Effects of Guided Imagery on Postoperative Outcomes in Patients Undergoing Same-Day Surgical Procedures: A Randomized, Single-Blind Study

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The purpose of this investigation was to evaluate the effects of guided imagery on postoperative outcomes in patients undergoing same-day surgical procedures. Forty-four adults scheduled for head and neck procedures were randomly assigned into 2 groups for this single-blind investigation. Anxiety and baseline pain levels were documented preoperatively. Both groups received 28 minutes of privacy, during which subjects in the experimental group listened to a guided imagery compact disk (CD), but control group patients received no intervention. Data were collected on pain and narcotic consumption at 1- and 2-hour postoperative intervals. In addition, discharge times from the postoperative anesthesia care unit (PACU) and the ambulatory procedure unit and patient satisfaction scores were collected.

The change in anxiety levels decreased significantly in the guided imagery group ($P = .002$). At 2 hours, the guided imagery group reported significantly less pain ($P = .041$). In addition, length of stay in PACU in the guided imagery group was an average of 9 minutes less than in the control group ($P = .055$).

The use of guided imagery in the ambulatory surgery setting can significantly reduce preoperative anxiety, which can result in less postoperative pain and earlier PACU discharge times.

Keywords: Alternative therapies, guided imagery, postoperative outcomes, same-day surgery.

As the cost of healthcare continues to escalate, providers search for alternative therapies to alleviate this financial burden, while continuing to improve patient care. Any intervention intended to heal or treat a disease that is "not included in the traditional medical curricula taught in the United States or Britain" is considered alternative medicine.[1] Guided imagery is an alternative therapy that has been used as an adjunctive treatment, in combination with general anesthesia for orthopedic, cardiovascular, and colorectal cases.[2-6] Guided imagery has been defined as a directed, deliberate daydream that uses all senses to create a focused state of relaxation and a sense of physical and emotional well-being.[4] Multiple investigations suggest that when guided imagery is administered before a surgical procedure, it can diminish a patient's preoperative anxiety and reduce postoperative surgical pain, use of narcotics, and length of postoperative hospital stay.[2-5,7] However, the value and feasibility of this intervention has not been adequately explored in the ambulatory care setting.

Surgery is a stressful event that can increase anxiety levels. There has been a focus in recent literature regarding the impact of high levels of anxiety observed in the preoperative period and the potential impact on postoperative outcomes. The fear of the unknown, loss of control, and pain or discomfort after surgery have a negative impact on anxiety and can potentially influence an individual's ability to cope with events postoperatively.[5,8,9]

Anxiety is a perpetuating factor that influences an individual's ability to cope with pain.[10] In the perioperative arena, using techniques to decrease anxiety may prove beneficial in reducing narcotic requirements, postoperative pain, and discharge times. In addition, it may be advantageous to identify patients in the preoperative holding area with substantial anxiety, who may be at risk for developing severe postoperative pain.[11] These patients in particular, may benefit from alternative therapies to alleviate preoperative anxiety.

Postoperative pain can result in prolonged lengths of stay, increased medication requirements, and lower patient satisfaction levels.[12] When guided imagery is used as a coping strategy before surgery, it can lessen a patient's preoperative anxiety and reduce postoperative surgical

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pain, narcotic use, and length of hospital stay for inpatient surgical procedures.[3]

A study by Laurion and Fetzer[12] investigated the effects of guided imagery and music on female patients undergoing laparoscopic gynecologic surgery. The researchers reported that the control group had a significantly higher pain score upon discharge than did the guided imagery and music groups. Tusek et al[4] examined the use of guided imagery in both men and women during the perioperative period to decrease patients' anxiety, pain, narcotic medication use, postoperative side effects, sleep quality, and length of stay. The guided imagery groups' median narcotic requirement was 36% less than that of the control group. Differences in patients' pain and anxiety were also markedly lower in the guided imagery group on all postoperative days.

In a pilot study examining the effects of guided imagery in elderly patients undergoing hip surgery, researchers reviewed the outcomes of pain relief, anxiety, and length of stay.[2] The results of the study revealed that patients who listened to guided imagery at least twice each day beginning in the preoperative period and continuing into the postoperative recuperation had a shorter length of stay, lower average pain ratings on a verbal numeric scale, and lower use of pain medication. Although anxiety levels at baseline and on day 3 were higher in the intervention group, the researchers found that when compared with the baseline measurements, the guided imagery group had a greater overall decrease in level of anxiety.

