¿What are rice bodies?: Differential diagnosis.

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Learning objectives

The purpose of this educational presentation is to review the medical literature regarding rice body formation and its differential diagnosis with special mention of their MRI appearance.

Background

Rice bodies are free corpuscles of synovial origin with a cartilage-like appearance that may reach hundreds in number in the intra-articular space. Such bodies were termed as such because of their close resemblance to grains of polished white rice, but in fact these particles are markedly variable in size, shape, and consistency.

Several theories exist as to the aetiology of rice body formation but the definite cause remains unclear. It is associated with synovial proliferation and hypertrophy in the joint space and it has been suggested that synovial cells undergo infarction and are shed into the joint where they become encased by fibronectin over time. Another theory simply suggests that fibrin accumulates in the villous structures of the hypertrophied synovium causing them to elongate and snap off.

Thus, the rice body formation is an uncommon nonspecific response to chronic synovial inflammation that occurs most commonly as a complication of inflammatory arthritis. The combined use of ultrasound, magnetic resonance imaging (MRI) and plain film makes it possible to reach a correct diagnosis and differentiate from other similar pathological conditions like pigmented villonodular synovitis and synovial chondromatosis.

Images for this section:
Fig. 1: Rice body formation resembles rice grains.
Findings and procedure details

Rice bodies

Although medical literature regarding rice body formation is very limited, we found this entity to be a rare disorder related to rheumatoid arthritis, systemic lupus erythematosus, seronegative arthritis, infectious arthritis (tuberculosis, atypical mycobacterial infection), non-specific arthritis, osteoarthritis, and bursitis. They are typically found as painless masses in association with chronic inflammatory conditions, most frequently seen in the knee synovium or shoulder bursae.

The rice body in rheumatoid arthritis synovitis appears both early and late in the course of the disease and is not related to the severity of clinical or radiological changes. However, removal of rice bodies may be accompanied by clinical improvement and reduction of synovitis.

Plain radiographs of the affected joints may be normal, show a soft tissue mass or increased joint space (Fig. 2 on page 6). On sonograms, rice bodies may appear as isoechoic to hyperechoic nodules in the bursa mimicking debris, blood, or viscous fluid or may appear as numerous intrabursal hypoechoic rice bodies with a hyperechoic rim, simulating oil-coated fried rice (Fig. 3 on page 7).

MRI produces the most characteristic findings of all imaging modalities. Rice bodies appear as isointense loose bodies in the T1-weighted series and with low-signal intensity on T2-weighted and proton density-weighted imaging, making it possible to restrict the diagnosis (Fig. 4 on page 8). The differential diagnosis depending on MRI features includes pigmented villonodular synovitis and synovial chondromatosis, being characteristic of the chondromatosis the appearance of high-signal T2-weighted intensity in case of uncalcified bodies (Fig. 5 on page 9) while this may change to low signal when the loose bodies calcify, those calcified bodies are then visibles on plain film, allowing the diagnosis to be made.

Synovial chondromatosis

Primary synovial chondromatosis (Fig. 5 on page 9) is a monoarticular benign neoplastic process representing chondroid metaplasia in the joint synovium with resultant formation of multiple intra-articular chondral bodies. If there is the presence of joint abnormalities (mechanical or arthritic), which may cause intra-articular chondral bodies, it is termed secondary synovial chondromatosis. Radiographs reveal multiple intra-articular calcifications or well-defined osteochondral loose bodies typically distributed
evenly throughout the joint in 70%-95% cases. These calcifications are characteristically innumerable and similar in size and shape (Fig. 6 on page 10). Typical chondroid ring-and-arc pattern of calcification is also common. Fragments may mature further and undergo enchondral ossification. Diffuse osteopenia, joint effusion, and extrinsic erosions of bone may be seen.

Secondary synovial chondromatosis also reveals osteochondral intra-articular bodies; however, these are fewer in number and more variable in size suggesting various times of origin (Fig. 7 on page 11). In addition, several rings of calcification may be identified in these bodies on radiographs, compared with the single ring seen in primary disease. Radiographic alterations associated with the underlying joint abnormality (most commonly, osteoarthritis) are also apparent and allow secondary disease to be distinguished from primary synovial chondromatosis.

CT is the optimal imaging modality to detect and characterize calcification in the vast majority of cases. The characteristic pattern on MRI is lobulated intraarticular, homogeneous intermediate signal intensity similar to that of muscle on T1-weighted images (Fig. 8 on page 12), with high-signal intensity on T2-weighted images and focal areas of low-signal intensity on all pulse sequences (Fig. 9 on page 13). These areas of signal void correspond to regions of calcification on radiographs or CT scans and became more conspicuous on gradient-echo MRI owing to magnetic susceptibility effects. The other less common pattern is multiple well-defined osteochondral loose bodies with fatty marrow (T1-weighted hyperintense) and foci of calcification.

