

The Efficacy of Acupuncture in Extracorporeal Shock Wave Lithotripsy

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ABSTRACT

Purpose: To evaluate the safety and efficacy of acupuncture in comparison with intravenous (IV) sedation in extracorporeal shock wave lithotripsy (ESWL).

Material and Methods: One hundred patients, who were scheduled for ESWL, were divided randomly into two groups of fifty patients (acupuncture and IV sedation). In the first group, acupuncture was carried out with special needles (0.30 × 18 mm), in two points 30 minutes before the procedure: point of 36 from the stomach meridian with an angle of 90 degrees and point of 60 from the urinary bladder meridian with an angle of 90 degrees. In the IV sedation group morphine 0.1 mg/kg was injected intramuscularly 30 minutes and intravenous diazepam 0.1 mg/kg for muscle relaxation and anti-anxiety, one minute before the procedure. The two groups were similar in terms of confounding factors. Pain (scored in 4 levels), blood pressure, heart rate, respiratory rate, and arterial blood oxygen saturation were recorded prior to IV sedation or acupuncture, 30 minutes after each, at the beginning of ESWL, 10 minutes after ESWL, and at the end of the procedure (times 1 to 5).

Results: In acupuncture group the pain intensity was less than IV sedation group (for time 3, $p=0.019$, for time 4, $p=0.002$, for time 5, $p=0.05$). Considering the pain incidence (each pain score except zero), there was a significant difference at time 4 ($p=0.012$). None of the procedures was stopped because of pain and none of the patients experienced complications during operation. Arterial blood oxygen saturation was between 95% and 100% for all of the patients in acupuncture group and recovery time was shorter ($p<0.0001$).

Conclusion: Acupuncture is a safe and effective method for analgesia. It has a faster recovery time and economical benefits. It also provides the ability to increase the shock wave voltage. We believe that it is a good alternative for IV sedation in ESWL, particularly in patients with lung and heart disease.

KEY WORDS: acupuncture, ESWL, pain, analgesia, lithotripsy

Introduction

Extracorporeal Shock Wave Lithotripsy (ESWL) is one of the newest methods in the treatment of urolithiasis, which was used in Germany for the first time. Today, ESWL is known as the treatment of choice in selected uri-

nary tract stones. At the initiation of its advent, it was tried to use it in outpatient services and proportionally to use a proper anesthesia method for outpatients.⁽¹⁾

The cause of pain during ESWL is tissue damage as the result of shock wave direct pressure effect, cavitation, and the effect of sound waves with low frequency.^(1,2) In the past times, general or epidural anesthesia was used for pain relief.⁽³⁾ In many studies, it was tried to use various methods for analgesia in ESWL. Some of these meth-

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ods were high frequency jet ventilation,⁽⁴⁾ paravertebral nerve block,⁽⁵⁾ local anesthesia,⁽⁶⁾ and different types of intravenous sedation,⁽¹⁾ but none of these anesthesia methods were accepted completely. On the other hand, with the advent of lithotripor (Dornier MPL 9000), the need to general or local anesthesia has declined, because with the advent of new technology in ESWL, the intensity of painful stimulus is reduced, but the need to analgesia is still remained.⁽⁷⁾ Acupuncture has a very old history in china and human civilization and it is one of the treatments of pain and anxiety.⁽⁸⁾

In terms of using acupuncture in lithotripsy, there are not many published researches, but it is recommended to use the analgesic result of acupuncture when the painful stimulus is not so strong. Grabow studied the analgesic effect of acupuncture in ESWL and showed that its result was comparable to placebo.⁽⁹⁾ Some of the studies (although not case-control) confirmed the analgesic effect of acupuncture in many painful syndromes^(10,11) and in some of the researches the effect of acupuncture was equal to analgesic effect of placebo.⁽¹²⁾ Furthermore, in acupuncture the sedative drugs or analgesic are not used, so there is lower complications.

In order to compare the analgesic effect of acupuncture in ESWL with IV sedation, this study was designed.

Materials and Methods

One hundred patients with ages from 18 to 70 years, who were candidates for elective ESWL, with ASA class I, II, were scheduled for this prospective study. Addiction and psychiatric illness were the exclusion criteria. Patients were randomly divided into two groups of acupuncture (Group one) and IV sedation (Group two). In these two groups variables such as pain score, blood pressure, heart rate (HR), respiratory rate (RR), arterial blood oxygen saturation (SPO₂) and recovery time (defined as the time between the end of ESWL procedure and the patient's discharge without vertigo, hemodynamic instability, dyspnea, nausea, and vomiting) were recorded. These variables were recorded in both groups at the same times, which are mentioned below:

1. Before starting Sedation/Acupuncture (time 1)
2. 30 minutes after Sedation/Acupuncture (time 2)
3. At the beginning of ESWL (time 3)

4. 10 minutes after starting ESWL (time 4)

5. At the end of ESWL (time 5)

In order to evaluate the analgesic effect in two acupuncture and sedation methods, pain intensity was evaluated by this scoring: Score 0 as completely painless, Score I as mild pain (tolerable by patients), Score II as moderate pain (with patient's complaint and tendency to ask a doctor for help), and Score III as severe and intolerable pain. Each pain score except zero was considered as a case of pain incidence.

