

Diminutive Incision Acromioplasty Assisted with Arthroscopy in the Treatment of Chinese Patients with Subacromial Impingement Syndrome

Z-Q Wen, J Pan, Z Chen, J-Y Du, P-C Gu, X-J Lin

ABSTRACT

Background: Many causes can lead to shoulder pain and subacromial impingement syndrome (SIS) is the most frequently recorded disorders. The aim of this study was to evaluate the clinical effects of diminutive incision acromioplasty assisted with arthroscopy for the treatment of Chinese patients with subacromial impingement syndrome.

Subject and Methods: Twenty-two patients with 24-painful shoulders subacromial impingement syndrome were enrolled. All painful shoulders were in Grades II (8) and III (16) according to Neer's classification. Detailed physical examination was performed. Conventional radiography and subsequent magnetic resonance imaging (MRI) of the shoulder region of all patients were done. The University of California at Los Angeles Shoulder (UCLA) score system was used for all patients to evaluate their satisfaction after surgery. The preoperative recordings of the UCLA scores were collected and all enrolled cases including 24-painful shoulders were available for follow-up in 1, 3, 6, 12 months after surgery.

Results: According to the UCLA scoring system, the symptom of all painful shoulders were improved after one year postoperatively. The average score before surgery from 15.4 points increased to 31.2 points postoperatively, showing a statistical difference ($p < 0.05$).

Conclusions: A diminutive incision acromioplasty assisted with arthroscopy is a reliable approach to treat Chinese patients with subacromial impingement syndrome. All painful shoulders were obviously improved in one year after surgery.

Keywords: Arthroscopy, diminutive incision, minimally invasive surgical procedure, subacromial impingement syndrome

Acromioplastia de Incisión Diminuta Asistida con Artroscopia en el Tratamiento de Pacientes Chinos con Síndrome de Pinzamiento Subacromial

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ABSTRACT

Antecedentes: Muchas causas pueden provocar dolor de hombro y síndrome de compresión subacromial (SIS) es el trastorno más frecuentemente registrado. El objetivo de este estudio fue evaluar la clínica. Efectos de la acromioplastia con incisión diminuta asistida con artroscopia para el tratamiento de Pacientes chinos con síndrome de pinzamiento subacromial.

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Sujeto y métodos: Se incluyeron veintidós pacientes con síndrome de afectación subacromial de 24-hombros dolorosos. Todos los hombros dolorosos estaban en Grados II (8) y III (16) de acuerdo con la clasificación de Neer. Se realizó examen físico detallado. Se realizaron radiografías convencionales y, posteriormente, imágenes de resonancia magnética (IRM) de la región del hombro de todos los pacientes. El sistema de puntuación de la Universidad de California en Los Angeles Shoulder (UCLA) se utilizó para que todos los pacientes evaluaran su satisfacción después de la cirugía. Los registros preoperatorios de las puntuaciones de UCLA se recopilaron y todos los casos incluidos, incluidos 24-hombros dolorosos, estaban disponibles para el seguimiento en 1, 3, 6 y 12 meses después de la cirugía.

Resultados: De acuerdo con el sistema de puntuación de UCLA, el síntoma de todos los hombros dolorosos mejoró después de un año después de la operación. La puntuación promedio antes de la cirugía de 15.4 puntos aumentó a 31.2 puntos después de la operación, mostrando una diferencia estadística ($p < 0.05$)

Conclusiones: Una acromioplastia de incisión diminuta asistida con artroscopia es un enfoque confiable para tratar a pacientes chinos con síndrome de pinzamiento subacromial. Todas las lesiones dolorosas se mejoraron obviamente en un año después de la cirugía.

Palabras clave: Artroscopia, incisión diminuta, procedimiento quirúrgico mínimamente invasivo, síndrome de pinzamiento subacromial

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INTRODUCTION

Shoulder pain is encountered in patients of all ages and activity levels. Many causes can lead to shoulder pain, including rotator cuff-tears, impingement, frozen shoulder, calcific tendonitis and osteoarthritis and among them subacromial impingement syndrome (SIS) is the most frequently recorded disorder (1–2). This disorder was first noted by Jaravay (3) and subsequently classically described by Neer in 1972 (4). He described it as three Grades: Grade I is characterized by reversible oedema and haemorrhage within the cuff and bursa, typically in patients younger than 25 years old. Grade II revealed irreversible changes including fibrosis and tendinitis, seen in patients 25 to 40 years old. Grade II has recently been modified to include small tears of the rotator cuff after patient diagnosis and treatments are reviewed. In Grade III impingement, chronic changes such as tears of the rotator cuff, biceps rupture, and bone changes are seen and usually occurs in patients 40 years of age and older. Up to now, the SIS encompasses a series of subacromial space pathologies such as subacromial bursitis, partial thickness rotator cuff-tears, rotator cuff tendinosis, calcific tendinitis as well as long-head rupture of Biceps tendon (5). These conditions may all present similarly and are usually diagnosed by magnetic resonance imaging (MRI) or arthroscopy.