In a research study by Halpin et al,[3] guided imagery was used on patients undergoing cardiac surgery. The purpose was to determine if a guided imagery program reduced anxiety, pain, and length of stay at a decreased cost to the consumer while maintaining a high level of patient satisfaction. There were no statistically significant differences between the guided imagery and nonguided imagery groups for "overall care and treatment provided"; however, patient satisfaction scores were higher in the guided imagery group.[3] Patients' anxiety improved by an average of 41% from before to after listening to the tapes, but only a small percentage (17.9%) reported that their pain was better after guided imagery. The average hospital stay was 1.5 days shorter in the guided imagery group (P = .000), and direct hospital cost was $1,982 less in the guided imagery group (P = .001). Mean pharmacy direct costs were $288 less for the guided imagery (P = .002); however, no statistically significant differences were noted in narcotic pain medication cost in either group.

Most of the studies performed to date use guided imagery by having the subjects listen to the tapes days or weeks before their surgeries.[3,4,7,12,13] Due to the increasing trend of same-day surgeries and varying processes for preoperative evaluations, it may no longer be feasible to begin guided imagery therapy days in advance. The outcomes related to the use of guided imagery may be affected by when and how often it is applied. In reality, most anesthesia providers meet their patients on the morning of surgery. Therefore, this study queried whether positive outcomes could still be obtained when guided imagery was implemented only on the day of surgery.

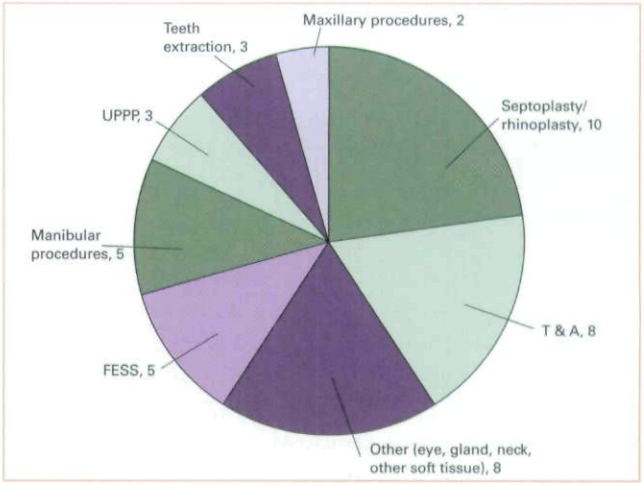

Figure 1. Types of Procedures
UPPP indicates uvulopalatopharyngoplasty; T&A, tonsillectomy and adenoidectomy, FESS, functional endoscopic sinus surgery.

There is limited evidence available on the feasibility and effectiveness of guided imagery for outpatient surgical procedures. The objectives of this study were to determine the effects of guided imagery on postoperative outcomes for patients undergoing same-day surgical procedures of the head and neck, to include ear/nose/throat (ENT), oral-maxillofacial (OMF), and plastic surgeries (Figure 1). Specifically, preoperative anxiety levels, analgesic consumption, postoperative pain, length of stay, and patient satisfaction were measured.

Materials and Methods

A randomized, single-blinded, quasi-experimental study was conducted at Wright-Patterson Medical Center at Wright-Patterson Air Force Base in Ohio to investigate the effects of guided imagery as an adjunct for postoperative outcomes in patients undergoing same-day surgical procedures of the head and neck. Approval was obtained from the Institutional Review Boards at the Uniformed Services University of the Health Sciences in Bethesda, Maryland, and at Wright-Patterson Air Force Base.

- *Inclusion and Exclusion Criteria.* Inclusion criteria were age 18 years and older; scheduled for outpatient surgery of the head or neck to be performed under general anesthesia; ASA physical status I, II, or III; ability to read and understand directions in English; and consent to participate in the study. Exclusion criteria included hearing loss severe enough to preclude listening to the compact disk (CD), vision loss too severe to complete data collection instruments without glasses, docu-

mented affective disorders, documented chronic pain disorders, and use of guided imagery before enrollment.

