

Comparative effectiveness research on incision healing after lumbar spinal surgery with different TDP irradiation durations

Original article

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Abstract: Objective: This research aims to investigate the best “Te Ding Dian Ci Bo Pu Zhi Liao Qi” (TDP) irradiation duration to enhance the efficacy of nursing and patient satisfaction.

Methods: A total of 34 eligible patients were randomly divided into the treatment group ($n=18$) and the control group ($n=16$) between December 2015 and December 2016. Qualitative and quantitative studies were combined to create an impersonal evaluation of incision pain score, time of stitches removal, duration of hospital stays, patient satisfaction, and subjective experience due to different TDP irradiation durations.

Results: The incision pain scores of the treatment group were 3.06 ± 0.899 and 1.35 ± 0.493 before and after treatment, respectively ($P < 0.05$), whereas those of the control group were 2.46 ± 1.127 and 1.0 ± 0.707 before and after treatment, respectively ($P < 0.05$). No significant difference was found between the treatment group and the control group ($P > 0.05$). The time of stitches removal and the duration of hospital stays of the treatment group were 14.85 ± 4.070 and 19.08 ± 6.652 , respectively, whereas those of the control group were 14.08 ± 0.641 and 23.15 ± 10.72 ($P > 0.05$), respectively. The patient satisfaction degree score of the treatment group was 2.77 ± 0.439 , whereas that of the control group was 2.08 ± 0.954 ($P < 0.05$).

Conclusions: TDP irradiation can effectively relieve the incision pain of patients after lumbar spinal surgery. The treatment group is superior to the control group in patient satisfaction.

Keywords: TDP • TDP irradiation duration • patient satisfaction • lumbar operation • time • incision pain • physiotherapy

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1. Introduction

TDP is a physiotherapy instrument invented in China in the 1980s. TDP is short for the Chinese Pinyin “Te Ding Dian Ci Bo Pu Zhi Liao Qi” (TDP), a specified electromagnetic wave spectrum treatment device, and is locally well-known as “god’s lantern.” The electromagnetic wave generated by TDP radiation heats the human body, thereby improves microcirculation, strengthens the immune system, relieves pain, reduces swelling,

and heals inflammation and incisions. It is widely used in agriculture, forestry, animal husbandry, and different departments in hospitals.^{1,2} Literature research^{3–5} reveals that the application of TDP showed a satisfactory effect in curing common orthopedic diseases, such as rheumatoid arthritis, scapulohumeral periarthritis, lumbocruical pain, and emergency or chronic injury of soft tissue. TDP is also used in the prevention of post-operative infections and promotion of margin healing in orthopedics. The duration of TDP irradiation lasts from 15 minutes to 1 hour. Meanwhile, TDP irradiation saves

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nurses' time and improves nursing efficacy. A total of 34 eligible patients after typical lumbar operation were randomly divided into the treatment group ($n=18$) and the control group ($n=16$) from December 2015 to December 2016.

2. Clinical data

A total of 34 cases are included in this study (27 males and 7 females). The mean age is 51.31 ± 12.168 years in the treatment group and 51.23 ± 11.994 years in the control group. The difference in the two groups by age, sex, body mass index, and diagnosis was not statistically significant ($P > 0.05$).

The patients who adopted traditional lumbar operation were included in this study. Exclusion criteria are as follows: (1) conservative treatment, (2) minimally invasive surgery treatment, (3) cervical operation or bone operation, and (4) speech and communication disorders.

3. Methods

Conventional treatment and nursing were applied to both groups. TDP irradiation treatment begins on the third postoperative day (Hua lun brand, cqi-25; Chongqing, China). The TDP irradiation duration is 20 minutes in the treatment group and 30 minutes in the control group; both were employed after preheating. The treatment was conducted twice a day, 20–30 cm from the wounds. The incision pain score, time of stitches removal, duration of hospital stays, and patient satisfaction were observed and recorded. A 3-point Likert scale was used to judge the degrees of patient's satisfaction, where 3=satisfaction, 2=basic satisfaction, and 1=dissatisfaction. Open-ended questions were used to obtain subjective experience. An example of the question is "How are you feeling after the TDP irradiation treatment?"

The incision pain score was judged combined with verbal descriptor scale, visual analog score, and face pain scale.⁶ In the face pain scale, 0–10 presents the pain degree: 0–3 for mild pain, 4–6 for moderate pain, and 7–10 for severe pain. The scores were recorded before the first treatment and after the last treatment.

SPSS 18.0 was adopted for data analysis. The mean \pm standard deviation was used for description, and paired t -test was used for data comparison. The difference was statistically significant ($P < 0.05$).

4. Results

The figures indicate the incision pain scores, the time of stitches removal, and the duration of hospital stays between the treatment group and the control group. The detailed data are given in Table 1.

