

# **THERAPEUTIC SUGGESTIONS PRESENTED DURING ISOFLURANE ANESTHESIA: PRELIMINARY REPORT**

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## **INTRODUCTION**

It is often assumed that any evidence of memory for intraoperative events indicates a lack of adequate anesthesia. However, the volume of evidence supporting the possibility that patients may continue to process information even during the putatively anesthetized state continues to grow. Most of this evidence comes from studies of implicit perception and memory.<sup>1</sup> These terms refer to the possibility that events that have not been consciously perceived, or are not consciously remembered, nonetheless may influence later experience, thought and action.

Such studies in general anesthesia have generally taken one of three forms. First, there have been studies which have used experimental paradigms derived from laboratory studies of implicit memory in neurologically impaired and normal subjects. For example, Kihlstrom and his colleagues successfully employed a priming paradigm to enhance later performance on a free association task in the absence of recall and recognition following anesthesia with isoflurane.<sup>2</sup> Subjects were presented a list of carefully matched paired associate words during their anesthesia for surgery. Later, subjects were presented with one half of the word pair and were asked to state the first word that came to mind. The magnitude of the priming effect was found to be relatively small, but highly significant.

The second form of implicit perception experiment which has been used in anesthesiology involves the presentation of suggestions for specific types of behavior, ie, ear pulls or chin touches. The subjects are instructed during their surgery by means of a tape-recorded message that they should engage in the behavior during a later postoperative interview. Typically, it is emphatically stated that this behavior is important and desirable.

Unlike traditional tests of memory, memory for the specific content of the presentation is not tested. Instead, behavioral assessments, which include frequency and duration of the target behavior, are utilized as evidence for continued processing during anesthesia.

The third form entails offering the anesthetized patient suggestions for a speeded recovery. The objective of this strategy is to reduce the incidence of common complications of surgery and anesthesia, ie, pain and nausea. Postoperative outcome is most often evaluated by means of self-report measures, observations by an independent observer, or both. The first report of these methodologies being used successfully in anesthesia was published more than thirty years ago.<sup>3</sup> Pearson found a significant decrease in the length of his patients' postoperative hospital stay. Since that time there have been several attempts at replication. Most recently, Evans and Richardson demonstrated this same effect, as well as a significant decrease in postoperative pyrexia and flatulence. In addition, the recovery of patients exposed to the therapeutic suggestion tape was rated as being significantly better than expected by their nurses as compared with an equivalent control group.<sup>4</sup>

However, not every study has succeeded in showing perception or memory. These failures have been attributed to the anesthetic cocktail,<sup>5-8</sup> age,<sup>5</sup> and psychological context.<sup>9,10</sup> In addition, several psychological considerations have been suggested as being important when attempting to elicit evidence of cognitive processing of information during adequate anesthesia. These have included the patient-investigator relationship, motivation of the patient and the grammatical form of the suggestions. It has been previously postulated that suggestions which are affirmative and direct behavior might be more effective in producing the desired behavior than those which are grammatically negative. For example, a suggestion that "you will not have pain" is thought to be less effective than "you will want to get up and out of bed very soon after surgery".

The purpose of the present study is to compare two forms of therapeutic suggestions to a no-suggestion control condition during a standardized anesthetic protocol. One form contains highly specific suggestions, ie, "The area of your surgery is insensitive to pain". The other form contains very general suggestions, ie, "All you have to do is think of yourself as well and you will be well". Both versions were modeled after suggestions used in hypnosis.

## **METHOD AND RESULTS**

A total of 26 patients (21 women, 5 men; ASA I or II), scheduled for either gynecologic (n=21) or orthopedic (n=5) surgical procedures have been studied so far, with Institutional Review Board approval and informed consent.

Anesthesia was induced with thiopental (3-5 mg/kg), followed by vecuronium (0.1 mg/kg) to produce paralysis of skeletal musculature, and maintained with isoflurane; no preoperative medication was given. Subjects were assigned to receive either a specific or general therapeutic suggestion tape, or a no-suggestion control tape, according to a predetermined schedule. All of the tapes contained 18 low frequency words from one of two matched lists. For example: *usufruct*, *megillah*, and *porphyry* are three such words. Both the subject and the postoperative interviewer were kept blind as to the content of the specially coded tapes.

