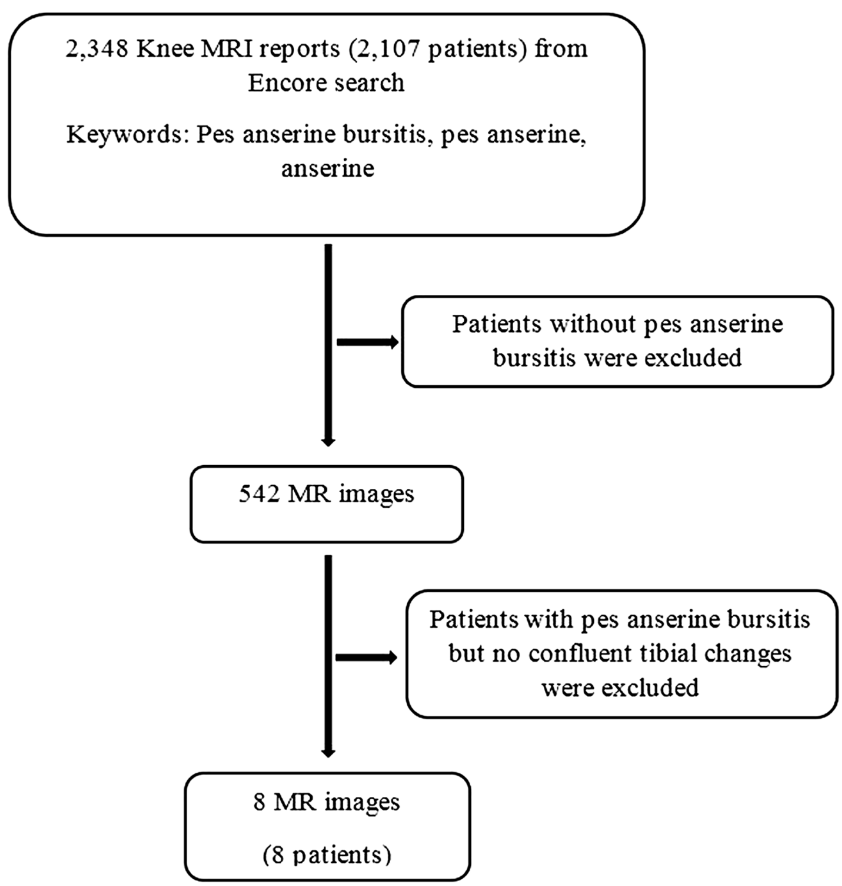

Fig. 1 Flowchart demonstrating patient selection

cases were right-sided. All of the patients had MRI available; additionally, 7 of the patients had radiographic images available from the time of diagnosis, and 4 patients who were treated non-surgically had radiographic images available from a few years after treatment. The mean follow-up period after non-surgical treatment was 3 years (range, 2–5 years). Five patients who were advised to undergo a biopsy procedure to address suspected malignancies were first advised to undergo additional radiological examinations. In these patients, MRI findings (described below) did not justify biopsy of the lesions. None of these patients therefore underwent a biopsy procedure.

Three patients had superficial disease, which appeared as cortical scalloping on the medial tibial aspect on MRI. One of these patients had normal radiographs, and another patient did not undergo radiography at the time of diagnosis. In the third patient, radiography demonstrated scalloping of the medial border of the proximal tibia adjacent to the soft-tissue density (Fig. 2a).

The remaining 5 patients had deep bony changes with extension into the medullary canal. Images from these patients demonstrated cortical-based lucency in the subchondral medial proximal tibia, cortical bone changes, and soft-tissue density on the medial proximal tibia (Fig. 3a).

In both groups, MRI demonstrated bony changes in the characteristic location of the pes anserine bursitis (Fig. 2b). A round mass measuring approximately 4.5 cm, 4 cm, and 2 cm, with a wide base that extended into the proximal tibia, causing bony changes of various depths, was observed. The mass-like abnormality was multiseptated in

Fig. 2 An 84-year-old man with osteoarthritis, previous bone infarct, and chronic right knee pain. The patient had tiny superficial bony changes. **a** Radiograph (anteroposterior view) of the right knee shows scalloping of the medial border of the proximal tibia (*arrows*) adjacent to the soft-tissue density (*arrowheads*) and previous bone infarct (*asterisk* on all images of this patient). **b** Coronal T1-weighted fast spin-echo image without fat suppression demonstrates a hypointense mass-like area (*arrowheads*), small cortical changes, and scalloping (*arrow*). **c** Postcontrast T1 fat-saturated axial image shows tiny peripheral enhancement (*arrowheads*) and septal enhancement (*arrow*) of the lesion. **d** Two years after treatment, radiograph (anteroposterior view) shows sclerosis in the medial tibia with adjacent decreased tibial scalloping (*arrow*)

