

Authors:

Seuk B. Kang, MD
Department of Anesthesiology
Gundersen Lutheran

Kevin M. Rumball, MD
Department of Orthopaedic
Surgery
Gundersen Lutheran

Robert S. Ettinger, MD
Division of Pediatric Hematology
and Oncology
Gundersen Lutheran

Continuous Axillary Brachial Plexus Block for Postoperative Analgesia in a Patient with Severe Hemophilia

Continuous Axillary Brachial Plexus Block (CABPB) is an effective method of controlling postoperative pain after upper extremity surgery. We report a case of using a CABPB to control postoperative pain and facilitate early joint mobilization with continuous passive motion and weight-bearing physical therapy after an elbow surgery in a patient with severe hemophilia.

With the advancement in the understanding of coagulation mechanisms and the parallel improvement of Factor VIII (FVIII) replacement therapy, regional anesthesia can be used in patients with hemophilia provided that FVIII activity levels are maintained above 80 percent during the procedure and then 30 percent thereafter. Reports of using regional anesthesia are scarce and there has been no report of using a CABPB in patients with hemophilia. Recently, we had a patient with severe hemophilia who underwent an extensive elbow surgery and needed effective pain control postoperatively to participate in the early joint mobilization therapies. We used a CABPB, and the patient was able to participate in the continuous passive motion and weight-bearing physical therapy on the first postoperative day.

CASE REPORT

A 36-year-old male patient (height, 178 cm; weight, 128 kg) with severe hemophilia was scheduled for a resection of the radial head, synovectomy, and contracture release of his right elbow. His medical history was significant for hemophilia A with a FVIII activity level of less than 1 percent. His surgical and anesthesia history included total knee replacements and ankle fusions under general anesthesia without difficulty. For the last several years, he experienced repeated hemarthroses of his right elbow resulting in Stage IV hemophilic arthropathy with pain, swelling, and limitation of motion. The range of motion of his right elbow was 30 to 105 degrees of flexion. He was unable to reach his mouth with his right hand. A neurological examination of his right arm was normal. His medications included FVIII and hydrocodone with acetaminophen.

The plan was to proceed with surgery under general anesthesia, evaluate neurological and vascular status of his right arm after he was fully awake from anesthesia, and then place a CABPB catheter the next day. After obtaining adequate analgesia, the patient's right arm was to be placed on continuous passive motion and physical therapy that required flexion and

extension of his elbow with a 2 kg of weight every two hours between his continuous passive motion therapies.

One hour before the surgery, the patient received 3500 units of intravenous FVIII followed by a continuous infusion of 215 units per hour. His FVIII dosage was determined by a FVIII falloff study and his FVIII level was 84 percent before entering the operating room. General anesthesia was induced with intravenous fentanyl, 250 mcg; propofol, 250 mg; and rocuronium, 75 mg. His trachea was intubated without trauma and anesthesia was maintained with inhalation of isoflurane and nitrous oxide for the 4-hour procedure. Blood loss was about 200 ml with the use of tourniquet. Postoperatively his pain was controlled with intravenous morphine. On the first postoperative day, the neurological and vascular examination of his right arm was normal and his VIII level was 115 percent. A CABPB performed by identifying the brachial plexus with a nerve stimulator (Stimuplex, B. Braun Medical Inc., Bethlehem, PA) connected to an 18-gauge, insulated Tuohy needle. Twenty ml of normal saline was injected through the needle and a 20-gauge polyamide radiopaque catheter (Contiplex B. Braun Medical Inc., Bethlehem, PA) was advanced 10 cm beyond the needle tip into the axillary neurovascular sheath. After a 5 ml test dose, 30 ml of 0.2 percent ropivacaine was injected through the catheter followed by a continuous infusion of 0.2 percent ropivacaine at a rate of 6 ml per hour. After obtaining adequate analgesia, his right arm was placed on a continuous passive motion machine. Every 2 hours between his continuous passive motion therapies, for 15 minutes he participated in physical therapy that required flexion and extension of his elbow with a 2 kg of weight. His pain was assessed on a visual analog scale of 0 to 10 (0: no pain, 10: the most unbearable pain) and maintained at less than 3 by adjusting the rate of ropivacaine infusion between 6 to 15 ml per hour. Intravenous morphine was made available as a rescue medication. His FVIII was checked every 12 hours and maintained between 33 to 150 percent by the continuous infusion of FVIII. He participated in continuous passive motion and weight-bearing physical therapies without difficulty. He experienced no break-through

