



Rapidly destructive arthrosis of the shoulder joints: radiographic, magnetic resonance imaging, and histopathologic findings



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Background: Rapidly destructive arthrosis of the humeral head is a rare condition with an elusive pathophysiologic mechanism. In this study, radiographic and histopathologic findings were analyzed to determine the clinical characteristics of this rare condition.

Methods: We retrospectively analyzed 189 patients who underwent total shoulder arthroplasty from January 2001 to August 2012. Among them, 9 patients showed a particular pattern of rapid collapse of the humeral head on plain radiography and magnetic resonance imaging (MRI) within 12 months from symptom onset. Patients with trauma, rheumatoid arthritis, steroid intake, neurologic osteoarthropathy, osteonecrosis, renal osteoarthropathy, or gout were excluded.

Results: All patients were women, with a mean age of 72.0 years (range, 63-85 years). The right side was involved in 7 cases and the left in 2 cases. The mean duration of humeral head collapse was 5.6 months (range, 2-11 months) from the onset of shoulder pain. Plain radiographs of all patients showed a unique pattern of humeral head flattening, which appeared like a clean surgical cut with bone debris around the humeral head. MRI findings revealed significant joint effusion and bone marrow edema in the humeral head, without involvement of the glenoid. Pathologic findings showed both fragmentation and regeneration of bone matrix, representing fracture healing.

Conclusion: The important features of rapidly destructive shoulder arthrosis are unique flattened humeral head collapse with MRI showing massive joint effusion and bone marrow edema in the remnant humeral head. This condition should be considered in the differential diagnosis of elderly women with insidious shoulder pain.

Level of evidence: Level IV, Case Series, Prognosis Study.

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Keywords: Humeral head destruction; MRI analysis; rapid destructive arthrosis

Institutional Review Board approval was provided by the Asan Medical Center. All patients gave informed consent to have their data published anonymously.

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Rapidly destructive arthrosis (RDA) has been reported in the hip joint. Since Postel and Kerboull⁷ first described this condition in 1970, its clinical course and pathophysiologic mechanism have remained obscure. No typical features have been described to easily differentiate the condition from other types of osteoarthritis. Only the time interval

from the onset of first symptoms, which is reportedly pain in most cases, to the stage of arthritis has been highlighted as differentiating. Postel and Kerboul defined rapid destruction as >2 mm in 1 year or 50% joint space narrowing in 1 year.

RDA in the shoulder is a rare event and is characterized by rapid collapse of the humeral head with no evidence of other nonseptic articular arthropathy. This condition presents a diagnostic challenge. Clinical features of most cases of monarticular, nonseptic arthritis are pain and restricted movement, which are noted in many nonseptic articular diseases like gout, Milwaukee shoulder, amyloid arthropathy, hemophilic arthropathy, primary synovial osteochondromatosis, and pigmented villonodular synovitis. Plain radiographs can help identify the unique changes in each pathologic process.

Little information is available in the literature on patients with rapid destruction of the humeral head, and only anecdotal case reports have been published. To the best of our knowledge, systematic evaluation of radiographic, magnetic resonance imaging (MRI), and histologic findings has not been reported. Here, we reviewed cases of RDA of the shoulder to characterize clinical and radiographic features.

Materials and methods

We retrospectively analyzed 189 patients who underwent total shoulder arthroplasty from January 2001 to August 2012. Inclusion of patients was based on history, availability of serially taken plain radiographs with a time interval of 1 month and MRI, and evidence of rapid destruction of the humeral head on serially taken radiographs within 6 months. Patients were excluded if they had a history of trauma, inflammatory arthritis, septic arthritis, avascular necrosis (AVN), neuropathic osteoarthropathy, or crystal arthropathy.

