Interscalene Anesthesia for Shoulder Arthroscopy in a Community-Sized Military Hospital

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Summary: The first 100 consecutive shoulder arthroscopic procedures performed under interscalene anesthesia at a small community-sized military hospital are the basis of this report. This method of anesthesia was compared with 100 shoulder arthroscopies performed in a previous 2-year time period under general anesthesia. A variety of arthroscopic and subsequent open reconstructive procedures about the shoulder were performed using both techniques. Using the interscalene method, 87 regional blocks were entirely successful. Thirteen patients required conversion to general anesthesia for adequate pain control; however, 4 of these had a complete block in the recovery room and required no postoperative narcotics. Seven patients required supplementation with local anesthetic when an open procedure became necessary. There were no major complications. Minor complications included 5 patients with transient Horner’s syndrome, 4 patients who experienced anxiety, which was controlled with sedation, and 3 with nausea or pruritus. Interscalene anesthesia provided excellent intraoperative and postoperative analgesia with low morbidity. On a subsequent questionnaire, all patients with a successful block reported that they were extremely satisfied with their experience. Ten patients who had previous shoulder surgery under general anesthesia preferred the interscalene method. In summary, interscalene anesthesia proved to be an excellent method of anesthesia for shoulder arthroscopy. The technique is reproducible within the resources available in most community-level hospitals. Key Words: Regional anesthesia—Interscalene block—Shoulder arthroscopy.

Recently, there has been increasing interest in the development of regional anesthetic techniques for orthopaedic procedures. With the use of various techniques and anesthetic agents, postoperative pain management has been facilitated and is an important aspect of surgical care. Regional anesthesia with a prolonged postoperative analgesic effect has the additional benefit of allowing many operative procedures to be performed on an outpatient basis.

Several reports have documented the efficacy of interscalene anesthesia for procedures about the shoulder. Brown et al. recently reported favorable results in comparing interscalene anesthesia with general anesthesia for shoulder arthroscopy in a large referral-based academic practice. This was the first major report examining this anesthetic technique for shoulder arthroscopy. Criticisms of interscalene anesthesia have been the perception that increased training is required to become adept at this technique and that it is time consuming when compared with general anesthesia. Furthermore, most reports concerning its efficacy have come from academic institutions and direct application...
to a community practice has been viewed with some skepticism.

The purpose of this study was to evaluate interscalene regional anesthesia for shoulder arthroscopy in a small community-sized military hospital. We were interested in documenting reproducibility, efficacy, and patient satisfaction.

**MATERIALS AND METHODS**

Keller Army Hospital at the United States Military Academy, West Point, New York, is a 65-bed hospital. It primarily serves the military academy, active-duty soldiers from the Northeast, and a sizeable retired population. In addition to three staff orthopaedic surgeons, there is one orthopaedic fellow. The professional staff has a complement of internists, general surgeons, and family practitioners such as would be found in a small community hospital. There is a board-certified anesthesiologist and two certified nurse anesthetists.

A retrospective review of the operative, anesthetic, and hospital inpatient records of the first 100 consecutive patients who underwent interscalene anesthesia for shoulder arthroscopy between August 1991 and July 1993 were reviewed. To permit a more comprehensive evaluation, 100 consecutive patients who underwent shoulder arthroscopy under general anesthesia from May 1989 and July 1991 were also retrospectively reviewed. To compare the two anesthetic techniques, data were collected documenting the type of procedure performed, the average age of patient, the average time from administration of the anesthetic until the procedure was initiated, the average operative time, and the average estimated blood loss. In addition, the duration of surgery, the postoperative side effects, the number of hospital days, and complications were recorded. A comparison of medication necessary for postoperative pain control and nausea was also made. All patients underwent a follow-up examination or were contacted by telephone regarding their anesthetic experience. They were questioned regarding side effects, unpleasant experiences during the course of treatment, and other concerns regarding the anesthetic or the surgical procedure. Statistical analysis was performed using the Student’s t-test with significance of <.05.