The treatment of SIS consists of conservative and operative approach. Most patients with SIS at the stage of Neer Grade I or II and partial rotator cuff-tear cases always achieved satisfied clinical effect by conservative

treatment. A broad spectrum of conservative treatments for SIS is available in primary healthcare, including rest, ice compress, nonsteroidal, anti-inflammatory drugs, corticosteroid injections, physical therapy and excise of muscle strength enhancement. In addition, several treatments including ultrasound therapy and laser therapy also received certain clinical effect in a short-term. When conservative treatment fails to relieve the symptoms associated with SIS or a complete cuff rupture is seen on MRI, operative intervention may be considered. Operative treatment contained open subacromial decompression [OSD] (4, 6), arthroscopic subacromial decompression [ASD] (7) and combination of both. Shortcoming of OSD include; larger incision with more trauma, excessive intraoperative bleeding, injury of surrounding soft-tissue and deltoid weakness. Adverse to early postoperative effective excise of shoulder joint, ASD and combination of both techniques have a tendency to replace OSD with the promotion and popularization of arthroscopic techniques. The approach of ASD was first described by Ellman (7). Such approach has the advantage of sparing the origin of the deltoid, reduced the disadvantage of OSD and checked the glenohumeral joint simultaneously. Ellman reported satisfactory results in 88% of patients at one to three years of follow-up (7). Many variations of this technique have been reported (8–11).

In the present study, we utilized the approach of diminutive incision acromioplasty assisted with arthroscopy to evaluate the clinical effects for the treatment

of patients with subacromial impingement syndrome. Totally, 22 cases with 24-painful shoulders were enrolled from March 2006 to December 2010 in our hospital. The University of California at Los Angeles (UCLA) Shoulder Rating Scale were assessed prior to surgery and postoperatively at 1, 3, 6 and 12 months.

SUBJECT AND METHODS

Ethics statements

The study was approved by the local Ethics Committee and all patients gave their informed consent prior to participation.

General features

A total of 24-painful shoulders in 22 cases diagnosed as SIS according to the comprehensive results of medical history, physical examination and imageological diagnosis from March 2006 to December 2010 in our hospital, were utilized in this study. Nine cases were males and 13 were females, among them two females had bilateral shoulder pain, with the gender ratio of 9:13 and no statistical difference between two genders. The age of patients ranged from 17 to 80 years old, with the median of 57 years. The average duration of the disease was 7.5 months, ranging from 6–26 months. Eight out of 24-painful shoulders were at the stage of Neer Grade II and the rest were Grade III based on the classification of Neer's. All patients had been unsuccessfully treated without surgery for more than six months. The UCLA Shoulder Rating Scale (12) was recorded prior to surgery and postoperatively at 1, 3, 6 and 12 months.

Clinical features

All patients have trauma or chronic strain history; among them 17 cases had obvious history of shoulder trauma and 16 cases had a history of chronic strain. All patients had varying degrees of shoulder pain, 18 of these felt pain at night. Tenderness occurred in the space between anterolateral acromion and small knot. Supraspinatus and infraspinatus atrophy was observed in 12 cases with relative long medical history. Painful *arc* test showed positivity in 19-painful shoulders, Neer test positive in 18-painful shoulders, Hawkins' test positive in 20-painful shoulders and drop arm test positive in 13-painful shoulders.

Image diagnosis

Conventional radiography (X-rays) and MRI examinations of all patients were performed preoperatively. The findings of radiography shown Type I (flat) acromion in two shoulders, Type II (curved) in eight shoulders and Type III (hooked) in 14 shoulders according to Bigliani's identification (13). The MRI sequences revealed six out of 24 shoulders complicated with rotator cuff-tears.

