

# Extracorporeal Shock Wave Therapy for Tennis Elbow; A Double Blinded Randomized Clinical Trial Comparing Two Different Energy Levels

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## ABSTRACT

**Objective:** The objective was to compare the two ranges of energy flux density for treatment of tennis elbow using ESWT technique.

**Study Design:** Quasi experimental study

**Place and Duration of Study:** This study was conducted at the Kanaan physiotherapy & spine clinic from February 2020 till July 2020.

**Materials and Methods:** A convenient sample of 50 was calculated by epitool software. Patients were divided into 2 groups of 25 patients in each group. Group A received shockwave therapy with an intensity of 0.3mJ/mm<sup>2</sup> and Group B received intensity of 0.2mJ/mm<sup>2</sup>. The outcome variables are pain, maximal grip strength and Upper Extremity Functional Index.

**Results:** Shockwave at 0.3mJ/mm<sup>2</sup> was found to be more effective in improving pain and maximal Grip strength at the post-treatment level while both 0.3mJ/mm<sup>2</sup> and 0.2mJ/mm<sup>2</sup> were found equally effective on Upper Extremity Functional Index.

**Conclusion:** This Study concluded that the patients who were treated with 0.3mJ/mm<sup>2</sup> intensity of shockwave had better outcomes of Maximal Grip strength at 6th Month.

**Key Words:** Tennis elbow, Extracorporeal Shock Wave Therapy

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## INTRODUCTION

Tennis elbow which is also called lateral epicondylitis in medicine language is considered as one of the common and most observed injuries of the arm and especially observed among professional population.<sup>1</sup> This injury is a considered a challenge as it is challenging to treat, susceptible to recurrence.<sup>2,3</sup> Tennis elbow may be observed at any age but it is most common within age group of 40 to 65 years with higher incidence among women.<sup>4</sup> Prolonged exposure to vigorous and repetitive activities have been reported as main cause to tennis elbow.<sup>5</sup>

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The choice of treatment mainly depends on the common practice of physiotherapists and doctors which may include surgical or physiotherapy treatment.<sup>6</sup> There are different treatment options in physiotherapy i.e. electrotherapeutic and non-electrotherapeutic.<sup>7,8</sup> Electrotherapeutic therapy includes laser therapy, ultrasound and extracorporeal shockwave therapy (ESWT) etc.<sup>9,10</sup> Electrotherapeutic treatment results in cell activity which results in therapeutic benefits and reliefs.<sup>11</sup> Non-electrotherapeutic therapy includes acupuncture, exercise, bracing, manipulation treatment, and taping.<sup>12,13</sup>

The use of extracorporeal shockwave therapy is emerging as popular treatment method for treating tennis elbow.<sup>14</sup> Extracorporeal shockwave therapy is a non-invasive technique that uses pressure waves of different intensities to treat various musculoskeletal disorders.<sup>15</sup>

The purpose of the present study was to assess the outcomes of extracorporeal shockwave therapy in the treatment of tennis elbow. Two different ranges of energy flux density were compared for the treatment of tennis elbow with ESWT.

**MATERIALS AND METHODS**

A quasi experimental study design was used in the study, in which all the patients participating in the study were divided in to two separate groups by lottery method. Convenient sampling was used. After sampling, participants were allocated to two categories of intervention and treatment groups. The study was conducted in Kanaan Physiotherapy & Spine clinic. A sample size of 50 patients was taken in this study by Epitool software. But 55 patients were included in this study in order to maintain an adequate follow up. The duration of the study was 06 months from February 2020 till July 2020. The participants were allocated into 02 groups using lottery method. In Group A ESWT treatment with energy level of 0.30 mJ/mm<sup>2</sup> was used for subjects in Group A, Patient were asked to sit with pillow under elbow. Before application of ESWT, Heating pad was applied for 10 mints and Ultrasound was used. After application of ESWT, cryotherapy was applied for 7 minutes. Total 27 patients were allocated in group A. In Group B, ESWT treatment with energy level of 0.20 mJ/mm<sup>2</sup> was used for subjects in Group B, comparatively low intensity energy level than that used for subjects in Group A. Patient were made to sit with pillow under elbow. Before application of ESWT, Heating pad was applied for 10 mints and Ultrasound was used. After application of ESWT, cryotherapy was applied for 7 minutes. Total 28 patients were allocated in group B. Each patient had 2 sessions in one week and the treatment lasted for 3 weeks. The patients were assessed at pre-treatment level to confirm the baseline comparability and at post –treatment level to check the efficacy of treatment provided. Follow-ups assessment were maintained at 3rd and 6th month by phone calls. Patient Selection Criteria included patients with Age 20-60 years and were having chronic tennis elbow, more than 3 months. Exclusion Criteria included those Patients who were not willing to participate for the mentioned study, Patients who do not have chronic tennis elbow illness. (Less than 3 months) and patients having Red flags i.e. Rheumatoid arthritis, Osteoarthritis, neoplasm. Written informed consent was

