



## Comparison of subacromial tenoxicam and steroid injections in the treatment of impingement syndrome

### Omuz sıkışma sendromu tedavisinde subakromiyal tenoksikam ve steroid enjeksiyonlarının karşılaştırılması

Hakan Çift, MD.,<sup>1</sup> Feyza Ünlü Özkan, MD.,<sup>2</sup> Sena Tolu, MD.,<sup>3</sup> Ali Şeker, MD.,<sup>1</sup> Mahir Mahiroğulları, MD.<sup>1</sup>

<sup>1</sup>Department of Orthopedics and Traumatology, İstanbul Medipol University, İstanbul, Turkey

<sup>2</sup>Department of Physical Medicine and Rehabilitation, Fatih Sultan Mehmet Training and Research Hospital, İstanbul, Turkey

<sup>3</sup>Department of Physical Medicine and Rehabilitation, İstanbul Medipol University, İstanbul, Turkey

#### ABSTRACT

**Objectives:** This study aims to assess and compare the efficacy of subacromial tenoxicam and steroid injections in treating patients with shoulder impingement syndrome.

**Patients and methods:** Forty patients having shoulder impingement syndrome with findings of rotator cuff tendinitis or subacromial bursitis on magnetic resonance imaging were included in the study. Patients were randomized into two subacromial injection groups: patients in the first group (10 males, 10 females; mean age 45.3 years; range 32 to 67 years) were administered 20 mg tenoxicam three times by weekly intervals, and patients in the second group (8 males, 12 females; mean age 46.5 years; range 29 to 73 years) were administered 40 mg methylprednisolone acetate just for once. Visual analog scale (VAS), active range of motion (ROM) of the shoulder joint, and Disabilities of Arm, Shoulder and Hand (DASH) questionnaire scores were evaluated at baseline, six weeks after treatment, and first year.

**Results:** Visual analog scale, DASH, and active ROM scores in both groups were statistically significantly improved. No statistically significant difference was detected between subacromial tenoxicam and steroid injections in terms of post-treatment VAS, DASH, and active ROM scores. Mean pre- and post-treatment VAS scores in tenoxicam group were 7.8 (range, 3-9) and 2.6 (range, 2-4), respectively. Mean pre- and post-treatment VAS scores in steroid group were 6.2 (range, 3-10) and 3.6 (range, 0-7), respectively. Mean pre- and post-treatment DASH scores in tenoxicam group were 59.4 (range, 45-80) and 14.7 (range, 8.3-25.8), respectively. Mean pre- and post-treatment DASH scores in steroid group were 56.7 (range, 33.3-85.8) and 18.1 (range, 0-69.2), respectively. Although the improvement in active ROM was higher in the steroid group, difference between two groups was not statistically significant.

**Conclusion:** Both subacromial tenoxicam and steroid injections may be successfully used in the treatment of patients with impingement syndrome. Subacromial tenoxicam injection may be preferred as a first-line intervention in these patients thanks to its safe profile.

**Keywords:** Methylprednisolone acetate; shoulder impingement syndrome; shoulder pain; tenoxicam.

#### ÖZ

**Amaç:** Bu çalışmada omuz sıkışma sendromlu hastaların tedavisinde subakromiyal tenoksikam ve steroid enjeksiyonlarının etkinliği değerlendirildi ve karşılaştırıldı.

**Hastalar ve yöntemler:** Çalışmaya manyetik rezonans görüntülemesinde rotator kılıf tendinozis veya subakromiyal bursit bulguları olan omuz sıkışma sendromlu 40 hasta dahil edildi. Hastalar randomize olarak iki subakromiyal enjeksiyon grubuna ayrıldı: birinci gruptaki hastalara (10 erkek, 10 kadın; ort. yaş 45.3 yıl; dağılım 32-67 yıl) üç kez olmak üzere birer hafta ara ile 20 mg tenoksikam, ikinci gruptaki hastalara (8 erkek, 12 kadın; ort. yaş 46.5 yıl; dağılım 29-73 yıl) 40 mg metilprednizolon asetat sadece bir kez uygulandı. Görsel analog ölçeği (GAÖ), omuz eklemine aktif eklem hareket açıklığı (EHA) ve Kol, Omuz ve El Sorunları Anketi (DASH) skorları tedavi başlangıcında, tedavi sonrası altıncı haftada ve birinci yılda değerlendirildi.