After consent for anesthesia was obtained, patients meeting inclusion criteria were approached regarding possible involvement in the study. Forty-four subjects consented to participate during the preoperative process. With the use of computerized random number generation, the patients were assigned to either the guided imagery or control group.

• *Anxiety Measurements.* On arrival to the preoperative holding area, each participant was isolated from other patients by a privacy curtain. Before receiving sedation, the research participant's baseline anxiety was measured using the Amsterdam Preoperative Anxiety and Information Scale (APAIS) and a vertical visual analog scale (vVAS). The APAIS is a self-report tool used to assess level of preoperative anxiety.[14] The vVAS was used by having the subject mark the point on a 100-mm vertical line, which reflected what he or she was experiencing. The distance was measured in millimeters from zero to the point marked to obtain a numerical data point. Baseline pain was also measured using a vVAS. Reliability of measurement of the vVAS was established by using the same ruler for all measurements, and a second researcher performed repeat measurements to confirm accuracy and consistency.

After the initial measurements were obtained, subjects in the guided imagery group were provided with a CD player, headphones, and a guided imagery CD. This CD led the patient through a progressive relaxation and guided imagery exercise. While in the preoperative holding area, the subjects in the guided imagery group listened to the 28-minute CD, whereas the control group was provided 28 minutes of privacy but no CD. Shortly before transfer to the operative suite, and before receiving midazolam, all participants' anxiety levels were reassessed with the vVAS.

Before induction, the anesthesia provider ensured that the headphones were placed on the guided imagery subject and that a second guided imagery CD was initiated. This CD consisted of soothing biorhythmic music combined with positive, encouraging statements. The subject was directed to set the volume to a level of comfort and the CD was permitted to play throughout induction. Before incision, the CD player was stopped and the ear buds were removed from the subject's ears to ensure no potential harm to the participant. For protection of the single-blinded nature of the study, the CD was not restarted in the postoperative period.

• *Anesthesia.* A standardized anesthetic protocol was designed incorporating the most common medications and anesthetic agents currently used at this facility. Based on subject requirements and the anesthesia providers' assessment, all patients were administered midazolam, 0 to 5 mg intravenously (IV), preoperatively. For postoperative nausea and vomiting prophylaxis, patients received IV ondansetron, 4 mg, and dexamethasone, 4 to 8 mg. A consistent induction sequence of fentanyl, 1 to 3 µg/kg; lidocaine, up to 1.5 mg/kg; propofol, 1 to 2 mg/kg; and either rocuronium, 0.6 to 1.2 mg/kg, or succinylcholine, 1 to 1.5 mg/kg, was administered. Sevoflurane was used and titrated at the provider's discretion. Maintenance of anesthesia was supplemented with fentanyl IV, up to 8 µg/kg. On emergence, morphine, 1 to 10 mg; hydromorphone (Dilaudid), 0.2 to 2 mg; or fentanyl, up to 150 µg, was used based on provider preference. If required, neuromuscular blockade was reversed using neostigmine, 0.05 mg/kg IV, and glycopyrrolate, 0.01 mg/kg IV.

• *Postoperative Data Collection.* All postoperative data was collected in the postoperative anesthesia care unit (PACU) and the ambulatory procedure unit (APU) by a blinded investigator. The postoperative data collection period began with arrival to PACU and terminated when APU discharge criteria were met. One hour after departure from the operating room, the investigator had subjects rate their pain over the first hour using the vVAS. At the second hour, subjects were again asked to rate their pain over the previous hour on the vVAS. At the 2-hour data collection point, patient satisfaction was assessed using a 5-point Likert scale.

Discharge time from PACU and APU were based on the time the patient actually met discharge criteria. This was to control for multiple factors that could delay actual discharge time, such as arrival of transportation, staff availability, lack of discharge orders, and bed availability. Time in APU began immediately after PACU discharge criteria were met and terminated when patient met APU discharge criteria.

Analgesics were administered postoperatively in PACU and APU by the staff nurses in accordance with postoperative orders and were documented on the standard medical record. The blinded investigator reviewed the charts afterward to obtain this data. Analgesics administered were converted into morphine equivalents for analysis.