taken. Visual Analogue Scale was used to assess the level of pain of patients, UEFI (Upper Extremity Functional Index) to assess the Functional Status of patients and Hand grip strength of patients was assessed using the Dynamometer. Visual Analogue score was taken at pre-treatment, post treatment level, Follow up sessions at month 3 and month 6. The hand grip strength of patients of both groups was assessed by the Hand Dynamometer was assessed four times and for each reading, an average of three readings was calculated and recorded. The study was approved from ethical review committee of Kanaan physiotherapy & spine clinic. The data was analyzed using SPSS for Windows software, version 20.

**RESULTS**

Amongst 27 patients of group 0.30mJ/mm<sup>2</sup> 19 were males and 8 were females whereas amongst 28 patients of group 0.20mJ/mm<sup>2</sup>, 16 were males and 12 were females. Amongst males, many of them were painters, bankers and masons whilst the females were chefs. House maids and knitters. The reason of having this complaint was repetitive use of the extensor compartment of the forearm. Amongst 55 patients, had 54 had Right side affected whilst only 2 of them had left Hand affected and P-value was found to be 0.98. Amongst 27 patients of group 0.3mJ/mm<sup>2</sup>, 15 had normal BMI, 12 were obese and none were underweight from this group. Amongst 28 patients of group 0.2mJ/mm<sup>2</sup>, 18 had normal BMI, 9 were obese and 1 was found to be overweight and p value was found to be 0.26 i.e. Non-significant as mentioned in table 1.

**Table No. 1: Group statistic data**

Demographic details	Group A	Group B
Male/Female	19/8	16/12
Mean age± SD	33.81(6.7)	32.86(6.31)
Dominant arm affected	26	27
Body Mass Index	Normal 11 Obese 14 Underweight 0	Normal 14 Obese 10 Underweight 1

**Table No.2: Visual analogue scale results**

Group of the patient	Pre-Treatment Value (Mean ± SD)	Post-Treatment Value (Mean ± SD)	Follow up 3 Month (Mean ± SD)	Follow up 6 Month (Mean ± SD)	P-Value
0.3mJ/mm <sup>2</sup>	10 ± 0.00	5.36 ± 0.90	3.72 ± .979	1.96 ± .790	<0.001
0.2mJ/mm <sup>2</sup>	10 ± 0.00	6.52 ± 0.82	3.44 ± .583	2.32 ± 1.145	<0.001

**Table No.3: Upper extremity functional index**

Group of the patient	Pre-Treatment Value Mean ± SD	Post-Treatment Value Mean ± SD	3 Month Follow Up Mean ± SD	6 Month Follow Up Mean ± SD	P-value
Group 0.3mJ/mm <sup>2</sup>	52.84 ± 1.40	67.52 ± 2.14	70.92 ± 2.01	70.16 ± 1.62	<0.001
Group 0.2mJ/mm <sup>2</sup>	52.88 ± 1.76	64.2 ± 6.07	66.56 ± 6.65	66.85 ± .5.89	

**Table No.4: High Grip Strength Results**

Group of the patient	Pre-Treatment Assessment Mean value $\pm$ SD	Post-Treatment Assessment Mean value $\pm$ SD	3 month Follow up Mean value $\pm$ SD	6 Month Follow Up Mean value $\pm$ SD	P-value
0.3 mJ/mm <sup>2</sup>	31.62 $\pm$ 5.1	41.4 $\pm$ 6.06	46.5 $\pm$ 5.8	50.42 $\pm$ 6.18	<0.01
0.2 mJ/mm <sup>2</sup>	26.25 $\pm$ 8.1	41.2 $\pm$ 9.33	43.6 $\pm$ 9.17	45.80 $\pm$ 8.7	<0.01

The results of visual analogue scale were presented in table 2 and concluded that the patients who were treated with 0.30 mJ/mm<sup>2</sup> had their pain between a range of 6 and 4 soon after their treatment whilst those who were treated with 0.20 mJ/mm<sup>2</sup> had it in between 6 and 7. Later at 3 and 6 month follow up, the pain was less in those patients who received Shockwave therapy at 0.30 mJ/mm<sup>2</sup>. In independent sample t test, the p-value for the patient after they had been treated was found to be .00 which means that the treatment which was provided was effective and patients of both groups had their pain treated, thus significant.

