Observation and Nursing of the Therapeutic Effect of Extracorporeal Shock Wave Therapy on Tennis Elbow

Wanping Jia, Philippine Christian University, Philippines
Guangyong Zhao, Linyi University, China

ABSTRACT

Tennis elbow is a chronic inflammatory injury caused by the connection between the humerus and the tendon attachment point in the elbow. Further in-depth research is needed to cure tennis elbow with extracorporeal shock waves. This article selects 400 tennis elbow patients who were recuperated at Southwest Medical University in 2020 and uses extracorporeal shock wave therapy and ultrasound therapy to compare and analyze the visual analogue scale of pain and positive rate of traction characteristics before and after treatment and summarizes nursing care. The research results indicate that after extracorporeal shock wave and ultrasound treatment, the lower the pain visual analogue scale and the faster the positive rate of traction features in patients, and the better the treatment effect of extracorporeal shock wave. The most accurate impact treatment site is the most painful area that the patient usually feels. The research results provide theoretical data support for the efficacy of extracorporeal shock wave therapy for tennis elbow.

KEYWORDS
Extracorporeal Shock Wave, Tennis Elbow, Ultrasound Therapy, Visual Analogue Scale

INTRODUCTION

Tennis elbow is a sterile inflammation caused by long-term arm waving and stretching of the elbow joint, resulting in certain damage between the humerus and the common extensor tendon of the elbow (Marei et al., 2022). It is an occupational disease. The etiology of tennis elbow is currently complex. The incidence rate of minors is low. It is common for those who need to repeatedly exercise their wrist joints and rotate their forearms, and tennis, badminton players, and bricklayers are at risk (Buchbinder et al., 2006). The main symptoms of this disease are pain on the outer side of the elbow, which can be traction and affect the upper and lower arms of the elbow joint. The grip strength decreases, and the elbow and wrist joints are not suitable for manual labor. Severe cases may even affect daily life (Cho et al., 2016). There are currently many clinical methods for treating tennis elbow. Both traditional

DOI: 10.4018/IJHISI.325226

This article published as an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0/) which permits unrestricted use, distribution, and production in any medium, provided the author of the original work and original publication source are properly credited.
Chinese medicine and western medicine have treatment methods, such as rest, taking analgesic drugs, local blocking, acupuncture and moxibustion, etc., but there are some differences in the treatment cycle and recovery effect (Cho et al., 2012). Extracorporeal shock wave therapy is a type of shock wave therapy that effectively treats patients’ diseases using pulsed sound waves (Aydın & Atiç, 2018). It stimulates the patient’s pain area through medium conduction and moving the probe, which has a good effect on tennis elbow disease (Dedes et al., 2020).

There have been certain research results on the therapeutic effect of extracorporeal shock waves on tennis elbow. Some researchers suggest that tennis elbow disease is formed under the influence of various sports. Tennis elbow is mainly caused by excessive strain, stretching, arm rotation, and excessive force during long-term movement of the elbow joint, resulting in the tearing of the connection between the common tendon and the elbow joint. A chronic aseptic inflammation occurs, with local compression of blood vessels and nerves, resulting in clinical symptoms such as elbow pain, inability to grip, and difficulty raising the arm (Xiong et al., 2019). Extracorporeal shock waves are based on the strong wave principle of physical mechanical pulse stamping. By accurately determining the location of pain in patients with shock waves, local treatment relies on mechanical stress effects, piezoelectric effects, pain relief, etc. (Singh & Ningthemba, 2022).

The study aims to promote and accelerate local blood circulation by propagating mechanical pulse pressing strong waves between various tissues, forming a gradient difference between energy and torsion, and releasing nerves compressed by the common tendon of the forearm extensor muscle, thereby reducing pain perception in patients. At the same time, it continuously activates peripheral cell vitality and forms free radicals to suppress pain, achieving the effect of treating tennis elbow. Some researchers have compared the effectiveness of centrifugal contraction training, extracorporeal shock wave therapy, and a combination of the two in treating tennis elbow disease (Harniman et al., 2004). It was found that compared to before treatment, the three treatment methods showed a significant decrease in pain visual simulation scores and an increase in grip strength values after treatment (Karaca et al., 2022). The combination of the two treatment methods has a higher therapeutic effect and overall effectiveness than centrifugal contraction training and extracorporeal shock wave therapy (Rompe et al., 2009).

