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ORIGINAL ARTICLE

The usefulness of bright light therapy for patients after oesophagectomy

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KEYWORDS
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Summary
Objectives: The prevention of delirium is an important issue in the field of perioperative nursing. The objective of this study was to verify the usefulness of acute-stage bright light exposure on patients following oesophagectomy.
Methods: The participants were oesophagectomy patients that were removed from their ventilators the day after surgery. After extubation, we assigned the participants to either the exposure group or control group. At Day 2 after surgery, the exposure group underwent two hours of bright light exposure for four days. In both groups, we monitored physical activity and autonomic activity. In addition, we scored the participants on the NEECHAM Scale and evaluated their postoperative delirium and postoperative arrhythmia.
Results: On the nights of Days 4 and 5, the amount of activity of the exposure group was significantly lower and The sympathetic nervous index was significantly lower on the night of Day 5. The level of arrhythmia was lower in the exposure group and we observed a significant difference on the night of Day 4 and the daytime of Day 5 after surgery. The occurrence rate of postoperative delirium tended to be lower in the exposure group, but there was no significant difference. None of the participants in the exposure group had NEECHAM Scale scores below the cut-off value from the night of Day 4 onwards.

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Conclusion: We conclude that postoperative bright light exposure adjusted the sleep—wakefulness cycle and improved the bed rest of patients. It was also indicated that bright light therapy is useful for reducing postoperative delirium.

Introduction

The treatment of oesophageal cancer by resection followed by reconstruction is highly invasive surgery with a long operation time that involves manipulation of the vital organs of three areas—the cervical region, the thoracic region and the abdominal region. Moreover, based on recent advancements in surgical techniques and perioperative management as well as the concomitant use of chemotherapy and radiation therapy, candidates for oesophagectomy are beginning to include older patients as well as younger patients and more severe cases. Due to the high level of invasiveness due to anaesthesia and surgical manipulation, patients who have undergone oesophagectomies require thorough postoperative management and, as a result, generally stay in the intensive care unit (ICU).

Patients in the ICU are often unable to attain sufficient rest due to the burdens of anaesthesia and surgical stress, the effects of various drugs, pain, anxiety over their prognosis, room lighting that makes it difficult to distinguish night from day, noises caused by medical equipment and a wide range of other factors. In some cases, patients exhibit a transient neurologic manifestation called postoperative delirium. The occurrence of postoperative delirium leads to increased psychologic burden and delays postoperative recovery for the patient. Therefore, the prevention of postoperative delirium is an important issue in the field of perioperative nursing (Mackenzie et al., 2004; Dimick et al., 2005; Low et al., 2007).

Miyazaki et al. (2003) investigated the correlation between the serum melatonin circadian rhythm and ICU psychosis and points out that an irregular pattern of melatonin circadian rhythm may be associated with ICU psychosis. Azama et al. (2007) discovered that both the expression of circadian clock genes and melatonin secretion level decreased following oesophagectomy, thereby suggesting that surgical stress affects the peripheral clock as well as endogenous hormones. These two studies demonstrate a possible link between postoperative delirium and circadian rhythm.

In recent years, bright light therapy has gained attention as a method of environmental improvement for adjusting a person's circadian rhythm. In 1980 it was discovered that light with an intensity of 2500 l× or more (bright light) acted powerfully as an entraining agent for a person's circadian rhythm (Lewy et al., 1980). In addition, bright light was found to possess therapeutic effects for terminal-stage patients and dementia patients and for the states of depression and sleeping disorders in patients with seasonal affective disorder (Cohen et al., 1994; Sakakibara et al., 1999; Koyama et al., 1999).

The exposed timing of bright light therapy has been studied in the case of exposure in the early morning when body temperature is increased. Early morning exposure can advance the phase of the circadian rhythm of a human being (Honma et al., 1987a,b; Honma and Honma, 1988, 1989). Moreover, in regards to light intensity and exposure time, Levitan (2000) reported that an intensity of 5000 l× for one hour a day is the most beneficial dose for usage in bright light therapy for patients with seasonal affective disorder.

The side effects of bright light therapy have been examined in two studies. Gallin et al. (1995) exposed patients with seasonal affective disorder to light with an intensity of 10,000 l×. Kobayashi et al. (2001) exposed ten patients with sleep disorder in a geriatric hospital to light at an intensity of 8000 l×. In both studies, the results of visual acuity, intraocular pressure, papillary reaction, ocular position, eye movement, slit lamp examination, ocular fundus examination and Amsler grid tests were examined before and after exposure to light and no ophthalmologic aberrations were observed.

In summary, bright light therapy is a useful and confirmed method for treating dementia, depression and sleeping disorders in the field of psychiatry. However, thus far few studies have been conducted regarding the use of bright light therapy for the prevention of sleep disorders and delirium in the postoperative period. In 2007, my collaborative researcher, Taguchi, reported on the possibility that bright light therapy decreases the rate of onset of postoperative delirium in patients after oesophagectomy (Taguchi et al., 2007). However, because the sample size was small and the period of intervention was not fixed, no definitive results could be obtained.

Purpose of the study

This is a randomised controlled trial to verify the usefulness of bright light therapy for patients following oesophagectomy to use the index acquired through physical activity, autonomic activity, incidence of post operative arrhythmia and level of acute delirium. Adjusting the light environment using bright light is a non-invasive and useful form of care, but this method is not established with critical care patients. Patients decrease their capacity for self-support in the postoperative period; therefore, it is necessary for nurses to control the environment in order to ensure good conditions for such patients.

Therefore, we designed a study to improve the light environment in the postoperative period and to evaluate the relationship between postoperative rest and bright light exposure.

Methods

Subjects

The participants were adult patients hospitalised between February 2006 and October 2006 to undergo surgical resec-