Partial-thickness rotator cuff tears (PTRCTs) have long been recognized as an often asymptomatic consequence of the aging process as well as a potential source of shoulder dysfunction. Other possible etiologic factors include anatomic impingement and trauma (including repetitive microtrauma). In the past, the difficulty in accurately diagnosing and characterizing the elements contributing to PTRCTs has compromised the ability to understand the natural history of this condition. More recently, magnetic resonance (MR) imaging and arthroscopic assessment have allowed more precise characterization of PTRCTs. Nevertheless, the optimal clinical approach to this entity has not yet been completely defined.

**Natural History**

Partial cuff tears may involve either the articular surface or the bursal surface or may be confined entirely within the tendon substance. Tears on the articular surface are two to three times more common than bursal-surface tears in most reports. Throwing athletes may show a predilection for articular-surface tears. Most tears affect the supraspinatus tendon. The infraspinatus, subscapularis, and teres minor tendons are much less commonly involved.
Most clinical and cadaveric reports have demonstrated that partial tears are more common than full-thickness rotator cuff tears (FTRCTs). In part, this finding is age-dependent, as the peak incidence of PTRCTs occurs in the fifth and sixth decades, whereas FTRCTs occur with greater frequency in the later decades of life.

The natural history of PTRCT has never been completely documented. Codman suggested that spontaneous healing of PTRCTs might occur, although he provided little evidence to support his contention. Fukuda et al examined histologic sections of PTRCTs and found no evidence of active tissue repair. The earlier peak incidence of PTRCTs relative to FTRCTs demonstrated by epidemiologic data and imaging studies suggests that progression may occur. However, it is not clear whether this progression in cuff tear size correlates with clinical symptoms.

Serial arthrography has been used in an attempt to define the progression of symptomatic articular-surface PTRCTs when treated non-operatively. In a study of 40 shoulders, 11 tears (28%) progressed to being FTRCTs in just over 1 year. Four PTRCTs (10%) were thought to have healed completely. The authors concluded that although some small posttraumatic articular-surface PTRCTs in young patients may have the potential for healing, most tears continue to enlarge with time.

The role of operative treatment in modifying the natural history of PTRCT is poorly defined. There is no evidence that debridement of a partially torn cuff stimulates a healing response. Intuitively, subacromial decompression might delay the progression of cuff disruption in cases of PTRCT caused by subacromial outlet narrowing.

Rehabilitation to restore normal joint mechanics and strengthen the rotator cuff musculature might itself influence progression of cuff disease, particularly in cases of dynamic impingement.

Anatomy

The suprascapular artery is the primary vascular supply to the supraspinatus tendon. Selective injection studies have shown that the articular surface of the cuff is relatively hypovascular compared with the bursal cuff surface. This finding has been suggested as a factor in the tendency for partial tears to occur more frequently on the articular surface of the cuff.

Histologic studies of cadaveric and clinical specimens have defined the rotator cuff microstructure. Collagen bundles located near the articular surface of the cuff are thinner and less uniform than the...
Degenerative partial tears most commonly involve the deep surface of the rotator cuff. Their tendency to involve the articular side of the cuff may be related to tenuous vascularity, particularly with senescence. Degenerative tears are often associated with extensive laminated and may remain entirely intratendinous.

Trauma is more often associated with articular-surface tears than with bursal-surface tears. This association is also seen in cases of repetitive microtrauma. Glenohumeral instability and traction stress on the rotator cuff in the throwing athlete can lead to undersurface tears in the absence of extrinsic anatomic impingement. Articular-surface tears in young athletes generally occur in otherwise healthy tissue, in contrast to the degenerative tears seen in older individuals.

Recently, Walch et al. and Jobe described a subset of articular-surface PTRCTs that develop secondary to “internal impingement.” Throwers and other overhead athletes may experience posterior shoulder pain when repetitive contact occurs between the undersurface of the supraspinatus and the posterosuperior glenoid during the late cocking phase of the throwing motion. Fatigue of the dynamic stabilizers and excessive external rotation secondary to overstretching of the anterior capsule may predispose individuals to development of internal impingement.