pain and required no rescue medication except hydrocodone, 10 mg with acetaminophen, 500 mg each night to help him to sleep. On the third postoperative day, the catheter was removed. There was no bleeding at the skin puncture site or hematoma formation in the axilla. The patient's sensory function returned to normal in 3 hours. He was discharged from the hospital on the fourth postoperative day with an intravenous catheter in place to self-administer FVIII. He returned for FVIII level checks for the next 2 days and then every 2 to 5 days for 3 weeks as he was being tapered off the replacement therapy. His FVIII level was maintained between 33 to 58 percent. Three weeks postoperatively, he remained free of pain. The range of motion of his right elbow was 25 to 100 degrees of flexion. He was able to reach his mouth with his right hand. The patient was satisfied with the surgical outcome, postoperative pain control, and hemophilia management.

DISCUSSION

Hemophilia A is a bleeding disorder resulting from a genetic deficiency of FVIII and is the most common and most serious hereditary disorder of coagulation. It is transmitted as an X-linked recessive trait with variable expression. The incidence is estimated at 1 in 10,000 to 25,000. Hemarthrosis is the most common manifestation of moderate to severe hemophilia A. Repeated bleeding into a joint can cause chronic synovial inflammation and progressive cartilage degeneration, known as hemophilic arthropathy, that often requires surgery.^{1,2} With the advancement of VIII replacement therapy, orthopedic surgery can be performed safely under general or regional anesthesia provided that the FVIII level is maintained at 80 to 100 percent during surgery and above 30 percent postoperatively.²⁻⁴ In preparing patients with hemophilia for surgery, FVIII levels are routinely raised to approach 80 to 100 percent to compensate for its intraoperative decline secondary to dilution, short half-life, or possible resistance, and to insure that FVIII levels do not drop below 30 percent during surgery and the immediate postoperative period. FVIII dosage is determined by preoperative FVIII falloff studies that allow the development of a dose response curve so that the dosages and timing can be tailored to the individual patient to maintain the desired FVIII level.^{2,3} There is no conclusive data showing the precise level of FVIII activity or how long the level should be maintained postoperatively. It is generally believed that a FVIII level of greater than 30 percent postoperatively for 10 days is sufficient.²⁻⁶ In our patient, we had difficulty maintaining a steady FVIII level because of the frequent failures of the intravenous infusion site. His FVIII levels were as low as 33 percent and as high as 150 percent.

The successful use of axillary block, continuous epidural, and spinal anesthesia has been reported in patients with hemophilia provided that the patient's FVIII levels were maintained above 30 percent.^{4,7} However, we found no report of using a CABPB in patients with hemophilia in our literature search.

A CABPB provides excellent postoperative analgesia⁸⁻¹⁴ and can be used to facilitate early joint mobilization with

continuous passive motion.^{8,9} To improve the joint mobility after elbow surgery, early physical therapy with continuous passive motion has been advocated.^{8,9} Lennon⁸ and Morrey⁹ described placing a CABPB in the recovery room after the patient is fully awake from general anesthesia so that the neurological and vascular evaluation of the operated extremity can be performed prior to placing the block.

The risk of vascular complication from placing a CABPB in patients with hemophilia is unknown. For patients without hemophilia, Morrey⁹ and Gaumann et al¹⁰ reported no bleeding from 26 and 20 patients, respectively. Mezzatesta et al¹¹ reported one axillary artery puncture in 20 patients. Sada et al¹² reported one major hematoma formation in 597 patients.