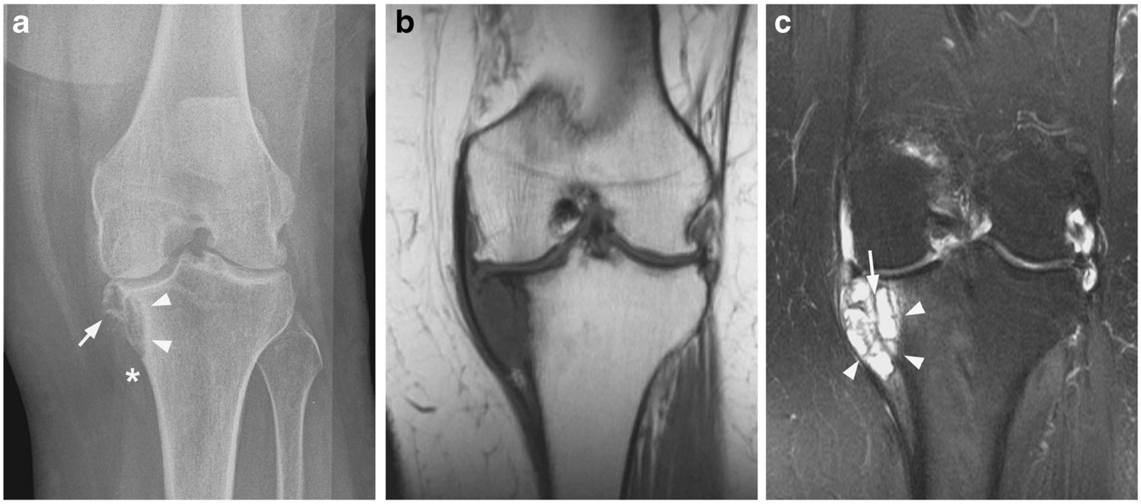

Fig. 3 A 57-year-old woman with osteoarthritis and chronic left knee pain. **a** Radiograph (anteroposterior view) of the left knee shows multiloculated surface lucencies (*arrowheads*) in the subchondral medial proximal tibia and adjacent soft-tissue density (*asterisk*). The patient had bony changes of the medial border of the proximal tibia and intramedullary extension (*arrow*). **b** Coronal T1-weighted fast spin-echo image without fat suppression shows a mass-like hypointense area arising with a wide base from the anserine bursa and extending into the proximal tibia, causing moderately deep bony changes. **c** Coronal T2-weighted fat-saturated fast spin-echo image shows a multiseptated mass (*arrow*) with increased heterogeneous signal intensity at the same location (*arrowheads*), consistent with pes anserine bursitis

some cases and had fluid signal characteristics with low T1 signal and increased heterogeneous T2 signal (Fig. 3b, c). In 2 patients who underwent MRI with gadolinium, each lesion demonstrated thin enhancement along the periphery but no enhanced central areas (except for thin septal enhancement; Fig. 2c). Variable amounts of edema-like signal were present around the lesions; these signals were best demonstrated on T2-weighted sequences (Fig. 4a, b). The overlying skin and superficial subcutaneous tissues were intact with no visual abnormality of the skin other than swelling. The osseous changes were consistent with secondary pressure rather than a primary tibial lesion producing extraosseous soft-tissue changes.

Clinically, all 8 patients presented with chronic medial knee pain. Clinical and laboratory (CRP and ESR) findings did not suggest the presence of infection in any of the study patients. Seven patients had a history of osteoarthritis; the remaining patient had experienced a running injury in the past. None of the patients had recent trauma. None of the patients underwent a biopsy procedure over the time period studied; diagnosis was based on MRI features and clinical evaluation.

One patient underwent steroid injections into the joint space, 1 patient underwent surgery because of advanced osteoarthritis, and the remaining patients were treated with decreased activity, non-steroidal anti-inflammatory drugs, and application of ice. The surgical pathology findings of the patient who underwent total knee arthroplasty were consistent with degenerative osteoarthrosis. In the 4 patients who were treated non-surgically and had radiographs available from a few years after treatment, the images demonstrated sclerosis of the medial aspect of the tibia (Figs. 2, 4c, d).

Discussion

In this study, we found that pes anserine bursitis with cortical scalloping and intramedullary extension has a characteristic appearance on radiographs and MR images. MRI in particular provided sufficient information to demonstrate the broad base of the lesion in the pes anserine bursa and to identify mechanical bony changes and well defined margins, thus allowing a correct diagnosis to be made.

