Anesthesia & Analgesia
Issue: Volume 82(1), January 1996, pp 148-152

Publication Type: [General Article]
ISSN: 0003-2999
Accession: 00000539-199601000-00027

Therapeutic Suggestion Has No Effect on Postoperative Morphine Requirements

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Accepted for publication July 26, 1995.

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Abstract

This study was designed to confirm the effect of therapeutic intraoperative auditory suggestion on recovery from anesthesia, to establish the effect of preoperative suggestion, and to assess implicit memory for intraoperative information using an indirect memory task.Sixty consenting unpremedicated patients scheduled for elective gynecologic surgery were randomly divided into three equal groups: Group 1 received a tape of therapeutic suggestions preoperatively, and the story of Robinson Crusoe intraoperatively; Group 2 heard the story of Peter Pan preoperatively and therapeutic suggestions intraoperatively; Group 3 heard the Crusoe story preoperatively and the Peter Pan story intraoperatively. A standardized anesthetic technique was used with fentanyl, propofol, isoflurane, and nitrous oxide. After surgery, all patients received patientcontrolled analgesia (PCA) with a standardized regimen. In the 24 h postsurgery, morphine use was recorded every 6 h and at 24 h an indirect memory test (free association) was used to test for memory of the stories. Anxiety scores were measured before surgery and at 6 and 24 h postsurgery. There were no significant differences between groups for postoperative morphine use, pain or nausea scores, anxiety scores, or days spent in hospital after surgery. Seven of 20 patients who heard the Pan story intraoperatively gave a positive association with the word "Hook," whereas 2 of 20 who did not hear the story gave such an association. Indirect memory for the Pan story was established using confidence interval (CI) analysis. (The 95% CI for difference in proportion did not include zero). No indirect memory for the Crusoe story could be demonstrated. This study did not confirm previous work which suggested that positive therapeutic auditory suggestions, played intraoperatively, reduced PCA morphine requirements. In contrast, a positive implicit memory effect was found for a story presented intraoperatively.

(Anesth Analg 1996;82:148-52)

There is evidence that processing of auditory information takes place in the brain during the state of apparent unconsciousness in general anesthesia [1,2]. Two different kinds of memory can be distinguished: explicit and implicit [3]. Explicit memory requires conscious retrieval of information as in recall and recognition. Explicit memory for events or stimuli during general anesthesia is often called "awareness," an experience that may cause severe psychologic problems [4]. Implicit memory, on the other hand, occurs when facilitation of task performance

Outline

occurs due to prior exposure to target materials. In contrast to explicit memory, implicit memory does not require conscious or intentional recollection of the target materials [3].

Various clinical investigations have studied whether implicit memory for verbal and other stimuli occurs after adequate general anesthesia. There are many studies on implicit memory function during general anesthesia, some with positive, some with negative results; for a debate on this issue, see Ghoneim and Block [5] and Merikle and Rondi [6]. It has been suggested that salience of the information presented may be relevant to whether it is processed [7]. Therefore, several investigators have used positive therapeutic auditory suggestions, presented intraoperatively, to promote postoperative well being and recovery. These paradigms are more relevant to the patient than the presentation of neutral stimuli and thus, perhaps, more likely to have an effect. Evans and Richardson [8] showed that intraoperative therapeutic suggestions significantly reduced the time spent in hospital after surgery, but Liu et al. [9] were unable to replicate their findings [see also Millar [10] for an extended discussion]. Duration of hospital stay is, however, a rather weak criterion, since it might be influenced by factors other than the patient's well being (e.g., the skills of the surgeon). Measuring postoperative recovery by the amount of morphine used by patient-controlled analgesia (PCA) may provide a more desirable criterion, allowing an observer-independent measurement of the patient's analgesic requirements. The positive results of a study by Korunka et al. [11] confirm the feasibility of using analgesic medication as an outcome variable. McLintock et al. [12] and more recently Caseley-Rondi et al. [13] showed a significant reduction of patients' morphine requirements with PCA after having administered therapeutic suggestions intraoperatively. The present work was initiated as a replication and extension of the potentially important finding by McLintock et al. [12].

If intraoperative suggestions facilitate recovery, then it seems reasonable that preoperative suggestions should have at least an equal, and perhaps greater, effect. The therapeutic effect of a supportive interview preoperatively was studied by Egbert et al. [14,15], and more recently by Reading [16]. They found reduced opioid requirement and earlier discharge in patients who had been visited preoperatively by their anesthesiologist and given information and instructions on the postoperative course. Hence, preoperative anxiety appears to be an important factor in postoperative recovery. Several studies reported associations between preoperative fear or anxiety and postoperative distress and pain, with more fearful patients experiencing more distress and pain [17,18]. Therefore, one can conclude that reducing patients' preoperative anxiety should improve postoperative outcomes. A combination of the two approaches (pre- and intraoperative administration of suggestions) has not, to the best of our knowledge, been undertaken.