Clinical Presentation

The frequent occurrence of PTRCTs in both cadaveric studies and MR imaging studies of asymptomatic individuals suggests that such tears are not always symptomatic. The symptoms of PTRCT are nonspecific, with pain being predominant. A painful arc of motion between 60 and 120 degrees of elevation (seen in many patients with subacromial pain of various causes) is present in most symptomatic patients. Partial tears may be associated with glenohumeral joint contracture and loss of motion, which manifests as posterior capsular tightness and resultant restriction of internal rotation. Obligate anterosuperior translation of the humeral head may result from posterior capsular contracture and may serve to potentiate impingement symptoms.

Strength is generally preserved on clinical examination. However, pain inhibition may result in both apparent loss of strength and a decrease in active range of motion in patients with a partially intact cuff. Partial-thickness tears are often associated with pain on testing for the classicJobe sign (active resistance to shoulder abduction with the shoulder positioned in 90 degrees of abduction). The lag signs described by Hertel et al. may be helpful in separating PTRCTs from FTRCTs. The external-rotation lag sign is nearly always negative with PTRCTs and, in many cases, is positive with complete tears (particularly with larger tears). Discernible weakness (unrelated to discomfort) and atrophy of cuff musculature indicate a high likelihood of full-thickness involvement. The impingement signs described by Neer (pain with forced passive forward elevation) and Hawkins (pain with passive internal rotation of the arm placed in 90 degrees of forward elevation) are positive in nearly all patients with symptomatic PTRCTs. These maneuvers may be repeated after injection of 10 mL of 1% lidocaine into the subacromial space (impingement test). Diminution of pain on repeat testing after subacromial injection is indicative of a subacromial lesion.

Throwing athletes warrant particular attention to the shoulder...
laxity examination. Increased anterior translation has been proposed as the instability pattern likely to generate rotator cuff lesions. Subtle degrees of anterior subluxation may be difficult to discern on physical examination with the standard means of manually evaluating glenohumeral translation. To better define the presence of instability, apprehension is assessed with the shoulder placed in 90 degrees of abduction and external rotation in the supine patient. The expression of apprehension in this position is highly suggestive of underlying anterior instability. Augmentation with an anteriorly directed force on the proximal humerus increases diagnostic yield. A posteriorly directed force that reduces apprehension lends further support to the diagnosis of anterior instability. The presence of pain alone with testing in this fashion is nonspecific and an unreliable indicator of anterior instability. Pain produced with external rotation of the abducted shoulder may be related to a variety of conditions, including glenohumeral instability, rotator cuff disease, and degenerative joint disease or internal glenoid impingement.

In the overhead athlete, external rotation in abduction is characteristically increased in the dominant shoulder, with a concomitant loss of internal rotation. Pain at the posterior joint line with maximal external rotation of the abducted shoulder in these individuals may be related to internal impingement. Posterior translation of the humeral head (the Jobe relocation maneuver) characteristically relieves this pain. It is a matter of debate whether rotator cuff injury observed in individuals with internal impingement develops as a result of pathologic anterior glenohumeral subluxation or whether it occurs as a result of repetitive cuff abrasion in an otherwise stable shoulder.

The clinical course of patients with PTRCTs is often indistinguishable from that of patients with impingement syndrome without cuff failure or with small FTRCTs. Most patients improve with conservative measures over 6 months, and some continue to improve up to 18 months from initiation of treatment.

Because of the considerable overlap in clinical presentation, symptoms caused by PTRCTs may be difficult to differentiate from those due to other conditions, such as subacromial bursitis, bicipital tendinitis, and mild cases of frozen shoulder. Furthermore, associated shoulder lesions are common in patients with surgically diagnosed PTRCT. These associated conditions may contribute to the symptoms experienced by individuals with PTRCTs. Biceps tendon fraying or rupture may accompany a PTRCT. Labral degeneration or tearing occurs in as many as a third of patients even if those with symptomatic instability are excluded. Posterosuperior labral lesions or osteochondral lesions of the humeral head are occasionally present in throwing athletes with articular-surface PTRCTs.

