Therapeutic Influences of Plants in Hospital Rooms on Surgical Recovery

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Abstract. Medical and psychological measurements of surgical patients were tested to determine the influence of plants and flowers within hospital rooms. Eighty female patients recovering from a thyroidectomy were randomly assigned to either control or plant rooms. Patients in the plant room viewed 12 foliage and flowering plants during their postoperative recovery periods. Data collected for each patient included length of hospitalization, analgesics used for postoperative pain control, vital signs, ratings of pain intensity, pain distress, anxiety and fatigue, the State-Trait Anxiety Inventory Form Y-1, the Environmental Assessment Scale, and the Patient’s Room Satisfaction Questionnaire. Patients in hospital rooms with plants and flowers had significantly shorter hospitalizations, fewer intakes of analgesics, lower ratings of pain, anxiety and fatigue, and more positive feelings and higher satisfaction about their rooms when compared with patients in the control group. Findings of this research suggest the therapeutic value of plants in the hospital environment as an effective complementary medicine for surgical patients.

Surgery is a threatening experience with multiple stressful components such as physical pain and discomfort, worries about illness, isolation from family and friends, fear of medical procedures, and lack of familiarity with medical personnel, hospital equipment, and the sterile hospital environment. Numerous studies suggested that greater stress or anxiety associated with surgical experience is typically related to more severe postoperative pain and a slower and more complicated postoperative recovery (Cohen and Williamson, 1991; Johnston and Wallace, 1990; Mathews and Ridgeway, 1981). Some of the postoperative problems related to stress can be mediated through intakes of anesthetics and analgesics; however, these drugs have side effects, which can produce postoperative physiological problems (e.g., vomiting, headaches, nausea, and pain at the incision site), drug dependency, and even be fatal if not properly administered (Abbott and Abbott, 1995; Coniam and Diamond, 1994). Therefore, it would be useful to develop nonpharmacological approaches to improving the patient experiences with pain and stress during hospitalization.

To promote the speed of postoperative recovery and to improve the quality of life during hospitalizations, it is important to provide patients with not only the best treatment possible, but also to remove such sources of stress and to counter them with positive distractions. The viewing of nature and/or plants has been considered an effective positive distraction, which may provide ample involuntary attention, increase positive feelings, block or reduce worrisome thoughts, and promote restoration from stress (Ulrich, 1992). Researchers who have assessed the impact of nature/plants on human health have suggested that nature and plant experiences are positively associated with human physical (Chang and Chen, 2005; Coleman and Mattson, 1995; Ulrich et al., 1991), psychological (Kaplan, 1995; Kaplan and Kaplan, 1995), emotional (Adachi et al., 2000; Ulrich, 1981; Ulrich et al., 1991), and cognitive health (Cimprich, 1993; Hartig et al., 1991; Tennessen and Cimprich, 1995). In addition, viewing nature/plants is linked to pain reduction, less need for analgesics, and fast recovery from surgery (Diette et al., 2003; Park et al., 2004; Ulrich, 1984).

Clinical trials concerning the health benefits of viewing indoor plants on stress and recovery of surgical patients within a hospital setting do not exist. This investigation determined if exposing surgical patients to plants influenced stress reduction and recovery from surgery using various medical and psychological measurements.

Materials and Methods

Subjects. The sample consisted exclusively of patients who had undergone thyroidectomy surgery, which is a comparatively standardized medical procedure with similar postoperative management in the uncomplicated cases. Eighty female patients (mean age, 36.2 ± 10 years) were studied from July 2005 to Jan. 2006 in an 809-bed suburban university-affiliated hospital in Korea. Human research protocols for this study were approved by the Institution Review Boards of both the academic and hospital setting. Patients were informed that their medical history and current medical records would be reviewed and each signed an informed consent form. Patients were randomly assigned to either control or plant rooms (Fig. 1) as they became available. Equal numbers of single and six-patient rooms were used for two treatments. The rooms, which were located on the same floor and the same side of the building, were identical except for the presence or absence of plants. Patient views from the hospital windows were only of the sky with no presence of trees or other buildings. Patients in the plant group were allowed to view plants during their recovery periods after surgery until discharge. Excluded from the study were patients who were younger than 19 years or older than 60 years and those who reported a chronic (e.g., diabetes or high blood pressure) or current acute (e.g., upper respiratory infection) health problem, a history of psychiatric problems (e.g., depression or anxiety), or uncorrected hearing or visual impairments. All were in good health before surgical treatment.

