vaged or that had not been used in a number of years was disposed of appropriately. We tried to simplify storage and then we labelled, labelled, labelled.

New easy-access plastic storage bins replaced old cardboard boxes. To increase floor space, an unused scrub sink was removed, and peg boards were hung for additional storage space on the available wall space.

We tried to keep change-over time simple by having attendants remove dirty items used for the previous case. Nurses would replace these with clean items for the following case. This is where flexibility and communication became important.

We catalogued instrument trays with pictures and names familiar to our staff. Another book was started to document tasks assigned to each shift, because the staff eventually grew in number and worked extended hours during the week and on the weekends.

An orientation program was prepared emphasizing "on the job training," for as we trained the new staff, we too were learning how to work together, combining these two positons. All of us were assimilating our new responsibilities as a team.

Computer print out sheets for pick lists have now invaded our domain. These have facilitated supply/case match-ups. However, one still has to learn the language.

Ongoing in the process is a basic "how to" book, as well as updating computer print out sheets, meetings and questionaires that confirm we are indeed all learning the same things together.

There was total cooperation and participation between the attendants and nursing staff for this process to have happened. Enhanced communication skills and good team work were also part of the success. It was definitely not an easy year, and at times it was very stressful for everyone in the department. Empowerment to change our environment to suit our needs certainly made it worthwhile. To be responsible for the changes certainly gives staff a feeling of ownership of the daily routine in their work environment.

In less than six months we had become more comfortable with the position of OR attendant. The process of teaching and learning has been exceptional, and we have all developed an overall sense of teamwork.

OR attendants are a terrific group of caring individuals, and I applaud them for what they have accomplished so far. Their future can only continue to improve for them and their clients. ■

Cervical Plexus Block for Carotid Endarterectomy: A Nursing Care Plan

By S. June Hill, RN, CPN(C)

Recent interest in cervical plexus block (CPB) used for carotid endarterectomy surgery has become "the topic of conversation" at St. Boniface General Hospital (SBGH), in Winnipeg, Manitoba. No longer are the rhythm of the respirator and beat of the monitors the only sounds heard in the theater during this major surgery. As the surgeon applies the carotid cross clamp, what appears to be a casual social conversation ranging from grandchildren to gardening is actually an intraoperative assessment tool for monitoring changes in patient speech pattern or neurological status.

Abstract

Historically, carotid surgery is identified in the operating room as a major surgical procedure. Although the surgical intervention remains the same, a regional anesthetic technique calls upon perioperative nurses to utilize their assessment and planning skills astutely preparing innovative nursing interventions that enable successful patient outcomes.

The key to a successful nursing care plan for a carotid endarterectomy performed under cervical plexus block is an awareness of the patient's physiological needs as well as the environmental influences they may be experiencing.

As the administration of regional anesthesia for major surgery become more prevalent, there is a resurgent demand for traditional holistic nursing interventions in the operating room. The perioperative nurse must couple technical expertise with intuitive assessment skills and administration of compassionate nursing care.

Historical

Traditionally at SBGH, carotid endarterectomies were performed only under general anesthesia. Late in 1996, SBGH anesthetist Dr. Matthew Cohen, incorporated use of the cervical plexus block technique which he acquired while training under Dr. Matthew Posner & Dr. Patrick Sullivan at Ottawa Civic Hospital. Shortly after, other SBGH anesthetists also began providing this alternative anesthetic method for the carotid patient.

The use of local or regional cervical block is not a new concept in vascular surgery. The first carotid endarterectomy was performed by Debakey in 1953, under local anesthetic. (Shah et al., 1994). The use of cervical plexus block was first performed by Halstead in 1884 at Bellevue; however, it was Labat who popularized the technique in America. Within the past decade, the popularity of CPB has reemerged as regional techniques provide the optimal method for monitoring continuous cerebral function during carotid endarterectomy surgery (Masters, Castresana, & Castresana, 1995).

Advantages/Disadvantages

Traditionally, general anesthesia for carotid endarterectomy has been advocated for its cerebral protective effects with the use of selected anesthetic agents. However, general anesthetics may imply a greater

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perioperative blood pressure lability and longer surgical intensive care unit stay postoperatively. (Ombrellaro, Freeman, Stevens, Goldman, 1996).

The ability to monitor the intraoperative neurological status of the patient undergoing carotid endarterectomy is the major advantage to using the regional block. There is a potential for decreased need of shunt insertion which in itself potentiates the risk of thrombus or air embolism related stroke. (Wilke, Ellis, McKinsey, 1996). Reduced need for postoperative ICU invasive monitoring contributes to a shorter hospital stay associated with use of regional anesthesia. Patients undergoing carotid endarterectomy at St. Boniface General Hospital are now considered for "Assess in Recovery Room" status as an alternative to routine Surgical Intensive Care Unit admission. Thus, patients may be discharged earlier providing potential hospital utilization savings.