Some researchers have studied the treatment of humeral Epicondylitis in middle-aged and elderly people by extracorporeal shock wave combined with acupuncture and moxibustion (Palekar et al., 2023). It was found that both treatment methods significantly reduced the pain visual simulation score and traction feature positivity rate of patients before and after treatment (Saggini et al., 2008). After treatment, random visits were conducted every 2 months and it was found that the pain visual simulation score and traction positive rate in the treatment group were lower than those in the control group (Park et al., 2018). Researchers have studied the therapeutic effect of external shock wave combined with exercise rehabilitation training on tennis elbow (Buchbinder et al., 2002). It was found that the combination of shock wave therapy and exercise training achieved a 95% cure rate, significantly higher than the 75.00% cure rate of shock wave therapy alone (Persson Krough et al., 2021). Meanwhile, the Barthel index of both treatment methods significantly increased, with the shock wave therapy combined with exercise training group showing a greater increase (Zhu et al., 2005).

Some researchers have studied the combination of extracorporeal shock wave technology and torsion training to treat tennis elbow (Singh & Ningthemba, 2022). By comparing the therapeutic effects of extracorporeal shock wave technology combined with torsion training and pure extracorporeal shock wave therapy on tennis elbow patients, it was found that the therapeutic effect of extracorporeal shock wave technology combined with torsion training therapy is very significant, reaching 98%. Twisting training for tennis elbow can improve local pain in the elbow joint (Rasmussen et al., 2008). Researchers have treated stubborn tennis elbow with extracorporeal shock wave combined with electroacupuncture (Reznik et al., 2013). By establishing a separate electroacupuncture group, a separate shock wave group, and a combination of two treatment groups, the pain visual simulation, pain severity, and daily ability assessment of the three treatment methods were compared. The improvement degree
of the combined treatment group was significantly better than that of the single electroacupuncture group and the shock wave group (Reznik et al., 2017). Both extracorporeal shock wave therapy and electroacupuncture therapy have therapeutic effects on tennis elbow. But when combined, the treatment effect is even better than any other treatment method, which can effectively compensate for the long-term poor effect of electroacupuncture therapy and increase the pain resolution of shock wave therapy. The mechanism of extracorporeal shock wave therapy has been explored (Seil et al., 2006).

Tennis elbow is a chronic inflammatory injury caused by the connection between the humerus and the tendon attachment point in the elbow. During long-term training and competition, prolonged fatigue leads to deformation and adhesion of the fibrous tissue between the humerus and the extensor tendon, forming the tennis elbow. This study conducted a study on the treatment of tennis elbow with extracorporeal shock wave therapy. 400 tennis elbow patients from Southwest Medical University in 2020 were selected and treated with extracorporeal shock wave therapy and ultrasound therapy to compare the therapeutic effects of the two treatment methods on patients. It analyzed the visual simulation scores of pains before and after treatment, as well as the positive rate of traction characteristics for two treatment methods, and summarized clinical nursing, providing theoretical data support for the efficacy of extracorporeal shock wave treatment of tennis elbow.

**EXPERIMENTAL METHODS**

**Research Subjects**

This study selected 400 tennis elbow patients admitted to Southwest Medical University from 2020 to 2021. Patients choose extracorporeal shock wave therapy or ultrasound therapy according to their own preferences. To conduct a comparative clinical trial, we will randomly select 200 patients from each of the two treatment methods, ensuring that the study population is representative of the target patient population by applying specific inclusion and exclusion criteria such as age range, medical history, and current health status.

According to clinical diagnosis and treatment guidelines and rehabilitation manuals, the main symptoms of tennis elbow disease are as follows:

1. The patient experiences pain at the elbow joint, especially when lifting, rotating, exerting force, or holding objects, with intense pain and weakness;
2. The patient’s elbow joint did not show any signs of redness or swelling locally, and there was no significant abnormality in the range of motion of the elbow joint. However, the forearm extensor tendon traction test was positive;
3. The laboratory CT examination showed no abnormalities, and the X-ray film showed (-), with scattered calcification shadows and periosteal reactions visible at the elbow joint.

The patient’s age in this study is relatively scattered, ranging from 20 to 60 years old. The shortest duration of a general illness is 7 days, and the longest can be up to 2 years or more. During the experiment of this project, an informed consent form was signed in advance with the patient. Exclusion criteria include pregnant and lactating women; patients with severe heart, liver, kidney, and brain dysfunction; individuals who are unable to tolerate or unwilling to accept this observation protocol.