**Bulgular:** Her iki grupta GAÖ, DASH ve aktif EHA skorları istatistiksel olarak anlamlı şekilde iyileşti. Tedavi sonrası GAÖ, DASH ve aktif EHA skorları açısından subakromiyal tenoksikam ve steroid enjeksiyonları arasında istatistiksel olarak anlamlı farklılık saptanmadı. Tenoksikam grubunda tedavi öncesi ve sonrası ortalama GAÖ skorları sırasıyla 7.8 (dağılım 3-9) ve 2.6 (dağılım 2-4) idi. Steroid grubunda tedavi öncesi ve sonrası ortalama GAÖ skorları sırasıyla 6.2 (dağılım 3-10) ve 3.6 (dağılım 0-7) idi. Tenoksikam grubunda tedavi öncesi ve sonrası ortalama DASH skorları sırasıyla 59.4 (dağılım 45-80) ve 14.7 (dağılım 8.3-25.8) idi. Steroid grubunda tedavi öncesi ve sonrası ortalama DASH skorları sırasıyla 56.7 (dağılım 33.3-85.8) ve 18.1 (dağılım 0-69.2) idi. Steroid grubunda aktif EHA'daki iyileşme daha yüksek olmasına rağmen, iki grup arasındaki farklılık istatistiksel olarak anlamlı değildi.

**Sonuç:** Omuz sıkışma sendromlu hastaların tedavisinde hem subakromiyal tenoksikam hem steroid enjeksiyonları başarılı bir şekilde kullanılabilir. Subakromiyal tenoksikam enjeksiyonu güvenli profili sayesinde bu hastalarda birinci basamak girişim olarak tercih edilebilir.

**Anahtar sözcükler:** Metilprednizolon asetat; omuz sıkışma sendromu; omuz ağrısı; tenoksikam.

Periarticular shoulder disorder refers to a set of diverse diseases including subacromial and subdeltoid bursitis, rotator cuff tendinitis, calcific tendinitis, and rotator cuff tear with or without adhesive capsulitis leading to shoulder pain and restricted range of motion (ROM).<sup>[1,2]</sup> Shoulder impingement syndrome is usually treated conservatively including resting, nonsteroidal antiinflammatory drugs (NSAIDs), subacromial injections (corticosteroids, local anesthetics, hyaluronate and recently tenoxicam), suprascapular nerve blockage, and physical and manual therapy.<sup>[3-6]</sup> Tenoxicam is a NSAID and analgesic of the oxamic class. It has no detrimental effects on the cartilage and muscular structure. In a previous study by Ozkan et al.,<sup>[7]</sup> two injections of subacromial tenoxicam in patients with open subacromial decompression and rotator cuff tear repair had positive effect in gaining early ROM. In this study, we aimed to assess and compare the efficacy of subacromial tenoxicam and steroid injections in treating patients with shoulder impingement syndrome.

## PATIENTS AND METHODS

Forty patients who admitted to the Department of Orthopaedics and Traumatology, Istanbul Medipol University with primary complaint of shoulder pain between January 2012 and June 2013 were selected. Patients fulfilled the following inclusion criteria: 1) clinical sign of a painful arc and positive Hawkins test and/or Neer impingement sign; and 2) precise rotator cuff injury including rotator cuff tendinitis, or subacromial bursitis detected on magnetic resonance imaging. The exclusion criteria were as follows: 1) history of shoulder surgery; 2) full thickness rotator cuff rupture; 3) hemiplegic shoulder pain; 4) suspected fracture on X-ray or history of recent shoulder trauma; 5) limited active ROM and stiffness due to adhesive capsulitis; and 6) history of subacromial injections or physical therapy in the last three months. The study was approved by the local research ethics committee of the university hospital and informed consents were obtained from patients.

Patients were randomly allocated into subacromial tenoxicam or steroid injection groups. All patients were given home based exercise program including gravity-assisted distraction and oscillatory pendulum exercise. Subacromial tenoxicam (Oksamen®, Mustafa Nevzat, Turkey) injection was applied to the 20 shoulders of 20 patients (10 males, 10 females; mean age 45.3 years; range 32 to 67 years) in the tenoxicam group. Subacromial tenoxicam injections were applied totally three times by one week intervals during the course of the study.

Subacromial methyl prednisolone acetate (Depo-Medrol®, Eczacıbaşı, Turkey) injection was applied to 20 shoulders of 20 patients (8 males, 12 females; mean age 46.5 years; range 29 to 73 years) in the steroid group. Only one injection was performed during the course of the study.

All subacromial injections were applied to patients at a sitting position. A wide scrub was done and posterior arthroscopy portal was used for the needle entry point. While all injections were done by the same clinician, examinations were conducted by another examiner. Active ROM of the shoulder joint, visual analog scale (VAS) and disabilities of Arm, Shoulder and Hand (DASH) scores were evaluated and recorded at baseline, six weeks after the treatment, and first year.

