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Degenerative rotator cuff tear in an elderly athlete: a case report

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The incidence of rotator cuff tear increases with age. Degenerative rotator cuff tears are commonly seen in athletes above 40 years. These athletes are commonly involved in overhead activities. Repetitive microtrauma is a more important factor in rotator cuff degeneration than acute trauma. Conservative treatment is the mainstay treatment for these injuries. A case report of an elderly athlete who sailed competitively is presented. The clinical and radiographic presentations, management and rehabilitation of degenerative rotator cuff tears are discussed.
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KEY WORDS: chiropractic, degenerative, elderly athlete, rehabilitation, rotator cuff, sailing, shoulder, sports injury.

La fréquence de la rupture de la coiffe des rotateurs augmente avec l'âge et la maladie est souvent observée chez les athlètes de plus de 40 ans qui pratiquent des activités faisant appel à l'élévation des bras. Les microtraumatismes à répétition constituent un facteur plus important de rupture dégénérative de la coiffe des rotateurs que les traumatismes importants. La pierre angulaire du traitement est le traitement conservateur. Voici le cas d'un athlète âgé ayant participé à de nombreuses compétitions de voile. Il sera question, dans le présent article, de l'examen clinique et radiographique du patient, du traitement de la rupture dégénérative de la coiffe des rotateurs et de la réadaptation de la capsule articulaire.
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MOTS CLÉS : chiropratique, maladie dégénérative, athlète âgé, réadaptation, coiffe des rotateurs, voile, épaule, sports, blessure.

Introduction

Rotator cuff tears and subacromial impingement are common causes of shoulder pain.[1,2,3] The increasing number of elderly persons in the general population and the high incidence of rotator cuff pathology seen in cadaveric studies make the rotator cuff disease a timely topic.[4] The etiology of rotator cuff disease is multi factorial which includes morphology of the coracoacromial arch, tensile over-load, repetitive use, kinematic abnormalities, altered tendon vascular supply, collagen fiber abnormalities, and regional variation in material property.[5] Rotator cuff tears are subdivided into traumatic and degenerative groups as well as partial and full thickness tears. Acute macrotrauma is an uncommon mechanism of the rotator cuff tears in individuals aged less than 40 years.[1,6] As patients age, the incidence of rotator cuff tear increases.[1,3,4,6] Naviaser[1] states that this is particularly true for those who play sports requiring repetitive, powerful overhead motions, such as throwing a baseball or serving shots in tennis, or for those who engage in work with the arms at or above shoulder height. Wirth et al.[3] reports that a specific event initiated the symptoms in less than half of the patients with rotator

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cuff tears. The incidence of partial-thickness tears in cadaveric studies is reported to be 6% to 33%, almost twice as common as full-thickness tears (6%–19%).[4] Repetitive overhead activities as well as direct contact injuries are often related to the partial-thickness tears of the rotator cuff in athletes younger than 40 years.[4]

Conservative treatment of the partial and full-thickness rotator cuff tears are recommended by many authors prior to surgical treatment.[1–4,7–12] This case demonstrates the classic presentation of a degenerative rotator cuff tear in an elderly athlete. The essential clinical and radiographic features are reviewed in conjunction with principles of management and rehabilitation.

Case report

A 69-year-old retired male who sails competitively, presented with intermittent right shoulder pain. The reported onset followed by a day of sailing. Pain was initially sharp on abduction and flexion of the right shoulder and changed to a dull pain which lasted for several hours. It was aggravated by lying on the shoulder, reaching and lifting with the right arm. Pain was relieved by Tylenol and icing. The athlete reported that three years earlier he had injured the same shoulder while sailing. A diagnosis of supraspinatus strain was made by a chiropractor who treated him for four weeks. He was pain free and had full range of motion (ROM) by the end of the four weeks. Two years later he had a second similar injury. The diagnosis was a supraspinatus and teres minor strain for which he received treatment for three to four weeks by a chiropractor, followed by rehabilitation for three months. The athlete reported 80–90% improvement by the end of the treatment. Family and previous medical histories were unremarkable.

Examination revealed pain of the right anterior deltoid and a tender right acromioclavicular joint upon palpation. Active right shoulder abduction was painful at 100 degrees, and restricted at 120 degrees. However, if the shoulder was passively lifted to 90 degrees in abduction then the patient was able to actively abduct it to 140 degrees. Right shoulder internal rotation was also limited and painful. The Locking position test (abduction of the shoulder in 90 degrees of internal rotation) was positive. Active and passive cervical spine range of motion was mildly limited in all directions. The remaining cervical orthopaedic and neurological tests were within normal limits.