This study was designed to confirm the effect of intraoperative therapeutic suggestions on postoperative recovery, to establish the effect of preoperative therapeutic suggestions, to compare the effect of the two, and to assess implicit memory for intraoperative information using an indirect memory task.

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Methods

After approval of the Human Investigation Committee, informed consent was obtained from 60 patients scheduled for hysterectomy, myomectomy, or gynecologic laparotomy. Criteria for inclusion were age (18-65 yr), ASA physical status I-III, and fluency in written and spoken English. Patients with hearing impairment, mental impairment, drug addiction, or intolerance to morphine were excluded, as were patients using opioids, or those who had taken benzodiazepines within 24 h prior to surgery.

On the day of surgery, at the time of consent, patients were informed that a tape would be played to them just before and during surgery and that they would be visited every 6 h during the first 24 h by one of the investigators. They were also instructed in the use of the PCA pump. Information was obtained on age, weight, education, and history of motion sickness. State anxiety was assessed using the State-Trait Anxiety Inventory [19]. State and trait anxiety are assessed with two separate scales, both consisting of 20 self-descriptive items with a four-point rating scale to which patients respond by rating the intensity of their feelings at a particular moment (state) or in general (trait) (1 = not at all, 4 = very much so). Trait anxiety refers to an enduring disposition whereas state anxiety refers to a reaction to a particular situation. Anxiety scores may range from 20 to 80; higher scores reflect more anxiety. Trait anxiety was measured only once, 24 h

postoperatively, so that the results would not be confounded by state measurement.

The patients were randomly assigned to three groups. All patients listened to a tape in the preoperative holding area just before surgery and received a different tape during surgery. An autoreverse cassette player was used to play the tapes. Group 1 heard a 5-min tape of therapeutic suggestions preoperatively and a story about Robinson Crusoe intraoperatively; Group 2 heard a story of Peter Pan preoperatively and therapeutic suggestions intraoperatively; Group 3 heard the story of Robinson Crusoe preoperatively and Peter Pan intraoperatively. The therapeutic suggestions were nonspecific, and in an affirmative tone. They were meant to relax the patients and make them feel secure. All tapes were recorded in a female voice. The intraoperative tapes were played continuously from skin incision until start of closure so that the content of the tape was repeated several times.

No benzodiazepines were used. Induction of anesthesia was with fentanyl (1-3 micro gram/kg) and propofol 2 mg/kg intravenously. Anesthesia was maintained with isoflurane and nitrous oxide, at least 1.3 minimum alveolar anesthetic concentration (MAC) until skin incision and at least 1 MAC thereafter. Fentanyl was used up to 1 micro gram centered dot kg^{-1} centered dot h^{-1} as required. No other opioids were used. In the postanesthesia care unit, all patients received morphine 2 mg intravenously as required for pain relief. After being transferred to their rooms, they received a morphine PCA with 1.5-mg dose and a 6-min lockout with a maximum 4-h dose of 30 mg. If pain was unrelieved by PCA, the patients were given a bolus of 3 mg of morphine from the PCA pump. If required, droperidol was given for nausea.

At 6, 12, 18, and 24 h after surgery one of the investigators visited the patient to assess pain and nausea using separate 100-mm visual analog scales with anchors "no pain/nausea at all" at the lower end, and "worst pain imaginable/very nauseous" at the upper end of the scale. The morphine consumption by PCA during the previous 6 h was recorded, as were all other medications. If a bolus was given, this was included in the 6-h morphine use. State anxiety was reassessed at 6 h after surgery and trait anxiety was measured at 24 h. At 24 h, the patients were asked to identify the last thing they remembered before the operation, the first thing they remembered after the operation, whether they remembered anything about the operation itself, and whether they dreamed anything while they were asleep. An indirect memory test was then administered to test implicit memory for the stories: patients were asked to say "the first thing that comes to mind" upon hearing the words "Friday," "Hook," "Long," "King," and "Table," in this order, for half the patients and with "Friday" and "Hook" reversed for the others. Friday (i.e., the name of Crusoe's native friend) was the keyword for the Robinson Crusoe story [20] and Hook (after Captain Hook) for the Peter Pan story. The other words were fillers. A hit was defined as any association of the keyword with the relevant story, i.e., any response that could be coded as interpreting Friday or Hook as a person rather than a day of the week, or a tool, respectively, was scored as a hit. A positive association from a subject who had not heard the story was scored as a false-positive. The nurses taking care of the patients were asked to rate the patients' mental and physical recovery, both the day of and the day after surgery, on an ordinal scale (numbered 1 to 3), with lower scores representing better recovery.

