Brief Report

Levels of Consciousness During Regional Anesthesia and Monitored Anesthesia Care: Patient Expectations and Experiences

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Complaints of "intraoperative awareness" after regional anesthesia and monitored anesthesia care have been reported. We hypothesized that this may be due to either unmet expectations regarding levels of consciousness or states of consciousness resembling general anesthesia. A structured interview assessing expected and experienced levels of consciousness was given to 117 patients who underwent regional anesthesia or monitored anesthesia care. Complete unconsciousness was the state most often expected and subjectively experienced. Furthermore, only 58% of patients had expectations set by the anesthesia provider. These data indicate that, from the patient's perspective, the boundary between general and nongeneral anesthesia is obscured.

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There is increasing concern about intraoperative awareness by both physicians and patients.[1] Although most attention has naturally been focused on complaints of awareness during general anesthesia, there are also reports of patients complaining of intraoperative awareness after regional anesthetics and monitored anesthesia care (MAC).[2] Mashour et al.[3] demonstrated no statistically significant difference between the incidence of intraoperative awareness complaints in patients receiving general anesthesia (0.023%) and those who received only regional anesthesia or MAC (0.03%). These data suggest a need to characterize the counterintuitive complaint of awareness in patients not receiving general anesthesia.

We hypothesized that patients undergoing regional anesthesia or MAC may either have unmet expectations regarding their state of consciousness or experience states that are subjectively perceived as general anesthesia. To our knowledge, subjective states of consciousness during these anesthetic techniques have not been studied. We thus administered a structured interview assessing patient expectations and subjective experiences during regional anesthesia and MAC.

METHODS

After IRB approval, trained research assistants interviewed patients ≥18 yr old receiving regional anesthesia or MAC at two institutional sites. We made an *a priori* determination to interview ≥100 patients, as the lack of prior data precluded power analysis. Consent was obtained before any preoperative sedation and patients received no additional information regarding their anesthetic care. Interviews (Table 1) were administered postoperatively after patients met criteria for discharge from the recovery room. To assess for possible response-order bias, two forms with reversed orders of response options were randomly used. The authors were not involved with the survey administration.

Patients were asked to identify their expected level of consciousness on a 1–10 scale, with 1 being complete unconsciousness and 10 being complete wakefulness. The source of expectation and the highest/lowest levels of consciousness they experienced during the procedure were also assessed. Patients were also asked about preoperative anxiety and intraoperative pain on a 1–10 scale, as well as overall satisfaction. The interview was validated for patient comprehension before the study.

Logistic regression was used to determine risk factors for having at least a 5-point difference between the experienced and expected levels of consciousness.

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Table 1. Structured Interview to Assess Levels of Consciousness After Regional Anesthesia or Monitored Anesthesia Care

1. Thinking back to before the procedure, what level of consciousness did you expect? Use a scale of 1–10, with 1 being completely asleep and 10 being completely awake.
2. During the actual procedure, what was your highest and lowest level of consciousness, using the same 1–10 scale?
3. How did your actual experience compare with your expectations?
   1. My experience was as expected
   2. My experience was better than expected
   3. My experience was worse than expected
4. Who set your expectation for the level of consciousness during your procedure?
   1. Anesthesiologist or anesthesia provider
   2. Surgeon or member of surgical team
   3. Nurse
   4. My personal expectation
   5. Other (please specify)
   6. Do not know/do not remember
5. How much anxiety did you have before the procedure, with 1 being no anxiety and 10 being extreme anxiety?
6. How much pain did you have during the procedure, with 1 being no pain and 10 being the worst pain imaginable?

Based on this analysis, linear regression was used to model the expected level of consciousness and lowest level of consciousness. Fisher's exact tests were used to test for possible response-order bias and for a possible relationship between the source of expectations and the expected level of consciousness. All *P* values were two tailed, and a significance threshold of 0.05 was used. SPSS v.15 (SPSS, Chicago, IL) and SAS v.9.1 (SAS, Cary, NC) were used for analysis.

RESULTS

One hundred seventeen valid interviews were conducted between March 7, 2008 and July 10, 2008. Table 2 lists demographic information and patient characteristics. The anesthesia provider was reported as a source of expectations regarding level of consciousness by 68 patients (58%); "personal expectation" was the next most common response (29 patients, 25%), which included expectations based on prior anesthetic experiences (Fig. 1). The source of expectations did not differ according to the order of response options ($P = 0.14$) and did not influence the expected level of consciousness ($P = 0.77$). One hundred thirteen patients (97%) reported that their overall anesthetic experience was "as good as" or "better than" expected.