Measurements. Data collected included the length of hospitalization, analgesics used for postoperative pain control, vital signs, ratings of pain intensity, pain distress, anxiety and fatigue (PPAF), the State-Trait Anxiety Inventory Form Y-1 (STAI-Y1), the Environmental Assessment Scale (EAS), and the Patient’s Room Satisfaction Questionnaire (PRSQ).

Outcome data of length of hospitalization, postoperative analgesic intakes, and vital signs were extracted from patient charts. Length of hospitalization was defined as days from surgery to discharge. Postoperative analgesics were classified as weak, moderate, or strong on the basis of the drug and amount and whether it was administered orally or by injection. The weak category was dominated by small doses of talaflumate, a nonsteroidal anti-inflammatory drug (NSAID), and the moderate category included large doses of talaflumate up to 1480 mg.d−1. In the strong category, injections of ketorolac tromethamine (NSAID) or combinations with talafumate doses were used. Vital signs recorded were systolic and diastolic blood pressures (millimeters of mercury), body temperature (°C), heart rate (beats per minute), and respiratory rates (breaths per minute). Vital signs were defined as the average of three readings taken per day. All measurements were taken using standard, noninvasive technology and were recorded on patient charts.

Levels of the PPAF were measured using a 101-point numerical rating scale (NRS-101). The validity of the NRS-101 and its sensitivity to treatment effects have been well documented (Jensen and Karoly, 1992; Jensen et al., 1986). The NRS-101 (rating from 0 to 100) is reported to have several advantages over the other rating scales and to be more sensitive to treatment effect than the...
A meeting with the hospital
Analysis of covariance
‘Albolineata’), Syn-
PTeris cretica
Vinca minor
P = 0.045,
test (Higgins, 2004) using SAS
admission, after obtaining the informed con-
about surgical procedures. On the day of
be influenced by the content of the rooms.
In addition, nurses
provided so the patient could add comments.
To assess patient satisfaction with the
hospital room, patients were asked to com-
the EAS to test for differences between groups
Patients who viewed plants had significantly
shorter hospitalizations than those patients
without plants (P = 0.034). Analgesic intake
Fig. 1. Photographs of the two hospital room treatments. (A) No plants and (B) foliage and flowering
plants. The rooms, which were located on the same floor and the same side of the building, were
identical except for the presence or absence of plants. The combinations of plants used in each room
were identical. Room B contained single plants of arrowhead vine, cretan brake fern, variegated vinca,
and yellow star jasmine arranged with two plants each of dendrobium, peace lily, golden pothos, and
tentia palm.
NRS-11 (rating from 0 to 10) as a result of a
large number of response categories (Jensen
et al., 1986).
The STAI-Y (Spielberger, 1983) is com-
prised of a self-report measurement of anx-
ety and has been used extensively in research
and clinical practice. The STAI consists of
two scales. The STAI-Y1 scale includes 20
statements intended to measure transitory
feelings of tension, nervousness, apprehen-
sion, and worry, whereas the STAI-Y2 sec-
ton evaluates the stable personality trait
of anxiety proneness. This study used the
STAI-Y1 because it was designed to measure
changes in anxiety resulting from situational
stress. Psychometric properties of the STAI-
Y and studies supporting its construct val-
dity and reliability are presented in the
STAI-Y manual (Spielberger, 1983).
To measure patients’ feelings in response
to their hospital room, the modified EAS was
used (Rohles and Millicken, 1981). The EAS
consists of 13 adjective pair semantic differen-
tial scales. The EAS has been used in
previous studies to evaluate the affective
characteristics of the environment and vari-
ous features it contains (Laviana, 1985;
Laviana et al., 1983).
To assess patient satisfaction with the
hospital room, patients were asked to com-
plete the PRSQ, which indicated three posi-
tive and three negative qualities of their room
environments. Patients were further asked
about their willingness to return to their room
during any future hospitalization. Space was
provided so the patient could add comments.
Procedures. A meeting with the hospital
doctors and nurses was held before the
beginning of the research. Research objec-
tives were explained that included their need
to treat patients similarly. In addition, nurses
were assigned to help patients in both the
control and plant rooms and were urged not to
be influenced by the content of the rooms.
Patients were hospitalized a day before sur-
gery to be given preparatory information
about surgical procedures. On the day of
admission, after obtaining the informed con-
sent agreement from the patient and after
health screening, patients completed the
