

## Subacromial Injections of Corticosteroids and Xylocaine for Painful Subacromial Impingement Syndrome

Chung-Ming Yu, MD; Chih-Hwa Chen, MD; Hsien-Tao Liu, MD; Ming-Hsun Dai, MD; I-Chun Wang, MD; Kun-Chung Wang, MD

- Background:** Subacromial impingement syndrome, with pain and limited motion, is a common disease encountered daily in clinics. This study determined the efficacy of subacromial injections of corticosteroids and local anesthesia for treatment of painful subacromial impingement syndrome.
- Methods:** A total of 238 shoulders in 209 patients, with regular follow-up, were enrolled in this study. Mean patient age was 51 years (range 31-72 years). Each patient complained of shoulder pain with progressive motion limitation present for more than one month, which was not relieved by various nonsurgical treatments. The mean duration of symptoms before injection was five months (range 1-12 months). Each patient had a positive Neer impingement sign, Hawkins impingement sign, painful tendon sign, limited range of motion and did not show clinical evidence of a rotator cuff tear. Each patient was administered an injection of 1 ml of 2% Xylocaine and 1 ml of Rinderon suspension. A second injection was administered one week later for patients without obvious improvement. Following injections, patients were instructed to perform a home rehabilitation program for four weeks. Follow-up examinations were scheduled for one, two and four weeks, and three, six, nine and 12 months after injection. Outcome measures included the Constant-Murley score and shoulder range of motion.
- Results:** At follow-up four weeks after the first injection, 216 shoulders (91%) had satisfactory improvement in amount of pain and range of motion: mean improvements in the active range of motion of forward elevation, abduction, internal rotation and external rotation were 56°, 48°, 18° and 22°, respectively. However, at the first year follow-up, the satisfaction rate was slightly down at 88%, and 19 shoulders (8%; 16 patients) had recurrent pain and motion limitation after an average of 5.4 months (range 3-12 months). Each of these patients received another injection. Surgery was recommended for 22 shoulders (9%; 18 patients) that did not have satisfactory improvement. Of these patients, eight shoulders (seven patients) had a partial tear of the rotator cuff and 10 shoulders (eight patients) had complete rotator cuff tears.
- Conclusion:** Subacromial injection of corticosteroids and local anesthesia is an effective therapy for the treatment of symptomatic subacromial pathology, such as impingement pain, tendonitis and bursitis. The injection can substantially reduce pain and increase range of motion of the shoulder. If there is no

---

From the Department of Orthopedics, Chang Gung Memorial Hospital, Keelung.

Received: Jul. 13, 2005; Accepted: May 23, 2006

Corresponding to: Dr. Chih-Hwa Chen, Department of Orthopaedic Surgery, Chang Gung Memorial Hospital-Keelung, 222, Maijin Rd., Keelung, Taiwan 204. Tel: 886-2-24313131 ext 2613; Fax: 886-2-24332655; E-mail: afachen@doctor.com, afachen@cgmh.org.tw

improvement following injections, a rotator cuff tear should be suspected.  
(*Chang Gung Med J* 2006;29:474-9)

**Key words: subacromial impingement syndrome, subacromial injection.**

Subacromial impingement syndrome, a common cause of shoulder pain and motion limitation, is a common disease encountered daily in clinics.<sup>(1)</sup> This chronic repetitive syndrome, characterized by constant attrition and microtrauma, causes a progressive inflammatory process and subsequent degenerative process within the rotator cuff. Once diagnosed, the initial therapy for subacromial impingement syndrome is nonsurgical, and may include modification of activities, analgesic nonsteroid anti-inflammatory drugs, cryotherapy, ultrasound, electromagnetic radiation, corticosteroid injection and physical therapy.<sup>(2-4)</sup>

This study investigated the efficacy of subacromial injections of corticosteroids and local anesthesia for the treatment of painful subacromial impingement syndrome.

