Yonsei Medical Journal
Vol. 39, No. 2, pp. 97~102, 1998

☐ Original Article ☐

The Role of Acromioclavicular Arthritis in Impingement Syndromes

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The role of acromioclavicular (A-C) arthritis in stage 2 and 3 impingement syndromes was investigated in this study. Twenty-seven patients with stage 2 and 3 impingement syndrome were evaluated both clinically and radiologically for the presence of A-C arthritis. Patients with A-C arthritis who were treated by conservative or surgical methods were rated before and after therapy according to the University of California at Los Angeles (UCLA) shoulder rating scale. The follow-up period ranged from 7 to 16 months, with an average of 13 months. A-C arthritis was diagnosed in 21 of 27 patients (one grade 2 and 20 grade 3, according to Kellegren). Clinical and radiological evaluation of these 21 patients revealed A-C joint pain and a positive lidocaine injection test in all (100%), a positive horizontal adduction test in 20 (95.2%), decreased joint space in 18 (85.75%) and osteophytes in 11 (52.4%). Surgical treatment was considered for 12 A-C arthritis patients; and distal clavicle resection was performed in 11 of these cases. The average score measured by the UCLA rating scale increased from 13 to 28 in the group treated with surgery (satisfactory result), and from 10 to 13 in the group treated with conservative therapy (unsatisfactory result). The results of this study may be interpreted as demonstrating that A-C arthritis is a common etiologic factor in chronic impingement syndromes and its co-existance has a strategic importance in the choice of treatment method. Surgical resection of the distal clavicle should be considered in the presence of this pathology since this technique provides excellent results in pain relief and appears to be superior to conservative therapy in these cases.

Key Words: Acromioclavicular arthritis, shoulder impingement syndrome

A-C arthritis should be kept in mind in the evaluation of impingement syndromes of any stage. Neer described A-C arthritis as an etiologic factor in impingement syndromes and reviewed the treatment protocols of A-C arthritis as well as the indications for distal clavicle resection (Neer, 1983). Although treatment of this disorder generally begins with conservative therapy, a surgical approach is needed in most cases for permanent pain relief (Neviaser *et al.* 1982; Thorling *et al.* 1985; Rockwood and Young, 1990; Gartsman, 1993). According to Neer, indications for distal clavicle resection include: symptomatic A-C arthritis; a more extensive approach and dissection for supraspinatus muscle repair; and A-C joint enlargement or hypertrophy which results in impingement syndrome.

A-C arthritis is a serious problem, even alone, and its therapy may necessitate surgical procedure. Moreover, A-C arthritis is a cause and/or a component of the shoulder impingement syndrome. Therefore, in this prospective study, the role of A-C arthritis in the impingement syndrome was evaluated.

Received March 19, 1997
Accepted January 30, 1998
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MATERIALS AND METHODS

Twenty-seven patients with stage 2 or 3 impingement syndrome were examined clinically and roentgenographically between January 1993 and May 1995. There were 17 females and 10 males. The mean age was 57.6 years (between 42 and 72). The average duration of follow-up was 13 months (range from 7 to 16 months).

The dominant shoulder was involved in 21 patients. The diagnosis of impingement syndrome was based on a positive impingement sign and a positive impingement injection test (Neer, 1983). All the patients were also evaluated for the presence of A-C arthritis by clinical and radiologic findings. A-C joint pain and tenderness, positive horizontal adduction test and positive lidocaine injection test were considered as clinical findings of A-C arthritis. Lidocaine injection test was performed under an image intensifier in all of the patients. Standard shoulder X-ray was used in all of the patients for radiologic evaluation; in addition, AP shoulder X-ray in 100° abduction was used in 11 patients who could perform shoulder abduction. The presence of decreased articular space and osteophytes was considered for radiologic diagnosis of A-C arthritis. Cases were classified according to Kellegren *et al.* (1963).

After clinical and functional evaluation, a rehabilitation program of 3 to 6 months duration was prescribed for all patients. The rehabilitation program consisted of superficial and deep heat modalities, transcutaneous electrical nerve stimulation (TENS) as well as isometric, isotonic, passive range of motion (ROM), progressive resistive and proprioceptive neuromuscular facilitation (PNF) exercises.

Following the rehabilitation program, the patients were evaluated once more for clinical and functional improvement. For those who did not respond to conservative therapy, a surgical approach was preferred. If the distal clavicular side of the A-C joint was found with clinical and radiologic findings, distal clavicular resection (11 cases) was performed; also partial anterior acromioplasty (12 cases), coracoacromial ligament resection (12 cases) and rotator cuff repair (9 cases). All surgical interferences were made with open surgical procedure. Skin incision proceeded from a point just lateral to the anterior acromion towards one-finger-width lateral to the coracoid. A split was made by blunt dissection in the deltoid extending from the A-C joint capsule 5 cm downwards. Anterior acromioplasty, coracoacromial ligament resection and distal 1.5~2 cm of clavicular resection were performed. In the presence of a small, full-thickness tear in the rotator cuff, the tear was repaired by trimming the bare edges and re-attaching the tendon to the greater tuberosity by direct suture. Large rotator cuff tears were repaired by subscapularis muscle transfer. Samples from distal claviculae were taken after all distal clavicle resection operations and were examined for histopathological findings. Samples were stained with hematoxilen-eosin. After all surgical procedures, the patients were included in a post-op rehabilitation program of 3 months duration for the second time (Group A; treated with surgery, plus postop rehabilitation). In patients with rotator cuff repair, the same rehabilitation program without deep-heat modalities was applied. All of the exercise programs were performed gradually. Those patients who refused surgical treatment were also included in this second rehabilitation program (Group B; treated with conservative therapy alone).

