# Nerve Localization Techniques for Interscalene Brachial Plexus Blockade: A Prospective, Randomized Comparison of Mechanical Paresthesia Versus Electrical Stimulation

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Postoperative neurologic symptoms (PONS) are relatively common after upper extremity orthopedic surgery performed under peripheral neural blockade. In this study, we prospectively compared the incidence of PONS after shoulder surgery under interscalene (IS) block using the electrical stimulation (ES) or mechanical paresthesia (MP) techniques of nerve localization. For patients randomized to the MP group, a 1-in, 23-g long-beveled needle was placed into the IS groove to elicit a paresthesia to the shoulder, arm, elbow, wrist, or hand. For patients randomized to the ES group, a 5-cm, 22-g short-beveled insulated needle was placed into the IS groove to elicit a motor response including flexion or extension of the elbow, wrist, or fingers or deltoid muscle stimulation at a current between 0.2 and 0.5 mA. Each IS block was performed with 50–60 mL of 1.5% mepivacaine containing 1:300,000 epinephrine and 0.1meq/L sodium bicarbonate. Two-hundred-eighteen patients were randomized between the two groups. One patient was lost to follow-up. Twenty-five patients (23%) in the ES group experienced paresthesia during needle insertion. The incidence of PONS using the ES technique was 10.1% (11/109), whereas the incidence with the MP technique was 9.3% (10/108) (not significant). The PONS lasted a median duration of 2 mo, and symptoms in all patients resolved within 12 mo. The success rate, onset time, and patient satisfaction were also comparable between groups. We conclude that the choice of nerve localization technique can be made based on the patient's and anesthesiologist's comfort and preferences and not on concern for the development of PONS.
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Postoperative neurologic symptoms (PONS) are relatively common after upper extremity orthopedic surgery performed under peripheral neural blockade (9%–19%) (1–3). Fortunately, the PONS reported in these studies are often short-lived and mild in severity. Causes of these postoperative findings may be multifactorial. Possible etiologies include anesthetic factors, such as needle trauma (4) or toxicity from local anesthetics or additives. A second potential etiology is surgical trauma or traction injuries (5). Positioning of the upper extremity, either intraoperatively or postoperatively, can also affect the incidence of PONS, as can tourniquet use or localized pressure from splints or casts. Finally, preoperative conditions affecting neurological function in the distribution of the surgical or anesthetic site can also present as PONS (2). Determining the exact etiology of PONS is often difficult.

The most common methods of nerve localization of the brachial plexus via the interscalene (IS) approach are mechanical paresthesia (MP) and electrical stimulation (ES). Prior studies have compared the efficacy and complications of various localization techniques with different approaches to the brachial plexus, such as the axillary block (6–8). Other large studies have independently evaluated PONS after IS blocks using either ES (2) or MP (1). McClain and Finucane (9) randomized 42 patients to either paresthesia or nerve stimulator and found no difference in success rates between the groups. We know of no large series that has prospectively compared these techniques with regard to the development of PONS.

In a randomized, prospective fashion, we compared the incidence of complications, as well as the efficacy of IS blocks using the ES or MP techniques of nerve localization. Our hypothesis was that the incidence of clinically apparent PONS was not affected by the method of nerve localization of the brachial plexus via the IS approach. The primary outcome of this report was the incidence of PONS after IS block for

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arthroscopic shoulder surgery. The secondary outcomes were the anesthetic success rates of the different methods of nerve localization and overall patient satisfaction with each method.

## METHODS

After obtaining IRB approval for the study, 218 patients were randomized into one of two groups of nerve localization. A computer-driven random number generator printed 218 cards titled "nerve stimulator" or "paresthesia." The cards were placed in sealed, opaque envelopes by one of the co-investigators (VB). A physician co-investigator approached all potential subjects in a holding area on the day of surgery and obtained informed written consent. The physician co-investigator then chose one envelope at random and the patient was assigned to the indicated group.

Patients were transferred to the operating room and standard ASA monitors were placed. At the discretion of the attending anesthesiologist, subjects received IV midazolam (Baxter Healthcare, Deerfield, IL) in 1- to 2-mg increments every 1–2 min until they appeared calm and relaxed to the anesthesiologist. All patients remained awake and responsive throughout placement of the block. All blocks were performed by one of five physician co-investigator anesthesiologists working alone or in conjunction with an anesthesia resident (CA-1 or CA-3) or regional anesthesia fellow.