## Statistical analysis

SPSS for Windows version 15.0 software program (SPSS Inc., Chicago, IL, USA) was used for statistical analysis. Mann-Whitney U test was used to compare the differences between means of the two groups. Wilcoxon test was used to compare pre- and post-treatment mean values of each group. P values less than 0.05 were accepted as statistically significant.

## RESULTS

While there were no major complications after injections, patients in subacromial tenoxicam group complained of moderate burning like sensation during the injection process. Two patients had temporary hypotension. There was no statistically significant difference between subacromial tenoxicam and subacromial steroid groups regarding demographic measures and mean baseline ROM, DASH, and VAS scores ( $p>0.05$ ).

In tenoxicam group, mean pre- and post-treatment VAS scores were 7.8 (range, 3-9) and 2.6 (range 2-4), respectively. Mean pre- and post-treatment DASH scores were 59.4 (range, 45-80) and 14.7 (range 8.3-25.8), respectively. Mean pre- and post-treatment active ROM degrees were 105.1 (range 80-130) and 171.7 (range, 140-180), respectively. Subacromial tenoxicam injection displayed significant beneficial effects in all parameters at first year.

In steroid group, mean pre- and post-treatment VAS scores were 6.2 (range, 3-10) and 3.6 (range, 0-7), respectively. Mean pre- and post-treatment DASH scores were 56.7 (range, 33.3-85.8) and 18.1 (range, 0-69.2), respectively. Mean pre- and post-treatment active ROM degrees were 83.3 (range, 10-180) and 152 (range, 50-180), respectively, at first year.

Both subacromial steroid and subacromial tenoxicam injections statistically significantly improved active ROM, VAS, and DASH scores ( $p < 0.01$ ). There was a statistically significant difference between tenoxicam and steroid groups in mean change scores for VAS and DASH scales. The improvement in active ROM was slightly higher in the steroid group but difference between the two groups was not statistically significant (Table I).

## DISCUSSION

Impingement is painful functional limitation of the shoulder, thought to be secondary to compression or altered dynamics that irritate and ultimately damage the tissues around the shoulder joint. The classically accepted underlying pathologies are edema, hemorrhage, fibrosis, tendinitis, and partial or complete rupture of rotator cuff.

There are many conservative treatment modalities including NSAIDs, physical therapy, activity modification, suprascapular nerve blockage, and subacromial corticosteroid injections in the management of shoulder impingement syndrome.<sup>[6-9]</sup> Subacromial injections and physical therapy are amongst the most commonly used conservative methods. Subacromial steroid injection is common and an alternative compound which is effective and harmless to cartilage structure, while its cost effectiveness is still investigated. In this article, we aimed to present our results regarding the comparison of subacromial tenoxicam and steroid injections in the treatment of impingement syndrome which may bring a new perspective into the treatment strategy. Our results showed statistically significant beneficial effects of subacromial tenoxicam injections in impingement syndrome in terms of active ROM, VAS, and DASH scores.

Although majority of studies mention beneficial effects of subacromial corticosteroid injections,<sup>[10]</sup> various questions exist on detrimental effect of steroids on cartilage structure.<sup>[11]</sup> Besides, steroids

should be used with caution in patients with diabetes mellitus and hypertension.

Karthikeyan et al.<sup>[12]</sup> compared the efficacy of a single subacromial injection of tenoxicam, with a single injection of methylprednisolone in patients with impingement syndrome. Although tenoxicam injection exerted positive effects, they found significantly greater improvements in the methylprednisolone group. Their results differ from our study and this could be due to the single injection protocol of the study. In a study by Min et al.<sup>[13]</sup> triamcinolone and ketorolac were equally effective in the treatment of subacromial impingement with greater improvement in the University of California at Los Angeles shoulder scores at four weeks follow-up.

A high level of inflammatory cytokines, proteinases, and cyclooxygenase enzymes were shown to be expressed in the subacromial bursa of patients with rotator cuff tear.<sup>[14]</sup> Tenoxicam is a cheap NSAID and an analgesic of the oxycam class, is closely related to piroxicam and has a long half-life, which enables it to be administered once daily. It also readily penetrates the synovial fluid and has the ability to prevent adhesion formation.<sup>[15-17]</sup> Besides, it has no detrimental effects on cartilage structure, can be safely administered intraarticularly, and enables multiple injections during the course of treatment. In a study by Ozkan et al.<sup>[7]</sup> two subacromial tenoxicam injections applied weekly were effective in gaining ROM to perform daily activities in rotator cuff repaired patients, which in turn decreased the time to return to daily activities. We decided to administer three injections to increase the efficacy of tenoxicam in our study.