Surgical procedure

A total of 17 cases received general anaesthesia and the rest received long-term brachial plexus anaesthesia according to the body conditions of patients and the suggestion of the anaesthetist. Six patients were operated on in the lateral position, the arm abducted 45 °C and with 2 Kg plaster traction, the remaining 16 cases were operated in the semi-reclining position (beach chair), the upper body up 45 °C and affected arms were placed outside the side of the operation bed. The procedures of surgery are briefly summarized. (1) Arthroscopic subacromial inspection using the posterior approach; (2) The resection of abnormal synovia proliferation with electroshaver or burr; (3) The abscision or partial resection of the coracoacromial ligament with hook scalpel (4) The deltoid disarticulation along the edge of the acromion without the arthroscope. Such procedure provided a direct and clear view of the surgical area, allowing the surgeons to remove the abnormal tissue accurately and avoid damage of the normal structures (5). The wedge resection of the forward and lower part of the acromion (6). Patients underwent repair of the rotator cuff simultaneously. Subsequently, intra-articular joint were injected with sodium hyaluronate and the incision sutured.

Postoperative rehabilitation

Postsurgical shoulder joints were continuous compressed by ice for 12 hours postoperatively. Wound drainage was performed in the next 12–24 hours, antibiotics were used to prevent infection for two to three days postoperatively. Six patients with rotator cuff repair needed three weeks for shoulder joint fixation with an outreach frame, the other patients were able to carry out passive functional exercise of shoulder joint under guidance in the first day postoperatively. Next, active functional exercise of the shoulder joint with simple pendulum movement on the second day, postoperatively, was achieved. Three weeks after surgery, all of the patients were allowed to

start active strength exercises. The level of early activity should be less than angle of collided joints. Until six weeks after surgery, upper limb strength exercises were performed gradually. Rotator cuff repair in patients with full-thickness rotator cuff-tear needed rehabilitation for three months without any exercises after operation in order to recover the power of the rotator cuff.

Statistical analysis was made in SPSS 16.0 for Windows programme. Average UCLA scores pre- and postoperative were compared by unpaired student's *t*-test.

RESULTS

The preoperative recordings of the UCLA scores were collected and all enrolled cases including 24-painful shoulders were available for follow-up in 1, 3, 6, 12 months after surgery. According to the UCLA scoring system, we classified our patients into four Grades, "excellent" represented accumulative scores of UCLA more than 34 points, "good" represented that in the range of 28–33 points, "fair" represented that in the range of 21–27 points and "bad" represented that less than 21 points. The preoperative records of all enrolled shoulders revealed "bad", whereas only one month after operation such number decreased to 10 shoulders and the painful symptom of other eight shoulders was relieved, including three "excellent" and five "good". In the follow-up time point of 3, 6, 12 months after operation, the symptoms of all postoperative shoulders were relieved and the "bad" record disappeared. A total of 21 out of 24 (87.5%) shoulders were relieved, recorded as "good" or "excellent". The detailed data were summarized in the Table.

Table: Comparison of the case number of patients with SIS between pre- and post-operation using The University of California at Los Angeles Shoulder score system.

Follow-up time point (month)	bad (n)	fair (n)	good (n)	excellent (n)	Ratio* (%)
0	24	0	0	0	0.0
1	10	6	5	3	33.3
3	5	7	7	5	50.0
6	2	5	7	8	62.3
12	0	3	6	15	87.5

* The ratio of the case numbers of good and excellent to that of total case numbers.

The average preoperative score of all enrolled painful shoulders was 15.4 points, whereas in the follow-up time point of 1, 3, 6, 12 months after surgery such scores increased to 21.3, 26.7, 29.1 and 31.2, respectively

(Figure). Compared with the average preoperative score of painful shoulders, that of any follow-up time point showed statistical difference ($p < 0.05$). We found obvious improvement of patients' syndrome and obtained better clinical effects.

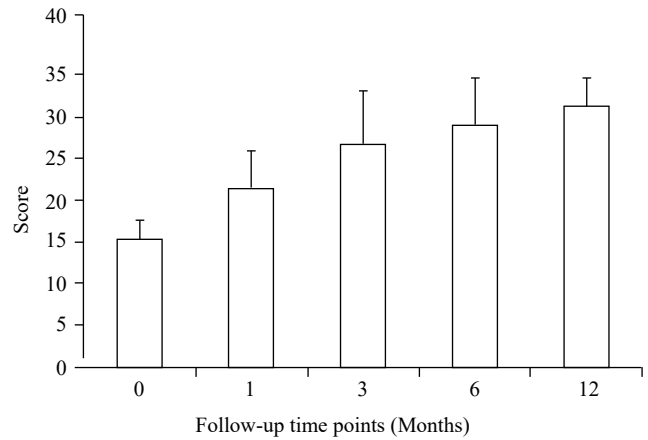


Figure: Comparison of The University of California at Los Angeles Shoulder scores between pre and postoperative shoulders. X-axle represents time points and Y-axle represents The University of California at Los Angeles Shoulder scores.

