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Background: Lateral epicondylitis or tennis elbow is a common cause of elbow pain. Resistant cases may lead to disability.

Patients and methods: Fifty five cases with unilateral resistant lateral epicondylitis in king Fahd hospital in Madinah Muunawarah were subjected to treatment by either extracorporeal shock wave therapy (ESWT) (n=32) or arthroscopic release of common extensor origin (n=23).

Results: In the first group (ESWT group), the average follow-up period was 36.7 months. The average VAS was 3.1 and the average DASH score was 50. The outcome was successful in 23 cases (18 excellent and 5 good) and non-successful in 9 cases (6 fair and 3 poor).

In the second group (treated by arthroscopy), the average follow-up period was 39.2 months. The average VAS was 1.8, the average DASH score was 44. The outcome was successful in 21 cases (19 excellent and 2 good) and non-successful in 2 cases (1 fair and 1 poor).

Conclusions: When compared to ESWT, arthroscopic release gave better outcome for resistant lateral epicondylitis.

Keywords: Tennis Elbow, ESWT, Arthroscopy

Abstract:

Introduction: Lateral epicondylitis, originally referred to as tennis elbow, affects between 1% and 3% of the population and is usually found in patients aged 35 to 50 years. Although it was initially thought that lateral epicondylitis was caused by an inflammatory process, recent microscopic studies of surgically removed tissues indicate that the main pathology is failure of regeneration in the extensor carpi radialis brevis tendon and nearby tissues. Most cases of lateral epicondylitis respond to conservative treatment protocols including medications, bracing, physical therapy, corticosteroid injections, shock wave therapy, platelet-rich plasma, and low-dose thermal ablation devices. When these are measures fail surgical intervention may be used with a high rate of success.

ESWT is a novel non-invasive therapeutic modality without surgery or surgical risks, and the clinical application of ESWT steadily increases over the years it is nowadays popular, and effective in the management of chronic tendon conditions in the elbow, shoulder, and pain at and around the heel. The success rate ranged from 65% to 91%, and the complications were low and negligible. The vast majority of the published papers showed positive and beneficial effects. FDA (USA) first approved ESWT for the treatment of proximal plantar fasciitis in 2000 and lateral epicondylitis in 2002.

Arthroscopic treatment for lateral epicondylitis is a safe and effective therapeutic option when appropriately indicated and performed in refractory cases of chronic lateral epicondylitis. It also allowed excellent viewing of the joint space for diagnosing and treating associated pathological conditions, with a minimally invasive procedure.

The purpose of this study was to compare the results of two different treatment modalities for resistant tennis elbow, arthroscopic treatment and the use of ESWT.

Patients and Methods: Fifty five patients suffering from unilateral refractory lateral epicondylitis for at least six months in king Fahd hospital in Madinah Muunawarah were treated in this study. The patients were divided into two treatment groups, the first group included 32 elbows treated by ESWT and the second group included 23 elbows treated by...
arthroscopic release of common extensor origin. The choice of the method of treatment was based on discussion with the patient after simple explanation of the procedure. All patients were subjected to pre-operative clinical examination to confirm the diagnosis and exclude other causes of elbow pain or brachialgia. X-ray examination of the affected elbow was done before intervention.

Inclusion criteria:
Chronic unilateral lateral epicondylitis for at least 6 months after failed conservative treatment.

Exclusion criteria:
Previous surgery for tennis elbow in the same limb, coagulation disorders, cervical spondylosis, radiculopathy, malunited fractures.

Pre-treatment data:
In the ESWT group, there were 32 patients (20 females and 12 males), 27 affected in the dominant side and 5 in the non-dominant side. The age ranged between 30 and 52 years old with an average of 38.7 years. The pre-treatment duration of symptoms ranged between 7 months and 36 months with an average of 22.9 months. The VAS ranged between 5 and 9 (average 7.3). The DASH score ranged between 64 and 90 (average 77.4), the average Nirschl score was 5.7(range 5-7).