The hydraulic electric extracorporeal shock wave therapy instrument and ultrasonic therapy developed by Wuhan Medical Device Factory are being used. The frequency of the shock wave therapy instrument is 90 times per minute, the voltage is maintained at around 10KV, and the capacity density is set to 0.2mJ/mm².
Treatment

The main process of extracorporeal shock wave therapy for tennis elbow patients in this study is as follows: 150 patients underwent extracorporeal shock wave therapy. Determine the exact location of pain by searching for pain points in the elbow joint. Choose 1-2 points for each impact, but make sure to avoid the nervous system and major blood vessels as much as possible. During extracorporeal impact, adhere to focusing on the pain point, with an impact energy of 1000W, 1500 impacts, and 60 impacts per minute. Maintain communication and communication with patients during the treatment period to ensure accurate stimulation of shock waves to the patient’s pain area and achieve effective treatment effects.

The main process of ultrasound treatment for tennis elbow in this study is as follows: an additional 150 patients underwent ultrasound treatment. After determining the key pain points of the elbow joint, carry out pain point by point treatment. Adhere to the repeated movement stimulation method, and move to the next pain point after 10 minutes of ultrasound treatment for each pain point. The ultrasonic intensity is set to 2W per square centimeter.

This study uses a visual analogue scale to assess the pain status of patients before, after 2 weeks, 4 weeks, and after treatment. The evaluation is set to a 10 point scale. According to the patient’s pain level at the time, 0 points are considered painless and 10 points are considered unbearable. Main judgment criteria: When there are basically no pain symptoms and no physical discomfort, it indicates that the effect is significant. When only some parts have pain symptoms, it indicates that the effect is acceptable. When the pain symptoms alleviate and the positive signs change to improvement, it indicates that the treatment is effective. Other situations are considered ineffective treatment. By observing the patient’s daily exercise, maintaining stability, stretching, and pain after treatment, and analyzing elbow joint function, the treatment effect evaluation of the patient is divided into four levels, as shown in Table 1.

This study uses SPSS statistical software to analyze experimental data. Using rank sum test, the data format is mean ± standard deviation.

EXPERIMENTAL RESULTS

Analysis of EXPERIMENTAL RESULTS

This study sets the course of treatment to 6 weeks and analyzes the patient’s condition before treatment, 2 weeks of treatment, 4 weeks of treatment, and after treatment. Table 2 shows the results of the patient’s treatment for 2 weeks, 4 weeks, and after treatment. Figures 1, 2, and 3 respectively provide a comparison of patient outcomes after 2 weeks of treatment, 4 weeks of treatment, and treatment.

Table 1. Evaluation of patient treatment effect

<table>
<thead>
<tr>
<th>Treatment Effect</th>
<th>Treatment Evaluation Score</th>
<th>Main Manifestations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healed</td>
<td>≥90</td>
<td>Pain, tenderness and other symptoms completely disappear, the arm can move normally, and the elbow joint movement is completely unlimited.</td>
</tr>
<tr>
<td>Significant</td>
<td>75-90</td>
<td>Symptoms such as pain and tenderness have been significantly improved, normal physical activity is possible, and the elbow can move freely.</td>
</tr>
<tr>
<td>Effective</td>
<td>60-75</td>
<td>Symptoms such as pain and tenderness have improved to some extent, but there is still mild pain during physical activity.</td>
</tr>
<tr>
<td>Ineffective</td>
<td>&lt;60</td>
<td>The pain is basically unchanged, the arm movement is not normal, and the elbow pain is obvious.</td>
</tr>
</tbody>
</table>
Table 2. Comparison of treatment effects between the two groups

<table>
<thead>
<tr>
<th>Treatment Cycle</th>
<th>Treatment</th>
<th>Healed</th>
<th>Improvement</th>
<th>Ineffective</th>
<th>Total Efficient %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Number</td>
<td>Percentage (%)</td>
<td>Number</td>
<td>Percentage (%)</td>
</tr>
<tr>
<td>2 weeks</td>
<td>Extracorporeal shock waves</td>
<td>25</td>
<td>16.67</td>
<td>110</td>
<td>73.33</td>
</tr>
<tr>
<td></td>
<td>Ultrasound therapy</td>
<td>15</td>
<td>10.00</td>
<td>100</td>
<td>66.67</td>
</tr>
<tr>
<td>4 weeks</td>
<td>Extracorporeal shock waves</td>
<td>52</td>
<td>34.67</td>
<td>90</td>
<td>60.00</td>
</tr>
<tr>
<td></td>
<td>Ultrasound therapy</td>
<td>30</td>
<td>20.00</td>
<td>95</td>
<td>63.33</td>
</tr>
<tr>
<td>After treatment</td>
<td>Extracorporeal shock waves</td>
<td>90</td>
<td>60.00</td>
<td>58</td>
<td>38.67</td>
</tr>
<tr>
<td></td>
<td>Ultrasound therapy</td>
<td>70</td>
<td>46.67</td>
<td>65</td>
<td>43.33</td>
</tr>
</tbody>
</table>