Group	Before irradiation	After irradiation	t	P
Treatment group	3.06 ± 0.899	1.35 ± 0.493	6.720	0.000
Control group	2.46 ± 1.127	1.0 ± 0.707	6.008	0.000
t	1.251	1.594		
P	0.235	0.137		

Table 1. Comparison of the scores of incision pain score between the two groups (d, mean \pm SD).

Index	Treatment group	Control group	t	P
Time of stitches removal	14.85 ± 4.079	14.08 ± 0.641	0.669	0.516
Duration of hospital stays	19.08 ± 6.652	23.15 ± 10.723	-1.113	0.287

Table 2. Comparison of the index of the time of stitches removal and the duration of hospital stays between the two groups (d, mean \pm SD).

According to the above data, a significant difference was found before and after TDP irradiation between the 2 groups ($P=0.000$). TDP irradiation was demonstrated again in the role of relieving pain. No significant difference was found between the treatment group and the control group before irradiation ($P > 0.05$). The treatment effect of the irradiation was the same either the treatment time was 20 min or 30 min (Table 2).

No significant difference was found in the time of stitches removal and the duration of hospital stays between the treatment group and the control group ($P > 0.05$).

The patient satisfaction degree score of the treatment group was 2.77 ± 0.439 , whereas that of the control group was 2.08 ± 0.954 ($t=2.420$, $P < 0.05$), meaning that the patient satisfaction in the treatment group is superior to that of the control group. A total of 94.1% of the patients in the treatment group answered, "satisfaction and basic satisfaction," whereas in the control group, this number declined to 62.5%. A patient in the treatment group mentioned, "The TDP is magical. I want to be treated longer with it." Some patients showed dissatisfaction for the treating time. Seven patients in the control group mentioned the following: "I can't continue lying on the side for 30min" (two cases), "The stressed side of my body will become numb when accepting TDP irradiation with long motionless time" (one case), "I feel my muscle falls down when lying on the side for too long" (one case), and "I feel dry" (two cases). One patient moved her TDP to the right shoulder after 10-minute irradiation directly to the cutting wounds. These patients explained that 30 minutes of TDP irradiation is very long. Nonetheless,

the patients gave a positive opinion on TDP irradiation: "I feel comfortable. I can easily sleep after treatment" and "The ideal time for treatment is after changing." One patient admitted in summer suggested, "The duration time in summer is better because it lasts shorter but longer in winter because of the climate factor."

5. Discussion

TDP, known as "god's lantern," was invented in Chongqing, Western China. TDP had won the gold award in the International Spring Fair in 1986 in Zagreb, Yugoslavia, and the "Eureka" World Expo silver inventors in the same year. Its products are sold to more than 50 countries and regions of the world. TDP composite coating plate contains over 30 sorts of essential elements of the human body. TDP turns electrical energy into thermal energy, generating an integrated electromagnetic wave of different wavelengths and energies. The wavelength range (2–25 μm) and intensity range (28–35 mW/cm^2) coincide with the integrated electromagnetic spectrum released by the human body;⁷ thus, selective absorption of internal organs is easy. The absorption of electromagnetic waves can increase the pain threshold and raise the enkephalin in the hypothalamic brain, thereby producing an analgesic effect. It can also dilate blood vessels, strengthen the blood and lymph circulation in lesions zone, and promote the absorption of exudates to relieve swelling. The electromagnetic wave can also increase the phagocyte ability of reticuloendothelial cells in blood, improve antibody, complement agglutinin, and strengthen the human body's defense system to diminish inflammation. In addition, it can enhance the permeability of the cell membrane and improve metabolism, thereby helping white blood cells to release proteolytic enzymes and

dissolve necrotic tissues; thus, TDP helps in incision healing.¹

Incision healing is prone to infection particularly after orthopedic operation. Inadequate drainage postoperation leads to incision ecchymosed; the main reasons are the surgical technique used, body's rejection of foreign materials, diabetes, obese, and use of immunosuppressants or hormones. The use of bone bonding interbody space and metal biomaterial enter the local tissue, thus declining the immune response and heightening the risk of infection.^{2,8,9} TDP has been widely used to help in incision healing after orthopedic operation. Despite its low treatment fee (8.8¥/time), it is effective and has no adverse reaction. As mentioned in the result, no significant difference was found between the treatment group and the control group in incision pain score, time of stitches removal, and duration of hospital stays. However, the treatment group is superior to the control group in terms of patient satisfaction. This result prompted that longer irradiation period is no longer regarded as the better treatment.

Lumbar vertebrae play an important part in bearing. Patients who accepted traditional lumbar surgery have difficulty in turning over by themselves because of the strong feeling of pain at the early stage posttreatment. Thus, they cannot lie on one side for a long time. Hence, 20 minutes of irradiation is recommended after traditional lumbar surgery, and the duration time may be extended to 30 minutes for people who take conservative treatment in the cases of lumbocrural pain. Climate is a considerable factor. The TDP irradiation duration may be adjusted based on the patient's disease and pain tolerance.

Conflicts of interest

All contributing authors declare no conflicts of interest.

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