**Pigmented villonodular sinovitis**

Pigmented villonodular disease is a rare benign neoplastic process in which there is synovial hypertrophy characterized by villous, nodular, and villonodular proliferation and hemosiderin deposition. These lesions are classified as localized or diffuse. Localized intra-articular form occurs exclusively in the knee joint. The diffuse intra-articular form most frequently affect the large joints, most commonly the knee and hip. Radiographic and sonographic images are often nonspecific. In diffuse form, radiographs demonstrate joint effusion, extrinsic erosion of bone and subchondral lucent area (with sclerotic ring) on both sides of the joint, preservation of joint space, soft tissue swelling, absence of calcification, and normal bone mineralization.

MRI reveals T2 hyperintense joint effusion with lobulated synovial thickening, which may be plaque-like or nodular, localized or diffuse, and demonstrating low-to-intermediate-signal intensity on both T1W and T2W sequences (Fig. 10 on page 14). Gradient-echo sequences confirm the presence of hemosiderin, which appears as prominent "blooming" of low signal intensity due to magnetic susceptibility artifact (Fig. 11 on page 15).
15). This low signal on T2W and GRE sequences, is virtually patognomonic to this entity. The proliferarion synovium also exhibits prominent contrast enhancement on post gadolinium T1W sequences.

Pigmented villonodular synovitis or other villonodular proliferative synovial disease usually appears as synovial thickening with fixed mural nodules on sonograms, and as markedly hypointense nodules on T1- and T2- weighted images owing to sinovial iron contents.

**Images for this section:**
Fig. 2: Hip radiograph showing a soft tissue mass laterally disposed (arrow).
Fig. 3: Shoulder ultrasound showing numerous intrabursal hyperechoic nodules which are called "rice body formation" in a patient with TB infection.
Fig. 4: RM sequences of the hip: a) axial T1 image shows a encapsulated and bilobulated liquid collection enlarging trochanteric bursae with very difficult to see loose corpuscles inside it because of its iso/intermediate-signal intensity. b) axial T2 clearly shows multiple low-signal intensity loose bodies in decline position. c) On post-contrast axial T1, liquid collection appears with marked peripheral enhancement without any intralesional enhancement related with the corpuscles. d) axial post-contrast CT in the same patient depicts the encapsulated collection with no evidence of free corpuscles, easily visible on MRI.
Fig. 5: RM coronal T2 in a patient with primary synovial chondromatosis shows proximal distention of long biceps tendon sheath with multiple loose bodies inside with iso/hyper-signal intensity relative to muscle, and focal areas of low-signal intensity on all pulse sequences. These areas of signal void correspond to regions of calcification.
Fig. 6: Radiographs reveal multiple intra-articular calcifications or well-defined osteochondral loose bodies typically distributed evenly throughout the joint or around it.
Fig. 7: Ankle Coronal GRE-T2 RM. Secondary synovial chondromatosis also reveals osteochondral intra-articular bodies; however, these are fewer in number and more variable in size suggesting various times of origin.
Fig. 8: Ankle axial T1 RM. Synovial chondromatosis. Multiple intra-articular polymorphous loose bodies with homogeneous intermediate-signal intensity similar to that of muscle surrounded by small synovial effusion
Fig. 9: Ankle sagittal T2 RM. Synovial chondromatosis. Multiple intra-articular polymorphous loose bodies with high-signal intensity on T2-weighted images and peripheric areas of low-signal intensity due to calcification.
Fig. 10: sagittal Knee T2 RM. Hyper-intense joint effusion with low-to-intermediate signal intensity synovial thickening with villonodular appearance.
Fig. 11: Axial Knee GRE-T2 RM. Hyper-intense joint effusion with low-to-intermediate signal intensity synovial thickening with villonodular appearance. Gradient-echo sequences confirm the presence of hemosiderin, which appears as prominent "blooming" of low signal intensity due to magnetic susceptibility artifact.
Conclusion

The rice body formation is a rare condition due to chronic sinovial inflammation. The combined use of ultrasound, MRI and plain film makes it possible to reach a correct diagnosis.

**Rice bodies** are iso- or hypointense to skeletal muscle on T1- and T2-weighted images, and can be clearly seen as loose corpuscles against the background of fluid on T2-weighted images.

**Synovial chondromatosis** can be difficult to differentiate from rice bodies, although it may appear with intermediate to high signal intensity on T1-weighted images and bright on T2-weighted images, making them more visible on T1-weighted sequences, the diagnosis clue could be the presence of multiple intra-articular calcifications that may be easily seen on plain film.

**Pigmented villonodular synovitis** appears as synovial thickening with fixed mural nodules markedly hypointense on T1- and T2- weighted images owing to sinovial iron contents. The Gradient-echo sequences confirm the presence of hemosiderin and help in making the correct diagnostic approach.

Personal information


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References