Patients randomized to the MP group underwent the following anesthetic induction: a 1-in, 23-g long-beveled needle (PrecisionGlide, Becton-Dickinson, Franklin Lakes, NJ) was placed into the IS groove with the bevel of the needle oriented parallel to nerve fibers. A paresthesia, explained to the patient as any sensory perception distant from the site of needle insertion, to the shoulder (excluding a paresthesia to the posterior shoulder area), arm, elbow, wrist, or hand was accepted as evidence of correct needle placement. In situations where another paresthesia (posterior shoulder, neck, or chest) was reported by the patient, the needle was withdrawn and redirected accordingly.

Patients randomized to the ES group underwent the following anesthetic induction: a 5-cm, 22-g short-beveled insulated needle (Stimuplex, B. Braun Medical, Bethlehem, PA) was placed into the IS groove with the bevel oriented parallel to nerve fibers. The initial settings for the nerve stimulating unit (Stimuplex, B. Braun Medical) were a current of 0.6 to 0.8 mA, with a pulse duration of 0.1 ms and a frequency of 2 Hz. A visible motor response including flexion or extension of the elbow, wrist or fingers, or deltoid muscle stimulation at a current between 0.2 and 0.5 mA was accepted as correct needle placement.

After obtaining satisfactory nerve localization with either technique, patients were given a 1 mL test dose to exclude severe pain on injection. Fifty to 60 mL of mepivacaine 1.5% (Carbocaine, Abbott Laboratories, North Chicago, IL) containing 1:300,000 epinephrine and sodium bicarbonate (0.1 meq/mL) was injected in divided doses with aspiration every 5 mL. A single trained investigator (VB) recorded the number of needle passes, sensory and motor responses, adverse reactions (tachycardia or seizures), and pain or accentuation (defined as a noticeable yet non-painful sensation) on injection for every block. If pain was experienced by the patient, the needle was withdrawn slightly, and the injection was continued. "Training" for this investigator involved observing and recording similar data in more than 2000 subjects in a prior study (10). The initial needle insertion counted as one "needle pass." Any subsequent forward movements of the needle that were preceded by retractions of the needle were counted as additional passes.

After injection of the local anesthetic, the patient was placed in the "beach chair" position sitting at approximately 75 degrees to the horizontal with the legs resting on a foot plate and prepared for surgery. Motor blockade was evaluated by testing deltoid and biceps function on a 3-point (0 = no movement, 1 = weak, 2 = normal) scale 5 min after completion of the local anesthetic injection. Sensory function was evaluated in the distribution of the median nerve at the same time interval using a 3-point scale (0 = numb, 1 = tingling, 2 = normal). These sites were selected because they were convenient to test during surgical preparation. On completion of surgery, the anesthesiologist performing the block rated the effectiveness of the block for surgical anesthesia as successful (the patient neither expressing nor reporting any discomfort throughout the surgical procedure), adequate (the patient experiencing mild discomfort that was successfully treated with a sedative or narcotic), or inadequate (required general anesthesia with a laryngeal mask airway or endotracheal tube.) Sedation during the procedure was at the discretion of the anesthesiologist and consisted of incremental doses of midazolam (Baxter Healthcare, Deerfield, IL), fentanyl (Abbott Laboratories, North Chicago, IL), or propofol (Baxter Healthcare).

On surgical follow-up (usually at 1 wk postoperatively), patients were asked a detailed series of questions regarding pain, paresthesias, or weakness in the distribution of the brachial plexus and their level of satisfaction with their anesthetic experience using a scripted questionnaire (Appendix) administered by VB. Four to five weeks postoperatively, patients were contacted by telephone, and this same questionnaire including postoperative neurological findings and satisfaction was repeated. Patients with neurological symptoms during either contact were followed with regular telephone calls until all symptoms resolved. Referrals for formal neurologic evaluation were left to the discretion of the attending orthopedic surgeon. However, no such referrals were made. Two anesthesiologist co-investigators reviewed the responses for each patient with a positive finding and classified them into one of

three groups: "likely anesthesia related," "likely surgical related," or "unable to differentiate." If the two co-investigators were not in agreement as to the classification of the PONS, a third anesthesiologist co-investigator was used to make the final anesthetic determination. An independent neurologist (AW), blinded as to all aspects of the protocol, reviewed the questionnaire responses for each patient with a positive finding. If the neurologist's determination differed from that of the anesthesiologist's, the neurologist's determination was taken as the final result.