Radiographs of the right shoulder revealed mild osteopenia, a decrease in the acromiohumeral joint space, superior subluxation of the humeral head, subchondral sclerosis of the greater and lesser tuberosities, and along the inferior margin of the acromion. Moderate degenerative changes of the acromioclavicular (AC), acromiohumeral and glenohumeral joints were evident. Marginal spurring and subchondral sclerosing along the superior and inferior margins of the AC joint, as well as osteophytes at the glenoid fossa were observed (Figure 1, this radiography does not belong to the athlete in this case but serves as a good example).

At initial onset (three years earlier), he was treated two to three times a week for four weeks using pulsed ultrasound (U/S) for two weeks followed by interferential current (IFC) for two weeks. Spinal manipulation therapy (SMT) and manual traction of the lower cervical spine, mobilization of the shoulder, ballistic exercises, back scratches, wall walking in flexion and abduction, and icing at home were implemented. On the second episode, the same treatment as above was rendered for three to four weeks, and strengthening exercises were included at the end. For the last episode, same treatment as before was implemented three times per week for four weeks. There was a minimal improvement in the athlete's condition at the end of this period. A referral to a sports specialist and an orthopaedic surgeon was made. Both specialists recommended an aggressive three month course of vigorous exercise. If no further improvement was reached at this point, surgery was recommended. However, athlete's range of motion, strength and pain were ninety percent improved after the three months of rehabilitation.

Discussion

Anatomical considerations

Rotator cuff muscles include: supraspinatus, infraspinatus, teres minor which attach to the greater tuberosity of the humerus and subscapularis which inserts into the lesser tuberosity. Clark and Harryman[13] reported that the tendons of the rotator cuff muscles fuse into one structure near or at their insertion into the tuberosities of the humerus. Therefore, the contraction loads of one cuff muscle can effect the attachment of neighboring tendons.[5] This interconnection may be important in the pathogenesis of cuff tears.[5] It was also noted that the coracohumeral ligament and fibers from adjacent cuff tendons reinforce the suprasinatus ten-