**Imaging**

Arthrography, ultrasonography, and MR imaging are all used to evaluate rotator cuff disorders. These studies are particularly accurate in the diagnosis of full-thickness tears, but have generally been found to be less accurate in the assessment of partial-thickness tears. These studies do have value, however, in ruling out FTRCT and other non-cuff-related disorders.

**Radiographic Evaluation**

While conventional x-ray films are helpful in the general evaluation of a painful shoulder, there is no specific plain-radiographic diagnostic feature of PTRCT. Indirect evidence of an advanced rotator cuff disorder, such as greater tuberosity or acromial sclerosis or anterior or acromial spurring, may be present on plain films. Larger chronic FTRCTs may have a decreased acromiohumeral interval. However, most patients with a PTRCT do not have these radiographic abnormalities, especially younger patients and those in whom trauma or instability is the cause of the tear. Nevertheless, plain radiographs are helpful in ruling out other causes of shoulder pain, such as acromioclavicular lesions or glenohumeral arthritis.

Standard x-ray views include an anteroposterior view of the shoulder, an axillary lateral view, and a supraspinatus outlet view. The supraspinatus outlet view best demonstrates curved or hooked acromial morphology, which is seen in some individuals with PTRCTs due to supraspinatus outlet narrowing. Os acromiale, which can cause impingement symptoms, can be seen on an axillary lateral film. Degenerative changes of the acromioclavicular joint are seen with a 15-degree cephalic-tilt anterosuperior (Zanca) view. An apical oblique (Garth) or West Point axillary view may be added if glenohumeral instability is suspected.

**Arthrography and Bursography**

Arthrography of the glenohumeral joint allows evaluation of the integrity of the undersurface of the rotator cuff. Proponents of arthrography report accuracy of better than 80% in the diagnosis of PTRCT. However, other clinical studies have found arthrography less valuable. Gartsman and Milne reported that arthrography detected only 7 of 46 arthroscopically proven articular-surface PTRCTs. Walsh et al. reported positive arthograms in only 8 of 17 surgically proven articular-surface PTRCTs.
Partial-Thickness Rotator Cuff Tears

PTRCTs. The use of fluoroscopy in conjunction with arthrography has been suggested to improve detection of PTRCTs.

Bursography may be performed as an adjunct to arthrography to aid in detection of bursal-surface PTRCTs that are inaccessible to the arthrographic dye. However, subacromial inflammation and adhesions limit the value of this technique. The accuracy of bursography in detecting surgically proven bursal-surface PTRCTs has been reported to range from 25% to 67%.3,11,12

Arthrography may have value in the diagnosis of FTRCT. It has the advantages of relatively low cost and ready availability. However, its role in the evaluation of PTRCT is limited. A negative arthrogram obtained for evaluation of a painful shoulder cannot reliably rule out the presence of a PTRCT. Further advanced imaging (i.e., MR imaging) or arthroscopic evaluation should be considered in this situation if clinically indicated.

Ultrasound

Sonographic evaluation of rotator cuff integrity has been shown to be accurate for the diagnosis of FTRCT. A PTRCT may be somewhat more difficult to detect. Fluid within the substance of the rotator cuff produces a focal hypoechoic area. Thus, a focal hypoechoic area at one of the cuff surfaces or within the cuff substance signifies a PTRCT. Linear echogenicity within the cuff substance with or without thinning of the cuff may also represent a partial-thickness tear.

Wiener and Seitz28 reported a sensitivity of 94% and a specificity of 93% in a series of 69 PTRCTs diagnosed by ultrasound. The authors suggest ultrasound as a reliable, quick, and cost-effective means of evaluating the rotator cuff.

Despite the high degree of accuracy in some reports, the clinical utility of ultrasonography for diagnosis of rotator cuff disorders may be limited by the availability of personnel experienced in the performance and interpretation of the study. These limitations may be particularly applicable in the somewhat more subtle ultrasonographic diagnosis of PTRCT.