• *Vertical Visual Analog Scale.* A review of studies consistently demonstrates that VAS and verbal rating scales have high construct validity.[15,16] Jensen et al[16] compared the sensitivity of a VAS, a verbal rating score for pain intensity, and a verbal rating score for pain relief. The results concluded that all 3 tools had a high validity, but the sensitivity in measuring changes in pain varied.[16] The VAS difference score was found to be the most sensitive to changes in pain. Compared with horizontal scales, vVASs have been rated as easier for patients to use.[15]

• *Amsterdam Preoperative Anxiety and Information Scale.* The APAIS is a self-report anxiety tool used to assess level of anxiety and information-seeking behaviors specific to surgery.[14] This measure is easily administered and can be completed in less than 2 minutes.[17] The APAIS consists of 6 items: 4 relating specifically to anxiety and 2 relating to a need for information.[14] Subjects use a 5-point Likert

Demographic variable	Control (n = 22)	Guided imagery (n = 22)	P
Age (y)	33.32 ± 10.76	35.91 ± 15.13	.516
Height (cm)	176.30 ± 8.76	172.85 ± 11.10	.257
Weight (kg)	82.26 ± 21.00	82.51 ± 16.45	.965
Length of surgical case (min)	67.50 ± 52.33	54.95 ± 41.92	.445
Gender			1.00
Female	9	9	
Male	13	13	
Race			.472
White	16	18	
African American	6	4	

Table 1. Demographic Variables
Data are given as mean ± SD or number of cases.

Anxiety score	Control (n = 22)	Guided imagery (n = 22)	P
APAIS	8.77 ± 3.96	8.05 ± 3.302	.628
vVAS baseline (mm)	24.14 ± 25.91	25.32 ± 27.80	.266
vVAS repeat (mm)	21.50 ± 26.70	11.86 ± 16.18	.002

Table 2. Anxiety Scores
Data are given as mean ± SD.
APAIS indicates Amsterdam Preoperative Anxiety and Information Scale; vVAS, vertical visual analog scale.

scale to rate their level of agreement with each item (1, not at all; 5, extremely).[14] In a study by Moerman et al,[17] the anxiety subscale, which was the portion used in this investigation, was found to have good internal consistency reliability, with Cronbach α equaling 0.86. Correlation of the anxiety subscale of the APAIS with the State-Trait Anxiety Inventory (STAI)–State revealed a high concurrent validity (0.74).[17] Boker et al[18] compared 3 anxiety scales, the VAS, the STAI-State, and the anxiety subscale of the APAIS for assessment of preoperative anxiety in patients undergoing same-day surgery. The researchers concluded that both the anxiety component of the APAIS and the VAS showed a statistically significant correlation to the STAI ($P < .001$) in surgical populations.[18] The VAS and APAIS are useful measurement tools that can provide the anesthesia provider with brief, valid, and reliable methods of assessing patients' anxiety in the preoperative period.[17-19]

- *Guided Imagery CD.* Michael R. "Ron" Eslinger, CRNA, MA, APN, BCH, CMI, FNCH, CAPT(ret), USN, of Healthy Visions, Oak Ridge, Tennessee, designed the guided imagery products used for this investigation. The CDs used were "Preparing for Your Surgery" and the CD specific to general anesthesia in "General Anesthesia and Conscious Sedation: 2 CD Set of Music and Suggestions." Both products consist of positive suggestions and biorhythmic music. Although many anesthesia providers use these types of CDs in their clinical practice and report positive outcomes in their patients, minimal data has been published to evaluate their use in outpatient surgeries.
- *Statistical Analysis.* Demographic data analysis was performed using descriptive and inferential statistics. Normality was determined mathematically, and in cases where variables did not meet strict normality assumptions, nonparametric procedures were used for statistical analysis. The Wilcoxon signed rank test was used to evaluate differences in anxiety within the groups. Narcotic use and patient's age, height, and weight were analyzed using the independent-samples t tests. Pain measurements, length of stay, satisfaction, and APAIS scores were analyzed using the Mann-Whitney U test. For all statistical tests, a P value of less than .05 was considered significant.

Based on results of a research investigation evaluating the effects of guided imagery on length of stay on cardiac surgical patients, where the mean difference (and standard deviation) in hospital stay for the guided imagery group was 5.6 days (± 1.2) compared with 7.5 days (± 3.2), a power analysis was performed. With use of an α of 0.05 and a β of 0.20, a total of 19 subjects per group were required to achieve significance. Factoring in a 15% attrition rate brought the total sample size to 44 subjects (22 per group).

Results

A convenience sample of 44 ASA classification I, II, and III adults was enrolled. The sample consisted of 26 men and 18 women, ranging in age from 18 to 71 years (mean ± SD, 34.6 ± 13 years). χ^2 analysis and independent-samples t tests were used to identify any significant differences in the demographic composition of the groups, and no statistically significant differences were found (Table 1).

The Wilcoxon signed rank test was used to compare initial anxiety levels with immediate preoperative anxiety levels for both groups (Table 2). The control group had a

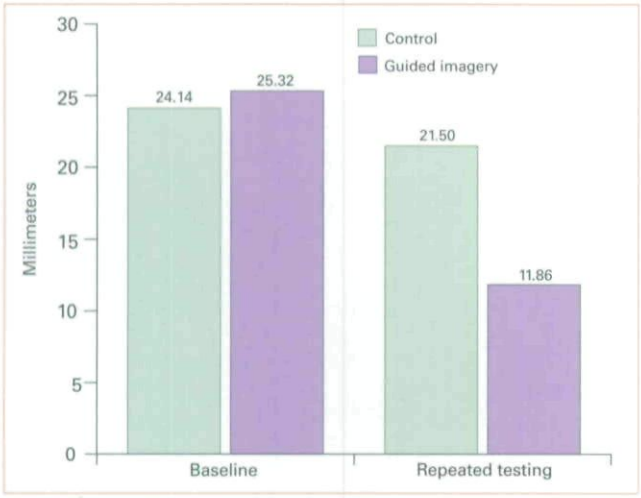

Figure 2. Mean Preoperative Anxiety Scores (mm) at Baseline and Repeated Testing, Using Vertical Visual Analog Scale

Control, $P = .266$; guided imagery, $P = 002$.

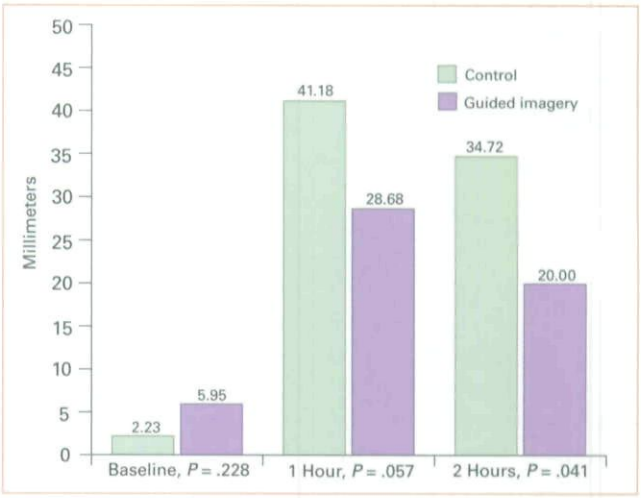

Figure 3. Baseline and Postoperative Pain Scores (mm), Using Vertical Visual Analog Scale

Variable	Control (n = 22)	Guided imagery (n = 22)	*P*
vVAS pain scores (mm)			
Baseline	2.23 ± 3.98	5.95 ± 10.19	.228
1 hour	41.18 ± 24.82	28.68 ± 27.16	.057
2 hours	34.72 ± 27.54	20.00 ± 28.92	.041
Narcotic use (mg)[a]			
Intraoperatively	20.35 ± 10.42	17.40 ± 8.24	.308
PACU	2.38 ± 4.46	1.77 ± 3.37	.964
APU	5.41 ± 4.14	5.05 ± 5.40	.569
Total	28.03 ± 11.64	24.55 ± 11.75	.335

Table 3. Postoperative Pain Scores and Analgesic Use

Data are given as mean ± SD. Measured in morphine equivalents.

[a] vVAS indicates vertical visual analog scale; PACU, postoperative anesthesia care unit; and APU, ambulatory procedure unit.

mean initial anxiety level of 24.14 mm and a mean repeat level of 21.50 mm ($P = .266$). The guided imagery group reported a significant decrease in mean anxiety levels from an initial 25.32 mm to a mean repeat level of 11.86 mm ($P = .002$; Figure 2). As no intervention occurred within the control group between the initial and repeat anxiety measurements, no change in anxiety would be expected. However, a significant decrease in anxiety did occur within the guided imagery group after listening to the CD preoperatively.

To determine total narcotic consumption, we reviewed subjects' records for intraoperative and postoperative analgesic use. These data were converted into morphine equivalents and compared between the 2 groups using an independent-samples *t* test. No significant difference was found ($P = .335$). The total narcotic use ranged from 7.5 to 57.0 mg (SD, 11.68 mg), with the mean for the control group at 28.02 mg and the guided imagery group at 24.55 mg. At each individual data collection point (intraoperative, PACU, and APU), the narcotic consumption between the 2 groups was compared and no significant difference was found (Table 3).

Doses of midazolam were compared between groups to identify any differences that may have contributed to postoperative outcomes. The assumption of normality was not met for the independent-samples *t* test, so the Mann-Whitney *U* test was used. No statistically significant difference was found ($P = 1.00$), with mean doses of midazolam for the control and guided imagery groups of 2.30 and 2.32 mg, respectively.

One- and 2-hour pain measurements between the 2 groups were compared using the Mann-Whitney *U* test (see Table 3). The mean level of pain for the control group at 1 hour was 41.18 mm compared with the guided imagery group at 28.68 mm, which approaches statistical significance ($P = .057$). The pain levels for the guided imagery group at 2 hours were significantly lower ($P = .041$) than the control group, with means of 20.00 and 34.72 mm, respectively (Figure 3).

The control group had a mean length of stay in the

Variable	Control (n = 22)	Guided imagery (n = 22)	P
Length of stay in PACU (min)	43.82 ± 20.49	34.82 ± 9.87	.055
Length of stay in APU (min)	103.41 ± 44.27	103.41 ± 55.47	.265
Patient satisfaction (1-5 scale)	4.90 ± 0.30	5.00 ± 0.00	.143

Table 4. Length of Stay and Patient Satisfaction Variables
Data are given as mean ± SD.
PACU indicates postoperative anesthesia care unit; APU, ambulatory procedure unit.

PACU of 43.82 minutes, and the guided imagery group's mean stay was 34.82 minutes (Table 4 and Figure 4). This difference of 9 minutes approached statistical significance ($P = .055$). The duration of APU stay, however, was not significantly different between the 2 groups ($P = .265$).

The patients were very satisfied with their anesthesia experience, regardless of their group assignment. Two patients in the control group rated their satisfaction as "satisfied (4)," 1 guided imagery subject was discharged before completing the survey, and all other patients gave ratings of "completely satisfied (5)." No significant difference in patient satisfaction was found ($P = .143$; see Table 4).

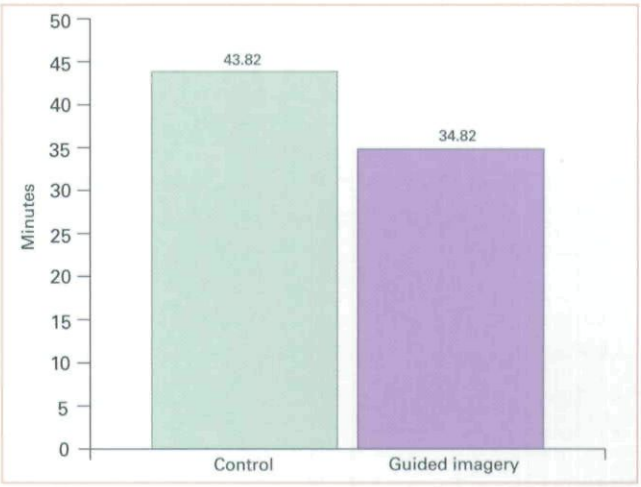

Figure 4. Length of Stay in Postanesthesia Care Unit
$P = .055$

Discussion

The concept of pain today has expanded beyond the traditional views of interpretation and modulation of nociceptive impulses.[20] The pain experience encompasses not only the nociceptive stimulus but also metabolic activity, stress, and emotional responses that exacerbate pain perception.[20,21] The emotional motor system is composed of the autonomic nervous system, the greater limbic system, the hypothalamic-pituitary-adrenal (HPA) axis, and the cranial nerve system.[20] The brain processes input from the central and peripheral nervous system, including afferent signals, thoughts, and emotions; this information is passed to numerous areas of the brain for interpretation and processing.

The limbic system is an integral part of the interpretation of pain, and includes the stimulation of the autonomic nervous system and the HPA axis in response to nociceptive stimuli.[20] Accumulating evidence currently points to the amygdala as a neural substrate of the interaction between pain and emotion.[22] It modulates pain behavior and experience; it is linked to both facilitatory and inhibitory pathways, where pain enhances its activity.[22] These connections between emotions and the modulation of pain support the theory that higher anxiety may affect an individual's perception and coping with the pain experience.[10]

The overall purpose of this research was to investigate the effects of guided imagery on preoperative anxiety and postoperative outcomes. Many studies performed to date, follow the advocated method of using guided imagery CDs or tapes days or weeks before surgery.[3,4,7,12,13] As mentioned previously, the increase in same-day surgeries makes implementation of guided imagery weeks in advance more challenging. Therefore, this investigation focused on using guided imagery on the day of surgery.

The reduction in preoperative anxiety for the guided imagery group was statistically greater than in the control group. Previous studies, such as by Antall and Kresevic,[2] Halpin et al,[3] and Tusek et al,[4] also found statistically significant decreases in anxiety after implementation of guided imagery, although they applied it for longer times. The results of this investigation suggest that when implemented only on the day of surgery, guided imagery may still aid in decreasing anxiety in patients undergoing surgical procedures.

No differences were found in narcotic consumption, time to discharge, or patient satisfaction. Despite statistically similar narcotic administration, the guided imagery group had statistically significantly lower pain levels at the 2-hour measurement, compared with the control group. This decrease in pain is consistent with previous findings by Tusek et al[4] and Laurion and Fetzer.[12] Although not statistically significant, 1-hour pain levels and PACU discharge times were lower in the guided imagery groups, suggesting potential clinical significance in these areas as well.

A limitation in the study is the trend of preemptive analgesia. Many providers at this facility provide loading doses of narcotics early in cases to reduce the amount of

narcotics required long-term. Additionally, many APU nurses dosed patients with oral analgesics as soon as they tolerated oral intake. These factors make it more challenging to assess differences in narcotic consumption. This investigation did not intend to manipulate anesthesia practice as it occurs on a daily basis. Instead, this investigation simply provided an additional benefit of guided imagery in the preoperative period and evaluated outcomes as they would occur in a normal daily routine at our institution.

Additional limitations of this study include a single-blinded approach and differences in types of surgeries. Although double-blind studies are usually desired, it is difficult to blind the patient owing to the nature of the study. Additionally, there are significant differences in the degree of pain and length of surgical time between the many types of head and neck procedures. Ideally, a study could focus on only one specific surgery, such as tonsillectomies; however, this was not feasible because of the volume of cases performed at this facility relative to the number of study subjects required.

Levels of operating room noise and variations in preoperative holding area times were not controlled for in this study. The volume and type of music played during surgery, as well as extraneous noise from staff and medical equipment can vary drastically. Other issues, such as surgical delays, staff availability, and room turnover times, can cause prolonged stays in the preoperative holding area. These are real-world conditions that occur daily; to avoid creating a fictitious surgical environment, no attempt was made to control them.

Conclusions

Guided imagery appears to show promise in the areas of decreased preoperative anxiety, length of stay in PACU, and postoperative pain. One advantage of this intervention is its ability to be used by a patient without the direct involvement of trained specialists. Patients can learn this relaxation technique on their own via tapes, CDs, or books. While it may be preferable to implement this therapy in advance of scheduled surgery, this study demonstrates the potential benefits of guided imagery even when used immediately before a procedure. Future research on the use of guided imagery with tighter controls in the same-day surgical settings is needed before any definite recommendations can be made.

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