Subacromial corticosteroid injection may have detrimental effects on tendon structure ultimately leading to rupture. In a study by Akpinar et al.<sup>[18]</sup> abnormally soft and light coloured tendons with fragmentation and inflammatory cell infiltration after four times of repeated corticosteroid injections were

**TABLE I**

Changes in visual analog scale, disabilities of arm, shoulder and hand questionnaire, and active range of motion scores in tenoxicam and steroid groups

Parameter	Tenoxicam group	Steroid group	<i>p</i>
	Mean±SD	Mean±SD	
Change in visual analog scale score	5.2±0.6	2.6±1.8	0.009*
Change in disabilities of arm, shoulder and hand score	44.7±7.0	38.6±14.3	0.014*
Change in active range of motion	66.6±12.4	68.7±51.4	0.695

SD: Standard deviation; \*  $p < 0.05$ .

demonstrated. Yılmaz et al.<sup>[19]</sup> suggested intradeltoid injections as an alternative route to avoid possible detrimental effects of steroids on rotator cuff tendons by repeated subacromial injections.

There are also conflicting results about the efficacy of subacromial corticosteroid injection for the treatment of impingement syndrome. There are reports about increased shoulder ROM with decreased pain after corticosteroid injection in shoulder impingement syndrome.<sup>[14,20,21]</sup> On the other hand, Vecchio et al.<sup>[22]</sup> demonstrated no beneficial effect of subacromial methylprednisolone over lignocaine injection on symptoms of impingement syndrome during 12 weeks of follow-up. Although Johansson et al.<sup>[23]</sup> reported short-term efficacy of subacromial corticosteroid injection in their systematic review about the interventions for subacromial pain, both subacromial corticosteroid and tenoxicam injections had been successful after one year in patients with impingement syndrome.

Rhon et al.<sup>[24]</sup> compared one-year outcome of subacromial corticosteroid injection with manual physical therapy in 104 patients with shoulder impingement syndrome. They conducted a randomized, single blind study in which physical therapy group received six sessions of manual physical therapy and the steroid group received 40 mg triamcinolone acetonide injections up to three total injections at least one month apart during the one year study period. Significant improvements in pain and life quality scales were achieved in both groups with no significant difference between the groups.

The lack of a physical therapy group is a limitation in our study. Further studies conducted in larger populations designed with a control group of physical therapy or a combination of physical therapy and tenoxicam injection may clarify the efficacy of subacromial tenoxicam injection in the treatment of impingement syndrome. The benefits of subacromial tenoxicam injections should also be investigated with pathological examinations to exhibit its effect on a cellular level which is another important limitation of our study.

In conclusion, patients with rotator cuff tendinitis, bursitis, or tenosynovitis may be successfully treated with subacromial tenoxicam or steroid injections. Given the favorable clinical effects and safer therapeutic profile, subacromial tenoxicam injection may be used as a first-line intervention in the management of shoulder impingement syndrome.

### Declaration of conflicting interests

The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

### Funding

The authors received no financial support for the research and/or authorship of this article.