Magnetic Resonance Imaging

Magnetic resonance imaging has become an established technique for diagnosis of FTRCT. Recently, techniques have been developed to more accurately characterize subtle cuff lesions, such as PTRCTs. Diagnosis of PTRCT is suggested by increased signal in the rotator cuff without evidence of tendon discontinuity on T1-weighted imaging. A PTRCT is depicted as further signal increase on T2-weighted images with a focal defect that is intratendinous or limited to one surface and does not extend through the entire tendon (Fig. 2). Rotator cuff tendinitis may produce increased signal and loss of anatomic definition of the cuff on T1-weighted and proton-density images, similar to the appearance of a PTRCT. Tendinitis is distinguished from PTRCT.

Fig. 2  Proton-density (A) and T2-weighted (B) coronal oblique MR images demonstrate an articular-surface partial-thickness tear (arrows).
by the finding of only moderate or decreased signal on T2-weighted images.

With the use of standard MR imaging techniques, the detection of PTRCT has been unreliable. Most series have reported that standard techniques are relatively insensitive in the detection of partial cuff tears. Taugbøler and Goodwin reported a sensitivity of 56% to 72% and a specificity of 83% to 85% for arthroscopically proven PTRCTs. Gartsman and Milne reported an 83% specificity of 83% to 85% for arthroscopically proven articular-surface PTRCTs. Wright and Cofield found only 6 definite PTRCTs on preoperative MR studies in a series of 18 patients.

Fat-suppression techniques accentuate fluid signal contrast on T2-weighted images and have been suggested as a means of increasing sensitivity of PTRCT detection. Clinical studies, however, have not consistently demonstrated improved reliability with this technique. In a study of 11 arthroscopically proven PTRCTs, fat-suppressed MR imaging had a sensitivity of 82%, a specificity of 99%, and an accuracy of 85%. Other studies have yielded less impressive results. Reinus et al compared fat-suppressed MR imaging with conventional T2-weighted imaging in the diagnosis of cuff lesions in a series of 20 arthroscopically proven PTRCTs. Although fatsaturated images improved the rate of detection of PTRCT, overall results were poor; 35% of PTRCTs were identified with fat-saturation technique, compared with only 15% with conventional MR imaging.

Magnetic resonance arthrography has also been suggested as a means of better evaluating cuff integrity. Although it appears to improve sensitivity, MR arthrography still has a fairly high false-negative rate. Hodler et al found that 5 of 13 partial tears found at the time of arthroscopy had been missed on preoperative MR arthrography.

The clinical utility of MR findings is further limited by the frequent occurrence of abnormal rotator cuff signal in asymptomatic individuals. The MR findings consistent with PTRCT or FTRCT are uncommon in asymptomatic adults less than 40 years old. However, both tear types become more common when older individuals are evaluated. In the study by Sher et al, PTRCTs were the predominant cuff lesion (24%) in asymptomatic shoulders of those between 40 and 60 years of age; in patients over 60 years old, FTRCT and PTRCT were nearly equally prevalent (28% and 26%, respectively). Thus, a substantial proportion of the population over the age of 40 may have abnormal findings on MR evaluation of the rotator cuff in the absence of clinical complaints. The possibility that MR evidence of a PTRCT could be an incidental finding should be considered when evaluating symptomatic patients, especially those over 40 years old.

Further developments in MR technology may improve its accuracy. At the present time, MR findings suggestive of PTRCT should be interpreted cautiously and used only as an adjunct to clinical evaluation when determining a treatment strategy.

Classification

Neer’s classification described three stages of rotator cuff disease: stage I, characterized by hemorrhage and cuff edema; stage II, cuff fibrosis; and stage III, cuff tear. Partial tears were not categorized separately. They have been considered advanced stage II lesions by some authors and early stage III lesions by others.

Ellman pointed out the difficulty of classifying partial tears in Neer’s scheme. He proposed a more detailed classification scheme that included specific consideration of the site and extent of partial cuff tears. The location (articular surface, bursal surface, or intratendinous) was recorded. Tear grade was defined in terms of depth. Grade I tears had a depth of less than 3 mm; grade II, a depth of 3 to 6 mm; and grade III, involvement of more than half of the cuff thickness (average cuff thickness, 9 to 12 mm).

Many authors have suggested that tears involving more than half of the tendon thickness are a significant threat to cuff integrity. Thus, the presence of a grade III PTRCT is often considered a relative indication for surgical repair in the symptomatic patient. Clinical data, although limited, seem to support this contention and suggest that it is a reasonable management guideline.

The etiology of PTRCT is not considered in most classification schemes. However, it may be important in terms of both prognosis and treatment selection. Gartsman and Milne and Morrison have emphasized the need to accurately define etiology in order to determine the most appropriate treatment plan.

In summary, classification of PTRCT should be descriptive in terms of the location (both the tendon involved and the surface affected), the size (depth) of the tear, and the cause.

Treatment

There is no simple treatment algorithm that can adequately address the management of PTRCT. In most cases, treatment of a symptomatic shoulder with a PTRCT is directed toward a primary diagnosis (such as impingement syndrome or instability), with treatment of the PTRCT often considered secondarily.
Thus, treatment selection is often dependent on defining the cause of the PTRCT. Because PTRCTs are frequently present in asymptomatic shoulders, the contribution of a PTRCT to symptoms in a painful shoulder is difficult, if not impossible, to establish in most cases. Therefore, careful identification and treatment of any associated condition is prudent.

**Nonoperative Management**

Individuals with a suspected PTRCT due to extrinsic outlet impingement or intrinsic tendinopathy are initially treated in the standard manner for patients with impingement syndrome. Subacromial bursal inflammation is controlled with activity modification, nonsteroidal medication, and the judicious use of injectable corticosteroids. Physical therapy is advanced as inflammation diminishes and pain subsides. Therapy should be first directed at eliminating capsular contractures and regaining full motion. Posterior capsular contracture is addressed by progressive stretching in adduction and internal rotation. Horizontal (cross-body) adduction exercises also serve to stretch the posterior capsule.

As pain decreases and motion improves, attention is focused on strengthening the rotator cuff and periscapular musculature. The function of the rotator cuff in dynamic stabilization of the glenohumeral joint is maximized through a program emphasizing progressive resistive exercises involving the use of elastic tubing or free weights. Rehabilitation of the periscapular musculature may serve to restore normal scapulothoracic mechanics and minimize dynamic impingement secondary to scapulothoracic dyskinesis.

Patients with PTRCTs thought to be due to instability are likewise treated initially with control of inflammation and pain. Particular attention is paid to rehabilitation of the rotator cuff and periscapular muscle groups. Restoration of proper shoulder mechanics is especially important in overhead athletes.

**Operative Management**

The timing of surgical intervention when conservative treatment fails has not been well defined. For tears considered to be related to extrinsic outlet impingement, 6 months of nonoperative treatment is generally considered appropriate. Patient factors, especially activity level, may influence the duration of the nonoperative program. In some cases, longer or shorter conservative treatment periods may be indicated.

The surgical treatment of PTRCTs has generally involved one of three approaches: tear debridement, acromioplasty along with tear debridement, or cuff repair in addition to acromioplasty. Surgery may be open, arthroscopically assisted, or entirely arthroscopic.

**Arthroscopic Technique**

Arthroscopic examination allows visualization of the articular surface of the cuff (Fig. 3), which is a distinct advantage over open surgery. The frequent association of glenohumeral lesions with PTRCTs suggests that a glenohumeral inspection should be performed at the time of every arthroscopic subacromial decompression. Hill-Sachs lesions, labral lesions, and other markers of anterior or instability should be sought during glenohumeral arthroscopy.

The diagnosis of PTRCT is often not made with certainty until the rotator cuff is examined arthroscopically. Partial tears have been found unexpectedly in as many as 15% to 33% of patients undergoing arthroscopic treatment of impingement syndrome.

The preferred treatment of some of these unsuspected tears may be open surgical repair. Therefore, the possibility of encountering a PTRCT and the need to convert to an open procedure should be anticipated and discussed with the patient before shoulder arthroscopy.