DISCUSSION

In the present study, we utilized diminutive incision acromioplasty assisted with arthroscopy to evaluate the clinical effects of the treatment of patients with SIS. During the period of one year follow-up, we found relief of patients' Syndrome and obtained better clinical effects according to the UCLA scores system.

Subacromial impingement syndrome is the compression of the supra-humeral structures against the anteroinferior aspect of the acromion and coracoacromial ligament. The structures most often irritated and inflamed with SIS are the rotator cuff muscles, the long head of the biceps and the subacromial bursa and pain frequently radiates to the lateral mid-humerus (4–5, 14–15). Patients always complain of pain at night, exacerbated by lying on the involved shoulder or sleeping with the arm overhead. Onset of shoulder pain and weakness following a fall in an individual over 40 years old should raise concern for complete tear of the rotator cuff. In our study, most patients were more than 40 years old and among these six shoulders of elder patients were complicated with partial rotator cuff-tears, such is consistent with previous report (5). Trauma is the potential cause for most impingement, such phenomenon was also observed in our study, most of patients have history of shoulder trauma and the pain usually develops insidiously over a period of weeks to months.

A thorough examination of the neck and shoulder is critical to properly diagnosing SIS. Many clinical

diagnostic tests have been developed for physical examination of the shoulder some of which are Hawkins, Neer, horizontal adduction, painful *arc*, drop arm, Yergason and Speed tests (5). Among them, Hawkins and Neer tests are quite efficient in diagnosis of SIS as they had high sensitivities and accuracy ratios (16). In our patients, 83.3% (20/24) painful shoulders were positive in Hawkins' test, while 75% (18/24) of these were positive in Neer test. Considering all enrolled shoulders are belonged to Neer Grade II and III, thus, there is relative lower specificity than precious reports (16). In addition, it is worth noting that 79.1% (19/24) painful shoulders showed positive in the painful *arc* test and 54.2% (18/24) painful shoulders were positive in the drop arm test. These implying that combination of various clinical diagnostic tests may be give better specificity.

Acromion morphology and its relationship to rotator cuff lesions are well documented by Bigliani and his colleagues (13). According to cadaveric dissections, he described three distinct types of acromions: Type I (flat), Type II (curved) and Type III (hooked). This classification system is based on the anterior slope of the acromion taken from supraspinatus outlet radiographs in the sagittal plane. A previous report found that shoulders with Type III (hooked) acromion have a higher incidence of rotator cuff-tears (17). From our study it is shown that more than half (58.3%) of the painful shoulders were classified into Type III (hooked) acromion, highlighting such type acromion has a high susceptibility to SIS. Interestingly, Ellman reported that none of the rotator cuff-tears found in his study were associated with a Type I acromion (18), but two of our painful shoulders were Type I acromion and one was diagnosed as partial rotator cuff-tears *via* MRI exam. It may be related with history of shoulder trauma in the patient.

Arthroscopic subacromial decompression is a well-evaluated procedure and advocated by several authors for the treatment of impingement syndrome in the shoulder (8–9, 19–20). It is an appropriate alternative technique for these open subacromial decompression when conservative treatment fails. As the aforementioned shortcoming of OSD, ASD have more and more performed worldwide. Ellman first published such technique with short-term follow-up demonstrating 89% satisfaction at two to five years (7). These findings have been expanded upon in patient number and length of follow-up by both Ellman and other authors, subsequently validating arthroscopic decompression as an effective treatment for subacromial impingement (21–22). Our results are consistent with these reports, but within a

relatively short-term follow-up received 87.5% satisfaction. As the limited cases, more cases and long-term follow-up need to be carried out, but to some extent, it has proven that our surgical method is useful for patients with SIS in China.

CONFLICT OF INTEREST

We declare that we have no conflict of interest.

AUTHOR'S NOTE

Zhi-Qiang Wen, Jun Pan and Zhong Chen conceived and planned the work that led to the paper. Zhi-Qiang Wen and Jing-Yu Du interpreted the evidence it presents. Peng-Cheng Gu and Xiang-Jin Lin wrote the paper or reviewed successive versions and took part in the revision process and Zhi-Qiang Wen approved the final version.

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