The auto-reverse tape recorder was started at the time of first skin incision and played continuously until the last stitch. At last skin stitch subjects were administered morphine sulphate (0.05 mg/kg) and the muscle relaxation was reversed. After tracheal extubation, the patients were taken to the recovery room. There they received additional morphine sulphate until they were comfortable. Patients were then started on patient-controlled analgesia (PCA) with morphine sulphate. PCA was administered at the following doses: 2 mg for patients aged 18-32 yr, 1.5 mg for patients between 33 and 46 yr, and 1 mg for patients between 47 and 60 yr. The lockout interval was 12 min for all subjects.

On the day following their surgery subjects were interviewed and administered a battery of psychological tests in counterbalanced order. The test battery included the McGill Pain and Nausea Questionnaires<sup>11,12</sup> and the Positive and Negative Affect Scales (PANAS).<sup>13</sup> Subjects were also administered an explicit memory test for the words presented during their anesthesia. This was accomplished by having the subjects rate the probability that they heard the words during their surgery on a scale from 1 (absolutely sure that they did not hear the word) to 5 (absolutely sure that they heard the word) while listening to a tape-recorded, randomized presentation of the target words along with an equal number of similar low frequency lures. Table 1 shows the mean and standard deviations of the scores obtained on the psychological tests by each of the groups.

The Well-Being score is a difference score derived by taking the sum of positive affect ratings minus the negative affect ratings on the PANAS,

hence, higher scores are more favorable. The Discomfort rating is the sum of the negative affect, total pain and total nausea scores, with lower scores being more favorable. One-way analyses of variance of each variable revealed significant group differences for Well-Being only, ( $F = 3.90$ ;  $df = 2,19$ ;  $p < 0.05$ ). However, it should be noted that the trends for Discomfort and Total Pain (ie, the sum of three different pain ratings) also showed better outcome in the experimental groups compared with control, and for patients receiving the specific suggestions compared with those who received general suggestions. There was no such trend for Total Nausea.

Table 1. Group Scores on Psychological Variables

Variable	Specific		General		Control	
	Mean	SD	Mean	SD	Mean	SD
Well-Being	17.14	7.43	8.86	8.65	7.13	5.77
Discomfort	23.00	10.17	36.71	19.30	41.25	24.12
Total Pain	10.14	7.01	18.43	12.57	20.38	12.42
Total Nausea	8.43	8.44	6.00	5.92	7.63	11.21

Planned comparisons revealed a significant difference between Specific Suggestion condition and controls on Well-Being, ( $t = 2.94$ ;  $df = 13$ ;  $p < 0.05$ ); there were strong trends for Discomfort and Total Pain, both  $p < 0.10$ . The General Suggestion group did not differ from controls on any of the variables; nor did the Specific Suggestion and General Suggestion groups differ significantly from each other.

Analysis of PCA usage and other behavioral measures of outcome has been deferred until data collection is completed. No subject showed explicit recognition of the words presented during surgery, or conscious recall of any intraoperative event.

## DISCUSSION

The results presented in this preliminary report, based on only a portion of the planned sample, suggest that the processing of auditory information during adequate anesthesia with isoflurane cannot be ruled out. Implicit perceptual processing appears to be enhanced when the material presented is specific and directive in nature, even in the absence of conscious recall and recognition. Postoperative affect and pain perception appear to be appropriate targets for intraoperative suggestions. The ability to influence the postoperative nausea experience appears to be limited. The otherwise overall tendency for the Specific Suggestions to produce more of an effect than the General Suggestions may indicate that the specific form

and content of statements made while patients are anesthetized may have some influence in determining postoperative outcome.

#### **AUTHOR NOTES**

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# MEMORY AND AWARENESS IN ANESTHESIA

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