Anatomy of the Cervical Plexus

The cervical plexus is formed from the first four cervical spinal nerves, C-1 through C4. The first cervical nerve is considered to have no sensory components and only minor motor components. The spinal nerves emerge from the intervertebral foramina and pass posterior to the vertebral artery and vein in the gutter formed by the anterior and posterior tubercles of the corresponding transverse process of the cervical vertebrae *(Figure 1)*. All but C-1 divide into ascending and descending branches that form a pattern of three loops, hence, the plexus formation (Masters, Castresana, & Castresana, 1995). Cranial nerves X,XI, and XII communicate with the vagus (C1, C2), the hypoglossal (C1, C2) and the accessory (C2, C3, C4) nerves, thus explaining potential side effects from the cervical block technique. Deep branches of the cervical plexus provide motor innovation to muscles of the neck, including the phrenic nerve (C3, C4, C5).

Superficial structures to be cognizant of include the external jugular vein, which crosses the supraclavicular muscle at approximately the C4 level.

Method of Administration

Approximately ninety minutes prior to surgery, patients should have a topical anesthetic cream (EMLA® 50 grams)applied generously to the surgical site. Protected by a clear occlusive dressing, the cream will provide analgesia to a depth of 3 - 5 mm *(Figure 2)*. This provides comfort during needle placement for local injection and during initial incision (Sullivan, Posner, 1995). In the operating room theater the clear dressing is removed immediately prior to block insertion.

A sterile regional administration setup with control syringe and three 22 gauge regional needles are required. Warmed prep solution is applied to a wide area encompassing the operative site. Using palpation of landmarks with the patient's head turned away from the side to be blocked, the anesthetist marks neck areas corresponding to transverse processes of C2 to C4.

In the deep cervical plexus block, the nerve roots are anesthetized at a point before the motor and sensory nerves separate. This provides anesthetic to the muscles corresponding to the cervical vertebrae and transverse processes of C-2, C-3, and C-4, allowing deep block for surgical retraction.

The deep block is performed prior to the superficial block so as not to distort the surface anatomical landmarks thus creating difficulty with initial needle positioning.

The first regional needle is inserted at C4, followed by C3 then C2, using C4 as guide placement *(Figure 3)*. With all three needles in position, 8 ml of 0.375% Bupivacaine with 1:200,000 epinephrine is first injected at C2, as this is the most difficult site to establish. This procedure is repeated for the C3 then C4 sites, removing each needle individually after injection.

A superficial cervical plexus block is used to supplement the deep block. Cephalad and caudal infiltrations are performed along the posterior border of the sternocleidomastoid muscle *(Figure 4)*. Local anesthetic is also infiltrated directly into the sternocleidomastoid muscle to facilitate analgesia during muscle retraction. *(Figure 5)*

Supplemental local infiltration of Xylocaine 1% plain is injected intraoperatively at the carotid bulb *(Figure 6)* prior to surgical manipulation as nausea, bradycardia and hypotension may occur when the carotid sinus is manipulated. (Sullivan, Posner, 1995)

Potential Complications

Syringe aspiration is performed prior to each injection to ascertain the needle is not intraarterial (vertebral artery) or intrathecal (spinal). Anesthetizing the phrenic nerve results in temporary paralysis of the ipsilateral diaphragm (Sullivan, Posner, 1995). This may be a concern in patients with severe lung disease or contralateral phrenic nerve palsy. Hoarseness (temporary recurrent laryngeal nerve palsy) may develop from local anesthetic injected too anteriorly,

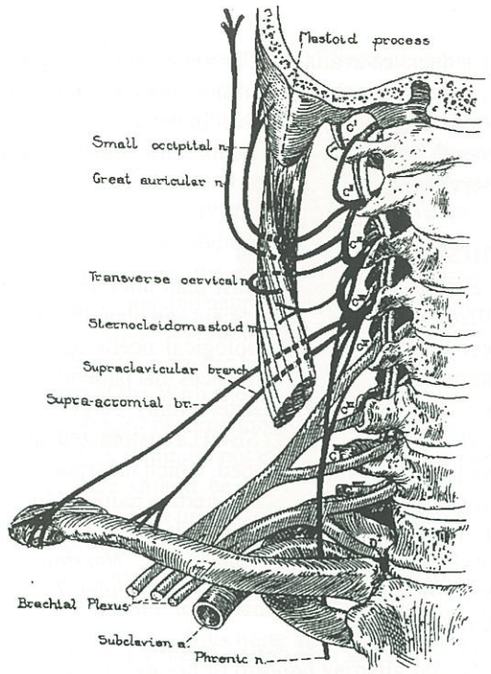


Fig. 1. Semischematic representation of the cervical plexux and phrenic nerve shown in relation to the transverse processes which are threaded by the vertebral blood vessels. Note: From "Blocking of Spinal Nerves" by John Adrian, MD, 1985, Labat's Regional Anesthesia Techniques and Clinical Applications, p 246. Copyright 1985 by Warren N. Green, Inc. