Iranian Red Crescent Medical Journal

ORIGINAL ARTICLE

The efficacy of transcutaneous electrical nerve stimulation in control of nausea and vomiting in patients undergoing chemotherapy

M Rivaz[1,3]*, M Asadizaker[2], N Elahi[2], M Ramzi[3]

[1]Faculty of Nursing, Firouzabad Azad University, Firouzabad, Iran, [2]Faculty of Nursing, Jondishapour University of Medical Sciences, Ahvaz, Iran, [3]Department of Internal Medicine, School of Medicine, Shiraz University of Medical Sciences, Shiraz, Iran

Abstract

Background: Despite advances in antiemetic treatment, complications are still problematic for a significant number of patients after chemotherapy. This study was performed to determine the efficacy of transcutaneous electrical nerve stimulation
(TENS) in the control of nausea and vomiting in patients undergoing chemotherapy at Nemazee Hospital in Shiraz, southern Iran.

Methods: 32 subjects with cancer from Outpatients Depatment in Nemazee Hospital affiliated to Shiraz University of Medical Sciences, in Shiraz, southern Iran were enrolled. The patients were randomly divided into two equal groups of TENS and placebo. Patients in both groups were matched for age, severity of nausea and vomiting and type of malignancy. Cisplatin or cyclophosphamide was used for chemotherapy and granistron along with dexametasone were used as antiemetic agents. In the test group, the p6 acupuncture point (acupoint) was stimulated by TENS when the antiemetic agent was administered and continued during wakening every 2 hours for 72 hours after chemotherapy. The placebo group was similarly treated but with an off mode stimulator.

Results: In regard to the severity of nausea, no statistically significant difference was observed between the two groups in the first 24 hours of chemotherapy but the intensity of nausea in the TENS group was significantly lower than those of the placebo group during 48 and 72 hours of chemotherapy. The mean frequency of vomiting during first, second and third 24 hours was significantly lower in the control group.

Conclusion: TENS can be used as an adjunct with antiemetics for controlling nausea and vomiting induced by chemotherapy.

Keywords: Transcutaneous Electrical Nerve Stimulation; Nausea; Vomiting; Chemotherapy

Introduction

Nausea and vomiting (N/V) are the most frequent and distressing side effects associated with cancer treatments.[1] After highly emetogenic chemotherapy, the nausea and vomiting produced can continue for several days that can have a major impact on patients moral, and quality of life.[2] Cisplatin is the head group of emetogenic chemotherapy drugs.[3] The most common immediate cisplatin-induced toxicity is severe nausea and vomiting, which can be dose limiting in some patients. In addition, many patients experience delayed nausea and vomiting which occur 24 to 120 hours after receiving cisplatin.[4] This complication is common in chemotherapy by cyclophosphamide.[5] The introduction of 5-HT3 receptor antagonists has revolutionized the treatment of nausea and vomiting.[4,6] However complete control of chemotherapy-induced nausea and vomiting (NV) remains elusive despite decades of research on pharmacological antiemetics.[7] Studies have shown that 50% to 93% of

***Correspondence:** Mojgan Rivaz, M.Sc, of Nursing Education, Faculty of Nursing, Firouzabad Azad University, Shiraz University of Medical Sciences, Shiraz, Iran. Tel: +98-9173159321, Fax: +98-711-6261001, e-mail: mrivaz@sums.ac.ir
Received: March 27, 2007 Accepted: July 26, 2007

patients still suffer from delayed nausea and vomiting despite aggressive medical intervention,[4] so its management is a priority for oncology health care workers.[8] Evidence is emerging that stimulation of the wrist at the pericardium (P6) acupuncture point minimizes nausea and vomiting. The P6 acupoint lies between the tendons of palmaris longus and flexor carpi radialis muscles 4 cm proximal to the wrist crease.[4,6,9] Clinical trials have shown some benefits for acupressure. This study was performed to determine the efficacy of TENS in control of nausea and vomiting in patients undergoing chemotherapy in Nemazee Hospital affiliated to Shiraz University of Medical Sciences in Shiraz, Southern Iran.

Materials and Methods

This study was a single blind clinical trial, which included 32 outpatients with cancer. The patients were randomly divided into two equal groups of TENS and placebo. Patients in both groups were matched for age, severity of nausea and vomiting and type of cancer. Cisplatin or cyclophosphaminde was used for Chemotherapy and granistron along with dexametasone were used as antiemetic agents. In the TENS group, the p6 acupoint was stimulated by TENS (10-15HZ for10 minutes) when the antiemetic agent was administered and continued during wakening every 2 hours for 72 hours after chemotherapy. In the placebo group, the same method was applied but with the stimulator in the off mode. Antiemetic drug was not used by any of the patients after chemotherapy. Having been taught and encouraged to comply, the patients were provided with a sheet on which they were asked to record vomiting times and the severity of nausea (according to Likert scale). The patients were followed up at home. Data were collected, coded and analyzed by SPSS software. Frequency, mean and standard deviation were determined. Mann-Whitney test was used to compare severity scores in two groups.

Results

Thirty-two patients were evaluated for the TENS and placebo component, 16 in each group. The average age was 40.5 for TENS patients and 39.5 years for placebo group Other criteria of the patients were gender (18 females and 14 males) mean disease duration, 10.7±7.9 and 11.6±7.5 months for TENS and placebo groups respectively. Chemotherapy schedule consisted of cisplatin based or cyclophosphamide. All variables as well as nausea severity, vomiting times and antiemetic agents used in two groups were matched. Before using stimulator, the severity of nausea was moderate in the first 24 h and sever in the second or third 24 h and the mean of vomiting times during the first, second and third 24 hours in TENS and placebo groups were 2.18±2.4, 4.18±2.6, 4.12±3 and 2.06±1.7, 4.06±2.6, 4.12±2.6 respectively. After using stimulator, in the first 24 hours of chemotherapy, 37.5% of TENS and 56.2% of placebo groups showed no or mild nausea. Absent or mild nausea was visible in 25% of TENS group and 12.5% of placebo group in the second 24 h, and in 56.2% of TENS group vs. zero percent of placebo group in the third 24 h (P=0.001, P=0.009 and P=0.009 respectively). The mean vomiting times during the first, second and third 24 hours in TENS was 0.25±0.57, 1.5±1.75 and 1.12±1.7 compared with 1.68±1.57, 3.5±2.3 and 3.18±2.45 of placebo group (P=0.001, P=0.009 and P=0.009 respectively).