We postulated that the risk of bleeding in our patient from a CABPB catheter should be no higher than that of a patient without hemophilia provided that patient's FVIII level was maintained above 80 percent while the catheter was being placed and then above 30 percent thereafter. We presented the result of our literature search to the patient and discussed the benefits and risks of a CABPB. He consented to receiving general anesthesia for the surgery and the placement of a CABPB postoperatively.

The use of 0.2 percent ropivacaine provided him with effective pain control while preserving motor function and allowed him to actively participate in the weight-bearing physical therapy.

In summary, we report a case of using CABPB in a patient with severe hemophilia for postoperative pain control and facilitate early joint mobilization after an extensive elbow surgery. We believe that CABPB can be used in patients with hemophilia provided that FVIII level is maintained above 80 percent during the placement of the catheter and then 30 percent thereafter.

REFERENCES

1. DiMichele D, Neufeld EJ. Hemophilia. A new approach to an old disease. *Hematol Oncol Clin North Am* 1998;12:1135-44.
2. Dewhurst WE, Glass DD. Hematological Diseases. In: Katz J, Benumof JL, Kadis LB, eds. *Anesthesia and uncommon disease*. Philadelphia, WB Saunders, 1998; 299-301.
3. Ellis N. Diagnosis and management of bleeding disorders. *Anesthesiology* 1977; 47:171-80.
4. Sampson JP, Hamstra R, Aldrete JA. Management of hemophilic patients undergoing surgical procedures. *Anesth Analg* 1979;58:133-5.
5. Batorova A, Martinowitz U. Intermittent injections vs continuous infusion of factor VIII in haemophilic patients undergoing major surgery. *Br J Haematol* 2000;110:715-20.
6. Nichol RO, Melelaus MB. Synovectomy of the knee in hemophilia. *J Pediatr Orthop* 1986;6:330-3.
7. Hack G, Hofmann P, Brackmann HH, et al. Regional anaesthesia in Haemophiliacs. *Anaesthesia, Intensivtherapie, Notfallmedizin* 1980;15:45-51.
8. Lennon LL, Stinson LW. Continuous axillary brachial plexus catheters. In: Morrey BF, eds. *The elbow and its disorders*. Philadelphia, WB Saunders, 1993; 167-72.
9. Morrey BF. Post-traumatic contracture of the elbow. Operative treatment, including distraction arthroplasty. *J Bone Joint Surg Am* 1990;72:601-18.

10. Gaumann DM, Lennon RL, Wedel DJ. Continuous axillary block for postoperative pain management. *Reg Anesth* 1988;13:77-81.
11. Mezzatesta JP, Scott DA, Schweitzer SA, Selander DE. Continuous axillary brachial plexus block for postoperative pain relief. Intermittent bolus versus continuous infusion. *Reg Anesth* 1997;22:357-62.
12. Sada T, Kobayashi T, Murakami S. Continuous axillary brachial plexus block. *Can Anaesth Soc J* 1983;30:201-5.
13. Salonen MH, Haasio J, Bachmann M, et al. Evaluation of efficacy and plasma concentration of ropivacaine in continuous axillary block: high dose for surgical anesthesia and low dose for postoperative analgesia. *Reg Anes Pain Med* 2000;25:47-51.
14. Wajima Z, Shitara T, Nakajima Y, et al. Continuous brachial plexus infusion of butorphanol-mepivacaine mixture for analgesia after upper extremity surgery. *Br J Anaesth* 1997;78:83-5.

† **Address for correspondence:**

Seuk B. Kang, MD
Department of Anesthesiology
Gundersen Lutheran
1836 South Ave.
La Crosse, WI 54601, USA
Phone: (608) 782-7300, ext. 52578
E-mail: sbkang@gundluth.org



Barnyard, Coon Valley, WI

Photo by James W. Terman, MD
Gundersen Lutheran