All the patients were rated before and after therapy for pain, limitations in daily living activities, problems at work and for recreational activities, and with the UCLA shoulder rating scale system (Fig. 1). Pre-therapeutic and post-therapeutic UCLA average scores of both groups and the differences between them were evaluated statistically with Mann Whitney-U test.

RESULTS

Twenty-seven patients with stage 2 or 3 impingement syndrome were included in this study, of whom 21 were found to suffer from A-C arthritis (one case grade 2 and 20 cases grade 3, according to Kellegren; 1963). The mean age of this group was 60.8 years (between 57 and 72). The other 6 patients with no A-C arthritis were younger than 55 years (between 42 and 54). Clinical and radiologic evaluation of these 21 patients revealed A-C joint pain in

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	Points
Pain	
Present all of the time and unbearable; strong medication frequently	1
Present all of the time but bearable; strong medication occasionally	2
None or little at rest, present during light activities; salicylates frequently	4
Present during heavy or particular activities only; salicylates occasionally	6
Occasionally and slight	8
None	10
Function	
Unable to use limb	1
Only light activities possible	2
Able to do light housework or most activities of daily living	4
Most housework, shopping, and driving possible; able to do hair and dress and undress, including fastening brassiere	6
Slight restriction only; able to work above shoulder level	8
Normal activities	10
Active forward flexion	
150 degrees or more	5
120 to 150 degrees	4
90 to 120 degrees	3
45 to 90 degrees	2
30 to 45 degrees	1
Less than 30 degrees	0
Strenght of forward flexion (manual muscle-testing)	
Grade 5 (normal)	5
Grade 4 (good)	4
Grade 3 (fair)	3
Grade 2 (poor)	2
Grade 1 (muscle contaction)	1
Grade 0 (Nothing)	0
Satisfaction of the patient	
Satisfied and better	5
Not satisfied and worse	0

Fig. 1. University of California at Los Angeles shoulder rating scale. Maximum score is 35 points. Satisfactory result (28>points)(34~35 point excellent and 28~33 point Good rating), Unsatisfactory result(28<points)(21~27 points mild rating, <20 point poor rating)(Paulos and Kody, 1994).

all (100%), a positive horizontal adduction test in 20 (95.2%), positive lidocaine injection test in all (100%), decreased joint space in 18 (85.75%) and osteophytes in 11 (52.4%) (Fig. 2 & 3). In 5 patients, pain after 120° of abduction could not be evaluated because of restriction in abduction due to rotator cuff tears.

In this study, surgical treatment was considered for 12 of 27 patients with impingement syndromes (Group A); and distal clavicular resection was performed in 11 of these cases. The pathologic examination of all resected clavicles showed cartilage degeneration, fibrillation and osteoarthritic changes (Fig. 4). Surgical indication because of the necessity to remove distal clavicula was made in 5 of 12 patients. The rotator cuff (RC) tears diagnosed in these 5 cases were repaired in this way. Dramatic pain relief was noted in patients with A-C arthritis after distal clavicle resection at the early postoperative period. None of the patients suffered from any complication due to surgical procedures. The average score measured by the UCLA rating scale

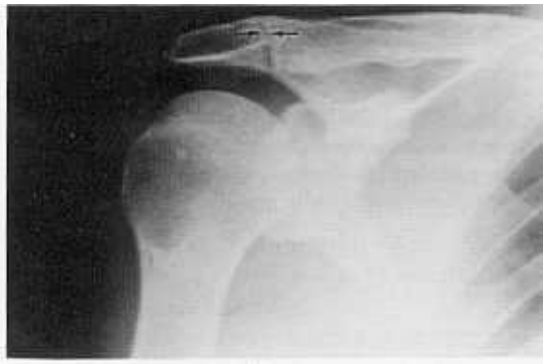

Fig. 2. Decreased joint space in the acromioclavicular joint (arrows)

Fig. 4. Irregular proliferation on surface cartilage of the acromioclavicular joint (H & E, ×400)

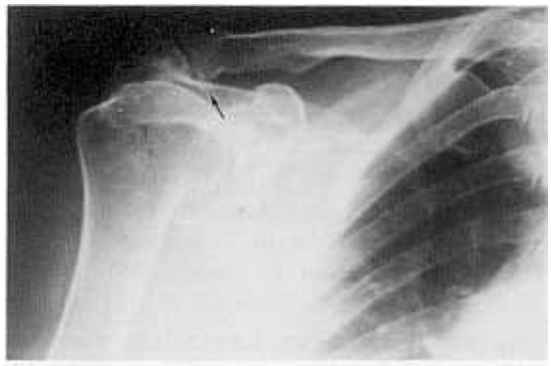

Fig. 3. Osteophytes in the acromioclavicular joint (arrow)

increased from 13 (pre-therapeutic score) to 28 (post-therapeutic score) in group A and from 10 to 13 in group B. The results were evaluated with Mann Whitney-U test and found satisfactory for group A and unsatisfactory for group B, and the difference between them was found to be statistically significant ($p<0.001$).