Discussion

According to our findings, in the first 24 h, there was no significant difference between TENS and placebo groups for severity of nausea before and after using TENS. This might be due to the effect of antagonist 5-HT3 receptors acting as antiemetic agent, which control nausea, and vomiting in the first 24 hours. Thus, the TENS effect was masked in the first day. In contrast, Roscoe et al. (2003) compared three groups of Sea-Band®, ReliefBand® and control groups and reported that Sea-Band® was more effective than the other two, on acute and early nausea and vomiting during the first day after chemotherapy.[1] A significant difference was seen between the two groups in regard to the second and third hours after intervention. This meant that, electrical stimulation of (p6) point caused reduction in delayed severity of nausea. Clinical studies have demonstrated that electrical stimulation as an adjunct to standard antiemetic drugs benefits cancer patients who are using a variety of chemotherapy agents including cisplatin. In this study more than 75% of the patients reported considerable decrease in the incidence and severity of nausea and vomiting.[10] Similar studies, investigating the efficacy of TENS in control of nausea and vomiting after chemotherapy

showed that TENS reduced the severity of nausea in 75% of patients.[4,11] A significant vomiting times difference was found between TENS and Placebo groups in first, second and third 24 hours. Other studies demonstrated that TENS increased the effect of Ondanestron antiemetic property.[6,12] However, Zarate et al. (2001) investigated the effect of electrical stimulation on P6 by ReliefBand® for prevention of nausea and vomiting after colecystectomy. They reported that ReliefBand® reduced nausea, but it did not affect vomiting frequency.[13] Our study suggested that TENS could be used as an adjunct to antiemetic agent to control nausea and vomiting induced by highly emetogenic chemotherapies.

Acknowledgements

We would like to thank the Office of Vice Chancellor for Research of Ahvaz Jondishapour University of Medical Sciences for financial support of this study and Dr. D Mehrabani at Center for Development of Clinical Studies of Nemazee Hospital for editorial assistance.

References

1 Roscoe JA, Morrow GR, Hickok JT, Stern RM. Nausea, vomiting remain a significant clinical problem: Trends over time in controlling chemotherapy induced nausea, vomiting in 1413 patients treated in community clinical practices. *J Pain Symptom Manage* 2000;**20(2):**113-21.

2 Hawthorn J. Nausea and vomiting. In: Grundy M. Nursing in hematology oncology 2nd Ed. Bailiere Tindall, 2001: pp. 211-18.

3 Erickson J. Cancer. In: Monahan S, Sand S, Marek N, eds. Medical-surgical nursing and illness perspectives. 7th. Ed. London, England: Mosby, 2003: p. 344.

4 Pearl ML, Fischer M, McCauley DL, Valea FA, Chalas E. Transcutaneous electrical nerve stimulation as an adjunct for controlling chemotherapy-induced nausea and vomiting in gynecologic oncology patients. *Cancer Nurs* 1999;**22(4):**307-11.

5 Lao L, Zhang G, Wong RH, Carter AK, Wynn RL, Berman BM. The effect of electro acupuncture as an adjunct on cyclophosphamide-induced emesis in ferrets. *PharmacolBiochem and Behav* 2003;**74:**691-99.

6 McMillan C, Dundee JW, Abram WP. Enhancement of the antiemetic action of ondansetron by transcutaneous electrical stimulation of the p6 antiemetic point in patients having highly emetic cytotoxic drugs. *Br J Cancer* 1991;**64:**971-72.

7 Roscoe JA, Morrow GR, Hickok JT, Bushunow P, Pierce HI, Flynn PJ, Kirshner JJ, Moore DF, Atkins JN. The Efficacy of acupressure and acustimulation wrist bands for the relief of chemotherapy-induced nausea and vomiting. *J Pain Symptom Manage* 2003;**26(2):**731-42.

8 Miller M, Kearney N. Chemotherapy-related nausea and vomiting-past reflections, present practice and future management. *Eur J Cancer Care* 2004;**13:**71-81.

9 Lee A, Done ML. The use of no pharmacologic techniques to prevent postoperative nausea and vomiting: a meta-analysis. *Anesth Analg* 1999; **88(6):**1362-69.

10 Dundee JW, Yang J, McMillan C. Non-invasive stimulation of the P6 (NeiGuan) antiemetic acupuncture point in cancer chemotherapy. *J R Soc Med* 1991;**84:**210–212.

11 Dundee JW, McMillan C. Positive evidence for p6 acupuncture antiemesis. *Postgrad Med J* 1991;**67:**417-22.

12 Ozgür Tan M, Sandikçi Z, Uygur MC, Arik AI, Erol D. Combination of transcutaneous electrical nerve stimulation and ondansetron in preventing cisplatin-induce emesis. *Urol Int* 2001;**67(1):**54-8.

13 Zárate E, Mingus M, White PF, Chiu JW, Scuderi P, Loskota W, Daneshgari V. The use of transcutaneous acupoint electrical stimulation for preventing nausea and vomiting after laparoscopic surgery. *Anesth Analg* 2001;**92:**629-635.