**Anesthetic Technique**

For the interscalene method, the patient is placed supine on a standard operating table and appropriate blood pressure and cardiac monitoring is established. Intravenous access is gained by using an 18-gauge catheter placed in the uninvolved upper extremity. With the patient supine, the head is turned with full lateral rotation toward the uninvolved opposite shoulder. This projects the sternocleidomastoid muscle on the operated extremity and appropriate landmarks outline the interscalene area. A transcutaneous nerve stimulator (Stimuplex; B. Braun Mfg, Munich, Germany) is used to identify the region of the cervical and brachial plexus. A specially designed 22-gauge electrically insulated Teflon needle allows electrical identification of the brachial plexus and immediate delivery of the anesthetic. Specifically, the patient is instructed to lift the head so as to contract the sternocleidomastoid muscle to outline its lateral border. At the level of the cricoid cartilage and along the lateral border of the muscle, finger palpation locates the groove between the anterior and middle scalene muscles. The needle is inserted at a 45° angle caudally. After piercing the platysma, the stimulator is turned on to 2 mA to verify a functioning circuit. As the needle is progressively inserted, an assistant decreases stimulator output to avoid excessive or discomforting contractions. The goal is to elicit a biceps, triceps, or forearm muscle contraction at an amplitude of ±0.4 mA. Once this has been accomplished, a 50/50 mixture (40 mL) of 0.75% bupivacaine and 3.0% chloroprocaine is injected. After injecting 35 mL of this mixture into the interscalene space, a subcutaneous field block is performed cephalad and caudad to the original puncture site. This will block the supraclavicular nerve and superficial cervical plexus as it courses toward the shoulder. Surgical anesthesia is present in 15 to 20 minutes with a duration of 8 to 24 hours. Intravenous sedation can be administered as desired.

For general anesthesia, endotracheal intubation was performed on all patients. Thiopental sodium (4 mg/kg) was used for induction and vecuronium (0.1 mg/kg) was used as a muscle relaxant. Maintenance agents consisted of nitrous oxide, oxygen, and isoflurane (0.5% to 1.0%) depending on the anesthesiologists preference. Fentanyl (3 to 6 μg/kg) was used for analgesia.

Since August 1991, we have performed all shoulder arthroscopies in a sitting position. We use a standard operating table with a vacuum bean bag that is positioned to support the patient’s torso. The bean bag is inflated with maximum support provided to the medial border of the operated scapula and torso on the operative side. Using the bean bag in this manner, this in effect extends the operating table laterally. With the bean bag inflated and providing this extra lateral sup-
port, the patient can be translated over to the edge of the table. This will maximize exposure to the anterior, lateral, and posterior aspects of the shoulder necessary for arthroscopy in a sitting position.

RESULTS

One hundred consecutive shoulder arthroscopies were performed under interscalene anesthesia from August 1991 to July 1993. The average age of the patients was 30 years old (range, 17 to 71 years). The average time from the administration of anesthetic until the skin incision was made was 27 minutes (range, 11 to 50 minutes). The procedures that were performed were:

1. Arthroscopy with open Bankart repair and/or capsular shift, 32.
3. Arthroscopic subacromial decompression with or without open rotator cuff repair, 28.
4. Diagnostic arthroscopy with labral debridement or loose body removal, 8.
5. Diagnostic arthroscopy with distal clavicle resection, 4.

The average operative time was 119 minutes (range, 17 to 213 minutes). The average estimated blood loss was 65 mL (range, 0 to 235 mL). Eighty-seven regional blocks (87%) were entirely successful. Thirteen patients required conversion to general anesthesia for adequate pain control. However, 4 of these patients had a complete upper extremity block in the recovery room and required no postoperative narcotics. Seven patients required supplementation with local anesthetic in the skin and subcutaneous tissues only when an open procedure became necessary. This was necessary with an open Bankart repair or capsular shift where the skin incision extended inferi orly toward the axilla. Postoperatively, 9 patients (9%) required either intravenous or intramuscular narcotic administration within the first 24 hours after surgery. In 71 patients, oral narcotics were required for pain management. In 20 patients, narcotics were not necessary. The average number of hospital days was 1.7 days (range, 0 to 4 days).

There were no major complications. Minor complications included transient Horner’s syndrome in 5 patients, anxiety that was controlled with sedation in 4 patients, and nausea or pruritus in 3 patients. Two patients had small hematomas that required no treatment. On a subsequent questionnaire, all patients with a successful block reported extreme satisfaction with their experience. Ten patients who had previous shoulder surgery under general anesthesia preferred the interscalene method.

There appeared to be a learning curve with this technique for our anesthesia personnel. In the first 50 interscalene blocks, the average time from administration of the anesthetic until skin incision was 44 minutes; however, in the second 50 interscalene blocks, the average time was 17 minutes.

One hundred consecutive shoulder arthroscopies were also performed using general anesthesia during the period May 1989 to July 1991. The average age of these patients was 34 years (range, 17 to 64 years). The average time from administration of anesthetic until the skin incision was made was 19 minutes (range, 14 to 22 minutes), $P < .05$. The procedures performed were:

1. Arthroscopy with open Bankart repair and/or capsular shift, 38.
2. Arthroscopic Bankart repair, 35.
3. Arthroscopic subacromial decompression with or without open rotator cuff repair, 18.
4. Diagnostic arthroscopy with labral debridement or loose body removal, 5.
5. Diagnostic arthroscopy with distal clavicle resection, 4.

The average operative time was 126 minutes (range, 21 to 187 minutes). The average estimated blood loss was 55/mL (range, 0 to 180 mL). In this group, intravenous or intramuscular narcotic medication was required in 62 (62%) of the patients for pain management postoperatively, $P < .0001$. Thirty-five patients (35%) required antiemetic treatment for postoperative nausea, $P < .001$. The average number of hospital days for those who received general anesthesia was 4 days (range, 2 to 9 days), $P < .05$. There were no major complications in this group.

DISCUSSION

Interscalene regional anesthesia for shoulder surgery is not a new concept. However, most reports are from large medical centers with formidable expertise in treating problems about the shoulder surgically. Furthermore, the anesthesia personnel is often very familiar with administering this technique and may have had special training. There has been one previous report concerning interscalene regional anesthesia and its application in shoulder arthroscopy. Brown et al.
reported favorable results when compared with general anesthesia as an anesthetic agent in a large series of patients undergoing shoulder arthroscopy. This report came from an academic institution with a large shoulder referral practice. They reported an 84% success rate with this method. The setup time for this method was the same as in the group where general anesthesia was used. They noted less need for postoperative narcotics, fewer overnight hospital admissions, and high patient satisfaction when compared with general anesthesia.

A common misconception among orthopaedists and anesthesiologists is that this technique requires extensive formal training and experience. Furthermore, it is felt that the procedure is too time consuming compared with general anesthesia. At Keller Army Hospital at the United States Military Academy, the Anesthesia Service consists of one board-certified anesthesiologist and two certified nurse anesthetists. Our anesthesiologist had received no additional formal training in the technique of interscalene anesthesia. Using appropriate literature resources, a strong willingness to learn the technique, and the adjunct of a transcutaneous nerve stimulator to properly locate the upper brachial plexus region, resulted in a high reproducibility of this technique by our anesthesia staff. From the surgeon’s perspective, the learning curve was extremely small.

Our results support the findings of Brown et al. There was a decreased need for parenteral narcotic usage for pain management and less postoperative nausea in the interscalene group. The average hospital stay was also shorter when compared with general anesthesia. Although the setup time for interscalene anesthesia was longer than with general anesthesia, this was most likely a result of a learning curve on the part of our anesthesia personnel. The time required for setup of the interscalene block decreased markedly in the second group of 50 patients and was consistent with the time required for general anesthesia. However, these results require some clarification. This was not a prospective, randomized study, but rather a consecutive series and, therefore, retrospective in nature. This introduces bias into the study. First of all, each group was evaluated from two different time periods. Obviously, the trend in the United States since the late 1980s has been toward a shorter duration of hospitalization. This could contribute to the observed difference in hospital stay of 4 days with the general anesthesia group during the 1989 to 1991 time period. The interscalene group averaged 1.7 days and this reduction cannot be attributed totally to the use of interscalene anesthesia because practice patterns have changed.