In all the patients in group two, 0.1 mg/kg IM morphine was administered 30 minutes before lithotripsy as premedication. In order to reduce anxiety and produce muscle relaxation 0.1 mg/kg diazepam IV was administered 1 minute before starting lithotripsy.

Acupuncture was performed in group one by Electro-acupuncture method using defined points in traditional Chinese medicine. In this group of patients, no analgesic and sedative drugs were administered for premedication. Half an hour before starting the procedure, acupuncture started and continued during lithotripsy and at the end of the procedure, acupuncture stopped.

Acupuncture was done by short sterile special acupuncture needles (0.30 × 18 mm).

For performing acupuncture, two points were used for punctures: point of ST 36 from stomach meridian and point of 60 from urinary bladder meridian (UB 60).

These points are on the known meridians in traditional Chinese medicine and are used in musculoskeletal pains, skeletal muscle relaxation, and sedation. As the pain source in lithotripsy is mostly musculoskeletal (and not somatic), these spots were selected for patient's analgesia and sedation.

Point of ST 36 is located four fingers below the lateral patellar notch and point of UB 60 is in the middle of the presumed line between lateral malleolus and calcaneus internal view. A pulse generator performed the stimulation. The low voltage-high frequency method, which is applied for acute pain was used for stimulating. Frequency was set on 60 and voltage increased gradually from zero till the paresthesia was felt in the needle place. Afterwards, in case of elimination of paresthesia feeling and patient tolerance, voltage was increased with 5 minute intervals until another episode of paresthesia occurred. This process was continued up to 30 minutes before the initiation of procedure.

At this time, voltage increased to a maximum of 2 volts and after 30 minutes lithotripsy started and electro-stimulation was continued during lithotripsy.

At the end of lithotripsy, acupuncture was stopped. A single specialist performed the punctures in group one and the injections of group two and all the measurements were done by another single anesthesiologist and an anesthesiology resident, blinded to the analgesia method.

A Dornier MPL 9000 machine was used to perform lithotripsy.

Two percent of the shock waves were in the range of 10 to 16 kv and others were from 16 from 18 kv and produced local pressure intensity was around 700 bar.

Informed consents had been obtained from the patients before the procedures. Data were analyzed by SPSS software using t, paired t, Mann-Whitney U, and Chi-square tests for statistical significant difference.

Results

One hundred patients, who were candidates for lithotripsy, were divided into two groups of 50 patients for acupuncture and IV sedation. In each group, there were 30 men and 20 women. The demographic data and stones' sizes are shown in table 1.

Regarding age, sex, weight, ASA class, and stone size, there was no significant difference between the two groups. Pain intensity in group one was significantly less than that in group two (p=0.5).

Considering pain incidence (each pain score except zero) in time 3 and 5, there wasn't any significant differences between the two groups (time 3, p=0.109 and time 5, p=0.086), but for time 4, the pain intensity was significantly less in group one (p=0.012) (fig. 1,2).

TABLE 1. Demographic and stone size in each group

Group	Mean stone diameter (mm)	Class ASA (I/II)	weight (±SD)	age (±SD)	Sex (f/m)
Acupuncture	16(7)	40/10	49(6)	52(7)	20/30
IV- Sedation	18(6)	38/12	51(6)	52(8)	20/30

TABLE 2. Recovery time in both groups

group	number	Recovery time (min)	P Value
Acupuncture	50	17	P<0.0001
IV Sedation	50	63	

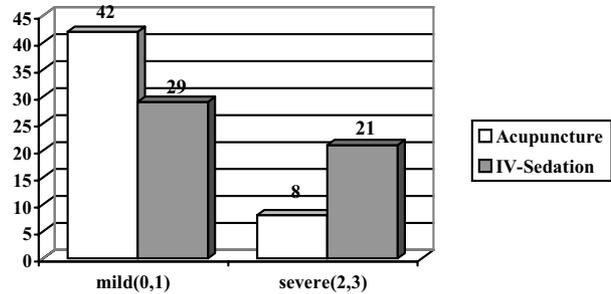


FIG. 1. Pain score in time 4

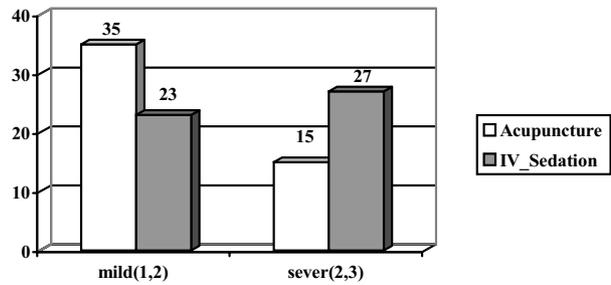


FIG.2. Pain score in time 5

None of the patients' treatment was stopped because of pain and none of the patients experienced complications during operation. SPO2 was between 95 % and 100% for all of the patients.