In the arthroscopy group, there were 23 patients (16 females and 7 males), 17 affected in the dominant side and 6 in the non-dominant side. The age ranged between 31 and 54 years old with an average of 39.6 years the pre-treatment duration of symptoms ranged between 6 months and 40 months with an average of 26.4 months. The VAS ranged between 5 and 9 (average 7.6), the DASH score ranged between 66 and 91 (average 76.8), the average Nirschl score was 5.8 (range 5-7). Table(1)

<table>
<thead>
<tr>
<th>Table (1): Pre-treatment data</th>
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<tr>
<td>Number</td>
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</tr>
<tr>
<td>Average age(years)</td>
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<td>Average Duration of symptoms(months)</td>
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<td>Average VAS</td>
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<td>Average DASH</td>
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<td>Average Nirschl score</td>
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Techniques
Extracorporeal shock wave therapy (ESWT):
Every patient is given three sessions of ESWT at weekly intervals. A total of 2000 shock waves (at 0.07 to 0.09 mJ/mm²) were administered at each session without anesthesia.

Technique of arthroscopic treatment:
Arthroscopy can be done in either lateral or prone position under ultrasound guided regional anesthesia using tourniquet in the upper arm. After visualization of the interior of the joint, through the lateral portal the origin of the extensor carpi radialis brevis tendon and the joint capsule must be resected by either a shaver or an electrothermal device. Decortication of the lateral epicondyle origin with a shaver and closure of the portals over drain.

Results:
All cases were available for follow up. Evaluation of the results was based on the visual analogue scale, the DASH score and the Nirschle score.

In the first group (treated by ESWT), the average follow-up period was 36.7(range 18-55 months). The average VAS was 3.1 (range 2-5) and the average DASH score was 50 (range 44-60). The average Nirschl score was 2.9(range 2-4)

In the second group (treated by arthroscopy), the average follow-up period was 39.2 months (range 22-57 months). The average VAS was 1.9 (range 1-3), the average DASH score was 44(range 40-54). The average Nirschl score was 1.7(range 1-3)

Concerning the time to return to sport or recreational activities, in the ESWT group it ranged between 3 and 6 weeks (average 4 weeks) and in the arthroscopic group, it ranged between 3 weeks and 7 weeks( average 5 weeks).

The success of treatment was based on the criteria of Roles and Maudsley. Cases with excellent or good outcome were rated as successful and cases with fair or poor results were classified as non-successful. Accordingly, in the ESWT group, 18 cases (56.25%) were excellent, 5 cases (16.625%) which means that 23 cases (71.875%) were successful. Furthermore, 6 cases (18.75%) were fair and 3 cases were poor (9.375%). So non successful results obtained in 28.125 % of cases in this group.
In the arthroscopy group, 19 cases (82.60%) were excellent, 2 cases (8.69%) were good which means that 21 cases (91.29%) were successful. Moreover, 1 case (4.34%) was fair and 1 case was poor (4.34%). So non successful results obtained in 8.68% of cases in this group.

Table (2): Post-treatment data

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<th>ESWT</th>
<th>Arthroscopy</th>
<th>P value</th>
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<tbody>
<tr>
<td>Average Follow up(months)</td>
<td>18-55(36.7)</td>
<td>22-57(39.2)</td>
<td>0.546981</td>
</tr>
<tr>
<td>Average VAS</td>
<td>2-5(3.1)</td>
<td>1-3(1.8)</td>
<td>0.00001</td>
</tr>
<tr>
<td>Average DASH</td>
<td>50(44-60)</td>
<td>44(40-54)</td>
<td>0.0001</td>
</tr>
<tr>
<td>Average Nirschl score</td>
<td>2.9(2-4)</td>
<td>1.7(1-3)</td>
<td>0.0001</td>
</tr>
<tr>
<td>Average time to return to recreational activities(weeks)</td>
<td>4</td>
<td>5</td>
<td>0.786435</td>
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Table (3): Results according to Roles and Maudsley score