Second, the increase in parenteral narcotics in the general anesthesia group could also be a reflection of inpatient hospitalization. There is a greater tendency for postoperative inpatients to be treated with parenteral narcotics for pain management. These practice patterns introduce a bias in trying to evaluate differences between these two groups and attempting to attribute them only to the difference in anesthetic technique. In addition, on the surface it would appear that an average hospital stay of 4 days in the general anesthesia group and a stay of 1.7 seven days in an interscalene group is still long compared with most institutions. This is easily explained by the types of patients served at a military hospital. Many of these patients were cadets at the United States Military Academy and single soldiers on active duty. These cadets and soldiers live in barracks without the benefit of family or friends to assist in early postoperative care necessary for outpatient surgery. Our hospital must frequently extend hospitalization to provide this support until patients are totally self-sufficient before discharge.

Despite these difficulties in drawing firm conclusions regarding interscalene anesthesia, we included this prior group of patients who underwent general anesthesia for shoulder arthroscopy to at least allow some perspective and point of reference to evaluate our early experience with the interscalene technique. Interscalene anesthesia appears to have other advantages in our practice. Our preferred method of shoulder arthroscopy is the sitting position. With the use of interscalene anesthesia, the patient can assist with positioning despite a level of sedation. Also, the sitting position in interscalene anesthesia allows for a simple transition to an open procedure as was necessary in a number of our cases. No prepping and draping is necessary. Although there was a need for additional local anesthetic to be placed in the inferior aspect of the wound as the incision approaches the axilla for anterior stabilization procedures, we did not consider this a failure of the technique. In none of these cases was additional local supplementation required during the deep dissection. Despite the necessity to perform even extensive dissection inferiorly, as in an inferior capsular shift procedure, we found the level of anesthesia to be complete and muscle relaxation adequate. As we frequently precede open stabilization procedures with a preliminary shoulder arthroscopy, we now routinely infiltrate the inferior one half of the anticipated skin incision as it extends inferiorly toward the axilla prior to inserting the arthroscope to insure adequate
analgesia. Finally, we have been extremely impressed and satisfied with the level of postoperative pain control without the other side effects of nausea. This is supported by the 71 patients who required only oral narcotics and the 20 patients in whom narcotic usage was avoided postoperatively.

Many complications can occur with interscalene anesthesia. These include phrenic and recurrent laryngeal nerve block, pneumothorax, total spinal anesthesia and cardiac arrest. All of our complications were minor and transient, the most common being Horner syndrome. This report would not be complete without acknowledging two other potential disadvantages with this technique. First, the surgeon cannot accurately access the neurological status of the operated extremity in the early postoperative period. It has been our experience that at least 6 to 8 hours are required for the return of motor function in the upper extremity. Second, hypotensive anesthesia is considered a useful adjunct, particularly in performing arthroscopic subacromial decompression. With an interscalene technique, the anesthesiologist can decrease blood pressure with intravenous agents but not as effectively as with general anesthesia.

This report reflects the experience of a community-sized military hospital with a sophisticated regional block technique for shoulder arthroscopy. Although our department performs a large number of shoulder procedures, and particularly arthroscopic procedures, the anesthesia personnel and resources are consistent with those found in most community-sized hospitals. The interscalene anesthesia technique as described was learned rapidly with little patient morbidity by personnel who had no additional formal training. Our study shows that interscalene regional anesthesia is an excellent method for shoulder arthroscopy and even for subsequent open procedures about the shoulder. Although firm conclusions cannot be drawn in comparing it with general anesthesia, we believe the interscalene method offers significant advantages intraoperatively and postoperatively as outlined. This method was reproducible and allowed excellent analgesia during and after surgery. Patient acceptance of this form of anesthesia was emphasized by those who had had a previous shoulder operation performed under general anesthesia. In these 10 patients, all of them preferred the interscalene method.

REFERENCES