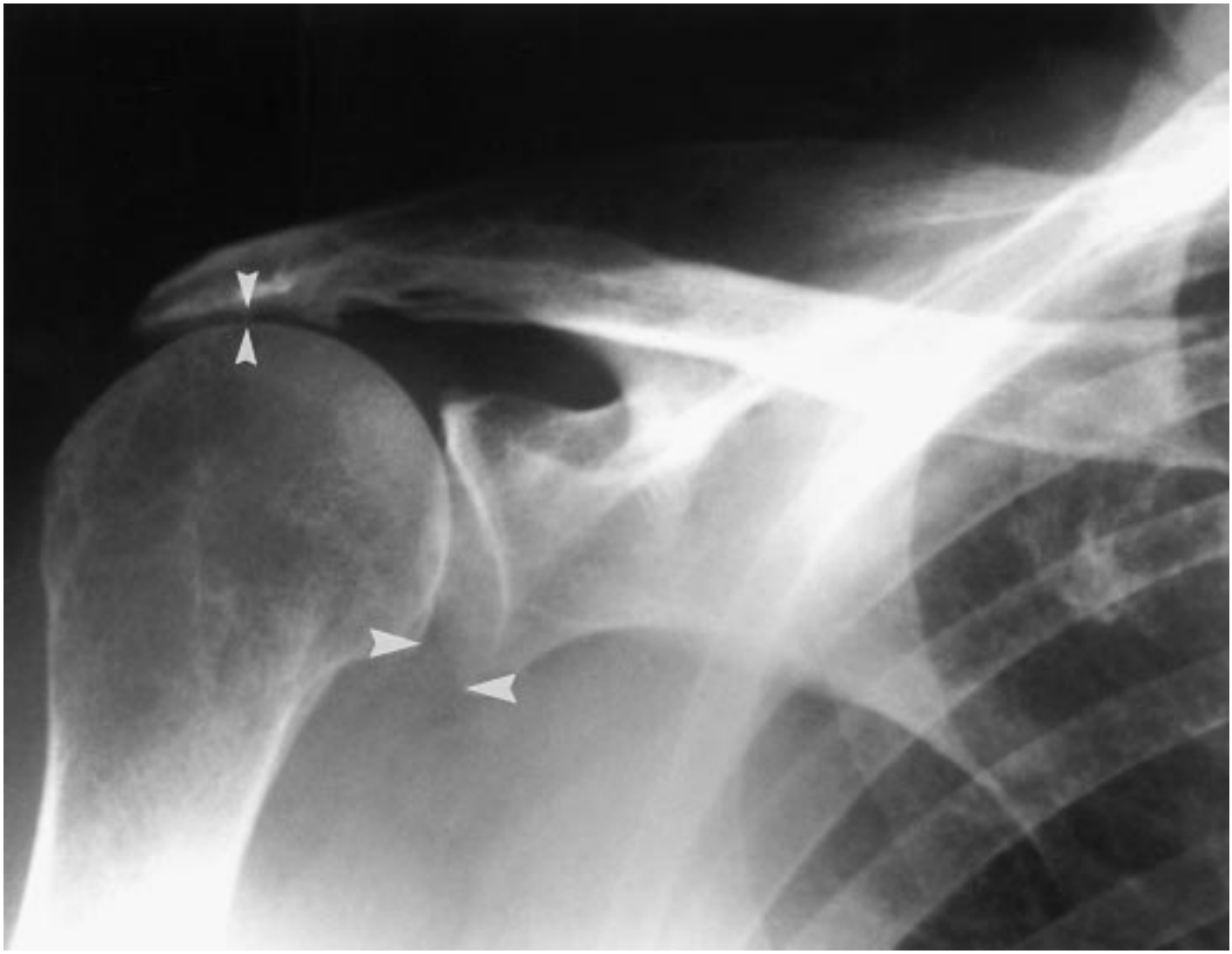

Figure 1 Anteroposterior radiograph of a right shoulder in internal rotation. Large arrow heads point to the superior migration of the humeral head with respect to the inferior margin of the glenoid fossa. Small arrow heads indicates decreased acromiohumeral joint space (minimum space should be 7 mm)[24] also indicating superior migration of the humeral head.

don.[13] The vascular supply to the rotator cuff tendons is different from that of typical synovial avascular tendons or paratenon-covered vascular tendons.[6] The rotator cuff tendons receive their blood supply through the bursal surface, musculotendinous junction, and the periosteum.[6] A "critical zone" of decreased vascularity near the insertion of the supraspinatus tendon has been identified.[6] However, other investigators have noted an adequate vascular supply on the bursal surface, with relative hypovascularity on the articular surface of the rotator cuff muscles.[6] This finding is consistent with reported higher incidence of the articular surface tear of the cuff.[4] Unthoff et al.[14,15] found that the subacromial bursal tissue were responsible for much of the initial healing response, and cautioned against the routine bursectomy at the time of tendon repair. In patients over 50 years of age, the intensity of the healing process has been reported to be less active than with younger patients.[16]

Biomechanics

Rotator cuff muscles are the stabilizers of the glenohumeral joint, and complex synergism of all of them is required for smooth shoulder movements. Keating et al.[5] studied cadaver shoulders to determine the strength relationship of the four rotator cuff muscles. They found subscapularis to be the most powerful and contributing 53% of the cuff moment, infraspinatus 22%, supraspinatus 14%, and teres minor 10%.[17]

Pathophysiology

There are intrinsic and extrinsic mechanisms of injury of the rotator cuff. Intrinsic mechanisms include primary age related degeneration and tenous blood supply.[6] Extrinsic factors include acute trauma such as a fall onto the shoulder, repetitive use such as throwing, variations in coracoacromial morphology causing primary subacromial impingement, kinematic abnormalities causing secondary impingement, and internal impingement.[6]

Repetitive microtrauma is a more important factor in rotator cuff degeneration than acute trauma.[6] Repeated stresses on the tendon lead to localized microscopic failures within the tendon substance.[6] These microtears can progress to partial and then full-thickness tears if not given sufficient time to repair.[6] The microtrauma can cause inflammatory or degenerative changes.[6] This is the mechanism of injury in athletes involved in repetitive eccentric traction loading on the tendinous insertion. This is the probable mechanism of injury in the case presented above. Naviaser[1] states that during repetitive and overhead motions, when the arm is raised, the tendons press against the acromial arch, resulting in a constant pressure and irritation. The combination of this with the tenuous blood supply produces a mechanical insult with resultant inflammatory response, leading to tendinitis.[1] When a muscle is torn or damaged, spasm and inflammation occurs followed by adhesion.[18] Pathological steps to rotator cuff disease include edema, tendinitis, fibrosis and tears. Muscle heals by scar tissue formation and sometimes ossification may occur.[18] Adhesions disrupt the normal muscle function, affecting the biomechanics, which then leads to pain and dysfunction.[18]