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<th></th>
<th>ESWT</th>
<th>Arthroscopy</th>
<th>P value</th>
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<tbody>
<tr>
<td>Excellent</td>
<td>18(56.25%)</td>
<td>19(82.60%)</td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>5(15.625%)</td>
<td>2(8.69%)</td>
<td></td>
</tr>
<tr>
<td>Fair</td>
<td>6(18.75%)</td>
<td>1(4.34%)</td>
<td></td>
</tr>
<tr>
<td>Poor</td>
<td>3(9.375 %)</td>
<td>1(4.34%)</td>
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Complications:
No complications reported in either group.

Statistical Analysis:
According to the SPSS statistical program, there was no significant difference between the two groups in the age (P=0.786534), pre-treatment duration of symptoms (P=0.976532), average VAS (P=0.698734), average DASH score (P=0.878652) or average Nirschl score (P=0.886451).

Regarding the post-treatment values, there was no significant difference in the follow up period between both groups (P=0.5469814). However, there was significant difference in favor of the arthroscopy group concerning the VAS(P=0.00001), DASH score(P=0.0001) and the Nirschl score (P=0.0001)

Discussion:
The sources of shockwave generation include electrohydraulic, electromagnetic and piezoelectric principles. Electrohydraulic shockwaves are high-energy acoustic waves generated under water explosion with high voltage electrode. The primary application in urology (lithotripsy) is to disintegrate renal stones. On the other hand, shockwaves in orthopedics (orthotripsy) are used to induce tissue repair and regeneration(3). Currently, extracorporeal shockwave therapy (ESWT) has many indications in the field of orthopedics especially in the treatment of sports related over-use tendinopathies such as proximal plantar fasciitis of the heel, lateral epicondylitis of the elbow, calcific or non-calcific tendonitis of the shoulder and patellar tendinopathy(3).

Many authors tried to explain the mechanism of pain relief after application of ESWT for soft tissue problems. Some of them claim that this is due to hyper-stimulation analgesia(7) Other authors attribute that to an initial increase followed by long decrease in substance P release from the region stroked by shockwaves. This may be explained by the observation of increased initial pain during and shortly after shockwave treatment of insertional tendinopathy followed by long lasting pain relief(8)

According to others, there is reduction of inflammatory mediators in the paratenon after application of extracorporeal shockwave. Moreover, tendon healing may be due to increase growth factors and tenocyte proliferation after using ESWT(7)

Many authors used ESWT for treating resistant lateral epicondylitis. Decker et al. (2002) treated eighty-five patients by three weekly sessions of ESWT. Using the criteria of Roles and Maudsley, after an average follow up of 30.7 months, 30.8% had an excellent and 42.3% a good result, while 11.5% had a fair and 15.4% a distinctly poor outcome.

Speed et al., (2002)(9) performed a double-blind placebo controlled trial using moderate dose ESWT versus sham treatment for chronic lateral epicondylitis. They reported no significant difference in the results between the two groups.

Chung et al., (2005)(11) compared ESWT versus stretching protocol for treating sixty subjects with resistant lateral epicondylitis. There was no significant difference in the outcome of both groups.

In a study by Furia (2005)(12) included 36 patients with chronic lateral epicondylitis. All patients were treated with a single application of 3200 shock
waves. Outcomes for 28 elbows (77.8%) were rated excellent or good on the Roles and Maudsley scale. In a study by Staples et al. (2008) they treated two groups of patients with lateral epicondylitis. Patients were assigned either to receive full dose or sub therapeutic dose of ESWT three times at weekly intervals. No significant difference was found in the outcome at follow up. Accordingly, they found little evidence to support the use of ESWT for the treatment of lateral epicondylitis.