DISCUSSION

A functional A-C joint is mandatory for normal shoulder function since clavicular rotation is essential for the abduction of this complex joint to more than 90° of the glenohumeral joint. This structure is also an auxilliary element for the attachment of the upper extremity to the trunk. A-C arthritis poses serious problems on the functions of the shoulder (Fukuda *et al.* 1986; Morrey and Kai-Nan, 1990).

Age is an important factor in the development of A-C arthritis. Arthrosis begins after the age of 20 (De Palma *et al.* 1949; Petersson, 1983; Horvath and Kery, 1984). A-C arthritis is an end stage of degenerative processes which progress during aging and result in narrowing of the joint space and finally in whole-joint failure. Reported loss of joint space at 60 years is about 0.5 cm (Petersson and Redlund, 1983). Our study also demonstrated the relation between A-C arthritis and age.

Neer included A-C arthritis in the etiologic factors of impingement syndromes and reviewed the indications for distal clavicle resection (Neer, 1983). Wirth and Breithner (1984) reported the indications for distal clavicle resection as osteolysis, osteoarthritis, rheumatoid arthritis, A-C joint tuberculosis and grade 3 Tossy A-C dislocations (A-C joint dislocated, acromioclavicular and coracoclavicular ligament disrupted (Tossy *et al.* 1963).

As age is an important etiologic factor in both A-C arthritis and impingement syndromes, co-existance of A-C arthritis should be investigated in the treatment of impingement syndromes. This fact should especially be kept in mind during the evaluation of older patients and those with stage 3 impingement syndrome (De Palma *et al.* 1949; Neer, 1983; Petersson, 1983).

The initial treatment of A-C arthritis should be non-operative. When conservative measures fail, surgical procedures should be considered (Neviaser *et al.* 1982; Rockwood and Young, 1990; Gartsman, 1993). In this study, patients with A-C arthritis who

were treated by conservative or surgical methods were rated before and after therapy according to the UCLA shoulder rating scale. The scores were found to be satisfactory for those operated on and unsatisfactory for those who were treated only by conservative measures. According to these results, we suggest that surgical procedures should be performed in the treatment of AC arthritis for pain relief and shoulder function.

Wagner (1953), Taylor and Tooke (1977), Grimes and Garner (1980), and Peterson (1987) reported good results by distal clavicle resection with classical open methods in the treatment of A-C arthritis. In recent years, arthroscopic resection of the distal clavicle has also been reported to be successful (Gartsman *et al.* 1991; Flatow *et al.* 1992; Bigliani *et al.* 1993; Gartsman, 1993; Kay *et al.* 1994). According to these reports, arthroscopy has important advantages compared to the classical open methods as it allows earlier application of passive and active motions, causes minimal damage in deltoid muscle and affords the chance of an early return to work. Although arthroscopic surgery has many advantages, we believe that open surgery for distal clavicle resection may still be preferable in the treatment of A-C arthritis.

Penny and Welsh (1981), Haeri and Wiley (1982), Neer (1983), Thorling *et al.* (1985) and Watson (1985), Fukuda *et al.* (1986), Daluga and Obozi (1989), reported the relation between A-C arthritis and shoulder impingement syndrome. According to these authors, any treatment plan which does not consider the coexistence of A-C arthritis will not be accurate and successful in the treatment of impingement syndromes. In our study, 5 patients who were operated on for the diagnosis of A-C arthritis were found to have rotator cuff tears. Thus, the decision of operation for A-C arthritis gave us the opportunity for the early treatment of rotator cuff tears. Considering this experience, we strongly suggest that surgery should be planned in the presence of A-C arthritis for the treatment of impingement syndromes. As A-C arthritis alone is also an important problem for the patient, preference for surgical procedure will be advantageous both for the surgeon and the patient since resection of the distal clavicle and early repair of rotator cuff tears, if present, will cause dramatic pain relief. For these reasons, in the presence of A-C arthritis, especially for patients with impingement syndrome who do not respond to conservative therapy, distal clavicle resection by surgical method should be planned. This strategy will bring the advantage of early repair for rotator cuff tears, and even if the rotator cuff is intact, distal clavicle resection alone will resolve the patient's problem.

According to the results of our prospective study and many reports in this field, the following points should be considered in the treatment of impingement syndromes:

1) A-C arthritis is a common cause of impingement syndromes.

2) Co-existance of A-C arthritis should be investigated in the treatment of impingement syndromes.

3) Surgical approach to A-C arthritis presents an opportunity for the early treatment of partial or minor complete rotator cuff tears. Distal clavicle resection resulted in pain relief during the follow-up period (maximum 16 months) in our patients with impingement syndromes due to or coexisting with A-C arthritis.

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