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**Fig. 3** Intact rotator cuff insertion site viewed from the posterior portal. BT represents the long head of the biceps tendon; HH, humeral head; RC, rotator cuff.
Arthroscopy may be performed with the patient in the beach-chair or lateral decubitus position. With the beach-chair position, the undersurface of the rotator cuff is best viewed by rotating the arthroscope in the standard posterior portal to look laterally while abducting the shoulder 30 degrees and externally rotating it 30 to 45 degrees in a position of slight forward flexion (Fig. 3). By sweeping the scope along the cuff insertion, one is generally afforded an excellent view of the biceps, supraspinatus, infraspinatus, and teres minor attachment sites. Placing the shoulder in maximum external rotation with 90 degrees of abduction allows direct assessment of internal impingement lesions.

Gentle debridement of undersurface tears is sometimes necessary to determine the true extent of the tear and may allow better estimation of tear depth (Fig. 4). Probing through an anterior portal allows assessment of cuff integrity in cases in which tear depth is difficult to discern. A probe introduced into the subacromial space is often helpful, allowing palpation of the cuff from above while viewing from the glenohumeral joint. A marker suture may be placed to localize the tear so that it may be more easily evaluated later when viewing from the subacromial space. An 18-gauge spinal needle is introduced from the lateral aspect of the shoulder and passed through the site of the cuff lesion. A No. 0 absorbable monofilament suture is passed through the spinal needle, and the needle is then removed, leaving the suture in place.

Bursal-surface tears are sometimes more difficult to evaluate, as hypertrophic bursitis can obscure the cuff surface. Occasionally, partial disruption of the bursal surface of the cuff is apparent on initial viewing of the subacromial space. In this situation, there is often an accompanying subacromial spur or prominent coracoacromial ligament. A complete inspection of the bursal side of the cuff should be performed, particularly if preoperative imaging studies indicate a cuff lesion. After debridement of hypertrophic bursal tissue, the shoulder is carried through a range of motion while viewing from the posterior portal. The shoulder is slightly abducted and rotated both internal-

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**Fig. 4** Arthroscopic views of grade I (A), grade II (B), and grade III (C) articular-surface PTRCTs, as classified in Ellman’s scheme. In that system, both the site and the extent of partial cuff tears are considered. Tear grade is defined in terms of depth. Grade I tears have a depth of less than 3 mm, and grade II tears have a depth of 3 to 6 mm. In grade III tears, there is involvement of more than half of the cuff thickness.
ly and externally to best visualize the supraspinatus insertion, which is the common site of bursal-surface PTRCTs (Fig. 5). Complete cuff visualization may be achieved by moving the arthroscope to the lateral or anterior subacromial portal. After debridement of frayed fibers, tear depth and extent can be assessed. Bursal-surface tears with associated articular-surface cuff lesions should be inspected carefully, as very often these represent full-thickness tears even if they do not appear so on initial inspection.

Arthroscopy affords no substantial advantage in the evaluation and treatment of intratendinous tears. Generally, these tears cannot be identified arthroscopically. Digital palpation and tissue appearance during open surgery have been used by some to identify and localize these lesions.

**Open Technique**

Open surgical approaches to the subacromial space offer excellent exposure of the bursal surface of the rotator cuff. Furthermore, inspection and palpation of the cuff may allow detection of intratendinous tears. However, articular-surface PTRCTs and other intra-articular lesions may be missed if the cuff is not incised.

“The color test,” an intraoperative cuff-staining technique described by Fukuda et al., can be used to more accurately diagnose and localize articular-surface tears during open surgery. Indigo carmine or methylene blue (3 mL) mixed with normal saline (17 mL) is injected into the glenohumeral joint. The shoulder is then put through a range of motion. Torn cuff tissue is preferentially stained by the dye. The biceps tendon sheath (long head) and rotator interval normally demonstrate uptake of the dye. Fukuda et al reported that the staining test detected articular surface tears in 65% of cases. The color test is more likely to be positive when more than half of the tendon thickness is involved. Laminted tears may take up dye along intratendinous extensions.