### REFERENCES

1. Kim SB, Yoon K, Park HS, Kwak H, Ha NJ, Park JS, et al. Ultrasonography in the shoulder impingement syndrome. *J Korean Acad Rehabil Med* 2000;24:542-50.
2. Ulaşlı AM, Erkeç S, Uyar S, Nacı B, Yılmaz Ö, Erdem HR. The effect of acromioclavicular joint degeneration on orthopedic shoulder tests. *Eklemler Hastalıkları Cerrahisi* 2013;24:77-81.
3. Naredo E, Cabero F, Beneyto P, Cruz A, Mondéjar B, Uson J, et al. 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.
4. Chen MJ, Lew HL, Hsu TC, Tsai WC, Lin WC, Tang SF, et al. Ultrasound-guided shoulder injections in the treatment of subacromial bursitis. *Am J Phys Med Rehabil* 2006;85:31-5.
5. Blair B, Rokito AS, Cuomo F, Jarolem K, Zuckerman JD. Efficacy of injections of corticosteroids for subacromial impingement syndrome. *J Bone Joint Surg [Am]* 1996;78:1685-9.
6. Düzgün I, Baltacı G, Atay OA. Manual therapy is an effective treatment for frozen shoulder in diabetics: an observational study. *Eklemler Hastalıkları Cerrahisi* 2012;23:94-9.
7. Ozkan K, Cift H, Unay K, Ozkan F.U, Kadioglu B, Akman B, et al. Physical therapy with subacromial tenoxicam injection in patients with open subacromial decompression and rotator cuff tear repair: a pilot randomized controlled study. *Eur J Orthop Surg Traumatology* 2010;20:603-6.
8. Akgün K, Birtane M, Akarirmak U. Is local subacromial corticosteroid injection beneficial in subacromial impingement syndrome? *Clin Rheumatol* 2004;23:496-500.
9. Ozkan K, Ozcekcik AN, Sarar S, Cift H, Ozkan FU, Unay K. Suprascapular nerve block for the treatment of frozen shoulder. *Saudi J Anaesth* 2012;6:52-5.
10. Yu CM, Chen CH, Liu HT, Dai MH, Wang IC, Wang KC. Subacromial injections of corticosteroids and xylocaine for painful subacromial impingement syndrome. *Chang Gung Med J* 2006;29:474-9.
11. Hauser RA, Sprague IS. Outcomes of prolotherapy in chondromalacia patella patients: improvements in pain level and function. *Clin Med Insights Arthritis Musculoskeletal Disord* 2014;7:13-20.
12. Karthikeyan S, Kwong HT, Upadhyay PK, Parsons N, Drew SJ, Griffin D. A double-blind randomised controlled study comparing subacromial injection of tenoxicam or methylprednisolone in patients with subacromial impingement. *J Bone Joint Surg [Br]* 2010;92:77-82.
13. Min KS, St Pierre P, Ryan PM, Marchant BG, Wilson CJ, Arrington ED. A double-blind randomized controlled trial comparing the effects of subacromial injection with corticosteroid versus NSAID in patients with

- shoulder impingement syndrome. *J Shoulder Elbow Surg* 2013;22:595-601.
14. Voloshin I, Gelinas J, Maloney MD, O'Keefe RJ, Bigliani LU, Blaine TA. Proinflammatory cytokines and metalloproteases are expressed in the subacromial bursa in patients with rotator cuff disease. *Arthroscopy* 2005;21:1076.
  15. Boss AP, Maurer T, Seiler S, Aeschbach A, Hintermann B, Strebel S. Continuous subacromial bupivacaine infusion for postoperative analgesia after open acromioplasty and rotator cuff repair: preliminary results. *J Shoulder Elbow Surg* 2004;13:630-4.
  16. Talu GK, Ozyalçın S, Koltka K, Ertürk E, Akinci O, Aşık M, et al. Comparison of efficacy of intraarticular application of tenoxicam, bupivacaine and tenoxicam: bupivacaine combination in arthroscopic knee surgery. *Knee Surg Sports Traumatol Arthrosc* 2002;10:355-60.
  17. Ezberci F, Bulbuloglu E, Ciragil P, Gul M, Kurutas EB, Bozkurt S, et al. Intraperitoneal tenoxicam to prevent abdominal adhesion formation in a rat peritonitis model. *Surg Today* 2006;36:361-6.
  18. Akpınar S, Hersekli MA, Demirors H, Tandogan RN, Kayaselcuk F. Effects of methylprednisolone and betamethasone injections on the rotator cuff: an experimental study in rats. *Adv Ther* 2002;19:194-201.
  19. Yılmaz C, Gölpınar A, Öztuna V. The efficacy of subacromial corticosteroid injections in impingement syndrome. *Eklem Hastalik Cerrahisi* 2008;19:24-6.
  20. Blair B, Rokito AS, Cuomo F, Jarolem K, Zuckerman JD. Efficacy of injections of corticosteroids for subacromial impingement syndrome. *J Bone Joint Surg [Am]* 1996;78:1685-9.
  21. Green S, Buchbinder R, Glazier R, Forbes A. Systematic review of randomised controlled trials of interventions for painful shoulder: selection criteria, outcome assessment, and efficacy. *BMJ* 1998;316:354-60.
  22. Vecchio PC, Hazleman BL, King RH. A double-blind trial comparing subacromial methylprednisolone and lignocaine in acute rotator cuff tendinitis. *Br J Rheumatol* 1993;32:743-5.
  23. Johansson K, Oberg B, Adolfsson L, Foldevi M. A combination of systematic review and clinicians' beliefs in interventions for subacromial pain. *Br J Gen Pract* 2002;52:145-52.
  24. Rhon DI, Boyles RB, Cleland JA. One-year outcome of subacromial corticosteroid injection compared with manual physical therapy for the management of the unilateral shoulder impingement syndrome: a pragmatic randomized trial. *Ann Intern Med* 2014;161:161-9.