## METHODS

Between 2000 and 2004, a total of 264 shoulders in 233 patients were given subacromial injection in our orthopedic clinic. Twenty-four patients were excluded from our study due to loss of follow-up. Two hundred and thirty eight shoulders in 209 patients (52 males and 157 females), with regular follow-up of more than 12 weeks, were enrolled in this study. The mean age was 51 years (range 31-72 years). No patient had a previous history of significant shoulder trauma. Each patient complained of shoulder pain with progressive motion limitation for more than one month, which was not relieved by various nonsurgical treatments. The mean duration of symptoms prior to injection was five months (range 1-12 months).

At pre-injection assessment, a detailed physical examination was performed. Those patients with symptoms around the shoulder, such as septic shoulder (erythema, swelling, local heat), shoulder instability (apprehension test positive, relocation test positive), cervical spondylosis (Spurling test positive), biceps tendonitis (Yergason test positive, Speed test positive) and acromioclavicular joint pain, should be

excluded from a diagnosis of subacromial impingement syndrome and undergo other treatments. Each patient in this study had a positive Neer impingement sign,<sup>(5)</sup> Hawkins impingement sign,<sup>(6)</sup> painful tendon sign, limited range of motion and did not show strong clinical evidence of a rotator cuff tear (for example, there was neither positive drop arm test nor partial or full-thickness rotator cuff tear identified by ultrasonography).<sup>(7)</sup> Due to the limitation of revealing soft tissue pathology, a plain shoulder X-ray examination was not a routine procedure.

The shoulder function was evaluated with Constant's score<sup>(8)</sup> (pain, activity level, range of movement, power) and was documented meticulously before injection. Subacromial injection of 1 ml Rinderon (betamethasone) and 1 ml of 2% Xylocaine suspension was administered with a 21-gauge needle (Fig. 1). The needle was inserted under the anterolateral aspect of the acromion<sup>(9)</sup> (Fig. 2) carefully avoiding an injection directly into the rotator cuff tendon by documenting any unrestricted flow of the solution through the syringe. The effect of steroid injection is rapid, so if the patient did not improve within one week the injection may have been given in the wrong area, rather than in subacromial space, or the dose may have been insufficient. Therefore, a second injection was administered one week later for those



**Fig. 1** The two drugs used for subacromial injections: left, 2% Xylocaine; right, Rinderon (betamethasone).



**Fig. 2** The entry point for a subacromial space injection is inferior to the corner of the acromion process. The needle is parallel to the under surface of the acromion and is inserted about 3.5 to 4 cm deep.

patients without obvious improvement. After injection, patients were instructed to perform a 4-week rehabilitation program at home. The results were analyzed statistically by a paired t-test with statistical significance set at  $p < 0.05$ .

## RESULTS

Follow-up examinations were scheduled at one, two and four weeks, and three, six, nine and 12 months after injection. The mean duration of follow-up was 33 weeks (range 12-55 weeks). One hundred and ninety one shoulders (168 patients) achieved improvement immediately after the first injection. Forty-seven shoulders in 41 patients received a second injection one week after the first injection. Of these 47 shoulders, 25 shoulders (23 patients) improved after the second injection. Further studies and surgical interventions were performed on 22 shoulders (18 patients) that had a poor response to the second injection. At the follow-up evaluation four weeks after the first injection, 216 shoulders (91%; 191 patients) achieved improvement in the amount of pain and range of motion. The mean improvements in the active range of motion of forward elevation, abduction, internal rotation and external rotation were 56°, 48°, 18° and 22°, respectively. Pre-injection and post-injection shoulder range of motions are shown in Table 1. The Constant's score was employed to rate pain and func-

tion before injection and at follow-up (Table 2). The total Constant's scores were 44 before injection and 79.6 after injection ( $p < 0.01$ ).