**“Mini-open” Technique**

A combined arthroscopic and open surgical approach is useful in many situations. Arthroscopic glenohumeral examination is followed by arthroscopic subacromial decompression. If a PTRCT is deemed worthy of repair, arthroscopic instrumentation is removed, and a “mini-open” repair is performed. This is done through a deltoid-splitting approach, often incorporating the lateral portal in the incision. Adequate exposure is usually achieved without the need for detachment of the deltoid from the acromion. A deltoid-splitting incision placed too far anteriorly may increase the risk of avulsion of the deltoid from its attachment to the anterior acromion by overzealous retraction. Bursal-surface tears can be visualized directly. Articular-surface tears may be localized during the arthroscopic portion of the procedure with a marker suture.

Entirely arthroscopic techniques have been described and may be applicable in some instances. These include side-to-side repair of certain bursal-surface tears and tendon-to-bone fixation of tears at the supraspinatus insertion site.

**Results**

**Tear Debridement**

The value of debridement alone as treatment for PTRCT is uncertain. Andrews et al. and Snyder et al. have both reported success with tear debridement without acromioplasty. Andrews et al. reported that debridement alone in 34 patients led to 85% satisfactory results at an average follow-up of 13 months. The average age of the patients was 22 years, and most were competitive overhead athletes.

Snyder et al proposed debridement alone as a treatment for articular-surface PTRCTs. They
reported 94% satisfactory results in a mixed series of articular- and bursal-surface tears. Articular-surface tears were treated by debridement alone. Arthroscopic subacromial decompression was added for bursal-surface tears. The authors suggested that acromioplasty be performed selectively on the basis of clinical presentation and arthroscopic findings. Tear debridement was thought to provide pain relief in patients with articular-surface PTRCTs not due to primary impingement syndrome.

Success with debridement has not been uniform, however. Ogilvie-Harris and Wiley,35 reported their results with arthroscopic debridement of 57 PTRCTs without subacromial decompression. Satisfactory outcomes were achieved in only approximately 50%. Walch et al.42 reported suboptimal results for arthroscopic debridement of PTRCTs secondary to “internal impingement” with only transitory relief of pain.

Arthroscopic Subacromial Decompression

Most authors perform subacromial decompression (with or without debridement) either selectively or routinely as part of treatment of PTRCTs. Satisfactory results have been reported in 75% to 83% of cases treated by tear debridement and subacromial decompression.5,5,36 Success with arthroscopic subacromial decompression in patients with partial tears has been equal to that in patients with intact cuffs in most series.5,39

The location of the partial tear may be an important determinant of the success of subacromial decompression. At an average follow-up of 23 months (minimum, 1 year), Ryk2 reported 86% satisfactory results in the treatment of 35 PTRCTs by arthroscopic subacromial decompression. Of note, only one of the four patients with an isolated articular-surface tear had a satisfactory result. Patients with bursal-surface lesions had 94% satisfactory results. Exclusion of patients with instability likely led to a lower incidence of isolated articular-surface tears (4/35 [11%]) than in other reports. This suggests that arthroscopic subacromial decompression is particularly effective in patients with bursal-surface PTRCTs, at least in the short term.

Selective Repair

Because of concerns about cuff integrity and tear progression, repair of more extensive PTRCTs has been suggested.6,8,10 Miller and Lewis8 used the thickness of the cuff tear as the criterion for determining the need for open repair in 55 patients. In the patients in whom less than 50% of the tendon thickness was involved, arthroscopic subacromial decompression and cuff debridement alone was performed. In the 24 patients with more extensive tears (more than 50% involvement), a mini-open or arthroscopic cuff repair was added (20 and 4 patients, respectively). When this treatment guideline was used, 52 of 55 patients (95%) had satisfactory results, as evaluated with the UCLA scoring system at short-term follow-up (minimum, 1 year). The authors concluded that cuff repair should be considered for active patients with dominant-arm involvement and extensive tears (more than 50% of the cuff thickness) as determined arthroscopically. However, this study lacked a control group, which would have allowed comparison of the results of the more extensive repair with those of decompression alone.