Examples of PONS "likely surgical related" included pain or numbness around an incision site. Examples of PONS "likely anesthetic related" included dysesthesias in a distribution anatomically remote to surgery but within the distribution of the brachial plexus. All other PONS were characterized as "unable to differentiate." For the purposes of the study, to capture all possible PONS associated with the anesthetic block, the categories of "likely anesthetic related" and "unable to differentiate" were combined and compared with "likely surgical related."

Because of the nature of the two methods of needle localization and minimal sedation used, blinding on the part of the anesthesiologist performing the anesthetic, co-investigator recording the observations, or subject was not possible. Although an attempt was made to blind the co-investigator (VB) during contact for follow-up, it should be assumed that blinding for the follow-up telephone calls was imperfect.

### Power Analysis

Two studies have evaluated the incidence of PONS after the MP and ES techniques of the IS block independently (1,2). Borgeat et al. (2) found a 16% incidence at 10 days after ES. Urban and Urquhart (1) found a 9% incidence at 1 day and a 2.5% incidence at 14 days after the MP method. Estimating the incidence of PONS at 10 days by linear interpolation in the latter study provides an occurrence of 4.5%. Using an inference of proportions comparing two independent samples in a two-sided test, setting $\alpha$ at 0.05 with 80% power, yields a sample size of 109 patients in each group to detect a significant difference between techniques.

Variables described as mean ± SD were compared using $\chi^2$ test. Significance was set at $P < 0.05$. All analyses were performed using StatView 5 for Macintosh and Windows (SAS Institute, Cary, NC).

## RESULTS

Four-hundred-eighty-five patients were scheduled to undergo arthroscopic surgery of the shoulder with one of the 5 anesthesiologist co-investigators during the study period of March 17, 2004 to March 30, 2005. Procedures included labral repair, rotator cuff repair, acromioplasty, acromioclavicular resection, and capsular release. Of these potential subjects, 243 were excluded for one of several reasons, including contraindication to IS block (skin infection, allergy to local anesthetic, patient refusal, or severe pulmonary disease), age <18 yr or older than 70 yr, a significant language barrier, or clinical evidence of neurological deficits in the operative arm. Other exclusion criteria were a surgical request for a long-acting local anesthetic in the block, unavailability of VB and patient request for a particular method of needle localization based on prior experiences. Of the remaining 242 eligible subjects who were approached for recruitment, 24 refused to participate in the investigation. Therefore, 218 were enrolled into the study. One patient in the MP group was lost to all follow-up, leaving 109 patients in the ES group and 108 patients in the MP group for analysis. All remaining patients were successfully contacted on at least one of the two follow-up telephone calls. Seventy-two patients (66%) in the ES group were successfully contacted on early follow-up, whereas 95 patients (87%) were successfully contacted on late follow-up. Seventy-three patients (68%) in the MP group were successfully contacted on early follow-up, while 99 patients (92%) were successfully contacted on late follow-up.

**Table 1.** Patient Characteristics

| | Electrical stimulation | Mechanical paresthesia |
|---|---|---|
| Age (yr) | 46 ± 14 | 45 ± 15 |
| Height (cm) | 174 ± 9 | 174 ± 10 |
| Weight (kg) | 82 ± 16 | 83 ± 18 |
| Body mass index | 27 ± 4 | 27 ± 5 |

Values are mean ± SD.

There were no significant differences between groups.

There were no differences between the groups with respect to age, height, weight, or body mass index (Table 1). Success rate (defined as a successful or adequate anesthetic) as determined by the attending anesthesiologist was 94% in the ES group and 96% in the MP group ($P = 0.1198$). No patient who ultimately developed PONS had a failed block. Failed blocks were analyzed in their respective groups on an "intention-to-treat" basis. Twenty five patients in the ES group experienced a paresthesia during needle insertion (23%). Injection of local anesthetic occurred on 6 occasions, whereas the needle was redirected to obtain a motor response on the remaining 19. None of the 25 patients developed PONS. These patients were grouped as ES and also analyzed on an "intention-to-treat" basis.

Multiple variables were compared between the ES and MP groups (Table 2). Significant differences were found between groups with respect to milligrams of midazolam administered to patients, accentuation during injection, and time to perform the block.

No significant differences were found in the sensory or motor onset between the ES or MP groups (Table 3). Because of the progression of the surgical procedure and requests for sedation by patients, complete information on all patients was not obtained.