At the one year follow-up there were 19 shoulders (8%; 16 patients) that had recurrent pain and motion limitation after an average of 5.4 months (range 3-12 months). Of these 19 shoulders, 17 received only one injection and two received two injections, initially. Each of these patients chose to receive another injection; 11 improved greatly but eight did not improve. The rate of satisfactory improvement at final follow-up (12-55 weeks following injection) was 88% (208 shoulders; 183 patients). Surgery was recommended for 22 shoulders (9%; 18 patients) that did not achieve satisfactory improvement after the initial two injections of corticosteroids and Xylocaine. Prior to surgery, each patient underwent magnetic resonance imaging or arthrography<sup>(10)</sup> studies to obtain a definitive diagnosis. Of these patients, eight shoulders (3%; seven patients) had a partial rotator cuff tear, 10 shoulders (4%; eight patients) had a complete rotator cuff tear and four shoulders (1.7%; three patients) had calcific tendonitis of the rotator cuff but no tear. Patients

**Table 1.** Shoulder Range of Motion Before and Four Weeks After Injection

Shoulder Motion	Before Injection	After Injection
Forward Elevation	110°	166°
Abduction	36°	84°
Internal Rotation	32°	50°
External Rotation	34°	56°

**Table 2.** Functional Evaluation Before and Four weeks After Injection According to Constant's Score

	Normal	Before injection	After injection	<i>p</i> value
Pain	15	3	12	
Activities	20	6.5	14.8	
Activity level	10	2.5	7.8	
Positio	10	4	7	
Range of motion	40	27.1	37.3	
Abduction	10	6.5	9.2	
Flexion	10	6.4	9.5	
Internal rotation	10	7.2	9.2	
External rotation	10	7	9.4	
Power	25	8	14.5	
Total	100	44	79.6	< 0.01

with rotator cuff tears underwent acromioplasty decompression and debridement or repair. There were no injection- or surgery-related complications.

## DISCUSSION

Subacromial impingement syndrome is an extremely common source of shoulder and arm pain caused by ordinary use. The syndrome is characterized by narrowing of the subacromial space due to the presence of an anterior acromial spur or inferior acromioclavicular osteophytes<sup>(11)</sup> with secondary impingement of the bursa surface of the rotator cuff on the undersurface of the acromion.<sup>(12)</sup>

The clinical symptoms and signs are pain (on the top and front of the shoulder), mild weakness (worsening with overhead activity), shoulder stiffness and popping (bursitis).

White et al. compared subacromial corticosteroid injections (triamcinolone acetonide) and oral indomethacin therapy and suggested that there is no difference in the short-term efficacy of oral nonsteroidal therapy compared with local corticosteroid injection. Their study, however, was not powered and only 22 patients received six weeks of follow-up, resulting in a possible type 2 error.<sup>(6,13)</sup> Blair et al. demonstrated that subacromial injection of corticosteroids is an effective short-term therapy for symptomatic subacromial impingement syndrome.<sup>(14)</sup> Our investigation also showed that patients with symptomatic subacromial impingement syndrome achieved significant improvement in shoulder pain and range of motion following corticosteroid injections. The rate of satisfactory improvement was 91% at four weeks after the first injection and 88% at the one year follow-up. If there was no obvious and immediate improvement, a rotator cuff tear or severe calcific tendonitis were highly suspected. Further examination and definitive therapy was required.

Subacromial injection of corticosteroids has potential side effects. Laboratory studies have identified temporary loss of strength after intratendinous injection of corticosteroids, although few long-term deleterious effects have been observed. Clinically, direct injection into the tendon has reportedly caused late rupture.<sup>(15)</sup> Therefore, injection must be into the correct subacromial space and performed by a well-trained and experienced doctor; otherwise using sonographic-guided<sup>(16)</sup> or mixed-contrast material

with a fluoroscope monitor<sup>(17,18)</sup> to achieve injection accuracy is justified.