Clinical presentation

Athletes with degenerative rotator cuff tear are often in their mid forties or older.[1] Primary symptom is pain which is variable in intensity, typically located at the anterolateral margin of the acromion and described as aching and tender. These patients present with a long-standing history of intermittent shoulder pain that has become progressively more symptomatic.[1,3] Pain is usually constant, aggravated by overhead activity, worse at night, and only slightly decreased with anti-inflammatory drugs.[3] These symptoms are consistent with the ones in our athlete. Athletes often complain of weakness, associated clicking, crepitus, clunking or grinding with overhead activities.[1,8,19]

Physical examination

Miniaci and Salonen[19] suggest a systematic approach to the shoulder examination of an athlete. This includes inspection, palpation, range of motion, strength testing, neurologic assessment, and performance of special shoulder tests.[19] In addition, a thorough assessment of the cervical spine and of the upper extremity should be included because of the frequent referred pain in the shoulder region.[19] The posterior aspect of the shoulder is observed for potential atrophy of the supraspinatus, infraspinatus and part of the deltoid muscles.[1,8] Manual resisted muscle testing may reveal weakness in abduction, elevation, and external rotation. The size of the tear usually dictates the degree of weakness and pain.[3] Passive range of motion of the shoulder is full, whereas smooth active motion is diminished.[3] The complete full-thickness tears of the rotator cuff are

generally characterized by the preservation of passive motion and the absence of adhesive capsulitis.[3] However, patients with partial-thickness tears are more susceptible to development of adhesive capsulitis.[3] On lowering the arm from an overhead position the athlete experiences exacerbation of the symptoms in the midrange of motion.[3] The athlete often has difficulty and pain to fasten a bra, reach the back pocket, or loop a belt.[3] These restrictions are due to a tight posterior glenohumeral capsule causing diminished internal rotation.[3] The greater tuberosity of the humeral head, the lateral aspect of the tip of the coracoid, the coracoacromial ligament, the bicipital groove, and the anterior acromion may be tender to palpation.[3] Athletes with chronic impingement associated with ruptures of the rotator cuff commonly have subacromial crepitus with shoulder rotation.[3] The athlete in this case report also demonstrated diminished internal rotation, painful acromioclavicular joint and painful deltoid. Impingement signs such as that seen on the Neer's and Hawkin's tests may be positive.[1,4,7,8,19]

Imaging

Plain radiographs: One of the essential component is of the shoulder assessment is radiographic evaluation. Anteroposterior, axillary, and lateral views of the shoulder in the plane of the scapula are recommended.[19,20] Snyder[20] suggests that the most important of all of the radiographic projections for evaluating a shoulder with impingement and rotator cuff pathology is the supraspinatus outlet view or arch view. This view reveals the shape and the thickness of the acromion.[20] Subacromial sclerosis (the eyebrow sign) and osteophyte formation, sclerosis and cystic changes of the greater tuberosity, and decreased acromiohumeral space are characteristic changes of chronic rotator cuff disease.[19,20] These all match the radiographic findings in this case report. Kaneko et al.[21] found that the most significant radiographic findings in massive rotator cuff tears were superior migration of the humeral head and deformity of the greater tuberosity with a sensitivity of 78% and a specificity of 98%.

Arthrography: The arthrogram had traditionally been considered to be the gold standard imaging technique for diagnosis of rotator cuff disease.[20] A single-contrast arthrogram that demonstrates the simultaneous appearance of dye in the glenohumeral joint and the subacromial bursa indicates a high probability of a complete tear of rotator cuff.[1,19] The diagnosis of the partial-thickness tears of the rotator cuff have been difficult even with double-contrast arthrograms.[19,20] Patients often refuse the arthrography because of the risk for postinjection pain and inflammation caused by the contrast material used in arthrography.[20]

Magnetic Resonance Imaging (MRI): MRI is the current gold standard for rotator cuff imaging.[20] MR imaging is distinguished from other imaging modalities by its ability to assess various pathogenic factors on the evolution of complete rotator cuff tears, ranging from interstitial degeneration to partial tears.[19] Noninvasiveness, multi-planar capability, and excellent contrast makes MRI superior to arthrography.[19] Another advantage of MRI, especially when coupled with fat-suppression or arthrographic techniques, is its ability to assess the entire rotator cuff.[19,22] An abnormal increased signal intensity within the tendon, tendon retraction, and focal discontinuity are the direct signs of rotator cuff tear.[19] A continuous band of fluid transversing the full-thickness of the rotator cuff, extending from the glenohumeral joint to the subacromial bursa on T2-weighted images are diagnostic of a tear.[19] The partial-thickness tears of the rotator cuff are more difficult than the full-thickness tears to detect by imaging.[19] Positioning the arm in abduction and external rotation during MR imaging may be useful in detecting partial tears of the rotator cuff.[23]