Gündüz et al., (2012) treated 59 patients with lateral epicondylitis by three different treatment modalities one group treated by physical therapy, the second group was treated by local corticosteroid injection, and the third group was treated by ESWT. Evaluation was done clinically and by ultrasonography. Cases treated by ESWT had much more improvement of pain and grip strength than other groups.

On the Contrary, Notarnicola et al., (2014) evaluated the grip strength after using ESWT for treating 26 patients with lateral epicondylitis. They found a tendency toward a decrease in grip strength, especially in the dominant limb.

It is estimated that approximately 4–12% of patients with tennis elbow undergo operative intervention. This incidence increases to 25% in some referral centers.

Arthroscopic release for tennis elbow is becoming increasingly popular and involves a routine diagnostic arthroscopy of the elbow followed by debridement of the affected ECRB tendon. The procedure is completed by decortication of the lateral epicondyly. Arthroscopic release allows complete intra-articular visualization of the elbow. There is associated incidence of intra-articular pathology in 69% of cases at the time of arthroscopic tennis elbow release.

The reported improvement rate after arthroscopic treatment of tennis elbow is high sometimes reaches 91% to 97.7%. Recent advances in treatment and repair of these lesions along with the recognition of the presence and repair of coexisting lesions, have allowed arthroscopic techniques to reach high success rates.

Grewal et al., (2009) treated 36 patients with chronic lateral epicondylitis by arthroscopic release. The final overall results were favorable, with 31 of 36 subjects reporting improvement after arthroscopy. According to Mayo Elbow Performance Index score , 22 were good to excellent, 9 had fair result, and 5 were poor.

In another study by Yoon et al., (2015) arthroscopic release was done in 45 patients with chronic refractory lateral epicondylitis. After a mean follow up of 26.9 months, successful results were achieved in 82.2% of cases.

Similarly, Terra et al., (2015) treated 15 patients by arthroscopic release of the extensor carpi radialis brevis. The mean Mayo elbow functional score after the operation was 95 (ranging from 90 to 100). The VAS improved from a mean of 9.2 to 0.64 and the Nirschl’s scale reduced from an average of 6.5 before the operation to approximately one.

To our knowledge, this is the first study to compare arthroscopic release with ESWT for treating resistant lateral epicondylitis.

Radwan et al. (2008) in a comparative study included two groups of patients suffering from resistant tennis elbow. The first group (n = 29) was treated by ESWT and the second was treated by percutaneous tenotomy (n = 27). The success rate was 65.5% in the ESWT group compared to 74.1% in the tenotomy group.

Solheim et al., (2013) compared the outcome of patients treated by an open versus arthroscopic release for tennis elbow. The percentage of elbows with an excellent outcome was achieved in 78% of cases in the arthroscopic group compared to 67% in the open group.

In 2011, Othman had a published comparative study between arthroscopic release of extensor carpi radialis brevis and percutaneous release of the common extensor tendon for resistant tennis elbow. The results of both groups were comparable.

Another study in 2014 for treating tennis elbow conducted by the same author included 2 groups of patients treated using two non-surgical methods. ESWT was compared to local injection of platelet rich plasma. The improvement achieved by platelet rich plasma was better than that of ESWT. However, continued use of ESWT for treating tendinopathy is mainly due to the simplicity of the procedure and the relative success achieved by this technique.

Conclusions

Arthroscopic treatment proved to achieve superior results when compared to ESWT as regards pain relief, improvement of elbow function and patient satisfaction. However, ESWT can be
implicated as a second line treatment in cases of resistant tendinopathies before shifting to invasive or surgical lines of treatment.

References:
19. Yoon JP, Chung SW, Yi JH, Lee BJ, Jeon IH,


21. Solheim E.; Janne Hegna J. and Jannike Øyen (2013): Arthroscopic Versus Open Tennis Elbow Release: 3- to 6-Year Results of a Case-Control Series of 305