Weber2 included a control group when he compared the results in 35 patients with grade III PTRCTs (those with involvement of more than half of the tendon thickness) treated by arthroscopic debridement and subacromial decompression with the results in a group of similar patients treated with mini-open cuff repair in addition to decompression. Significantly better (P<0.05) results were obtained in those treated with open repair; a reoperation rate of 19% was reported for the arthroscopic group, but no reoperations were required in the mini-open group.

Open Treatment

Open treatment of PTRCT may be compromised somewhat by inability to directly visualize the articular surface of the cuff. However, repair of bursal-surface tears and subacromial decompression are readily performed with open techniques. Fukuda et al.11 have advocated open anterior acromioplasty as well as excision of the partially torn cuff segment with repair. They reported 92% satisfactory results at an average 34-month follow-up.

Itoi and Tabata9 reviewed the results of treatment of 38 partial-thickness tears by complete excision of the involved tissue followed by repair. Open acromioplasty was used selectively. Follow-up averaged 4.9 years. The results were satisfactory in 31 of the 38 tears (82%), as evaluated with the UCLA scoring system.

Treatment Recommendations

The approach to treatment of PTRCTs must take into account the heterogeneous nature of the condition. Etiology, tear location, tear depth, and patient age and activity level should be considered in selecting treatment. Acromial morphology should influence the decision to perform subacromial decompression, but treatment should be tailored to the individual patient. Bursal-surface tears are often the result of mechanical outlet
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impingement. For this reason, acromioplasty should generally accompany debridement or repair of bursal-surface tears. Acromioplasty should also be given strong consideration when degenerative articular surface tears are seen in older individuals. Subacromial decompression without acromioplasty (i.e., bursectomy or coracoacromial ligament release) may be appropriate for selected patients with hypertrophic bursal tissue and flat acromial morphology.

The decision to proceed to cuff repair is based primarily on the extent of the tear. Most authors use tear depth alone as an indicator of the need for repair, with no mention of tear size in terms of area. Tears involving less than half of the tendon thickness should be treated by debridement. Tears involving more than half of the tendon thickness may benefit from repair. Patients with higher activity levels may be more readily considered for cuff repair. However, caution should be exercised when dealing with the elite throwing athlete, in whom cuff debridement alone may be the most appropriate initial surgical intervention.

Articular-surface tears in young athletic individuals should be approached with a suspicion of occult instability. These undersurface tears of the supraspinatus may be the result of acute eccentric loading or repetitive stress with microinstability. The hypermobility associated with the dominant shoulders of throwing athletes may subject the cuff to abnormal stress. Internal impingement may play a role in some of these tears. Anterior capsulorrhaphy might reduce symptoms in cases of anterior capsular redundancy and instability by limiting external rotation but would be expected to decrease function in the overhead athlete. In the absence of evidence of instability, rotator cuff debridement alone may provide symptomatic relief. Acromioplasty is rarely indicated for the young athlete.

Surgical treatment may be effectively performed with the use of either open or arthroscopic techniques. Glenohumeral arthroscopy offers the advantage of direct viewing of the cuff undersurface. Repair of a high-grade PTRCT is generally performed with an open deltoiod-splitting approach. Some tears may be amenable to arthroscopic repair techniques, but only limited data are currently available to demonstrate the efficacy of this approach. Purely arthroscopic repair as well as mini-open techniques do not require deltoid detachment and its attendant postoperative concerns. However, rehabilitation is not accelerated because healing of the rotator cuff remains the limiting factor.

Summary

Partial-thickness tearing of the rotator cuff is a relatively common condition. However, the natural history of partial cuff tears and their contribution to clinical symptoms remain poorly characterized. Imaging modalities can be helpful but do not reliably depict partial tears.

Partial cuff tears can result from a variety of factors. These possible causes must be considered when designing a treatment plan. Extensive tears in individuals with high activity levels should be given particular consideration for repair.

References