PPAF, STAI-Y1, and EAS in the hospital
room.
For the plant room, 12 potted foliage and
flowering plants with sterile, soilless potting
mix were placed in the hospital room after
patients left the room for surgery. Plants
selected for the hospital rooms were den-
drobium (Dendrobium phalaenopsis), peace
lily (Spathiphyllum ‘Starlight’), golden pot-
hos (Epipremnum aureum), kentia palm
(Howea forsteriana), arrowhead vine (Sym-
gonium podophyllum ‘Albolineatum’), cretan
brake fern (Pteris cretica ‘Albolinea’),
variegated vinca (Vinca minor ‘llumina-
tion’), and yellow star jasmine (Trachelo-
spernum asiaticum ‘Ougonnishiki’). Single
plants of four species were arranged with two
plants each of dendrobium, peace lily, golden
pothos, and kentia palm. Plant selection was
based on space consideration, sunlight acces-
sibility, requirements of temperature and
humidity, low maintenance, and visual appeal
with various colors, sizes, patterns, and shapes. Plants were added or removed as
needed to accomplish each treatment. The
combinations of plants used in each room
were identical. Plants were grown in self-
watering containers, and patients were not
disturbed by plant maintenance during hos-
pitalizations. Patients were not told of the
study objectives or how to interact with the
plants. Control rooms contained no plant
materials.
During the recovery period, the PPAF and
the STAI-Y1 were administered on the first,
third, and fifth days after surgery. The second
trial of the EAS and the initial trial of the
PRSQ were administered on the last day of
hospitalizations. All measurements were
taken by the researcher except demographics,
analgesic intakes, and vital signs, which were
recorded by medical staff.
Data analyses. Analysis of covariance
(ANCOVA) (Littell et al., 2006) using SAS
PROC GLM (version 8.0; SAS Institute,
Cary, NC) was completed for data of hospi-
talization and the EAS to test for differences
between groups. Age was used as the cova-
riate for ANCOVA. A repeated-measures
ANCOVA (Littell et al., 2006) using SAS
PROC MIXED was done for data of vital
signs and the STAI-Y1 to test for differences
between groups at each day of
hospitalization and to compare trends
for groups over postoperative recovery peri-
dodes. Because of the differences in age and
preoperative score, the patient’s age and
preoperative score were used as the covari-
ates for a repeated-measures ANCOVA. The
exact χ² test (Higgins, 2004) using SAS
PROC FREQ was performed for analgesic
intake to test for differences between groups
at the day of surgery and first day after
surgery, Days 2 through 3 after surgery, and
Days 4 through 5 after surgery. Alpha level
was set at 0.05.
Results and Discussion
The mean length of hospitalizations for
the plant group was 6.08 d and was signifi-
cantly different from that of the control group
at 6.39 d. These records provide evidence that
patients who viewed plants had significantly
shorter hospitalizations than those patients
without plants (P = 0.034). Analgesic intake
was significantly different for the plant
group compared with the control group
at Days 4 through 5 after surgery (P = 0.04).
Patients exposed to plants were less fre-
quently given weak and moderate analogesics
compared with patients in the control group.
No significant day-by-group interactions
and no significant group differences were found
for vital signs during the recovery periods.
As shown in Table 1, the means are
presented for preoperative and postoperative
ratings of the PPAF and the STAI-Y1. Among
the PPAF outcomes, significant
day-by-group interactions were noted for
self-rated pain intensity, pain distress, and
fatigue (P = 0.045, P = 0.04, P = 0.048,
respectively). Levels of pain intensity, pain
distress, and fatigue remarkably decreased
for most patients in both groups throughout
the recovery periods. Pain intensity was
significantly lower for those patients exposed
to plants compared with no plants on the third
and fifth days after surgery (P = 0.012, P =
0.01, respectively). The dynamic changes of
pain distress were parallel with that of pain
intensity and were consistently lower than the
pain intensity ratings. Pain distress was sig-
nificantly lower for those patients exposed
to plants compared with no plants on the fifth
day after surgery (P = 0.002). Comparing
plant group patients with control group
patients, fatigue was significantly lower on the
fifth day after surgery (P = 0.01). No
significant day-by-group interactions were
reported and significant group differences
were found for self-rated anxiety and the
STAI-Y1. Patients in the plant group
had significantly lower anxiety than patients in
the control group during the recovery periods
(P = 0.01). Patients in the plant group
were characterized by significantly lower levels
of state anxiety and tension than patients in the
control group during the recovery periods
(P = 0.01). This result was consistent with
that of anxiety NRS-101 ratings.