Additionally, corticosteroids may have a deleterious effect on cartilage (either through an inadvertent injection into the glenohumeral joint rather than the subacromial space, or as a result of a full-thickness rotator cuff tear allowing communication between the subacromial space and glenohumeral joint). Injection of corticosteroids in the presence of a rotator cuff tear can also damage tissue available for later repair. Bjorkenheim et al. demonstrated that a series of more than three preoperative injections of corticosteroids was associated with failed rotator cuff repair.<sup>(19)</sup> Therefore, we recommended that patients receive at most two subacromial injections of corticosteroids.

In this study, patients were injected with corticosteroids and Xylocaine to reduce the possibility of acute discomfort caused by corticosteroids alone. This combination with Xylocaine may confound the results analysis in two ways. First, Xylocaine alone may have a therapeutic effect.<sup>(20)</sup> Alvarez et al. found that betamethasone was no more effective than Xylocaine alone in short-term (24 weeks) follow-up.<sup>(21)</sup> Furthermore, it remains unknown how corticosteroids and Xylocaine interact in vivo. Second, whether there is a placebo effect caused by subacromial injection (without steroid content) is unclear. A further prospective study with a control group is required to identify the efficacy of corticosteroid injections for subacromial impingement syndrome.

Subacromial injection of corticosteroids and local anesthesia is an effective, safe and simple therapy for symptomatic subacromial pathologies, such as impingement pain, tendonitis and bursitis. The injection can substantially reduce shoulder pain and increase range of motion. If there is no improvement following injection, a rotator cuff tear should be highly suspected.

## REFERENCES

1. Calis M, Akgun K, Birtane M, Karacan I, Calis H, Tuzun F. Diagnostic values of clinical diagnostic tests in subacromial impingement syndrome. *Ann Rheum Dis* 2000;59:44-7.
2. Downing DS, Weinstein A. Ultrasound therapy of subacromial bursitis. A double blind trial. *Phys Ther* 1986;66:194-9.
3. Kennedy JC, Willis RB. The effects of local steroid injection

- tions on tendons: a biomechanical and microscopic correlative study. *Am J Sport Med* 1976;4:11-21.
4. Rocks JA. Intrinsic shoulder pain syndrome: rationale for heating and cooling in treatment. *Phys Ther* 1979;59:153-9.
  5. Neer CS 2nd. Impingement lesions. *Clin Orthop Relat Res* 1983;173:70-7.
  6. Hawkins RJ, Brock RM. Anterior acromioplasty: early results for impingement with intact rotator cuffs. *Orthop Trans* 1979;3:274.
  7. Lach W, Dudarenko G, Brzosko M, Cyrylowski L, Flicinski J. Usefulness of ultrasonographic and MR imaging in diagnosis of shoulder impingement syndrome. *Chir Narzadow Ruchu Ortop Pol* 2003;68:307-11.
  8. Constant CR, Murley AH. A clinical method of functional assessment of the shoulder. *Clin Orthop Relat Res* 1987;214:160-4.
  9. Robert WO. Subacromial space injection. *Phys Sportsmed* 1999;4:99.
  10. Huber DJ, Koch E. Magnetic resonance tomography in disorders of the rotator cuff. *Orthopade* 1995;24:491-7.
  11. Bigliani LU, Ticker JB, Flatow EL, Soslowky LJ, Mow VC. The relationship of acromial architecture to rotator cuff disease. *Clin Sports Med* 1991;10:823-38.
  12. Cofield RH. Rotator cuff disease of the shoulder. *J Bone Joint Surg Am* 1985;67:974-9.
  13. White R, Paull D, Fleming K. Rotator cuff tendonitis: comparison of subacromial injection of a long acting corticosteroid versus oral indomethacin therapy. *J Rheumatol* 1986;13:608-13.
  14. Blair B, Rokito A, Cuomo F, Jarolem K, Zuckerman JD. Efficacy of injections of corticosteroids for subacromial impingement syndrome. *J Bone Joint Surg Am* 1996;78:1685-9.
  15. Ford LT, DeBender J. Tendon rupture after local steroid injection. *South Med J* 1979;72:827-30.
  16. Naredo E, Cabero F, Beneyto P, Cruz A, Mondejar B, Palop MJ, Crespo M. A randomized comparative study of short term response to blind injection versus sonographic-guided injection of local corticosteroids in patients with painful shoulder. *J Rheumatol* 2004;31:308-14.
  17. Yamakado K. The targeting accuracy of subacromial injection to the shoulder: an arthrographic evaluation. *Arthroscopy* 2002;18:887-91.
  18. Esenyel CZ, Esenyel M, Yesiltepe R, Ayanoglu S, Bulbul M, Sirvanci M, Kara AN. The correlation between the accuracy of steroid injections and subsequent shoulder pain and function in subacromial impingement syndrome. *Acta Orthop Traumatol Turc* 2003;37:41-5.
  19. Bjorkenheim JM, Paavolainen P, Ahovuo J, Slati P. Surgical repair of the rotator cuff and surrounding tissues. Factors influencing the results. *Clin Orthop Relat Res* 1988;236:148-53.
  20. Binder A, Parr G, Hazleman B, Fitton-Jackson S. Pulsed electromagnetic field therapy of persistent rotator cuff tendinitis. A double-blind controlled assessment. *Lancet* 1984;1:695-8.
  21. Alvarez CM, Litchfield R, Jackowski D, Griffin S, Kirkley A. A prospective, double-blind, randomized clinical trial comparing subacromial injection of betamethasone and xylocaine alone in chronic rotator cuff tendinosis. *Am J Sports Med* 2005;33:255-62.