Table 3 lists the expected level of consciousness, along with the highest and lowest levels of consciousness subjectively experienced. Complete unconsciousness ("1") was the modal response for the expected level of consciousness (38 patients, 32%). Complete unconsciousness was also the modal response for both the lowest level of consciousness (69 patients, 59%) and the highest level of consciousness (45 patients, 38%).

Table 2. Demographics and Patient Characteristics

	Overall
Total no.	117
Gender	
Male, no. (%)	45 (38)
Female, no. (%)	72 (62)
Age, mean (range)	58 (20–89)
ASA	
1, no. (%)	16 (14)
2, no. (%)	58 (50)
3, no. (%)	41 (35)
4, no. (%)	2 (2)
Anesthetic type	
MAC only, no. (%)	5 (4)
MAC + local, no. (%)	9 (8)
MAC + regional, no. (%)	72 (62)
Spinal, no. (%)	29 (25)
Epidural, no. (%)	2 (2)
Procedure type	
Orthopedic, no. (%)	37 (32)
Dermatological, no. (%)	14 (12)
Urological, no. (%)	19 (16)
Gynecological,[a] no. (%)	20 (17)
Plastics, no. (%)	7 (6)
Neurosurgical, no. (%)	5 (4)
General, no. (%)	15 (13)

MAC = monitored anesthesia care; ASA = classification of the American Society of Anesthesiologists.

[a] Includes breast procedures.

Total percentage may exceed 100 because of rounding effects.

Figure 2 shows the deviations of the experienced level of consciousness from the expected level of consciousness. Eighteen patients (15%) were at some time less awake than expected by at least 5 points, whereas nine patients (8%) were at some time more awake than expected by at least 5 points. Preoperative anxiety was a significant predictor of a patient being less awake than expected by 5 points or more, controlled for age, ASA classification, sex, pain, and type of anesthesia ($P = 0.005$) with an adjusted odds ratio for a unit increase in anxiety of 1.3 (95% CI, 1.1–1.5). No significant predictors were found for being more awake than expected by 5 or more points.

Neither the expected nor the lowest level of consciousness was related to anxiety, controlled for age, gender, and anesthetic type ($P = 0.59$ and 0.08, respectively). However, adding the expected level of consciousness as a covariate in the linear regression, a unit increase in anxiety led to a decrease in the minimum level of consciousness by 0.2 (95% CI, 0.02–0.36; $P = 0.03$).

DISCUSSION

We demonstrate that patients not undergoing general anesthesia most often expect and subjectively experience total unconsciousness. The perception of any sensory stimuli beyond unconsciousness might thus be misinterpreted as unintended intraoperative awareness and recall. Given the potential for such misinterpretation, anesthesia providers should clearly set appropriate expectations preoperatively. This is