Mean recovery time in group one was less than that in group two (p<0001) (fig. 3).

Discussion

The present study showed that acupuncture with electro-acupuncture method is more effective than IV sedation in relieving pain in ESWL with Dornier MPL 9000 machine. In 1997, National Institute of Health (NIH) recommended acupuncture for pain, nausea, and vomiting treatment and encouraged the scientists to perform more researches on the efficacy of acupuncture in different clinical problems.⁽¹³⁾ Mechanism of analgesia in acupuncture method is not still explained properly, but some of the proposed mechanism are as follows:

Some researches have shown that acupuncture

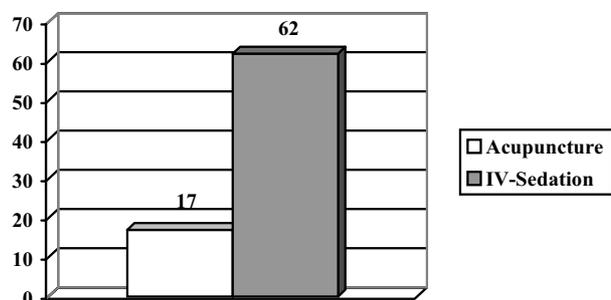


FIG. 3. Recovery time

increases the secretion of different types of beta-endorphin, serotonin and norepinephrine, which play a role in nociception.^(14,15) In acupuncture, the needling regions have their own properties in a 1-millimeter diameter. The electrical resistance of the skin is low in these special regions. Its connective tissue appearance is different from surrounding area.⁽¹⁶⁾ In general, electrical stimulus causes releasing the neurohumoral chemical transmitters.⁽¹⁶⁾ Anyway the acupuncture analgesia is not associated with physiological disorders and doesn't cause the inhibition of central or peripheral nervous system and the patient is awake during the procedure. Also, it has no complications such as drug overdosage or hypersensitivity and there has not been any report about mortality related to acupuncture, although the efficacy of acupuncture is limited,⁽¹⁰⁾ and on the other hand, some people are more sensitive to its effects.⁽⁹⁾

Intravenous sedation has been used successfully history for pain relief in ESWL, but it has its own complications.^(1,2) In addition, sometimes it does not produce effective analgesia.⁽⁷⁾ Grabow reported that acupuncture and placebo have a same analgesic effect.⁽⁹⁾ In this study, we compared acupuncture with IV sedation and there was not a placebo group. In Grabow's study, ESWL was performed with Lithostar machine, but in this study we used Dornier MPL9000.

In this study, the acupuncture was started 30 minutes before the initiation of painful stimulus (ESWL) and there was enough time for induction of the acupuncture. The needling regions in this study was different from that in Grabow's study. Also, the intravenous medications were different in the two studies. Grawbow used Visual Analogue Scale (VAS) for determining the pain intensity, but we scored the pain intensity as it was mentioned above. Therefore, it seems that the different results of the two studies are due to the considerable differences in their settings.

Peterson et al performed ESWL without any anesthesia in some patients.⁽¹⁷⁾ Although many patients tolerated the procedure, some of them needed sedation and analgesia. In addition, these patients could not tolerate the energy more than 16 kv. Of course all of the patients had received premedication, consisting of pethidine, diazepam, and topical lidocaine-prilocaine, which were applied for the area of ESWL procedure.

Loening et al used local anesthesia infiltration and they had successful results.⁽⁶⁾ Short-term

treatment results and long-term follow-up had no differences in comparison with general anesthesia group.

Finally, the results of the above studies show that the need to analgesia in ESWL is reduced with the progress in its technology and nowadays we can provide enough analgesia by less non-invasive anesthesia methods. As the analgesia effect of the acupuncture is basically limited, these findings about the reduction of the need for analgesia in ESWL have coordination with the results of this study about the efficacy of acupuncture in this regard.

The limitation of our study was the absence of a control group. For moral consideration, we must have a medical intervention to relief the patient's pain. On the other hand, treatment by acupuncture needs adequate information and experience and the basis of diagnosis and treatment in traditional Chinese medicine is different with the contemporary medicine.⁽¹²⁾ In traditional Chinese medicine, the treatment changes according to every person's conditions and also the details of treatment can be altered in each person during the treatment procedure.⁽¹²⁾ Hence, it is not matched completely with the research methods of scientific era (controlled, double-blind clinical trials), Therefore, if the acupuncture is performed under these conditions, it may reduce or even eliminate the optimum effects of acupuncture.

Finally, although there are several documents denoting the efficacy of acupuncture, a double-blinded study with placebo-control design should be performed in the future to evaluate the general efficacy of acupuncture and its specific role in ESWL.

Conclusion

Acupuncture is a safe and effective method for analgesia. It has faster recovery time, and economical benefits, providing the ability to increase the shock wave voltage. Thus, it can be an appropriate alternative.

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