Diagnostic Ultrasound: Ultrasonography is another means of examination of the rotator cuff. The advantages of ultrasonography include being noninvasive, rapid, relatively inexpensive, and capable of performing bilateral examinations in one session.[19] However, its greatest limiting factor is its operator dependency or its subjectivity of interpretation.[7,19]

Prognostic factors

Unsatisfactory outcome of the conservative measures were correlated with patients receiving workers' compensation benefits for proven shoulder disability and shoulder pain interrupting sleep.[4] Variables that correlated with a satisfactory outcome included improvement in pain relief, the ability to carry a 10 to 15 pound suitcase at one side and the ability to eat using a utensil.[4]

Treatment

The mainstay of initial treatment for most rotator cuff pathology is conservative measures.[1–4,7–11] Breazeale and Craig[4] suggested that the goals of rehabilitation of the partial-thickness tears of rotator cuff should include the elimination of pain and the restoration of motion, strength, and endurance. They advocated an initial period of rest, cold or heat application, nonsteroidal anti-inflammatory medication, modification of activities combined with physical therapy modalities and range of motion exercises.[4] The emphasis was placed on the range of motion since the partial-thickness tears frequently are associated with greater stiffness than the full-thickness tears are.[4] These authors believe that stretching with emphasis upon internal rotation, addresses the frequently associated posterior capsule contracture.[4] A progressive resistance exercise was to begin with the arms at the side in the least painful arc and to progress to a greater abduction and forward elevation in a graded fashion.[4] The authors state that conservative treatment is effective in reducing inflammation in all stages of rotator cuff pathology, but a satisfactory result from conservative care alone is successful in less than 50% of degenerative partial-thickness tears.[4] They recommend surgery for partial-thickness tears of the rotator cuff when conservative treatment fail.[4] Brier[7] suggested inclusion of passive mobilization therapy of the shoulder in the patient's rehabilitation program. Shrode[2] reported successful treatment of a patient with a bilateral stage I impingement syndrome using supraspinatus synchronization exercises, high-voltage electrical muscle stimulation, manual manipulation therapy of the humeral head, general shoulder mobilization and rehabilitation band exercises. However, this is only a case report and further research is necessary to validate the effectiveness of the suggested treatment protocol.

Wirth et al.[3] reported successful conservative treatment of the full-thickness tears of the rotator cuff using a home therapy kit that included elastic bands of six different colors and strengths, a pulley set, and a meter stick. They called this program "Orthotherapy" which included 3 phases.[3] Restoring full, painless range of motion to the affected shoulder was the goal of their first phase.[3] Codman pendulum exercises were used to initiate gentle stretching and followed by passive forward flexion, abduction, extension, internal rotation, and external rotation exercises using a meter stick.[3] Other exercises such as wall walking, posterior capsular stretches, and overhead stretching using a chin-up bar were utilized in this phase as well.[3] Patients were advanced to the second phase when the passive range of motion was improved and a functional range of motion has returned.[3] Strengthening exercises of the remaining muscles of the rotator cuff, the scapular stabilizing musculature, and the deltoid were used in this phase.[3] Wirth et al.[3] reported that a minium of 3 months was required for the most of their patients with rotator cuff defects to complete the second phase of therapy. The last phase involved the gradual reinstitution of normal activities, including work, hobbies, and sports.[3] They also advocated a maintenance program including both stretching and strengthening exercises three times per week.[3]

Row[12] emphasized two exceptions to the conservative management of the rotator cuff tears: a documented complete rotator cuff avulsion in a young patient and a complete rotator cuff avulsion in an elderly patient associated with disabling pain unresponsive to conservative treatment. Surgical procedures include arthroscopic debridement, open excision of the damaged portion of the tendon with tendon repair, subacromial decompression, or some combination of these procedures.[4]

Conclusion

Conservative treatment of the partial and full-thickness rotator cuff tears are recommended by many authors prior to the surgical treatment. Organized rehabilitation exercises emphasizing passive and active range of motion and strengthening are promising. The glenohumeral joint mobilization and chiropractic manipulation may be used at the later stages of the rotator cuff tears rehabilitation to decrease the chance of developing adhesive capsulitis.

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