The tapes were visually indistinguishable and were coded by someone not involved in observing the patients. The patients, investigators, and everyone else involved in the care of the patients were blind to the tape played during the surgery. Patients were instructed not to tell anyone the content of the preoperative tape but, in some cases, the investigators were inadvertently unblinded, after which the tapes were recoded.

One-way analyses of variance and covariance were used to compare mean scores of the three groups on most continuous variables. Visual analog scale scores and PCA measurements were analyzed using repeatedmeasures analyses of variance, using both group and type of surgery as between subjects factors. Multiple regression analysis was used to identify the contributions of pre- and postoperative state anxiety and ASA status in total morphine utilization normalized for patients weight, and in days of postoperative hospitalization. The indirect memory tests were analyzed with confidence interval (CI) analysis [21]; 95% CI for differences between proportions of hits and falsepositives were calculated.

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Results

Patients in the three groups did not differ significantly in age, ASA status, weight, education, preoperative state anxiety, or trait anxiety, or in the type of surgery Table 1. There were no significant differences between groups for pain or nausea scores, postoperative morphine utilization, or days spent in the hospital after surgery Table 2. Neither preoperative nor intraoperative therapeutic suggestions had an effect on any of these variables, nor did type of surgery. Since a substantial number of nurse ratings were lacking, these were not included in the statistical analysis. There was no significant difference in postoperative state anxiety between groups ($F = 1.47$, $df = 2,57$; $P = 0.24$), nor did the suggestions result in significantly lower postoperative state anxiety as compared with preoperative state anxiety. Stepwise multiple regression analysis showed that preoperative state anxiety and ASA status contributed significantly to total morphine utilization normalized for body weight ($F = 5.45$; $df = 2,57$; $P = 0.007$; $R^2 = 0.16$): higher anxiety states and lower ASA status were associated with increased morphine consumption. Postoperative state anxiety did not significantly contribute to morphine consumption, but was the only significant factor in the number of days spent in hospital after surgery ($F = 9.44$; $df = 1,58$; $P = 0.003$; $R^2 = 0.14$): higher postoperative anxiety states were associated with prolonged postoperative stay in hospital.


Table 1


Table 2

None of the patients showed explicit memory for the tape played during anesthesia when interviewed 24 h postoperatively. The indirect memory test, considering each story separately, compared proportions of hits in the relevant group with those of false-positives in the group that had not heard the pertinent story intra- or preoperatively Table 3. Seven of 20 patients who had been exposed to the Peter Pan story intraoperatively (Group 3) gave an association to Hook consistent with the story (proportion of hits in Table 3: 7/20 = 0.35). Only 2 of 20 patients who had not listened to the Peter Pan story (Group 1) associated Hook with the story (proportion of false-positives in Table 3: 2/20 = 0.10). Indirect memory for both the pre- and intraoperatively presented Peter Pan stories was established (95% CIs for differences between proportions did not include zero). No indirect memory for the Crusoe story could be demonstrated.


Table 3

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Discussion

The primary concern of the present study was to examine the effect of positive therapeutic suggestions, both preoperatively and intraoperatively, on postoperative PCA morphine usage. McLintock et al. [12] found that therapeutic suggestions played to patients during general anesthesia resulted in reduced postoperative PCA morphine requirements and Caseley-Rondi et al. [13] recently confirmed this finding. The present study failed to replicate those findings and, furthermore, did not show an effect of preoperative therapeutic suggestions. Some studies that found a positive effect of therapeutic suggestions [8,22] did not use standardized anesthesia. In this study, anesthesia was standardized and adequate anesthesia was ensured during the time the tape was played.

Although patients associated the keyword Hook with the Peter Pan story played to them intraoperatively, they did not associate Friday with the Crusoe story heard intraoperatively, a discrepancy that requires clarification. The Crusoe story was perhaps less well known to the patients in this study than the Peter Pan story although independent support for this assertion is lacking. Priming of old knowledge might be easier to show in an indirect memory test than learning of new information. One could conclude that at a level of 1.0 MAC, learning of new information (i.e., the Robinson Crusoe story and the suggestions) is inhibited, while priming of old knowledge (i.e., the Peter Pan story) is preserved. Block et al. [2], on the other hand, used 1.3 MAC concentrations and were able to show both. It is also possible that patients in Group 3, having heard a story preoperatively, expected to hear a story intraoperatively and were therefore more likely to associate the keyword with the story. However, the proportion of patients in Group 3 scoring a hit for the Pan story was the same as that of patients who had heard the Pan story preoperatively (Group 2).

We expected, but were unable, to show an effect of preoperative therapeutic suggestions since the patients were awake and alert. Apparently, 5 min of positive suggestions under highly stressful circumstances in unfamiliar surroundings were not sufficient to elicit an effect postoperatively.

The implicit memory findings are puzzling. One would expect patients to be more susceptible to information relevant to their situation, i.e., therapeutic suggestions, than to an irrelevant story [7]. A positive effect of the suggestions and a negative result of the indirect memory test would therefore not have been surprising. The opposite pattern was found here. Block et al. [2] found a similar

pattern: implicit memory effects, but no benefits from positive suggestions. It is possible that the measurement of memory is less "noisy" than the medical end-points currently available.

Egbert et al. [14,15] showed that patients who had been visited preoperatively by their anesthetist and had been well informed on the postoperative course, spent fewer days in hospital and required fewer opioids than others. Despite these encouraging findings, other workers have found mixed results with respect to a preoperative visit [22]. Therefore, the relationship between preoperative anxiety and fear and subsequent recovery is as yet unclear. If anything, there seems to be a negative relationship between preoperative fear and postoperative recovery measures. Trying to reduce preoperative anxiety would therefore be of benefit to patients' postoperative recovery. We attempted to do this by administering pre- or intraoperative suggestions to our patients, but were not successful. The dynamics of therapeutic suggestions remain to be fully elucidated in order to define the circumstances under which suggestions, both positive and negative, are effective.

The study was performed by the WHvdL and BLvL as part of their medical training at Erasmus University, Rotterdam, The Netherlands. We would like to thank Marcie Steinberg, CRNA, and Steve Mick, RN, for recording the tape, as well as the physicians and staff of Crawford W. Long Hospital of Emory University in Atlanta for their cooperation and Sony Nederland BV for providing the cassette players.

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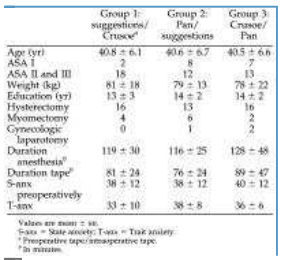
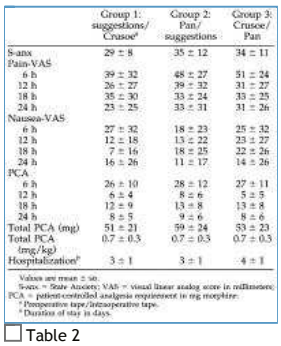


	Group 1: suggestions/ Crusoe[a]	Group 2: Pan/ suggestions	Group 3: Crusoe/ Pan
Age (yr)	40.8 ± 6.1	40.6 ± 6.7	40.5 ± 6.6
ASA I	2	8	7
ASA II and III	18	12	13
Weight (kg)	81 ± 18	79 ± 13	78 ± 22
Education (yr)	13 ± 3	14 ± 2	14 ± 2
Hysterectomy	16	13	16
Myomectomy	4	6	2
Gynecologic laparotomy	0	1	2
Duration anesthesia[b]	119 ± 30	116 ± 25	128 ± 48
Duration tape[b]	81 ± 24	76 ± 24	89 ± 47
S-anx preoperatively	38 ± 12	38 ± 12	40 ± 12
T-anx	33 ± 10	38 ± 8	36 ± 6

Values are mean ± sd.
S-anx = State anxiety; T-anx = Trait anxiety.
[a] Preoperative tape/intraoperative tape.
[b] In minutes.

Table 1



	Group 1: suggestions/ Crusoe[a]	Group 2: Pan/ suggestions	Group 3: Crusoe/ Pan
S-anx	29 ± 8	35 ± 12	34 ± 11
Pain-VAS			
6 h	39 ± 32	48 ± 27	51 ± 24
12 h	26 ± 27	39 ± 32	31 ± 27
18 h	35 ± 30	33 ± 24	33 ± 25
24 h	23 ± 25	33 ± 31	31 ± 26
Nausea-VAS			
6 h	27 ± 32	18 ± 23	25 ± 32
12 h	12 ± 18	13 ± 22	23 ± 27
18 h	7 ± 16	18 ± 25	22 ± 26
24 h	16 ± 26	11 ± 17	14 ± 26
PCA			
6 h	26 ± 10	28 ± 12	27 ± 11
12 h	6 ± 4	8 ± 6	5 ± 5
18 h	12 ± 9	13 ± 8	13 ± 8
24 h	8 ± 5	9 ± 6	8 ± 6
Total PCA (mg)	51 ± 21	59 ± 24	53 ± 23
Total PCA (mg/kg)	0.7 ± 0.3	0.7 ± 0.3	0.7 ± 0.3
Hospitalization[b]	3 ± 1	3 ± 1	4 ± 1

Values are mean ± sd.
S-anx = State Anxiety; VAS = visual linear analog score in millimeters; PCA = patient-controlled analgesia requirement in mg morphine.
[a] Preoperative tape/Intraoperative tape.
[b] Duration of stay in days.

Table 2

Table 3

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