Fig. 1. Photographs of the two hospital room treatments. (A) No plants and (B) foliage and flowering
plants.
Significant differences between the EAS responses of the two groups were found for the eight items (Table 2). The EAS responses to plants indicated that patients during the recovery periods reported their rooms had a pleasant smell and were more satisfying, relaxing, comfortable, colorful, happy, calming, and attractive compared with those in the control rooms.

Results of the PRSQ showed the majority of patients in the plant group indicated that plants were the most positive qualities of their rooms (95%), whereas patients in the control group reported watching television as the most favorable aspect of their rooms (85%). The next categories of positive qualities regarding the hospital room included large windows (57%), sunshine (48%), and appropriate temperature (37%) for the plant group, whereas appropriate temperature (55%) and large windows (40%) were highly favored for the control group. Regarding negative qualities of the hospital room, patients in the control and plant groups had similar negative comments concerning toilet facilities, insufficient space, and hospital environments. Patients were further asked about their willingness to return to their room during any future hospitalization. Ninety-three percent of patients in the plant group responded positively, whereas 70% of patients in the control group reported a willingness to return.

Voluntary comments of patients were collected from nurses and from the PRSQ. Many patients in the plant group stated that plants helped them relax or feel less anxious, and some believed that plants had diminished their pain. Patients also reported that plants in their rooms created a positive image of the hospital and of the medical staff who were sensitive to the healing potential of “nearby nature.” Results indicate that female patients who were recovering from thyroidectomy in hospital rooms containing plants had significantly shorter hospitalizations, less need for analgesics, lower ratings of pain, anxiety, and fatigue, and more positive feelings and higher satisfaction about their hospital rooms compared with patients without plants. This study extends earlier research, which showed male and female surgical patients with a window view of trees had shorter hospital stays, fewer negative comments in nurses’ notes, and fewer intakes of analgesics than did patients with a window view of a brick wall (Ulrich, 1984).

Interior hospital spaces can be made healthier with the presence of living plants. Previous research has indicated that indoor plants reduce sick-building syndrome by removing pollutants (Darlington et al., 2001; Wolverton et al., 1989; Wood et al., 2002), increase relative humidity up to human comfort level (Lohr, 1992; Wolverton and Wolverton, 1993), and improve indoor air quality by reducing the quantity of mold spores and airborne microorganisms (Wolverton and Wolverton, 1993).

Colorful fresh cut flowers and blooming or green plants could be a complementary...
medicine for patients. If properly maintained, indoor plants can provide a great opportunity for patients to experience nature in all seasons when outdoor scenery could not provide this benefit. Furthermore, plants provide meaningful therapeutic contact, especially for patients spending much of their time indoors while recovering from painful surgery.

Findings from this study may not be applied to the immediate environments of severely immunocompromised and intensive care unit patients. However, this study provides strong evidence that contact with plants is directly beneficial to patients’ health. This nonpharmacological complementary approach is medically beneficial and clearly cost-effective not only to patients, but also to health insurance companies by reducing the costs of hospitalization and analgesic consumption. Healthcare professionals and hospital administrators need to consider the use of plants and flowers to enhance healing environments for patients.

**Literature Cited**