Figure 1. Comparison of the effects of the two treatment methods in patients treated for 2 weeks

Table 2, Figure 1, Figure 2, and Figure 3 can be seen that both extracorporeal shock wave and ultrasound therapy have good effects on tennis elbow disease, and extracorporeal shock wave therapy has a more significant and faster onset of effect. After treatment with ultrasound, only 77% of patients improved and were cured after 2 weeks. After 4 weeks, it reached 83%. After a course of treatment, only 15 patients remained ineffective.

Tables 3 and 4 provide the visual simulation scores and positive rates of traction features for pain before treatment, 2 weeks of treatment, 4 weeks of treatment, and after treatment. Figure 4 shows the pain visual simulation score values for two treatment methods. Figure 5 shows the positive rates of traction characteristics for two treatment methods. From Table 3 and Figure 4, it can be seen that as the duration of the two treatment methods increases, the patient’s pain visual simulation score decreases. For extracorporeal shock wave therapy, the pain visual simulation score decreased from 4.87 to 0.84,
indicating a significant therapeutic effect. For ultrasound therapy, the pain visual simulation score decreased from 6.92 to 2.21, indicating that the treatment effect is also good, but relatively poor compared
to extracorporeal shock wave therapy. From Table 4 and Figure 5, it can be seen that as the duration of the two treatment methods increases, the positive rate of traction characteristics in patients decreases rapidly. For extracorporeal shock wave therapy, the positive rate of traction characteristics in patients decreased from 76.82 to 11.32, indicating a significant therapeutic effect. For ultrasound therapy, the positive rate of traction characteristics in patients decreased from 90.21 to 20.45, indicating that the treatment effect is also good, but relatively poor compared to extracorporeal shock wave therapy.

Table 3. Visual analogue scores of before and after treatment in the two groups

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>Before Treatment</th>
<th>Treatment for 2 Weeks</th>
<th>Treatment for 4 Weeks</th>
<th>After Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extracorporeal shock wave group</td>
<td>150</td>
<td>4.87</td>
<td>2.14</td>
<td>1.31</td>
<td>0.84</td>
</tr>
<tr>
<td>Ultrasound treatment group</td>
<td>150</td>
<td>6.92</td>
<td>4.77</td>
<td>3.61</td>
<td>2.21</td>
</tr>
</tbody>
</table>

Table 4. Positive rate of traction characteristics after treatment in two groups

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>Before Treatment</th>
<th>Treatment for 2 Weeks</th>
<th>Treatment for 4 Weeks</th>
<th>After Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extracorporeal shock wave group</td>
<td>150</td>
<td>76.82</td>
<td>31.23</td>
<td>20.63</td>
<td>11.32</td>
</tr>
<tr>
<td>Ultrasound treatment group</td>
<td>150</td>
<td>90.21</td>
<td>44.61</td>
<td>32.12</td>
<td>20.45</td>
</tr>
</tbody>
</table>

Figure 4. Visual analogue scores of two treatments
Before conducting extracorporeal shock wave therapy for tennis elbow disease, it is necessary to prepare sufficient equipment and check whether the equipment is operating properly and properly adjusted (Dedes et al., 2021). Eliminate potential malfunction risks of the instrument and ensure smooth treatment. The treatment environment temperature is set at 24-26 °C. At the same time, nurses should communicate with patients in advance, introduce the treatment process, safety, reduce panic and fear, and strive to gain psychological recognition from patients. If conditions permit, treatment cases with results can be broadcasted. By allowing successful treatment patients to share the treatment process, it helps patients trust the treatment effectiveness. Patients also need to be careful not to overeat or empty stomach, which is important for accurately locating the affected area. Doctors should inform patients of the adverse consequences of slight movement during the treatment process and guide them to position themselves correctly. Doctors need to accurately and comprehensively understand the patient’s pain location and degree, and determine whether there are other diseases, such as various tumors, skin allergies, etc. (Qi et al., 2017).