**Table 2.** Anesthetic and Patient Characteristics

| | Electrical stimulation | Mechanical paresthesia |
|---|---|---|
| Dose of midazolam (mg)* | 3.0 ± 1.8 | 1.6 ± 0.9 |
| Number of needle passes | 5.4 ± 6.4 | 4.9 ± 4.2 |
| Time to perform block (min)† | 5.0 ± 2.7 | 4.1 ± 2.3 |
| Pain during injection | 12 (11) | 15 (14) |
| Accentuation during injection* | 31 (28) | 61 (56) |
| History of DM | 2 (2) | 3 (3) |
| Attending versus trainees | 49/60 | 38/70 |
| Postoperative pain at needle site | 9 (9) | 8 (9) |
| Satisfaction rate—early f/u | 93% | 90% |
| Satisfaction rate—late f/u | 95% | 87% |

Data are described as mean ± SD or as n (%).

DM = diabetes mellitus.

Attending versus Trainees indicates what individual performed the block.

* $P < 0.0001$; † $P < 0.01$.

Two and four patients, in the ES and MP groups, respectively, experienced PONS that were determined to be likely surgically related and no further follow-up was performed. Eleven patients (10.1%) in the ES group reported PONS that were likely anesthetic related or unable to differentiate on either the early or late follow-up. Ten patients (9.3%) in the MP group reported PONS that were likely anesthetic-related or unable to differentiate on either the early or late follow-up. There was no significant difference between the groups with regard to incidence of likely anesthetic-related or unable to differentiate PONS. The details of each patient who experienced PONS and the relationships to the motor or sensory responses experienced during their anesthetic are outlined in Table 4. The PONS lasted a median duration of 2 mo (25$^{th}$ percentile = 1 mo; 75$^{th}$ percentile = 3 mo). PONS resolved within 12 mo in all patients. No referrals were made by the orthopedic surgeon for formal neurologic evaluation. Table 5 compares characteristics of the anesthetics and patients for all subjects who developed PONS with those who did not suffer this complication. The only significant difference was that postoperative pain at the needle site was reported more frequently in those patients who also developed PONS.

**Table 3.** Patients Exhibiting Some Evidence of Brachial Plexus Blockade (0 or 1) at 5 min After Completion of Local Anesthetic Injection

| | Electrical stimulation (N = 102) | Mechanical paresthesia (N = 102) |
|---|---|---|
| Deltoid | 94 (92%) | 95 (93%) |
| Biceps | 83 (81%) | 89 (87%) |
| Median nerve | 83 (81%) | 89 (87%) |

Values are N (%).

Motor blockade was evaluated by testing deltoid and biceps function on a 0 (no movement), 1 (weak), 2 (normal) scale at 5 min. Sensory function was evaluated in the distribution of the median nerve at the same time interval using a 3-point scale (0 = numb, 1 = tingling, 2 = normal).

There were no significant differences between groups.

## DISCUSSION

The primary conclusion of our study is that there is no significant difference in the incidence of PONS between the ES and MP methods of nerve localization for the IS approach to the brachial plexus. Furthermore, the success rate, onset characteristics, and patient satisfaction were also comparable between groups. The implication of these findings is that clinicians may select either method of nerve localization based on factors such as anesthesiologists' experience, patients' preferences, or clinical setting without regard to the development of PONS.

Several prior studies have evaluated the incidence of PONS after peripheral nerve blockade for surgery. The incidence of PONS in these studies is quite variable and may reflect the methods used to identify PONS. The lowest rates were found in studies using retrospective analysis (11–13) or using surgical referrals to detect PONS (14,15). The rate of PONS attributable to the anesthetic in these reports is generally 2% or less.

This contrasts with other reports that have used prospective methodology and direct patient follow-up. These studies (1–3,16) reported PONS occurring in 11% to 16% of patients after various peripheral nerve blocks. Both the methodology and the incidence of PONS in our report are similar to that of these other prospective studies.

It is important to emphasize that each of the noted studies, as well as this report, included both a peripheral nerve block and a surgical procedure. Consequently, the etiology of the PONS may have been related to the anesthetic, the surgical procedure, an event during recovery, or a pre-existing condition that only manifested after anesthesia and surgery. Lynch et al. (5) reported a 3% incidence of new brachial plexus deficits after shoulder arthroplasty performed under general anesthesia without a regional anesthetic. Furthermore, McCartney et al. (17) found no difference in the incidence of postoperative paresthesias after hand surgery performed with either an axillary block or general anesthesia. Therefore, it is important to accept that the etiology of PONS is not always related to the peripheral nerve block alone.