From the database, 9 patients who showed rapid destruction of the humeral head on serially taken radiographs within 6 months were selected. All patients were women, and the mean age was 72 years (range, 65-85 years). All patients presented with insidious onset of shoulder pain, with 7 (77.7%) cases of the right side and 2 (22.22%) of the left side. The duration of symptoms ranged from 2 to 11 months, with an average of 5.7 months. No patients had bilateral involvement. We reviewed medical records of all patients. No patients had a history of alcohol or steroid intake. None of them had any history of vascular compression, vasculitis, arterial embolism, thrombosis, or exposure to radiation. The chief complaint of the patients was pain and restriction of movement. None of the patients had pseudoparalysis, which we could find in cuff tear arthropathy. All patients presented with pain with only active motion limitation due to pain.

Follow-up radiographs, magnetic resonance images, and clinical reports were available for all patients. Of the 9 cases, 1 patient had a rotator cuff repair with acromioplasty before 24 months. Systemic markers of infection, such as preoperative C-reactive protein level and erythrocyte sedimentation rate, were not indicative of any infection, and intraoperative culture showed no growth. We therefore ruled out the possibility of infection as the

cause of rapid destruction due to previous surgery. The minimum follow-up time was 24 months, with an average of 27.5 months.

MRI studies were performed with a 1.5T unit (Signa; GE Healthcare, Seoul, Korea) with a dedicated shoulder coil, 14-cm field of view, and 4-mm section thickness with a 1-mm gap. All protocols included T1-weighted MRI of the symptomatic shoulder in both the coronal and sagittal planes. Short tau inversion recovery images or fat-suppressed T2-weighted images of the involved shoulders were obtained in coronal and sagittal planes.

Magnetic resonance images were retrospectively evaluated by 2 of the authors. Data recorded from MRI were analyzed for (1) presence of a large volume of joint effusion, (2) change in signal intensity in the bone marrow, (3) presence of rotator cuff tear, (4) bone debris or calcification in joint fluid, and (5) presence of synovitis (synovial hypertrophy).

It was difficult to measure the exact extent of rotator cuff tear because the humeral heads were flattened. For that reason, we evaluated the size of rotator cuff tear by the location of the margin of the retracted tendon on the coronal view of T2-weighted MRI. The locations of the retracted tendon margin were divided into 3 parts. Zone 1 was from the greater tuberosity to the lateral margin of the acromion; zone 2 was from the lateral margin of the acromion to the glenoid; and zone 3 was the medial side of the glenoid. The amount of joint fluid was graded 0 to 3 according to the modified staging system described by Mitchell et al.⁴

All patients underwent total shoulder arthroplasty, resulting in relief of symptoms. Depending on the zone of the cuff tear, the patient did or did not undergo rotator cuff repair. Seven patients who had full-thickness cuff tear underwent rotator cuff repair surgery. We were able to achieve rotator cuff repair in all 7 cases after implanting the prosthesis. Bone grafting was not performed in any of the cases. The Global total shoulder prosthesis system (DePuy Synthes, Warsaw, IN, USA) was used in all cases. The bone was sclerotic in nature on intraoperative examination. Resected humeral head specimens were subjected to histopathologic examination. After surgery, no clinical or radiologic complications, such as prosthetic loosening, glenohumeral instability, periprosthetic fracture, rotator cuff tears, infection, neural injury, and deltoid muscle dysfunction, were observed in the early or late postoperative period.

Results

All 9 patients showed rapid collapse of the humeral head on serial radiographs. In addition, rapid loss of the humeral articular region (>2 mm in <5 months or 50% joint space narrowing in <5 months) was noted. Collapse showed a unique pattern of a "chopped humeral head" (Fig. 1, A and B and Fig. 2, A-C). At the time of presentation, collapse was found in less than one third of the hemisphere in 3 patients, in one third to two thirds of the hemisphere in 4 patients, and in more than two thirds of the hemisphere in 2 patients.

MRI in all 9 patients (100%) showed massive shoulder joint effusion and marrow edema in the metaphyseal region. Ill-defined marrow areas with low signal intensity on T1-weighted images and high signal intensity on short tau inversion recovery images were identified in the remaining humeral head in 9 patients (100%) (Fig. 1, C and Fig. 2, D).

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