A few cases of unusual presentations of pes anserine bursitis have been reported in the literature [8–10]. Some of these cases, especially those that are chronic and untreated, can be difficult to diagnose, as they cause bony changes and present as a solid mass [9]. Persistent inflammatory changes and synovial inflammatory cell infiltration in the bursa can cause cortical changes, a mass-like heterogeneous appearance, and intramedullary extension. Although 2 cases of bursitis with bony changes have been reported [8, 10], to our knowledge, no cases of pes anserine bursitis with intramedullary extension have previously been described.

Although the radiographic features cortical scalloping and intramedullary extension are helpful for the diagnosis of pes anserine bursitis, they cannot be used alone to diagnose these lesions as benign. Information from MRI is needed to differentiate between this type of bursitis and a surface or intramedullary neoplasm. The most important consideration for diagnosis is the location of the lesion and its broad bursal base, which is suggestive of pes anserine bursitis. MRI is helpful in demonstrating the broad base of the lesion overlying the pes anserine bursa, with displacement of the tendons outward. MRI is also useful for demonstrating the characteristics

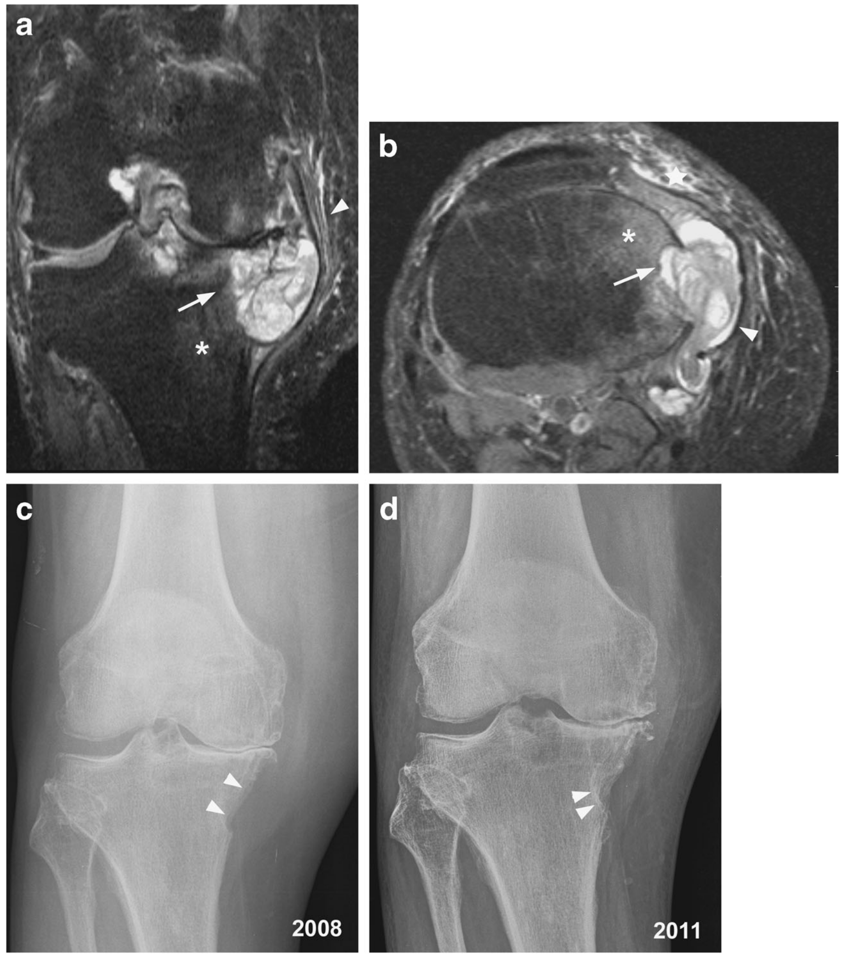

Fig. 4 An 86-year-old man with osteoarthritis and chronic right knee pain. The patient had bony changes of the medial border of the proximal tibia and intramedullary extension. **a** Coronal and **b** axial T2-weighted fat-saturated images demonstrate intramedullary extension and bony changes (*arrows*), soft-tissue edema and inflammatory changes (*arrowheads*), and bone marrow edema (*asterisks*). **c** Radiograph (anteroposterior view) of the right knee shows cortically based lucency and bony scalloping (*arrowheads*). **d** A few years after treatment, radiograph (anteroposterior view) demonstrates sclerosis on the medial tibia (*arrowheads*)

of the soft-tissue lesion, including fluid signal, well-defined margins, mechanical changes due to pressure on the adjacent structures, and the pattern of tiny peripheral enhancement. Therefore, MRI can be used to rule out benign or malignant neoplasms presenting as extrabursal lesions. After the diagnosis is made, follow-up radiographs of the lesion are helpful in demonstrating bony changes such as subcortical sclerosis. However, it should be noted that in cases of advanced bony defects and intramedullary extension, the base of the lesion may be difficult to visualize.