## 對於疼痛之肩峰下衝擊症候群患者施以肩峰下 注射類固醇混合局部麻醉劑

游重銘 陳志華 劉獻道 戴明勳 王宜君 王坤全

- 背景：** 肩峰下衝擊症候群造成肩膀疼痛及關節活動受限是一個臨床上很常見的疾病，本研究是探討類固醇加上局部麻醉劑於肩峰下注射對此一疾病之療效。
- 方法：** 在 209 位病人中共施行了 238 例肩峰下注射，並作了詳細的追蹤及分析，這些病人的平均年齡為 51 歲，所有的病人均有超過一個月以上的肩膀疼痛及關節活動受限的問題，雖接受各種保守治療仍無改善；所有的病人均有陽性之尼爾夾擊病徵及霍金氏病徵，但卻沒有強烈證據顯示有旋轉肌袖破裂。我們對這些病患實施肩峰下注射 1 西西 2% 賽落卡因及 1 西西臨得隆混合液，如果沒有明顯反應，可於隔週再追加一劑。
- 結果：** 臨床追蹤顯示，在注射後有 216 例肩膀有明顯的改善及滿意，在注射之四週後關節的活動度前舉，外展、內旋及外旋分別進步了 56°、48°、18°、22°。但在一年內 (3-12 個月不等，平均 5.4 個月) 有 19 (8%) 例症狀又復發，這些患者均接受再次注射。22 例注射後無改善之病患接受手術治療，其中 8 例為旋轉肌袖部分破裂，10 例為完全破裂。
- 結論：** 對於肩峰下衝擊症候群造成之疼痛、肌腱炎及滑囊炎、肩峰下注射類固醇及局部麻醉劑混合劑是一有效，安全及簡單之治療方法，它能緩解疼痛，增加運動範圍，假如注射後無明顯改善則要考慮是旋轉肌袖破裂。  
(長庚醫誌 2006;29:474-9)

**關鍵字：** 肩峰下衝擊症候群，肩峰下腔注射。

---

長庚紀念醫院 基隆院區 骨科

受文日期：民國94年7月13日；接受刊載：民國95年5月23日

索取抽印本處：陳志華醫師，長庚紀念醫院 骨科。基隆市204安樂區麥金路222號。Tel.: (02)24313131轉2613; Fax: (02)24332655; E-mail: afachen@doctor.com, afachen@cgmh.org.tw