One significant difference between the ES and MP groups is that the mean dose of midazolam before the block in the ES group was twice that in the MP group. This has the potential to affect patient-oriented responses such as satisfaction with the anesthetic. The goal of sedative management before the block was to provide anxiolysis only. It is clear, however, that anesthesiologists performing IS blocks are more comfortable administering more sedation when using the ES technique. This may be because no subjective patient response is necessary when using the ES technique, whereas a subjective patient response is essential to the MP technique. It may also be a result of anesthesiologists' perception that ES is more uncomfortable or distressing to patients compared with MP techniques.

**Table 4.** Postoperative Neurologic Symptoms and Relations to Motor or Sensory Responses During Anesthetic

| Patient # | Location of Twitch/Paresthesia | Location of Pain or Accentuation | Location of PONS | Description of PONS | Duration of PONS (mo) |
|---|---|---|---|---|---|
| Mechanical paresthesia technique | | | | | |
| 36 | Neck, chest, shoulder | P = Neck | Elbow | Shooting pain | 1 |
| 39 | Shoulder, triceps | A = Shoulder | Arm to hand | Pins and needles | 1 |
| 41 | Neck, shoulder | A = Hand | Forearm to thumb | Numbness | 3 |
| 72 | Shoulder | P = Arm | Shoulder to elbow | Shooting pressure | 2 |
| 92 | Shoulder | A = Shoulder | $4^{th}$ and $5^{th}$ fingers | Numbness | 12 |
| 131 | Shoulder, biceps | A = Arm to Hand | Wrist to thumb | Numbness | 9 |
| 147 | Shoulder | A = Forearm | Shoulder to elbow | Shooting pain | 1 |
| 148 | Shoulder | A = Shoulder | Biceps | Shooting pain | 2 |
| 151 | Elbow | A = Shoulder | Hand | Throbbing | 1 |
| 210 | Neck, biceps | A = Neck | Elbow to wrist | Shooting pain | 1 |
| Electrical stimulation technique | | | | | |
| 1 | Paresthesia to hand | P = Neck | Shooting pain | Arm to hand | 11 |
| 43 | Diaphragm, deltoid | A = Neck | Shoulder to hand | Shooting pain | 3 |
| 46 | Biceps | N | Triceps, biceps | Burning sensation | 1 |
| 56 | Trapezius, pectoralis, triceps | N | Elbow | Extreme pressure | 2 |
| 79 | Pectoralis, deltoid | N | Hand | Numbness | 12 |
| 150 | Trapezius, biceps | N | Arm | Pins and needles | 3 |
| 152 | Deltoid | A = Shoulder | Hand | Numbness | 1 |
| 174 | Trapezius, biceps | A = Neck | Biceps | Shooting pain | 1 |
| 188 | Trapezius, biceps | N | Hand | Numbness | 1 |
| 193 | Trapezius, deltoid | A = Neck | $4^{th}$ & $5^{th}$ fingers | Pins and needles | 1 |
| 207 | Trapezius, deltoid, pectoralis, biceps | N | Palm of hand | Tingling | 2 |

Location of twitch/paresthesia is as described by observer (VB); location of pain or accentuation as described by subject; description of PONS as described by subject. P = pain during injection of local anesthetic; A = nonpainful sensation or accentuation of paresthesia during injection of local anesthetic; N = no response during injection of local anesthetic.

A second significant difference between the ES and MP groups was a noticeable accentuation on local anesthetic injection. The incidence of accentuation (defined differently from pain on injection) on injection was twice as high in the MP group compared with the ES group. However, accentuation upon injection did not translate into a higher rate of PONS.

In analyzing the details of responses of patients who developed PONS (Table 4), there does not seem to be a relationship between the location of the paresthesia or motor response during ES and the location of the PONS. A correlation was found in 6 cases; no relationship was noted in the remaining 15. This may indicate that the mechanisms of PONS may be more complex than simply mechanical damage to a given nerve by the needle and may truly be related to other factors previously discussed.