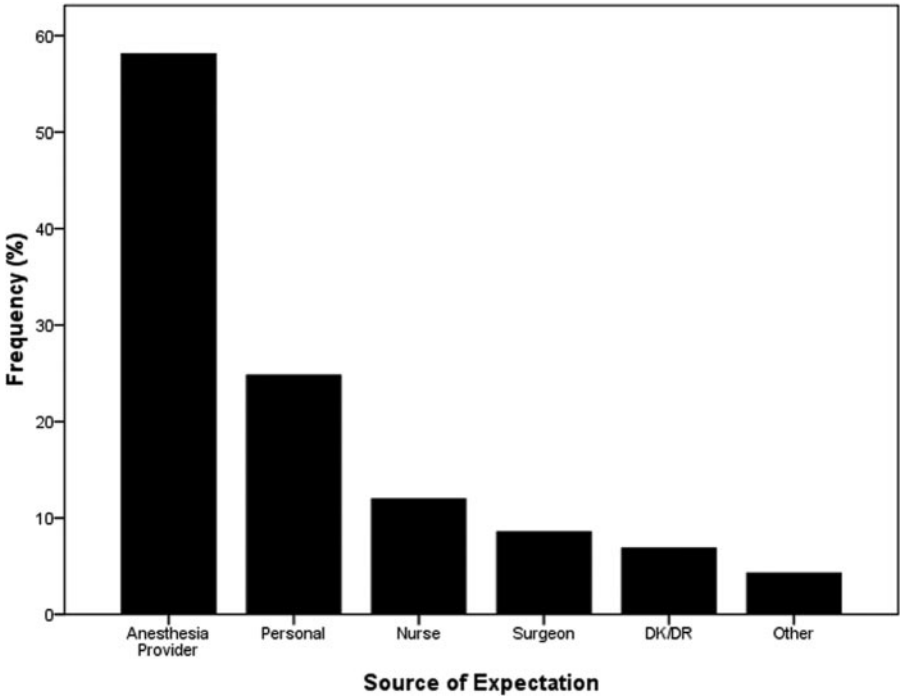

Figure 1. Source of expectations with respect to level of consciousness. Note: 10 patients reported more than one source of expectations. DK/DR = do not know/do not remember.

Table 3. Expected and Experienced Levels of Consciousness in Patients Undergoing Regional Anesthesia or Monitored Anesthesia Care

Level of consciousness	Expected	Highest level experienced	Lowest level experienced
1–3	48 (41%)	54 (46%)	80 (68%)
4–7	48 (41%)	24 (21%)	19 (16%)
8–10	21 (18%)	39 (33%)	18 (15%)

Levels of consciousness were collapsed to the ranges of 1–3, 4–7, and 8–10, with 1 being complete unconsciousness and 10 being complete wakefulness.

especially important as only 58% of patients had their expectations set by the anesthesiologist, resident, or nurse anesthetist during the preoperative visit. Finally, patients with higher preoperative anxiety levels are at risk for lower levels of consciousness during regional anesthesia or MAC.

Given the amnestic effects of both midazolam and propofol,[4,5] one limitation of the study design is that patients reporting complete loss of consciousness may have been awake but unable to recall the experience, notwithstanding possible implicit memory formation.[6] It was our goal, however, to assess only the subjective experience of the patient; patient experiences could be correlated with objective intraoperative observation in future studies. Furthermore, not all eligible patients during the study period were enrolled, but bias was likely minimal as omissions were due to scheduling issues unrelated to patient characteristics. Finally, we did

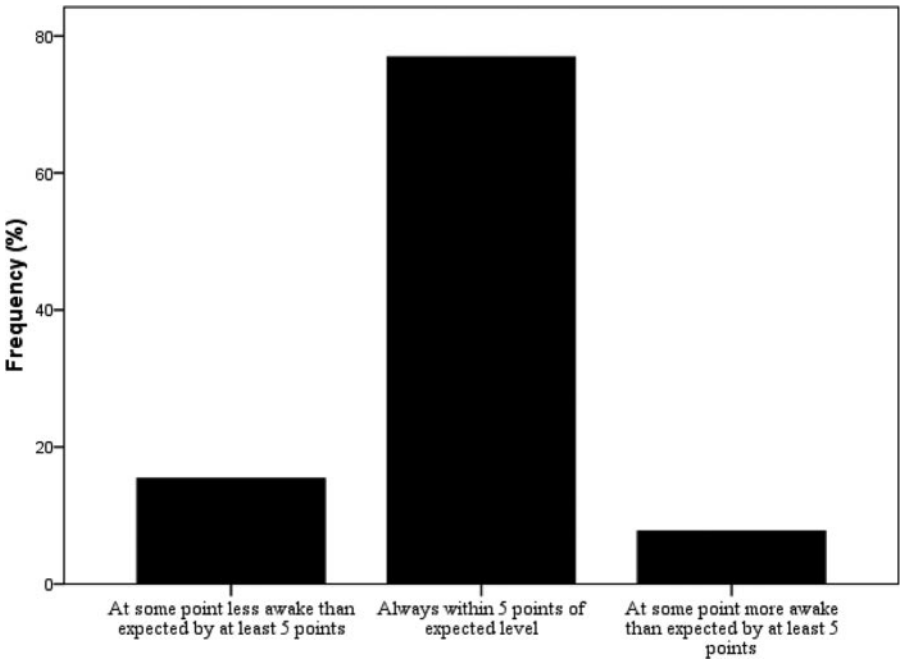

Figure 2. Comparison of expected with subjectively experienced levels of consciousness.

not assess expectations preoperatively to avoid conditioning intraoperative experiences. Future studies could compare preoperatively assessed patient expectations to postoperatively reported experiences.

In conclusion, the distinction between general and nongeneral anesthesia is often unclear from the patient's perspective. Anesthesia providers might better educate patients regarding intraoperative levels of consciousness and postoperative recall.

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