During the process of extracorporeal shock wave therapy, attention should be paid to the patient’s position to ensure comfort without affecting the determination of pain points. In the process of locating the pain point process, the position of the humeral epicondyle is shallow and easy to locate. During the treatment period, there may also be local swelling and pain. At the same time, it is important to inquire about the patient’s feelings and ensure that the treatment point is located exactly at the patient’s pain point. Adjust the impact position and intensity appropriately based on the patient’s self-perception. The most accurate impact treatment site is when the patient feels that the impact site is exactly the most painful area they usually experience. During the treatment process, there is often impact swelling and pain, and attention should be paid to observing the patient’s heart rate and
other abnormal symptoms. Once other symptoms appear, immediately stop the shock and notify the
doctor to handle it in a timely manner, analyzing the cause.

After undergoing extracorporeal shock wave therapy, it is first necessary to check whether the skin
of the patient’s treated area is intact and whether there are local symptoms such as redness, swelling,
bleeding, and damage (Rompe et al., 2008). If these symptoms occur, immediate measures such as
applying local ice and preventing infection should be taken. When the patient experiences a temporary
increase in blood pressure after surgery, it may not require treatment. Under normal circumstances,
it can be restored to normal within 1-2 days. After surgery, it is important to rest well, monitor blood
pressure dynamically, and constantly monitor for headaches, dizziness, and other conditions. After
the patient finished treatment, it was found that the pain had indeed achieved effective relief, but a
couple of days later, the pain appeared again, and after another week, it eased and disappeared (Deng et
al., 2021). This is a normal recovery process.

After the treatment is completed, regular follow-up visits should be conducted to keep the patient
informed of the pain relief situation as soon as possible. Let patients know that the effect of shock
wave therapy is relatively slow and cannot have an immediate effect on other treatment methods.
To completely relieve pain, it is necessary to persist in treatment for at least 2 courses of treatment.
Patients should also come to the hospital for follow-up in a timely manner. Focus on follow-up of
patients with poor treatment outcomes and urge them to adhere to treatment according to the course
of treatment.

DISCUSSION

The main purpose of this study is to compare the therapeutic effects of extracorporeal shock wave
and ultrasound therapy on tennis elbow patients. The results indicate that extracorporeal shock
wave therapy for tennis elbow has better efficacy and faster onset. After a course of treatment, only
15 patients remained ineffective. At the same time, this study also introduced the nursing process,
including preparing equipment, checking the patient’s condition, and determining the location of
the impact point.

In recent years, extracorporeal shock waves have gradually become an effective method for treating
tenis elbow. Compared with surgical treatment, extracorporeal shock wave has the advantages of
non-invasive, short recovery time, and stable treatment effect. From the results of this study, it can be
seen that the effect of extracorporeal shock wave treatment on tennis elbow is indeed very significant,
which provides important theoretical support for its promotion and application in clinical practice.

In addition, we have also seen some advantages of ultrasound therapy. This treatment method
can also significantly alleviate patients’ pain, but its treatment effect is slightly worse. It should be
pointed out that this study did not consider the side effects and safety of ultrasound therapy. Therefore,
future research needs to further explore the comparison between ultrasound therapy and extracorporeal
shock wave therapy, especially in terms of side effects and safety.

In addition to comparing treatment plans, this study also introduces the nursing process, which is
crucial for the smooth progress of the treatment process. Some methods, such as ensuring the patient’s
comfort during the treatment process, determining the accuracy of the impact point position, and
checking the patient’s symptoms after treatment, are very meaningful and can provide reference for
other fields of extracorporeal shock wave therapy.

CONCLUSION

This study selects 400 tennis elbow patients admitted to Southwest Medical University from 2020 to
2021, and conducts clinical comparative experiments using extracorporeal shock wave therapy and
ultrasound therapy. By observing the patients’ daily movements, maintaining stability, stretching,
and pain after treatment, the elbow joint function is analyzed, and the treatment effect of the patients is evaluated.

1. Using SPSS statistical software to analyze experimental data, it was found that both extracorporeal shock wave and ultrasound therapy have good therapeutic effects on tennis elbow disease, and extracorporeal shock wave therapy has a more significant effect and faster onset.

2. As the duration of both treatment methods increases, extracorporeal shock waves provide faster pain relief for patients. The positive rate of extracorporeal shock wave traction characteristics also decreased faster.

3. Active and scientific nursing can alleviate patients’ tension before treatment, ensure the smooth progress of treatment, and ensure patient cooperation and follow-up after treatment.

DATA AVAILABILITY

The figures and tables used to support the findings of this study are included in the study.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

FUNDING STATEMENT

This work was not supported by any funds.

ACKNOWLEDGMENT

The authors would like to show sincere thanks to those techniques who have contributed to this research.
REFERENCES