The differential diagnosis for pes anserine bursitis with the typical MRI appearance includes synovial and parameniscal cysts. Although anatomical variations of the anserine bursa and insertion of the anserine tendons have been described in the literature (e.g., the bursa appearing between the pes anserine tendons and the medial collateral ligament) [11, 12], a cystic-appearing lesion at the characteristic anatomical location can be confidently diagnosed as pes anserine bursitis [3]. However, in cases of pes anserine bursitis with bony changes, heterogeneous T2 signal intensity and peripheral enhancement may lead to misdiagnosis of the lesion as a neoplasm such as synovial sarcoma, cortical bone metastasis, synovial hemangioma, or giant cell tumor of the tendon sheath.

Synovial sarcoma can vary in appearance on MRI, but usually presents as a heterogeneous, solid mass that is mostly heterogeneously hyperintense on T2-weighted images and demonstrates diffuse heterogeneous enhancement. These lesions are rarely seen with smooth pressure erosions on the underlying bone [13–17]. The cases of pes anserine bursitis with bony changes in our study demonstrated low signal intensity on T1-weighted images and increased heterogeneous signal intensity on T2-weighted images. The two available MR images with contrast enhancement demonstrated predominantly peripheral and a tiny amount of septal enhancement.

Cortical bone metastasis can be difficult to diagnose, especially if there is no known primary malignancy. However, these metastases usually have a broad cortical base with periosteal reaction, whereas pes anserine bursitis has a bursal base without aggressive periosteal reaction [18].

Synovial hemangioma of the knee, another potential misdiagnosis, is very rare and usually occurs in young adults. On MRI, this lesion presents as a lobulated mass that is markedly hyperintense and demonstrates enhancement; again, these findings are different from those seen in cases of intramedullary pes anserine bursitis [16, 17].

Synovitis, including pigmented villonodular synovitis and rheumatoid arthritis, can also mimic bursitis. On MRI, rheumatoid synovitis demonstrates intermediate T2 signal because of the presence of synovial hypertrophy. Pigmented villonodular synovitis in the bursa (giant cell tumor of the pes anserine bursa) is a rare lesion that demonstrates diffuse and nodular thickening of the synovium and low to intermediate signal intensity on all sequences [19–21]. Gout, another inflammatory disease, has also been reported to occur in the pes anserine bursa, presenting as a mass-like lesion [22] without bony changes. It can be difficult to differentiate between gout and pes anserine bursitis, as the lesions demonstrate similar signal characteristics and enhancement patterns. None of the patients in our study was diagnosed with gout.

The location of pes anserine bursitis with cortical scalloping and intramedullary extension can usually be used to differentiate this condition from these other lesion types. However, a similar-appearing lesion known as a periosteal ganglion can occur in the same location [3], most commonly in the proximal shaft of the tibia near the pes anserine tendons. A periosteal ganglion is considered a mucoid degeneration of the connective tissue of the periosteum that subsequently leads to cyst formation [3, 23, 24] and is treated by surgical excision. This lesion is associated with superficial cortical erosions and scalloping of the underlying bone [7, 25–27]. In one reported case, the intramedullary component of the periosteal ganglion extended along the tibial shaft (with subsequent cyst formation), and MR images demonstrated a homogeneous high signal intensity mass with septa over the anterior lateral surface of the cortex, extending into the subcortical portion of the lateral metaphysis [27]. Conversely, the lesions in our study demonstrated heterogeneously high signal intensity on MRI; these images also clearly showed the broad base of the lesion in the bursa. The purely cystic appearance of a periosteal ganglion extending along the tibial shaft excludes other diagnoses.

Initial treatment of pes anserine bursitis usually involves decreased activity, non-steroidal anti-inflammatory drugs, and application of ice. Some cases have been successfully treated with injection of local anesthetic and/or corticosteroids into the bursa [1, 3, 9]. Because pes anserine bursitis can usually be treated conservatively, correct diagnosis is essential; misdiagnosis of this lesion as a neoplasm can lead to unnecessary biopsy and surgical treatment.

Our study was limited by the lack of follow-up serial MRI and X-ray images demonstrating the medial tibial bone before the changes occurred; if this information had been available, the bony changes could have been tracked throughout the healing process. Another limitation was that there was no biopsy of the lesions in our records.

In conclusion, pes anserine bursitis with intramedullary extension is an unusual and rare presentation. In this study, we identified cases in which findings in the tibia were believed to be secondary to the pes anserine bursitis, not caused by a tibial neoplasm. In all cases, a biopsy was not performed, and healing was demonstrated radiologically.

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Compliance with ethical standards

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

Conflicts of interest The authors declare that they have no conflicts of interest.

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