The results of Upper Extremity Functional Index were presented in table 3 and Independent sample t-test was applied to compare the groups at pre-treatment and post-treatment level and the p-value was found to be <0.05 post-treatment which means both groups i.e. those who were treated with 0.2 mJ/mm<sup>2</sup> and those who were treated with 0.3 mJ/mm<sup>2</sup> both had improved upper extremity functional Index.

The results of hand dynamometer were presented in table 4 all the patients who were included as subjects were asked to hold the dynamometer and the average of 3 recordings was taken. The patients Grip strength was found to be improved for both the groups at post-treatment level but at week 6 follow up, the results showed that the patients who were treated with 0.3 mJ/mm<sup>2</sup> had better grip strength outcome than those treated with shockwave at an intensity of 0.2mJ/mm<sup>2</sup>, p-value at this level of assessment was 0.03, thus significant i.e. <0.05.

One way Repeated Measured Analysis of Variance abbreviated as ANOVA was conducted to assess the null hypothesis that 0.2 mJ/mm<sup>2</sup> is more effective is treating patients with chronic lateral epicondylitis when measured before, after and in follow up treatment sessions. The results of ANOVA indicate a significant time effect, Wilk's Lambda, 0.48, F (3, 46) =301.7, p<0.01, n<sub>2</sub>=50. Thus there is a significant evidence to reject the Null Hypothesis.

Follow up comparisons indicates that each pairwise difference was significant, i.e. p-value< 0.01. There was a significant increase in scores over time suggesting that the patients who were treated with 0.3mJ/mm<sup>2</sup> had better grip strength at week 6 than the group that was treated with 0.2 mJ/mm<sup>2</sup>, i.e. alternate hypothesis proved.

## DISCUSSION

This is the first study that compared the treatment effects of two different intensities of Shockwave therapy in cases of Lateral epicondylitis. The results showed that both the treatments were effective in treating the patients and the pain was relieved after 3 weeks (2 sessions per week). Significant improvements were also found in both groups of Maximum Grip Strength and the Upper Extremity Functional Index. In this study, significant improvements were found in the pain score of patients at pre-test and post-treatment level. No significant differences were found at the follow up sessions rather the Grip strength was found to be better at week 6 Follow up session in case of the patients who were treated with 0.3mJ/mm<sup>2</sup>

None of the studies in the literature had ever made a comparison on the effects of two different intensities of Shockwave therapy however literature supports the usage of shockwave therapy in cases of chronic Tennis elbow. Shockwave therapy has always helped in short term pain relief<sup>16</sup>, this was the reason why we assessed the patients at 3rd and 6th month post-treatment to know if they had recurrence of pain or not. But our findings did not support this fact, rather all the patients of both groups had pain relief on a longer term.<sup>17-19</sup>

The Maximum grip strength was also assessed by the Dynamometer that helped us a lot knowing the significance of shockwaves at an intensity of 0.3Mj/mm<sup>2</sup>. The patients of group A had a long term maximal grip strength as compared to those of group A. A study showed better effects of shockwave therapy than ultrasound on hand strength.<sup>20</sup> Another study similar results of shockwave therapy showing its efficacy in lateral epicondylitis.<sup>21</sup>

The upper Extremity functional index was found to be significantly improved soon after the treatment i.e. after 3 weeks but no significant changes were observed at the follow up treatment sessions. Similar results were shown by other studies. Shockwave therapy has improved upper limb functioning in most of the studies.<sup>22,23</sup>

## CONCLUSION

It was concluded that shockwave at 0.3mJ/mm<sup>2</sup> was found to be more effective in improving pain and maximal Grip strength at the post-treatment level while both 0.3mJ/mm<sup>2</sup> and 0.2mJ/mm<sup>2</sup> were found equally

effective on Upper Extremity Functional Index. However, the patients who were treated with 0.3mJ/mm<sup>2</sup> intensity of shockwave had better outcomes of Maximal Grip strength at 6th Month.

**Recommendations:** The study should have been conducted at a greater number of patients and at acute state of tennis elbow to know the effectiveness of Shockwave in acute tennis elbow. A combination of therapies was also applied, rather we should have applied Shockwave therapy.

**Author's Contribution:**

Concept & Design of Study: Zahra Aslam  
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 Data Analysis: Muhammad Khizer Hayat, Hafiz Rana, Muhammad Arslan, Kehkshan Khalid  
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**Conflict of Interest:** The study has no conflict of interest to declare by any author.

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