**Table 5.** Comparison of Characteristics of Patients Who Developed Postoperative Neurological Symptoms (PONS) Versus Those Who Did Not Develop PONS

| | PONS | No PONS |
|---|---|---|
| Dose of midazolam (mg) | 2.0 ± 1.5 | 2.3 ± 1.6 |
| Number of needle passes | 5.6 ± 9.5 | 5.1 ± 4.8 |
| Time to perform block (min) | 4.2 ± 2.5 | 4.6 ± 2.5 |
| Pain during injection | 3 (14) | 24 (12) |
| Accentuation during injection | 12 (57) | 80 (41) |
| History of DM | 0 (0) | 5 (3) |
| Attending versus trainees | 12/9 | 72/124 |
| Pain at needle site* | 10 (53) | 8 (5) |

Data are described as mean ± SD or as N (%).

DM = diabetes mellitus.

Attending versus trainees indicates what individual performed the block.

* $P < 0.0001$.

No significant differences were noted in multiple variables (Table 5) comparing those patients who developed PONS with those who did not, except for pain at the site of injection. One interpretation of this finding is that there is a subset of patients who are more sensitive to sensory stimuli and may be more likely to report minor painful symptoms and minor PONS. Other, more stoic, patients may be less inclined to report pain or a paresthesia. This would explain the correlation between postoperative pain at the needle site and incidence of PONS.

The method of data collection in our study deserves comment. Prior prospective studies evaluating PONS after peripheral nerve blockade relied on subjective reporting by the operator on block specifics. In other words, anesthesiologists were responsible for recording detailed information regarding anesthetic blocks that they themselves were performing. Self-reporting can potentially lead to bias that may limit the validity of the results and conclusions (18,19). An integral component of our methodology was to have a single trained observer record all details of block placement.

There are several limitations to our report. First, patients, operators, and observers were not blinded as to the technique being performed. This may be a potential source of bias with regard to block placement characteristics or determination of block success. We attempted to compensate for this deficiency by

prescribing detailed definitions for number of needle passes, pain on injection, and success of anesthetic. However, this limitation needs to be presented.

Second, the assignment of the PONS to groups of "likely anesthetic related," "likely surgical related," or "unable to differentiate," is a subjective characterization made by anesthesiologists and a neurologist. The same characterizations made by an orthopedic surgeon may yield different results. During orthopedic surgery performed under general anesthesia, it is not uncommon to have PONS that, by definition, cannot be attributable to the anesthetic (5,20). The causes of PONS are multifactorial, as previously discussed. Unless very obvious (pain at incision site, or symptoms outside the distribution of the brachial plexus), most PONS were characterized as "unable to differentiate." This may lead to over-reporting of PONS attributable to the regional anesthetic.

A final limitation is the lack of formal, objective neurological (electromyogram or nerve conduction study) or anatomical (magnetic resonance imaging) testing in any patient presenting with PONS. These tests could potentially help discern the etiology of the PONS in many situations. However, in many instances, the PONS were minor and short-lived (Table 4); therefore, expensive and painful testing was not medically indicated.

In conclusion, the risk of developing a PONS after IS block in patients undergoing shoulder surgery is comparable between the ES and MP methods of nerve localization. Although the incidence of PONS in this setting with either method is approximately 10%, all symptoms resolved within 1 year. The success rates, onset times, and patient satisfaction were comparable with both techniques.

## Appendix

### Phone Follow-Up:

Hello, my name is *******, and I'm calling from the Hospital for Special Surgery. We're doing some follow-up with regard to your anesthesia.

Did you have any strange sensation, such as numbness, tingling, or pins and needles going down the arm or hand after the anesthesia wore off?

If Yes: how severe was it?

MILD: Barely noticeable; notices only when touches or is thinking about it.

MODERATE: definitely noticeable, notices it regularly.

SEVERE: Very preoccupied by the sensation, notices it constantly.

When did you first notice it? Did it wear off? When?

Did you have any pain in your arm other than the pain at the surgical site?

Where was the pain?

If yes: On a scale of 0 to 10, where 0 is no pain and 10 is the worst pain imaginable how would you rate that pain?

When did you first notice it? Did it wear off? When?

Did you have any weakness in your arm or hand after the anesthesia completely wore off?

What part of your arm or hand is weak?

If yes: How severe was it?

MILD: can move the joint, but it feels a bit weak.

MODERATE: Can move the joint but feels very weak.

SEVERE: cannot move the joint at all.

When did you first notice it? Did it wear off? When?

At the site that the anesthesiologist put in the block (neck), do you have any:

Pain—it hurts

Tenderness—it hurts when you touch it

Swelling

Discoloration—black and blue area

Skin breaks—scabs, holes, etc.

Are you satisfied with the anesthesia you received?

Would you have it again?


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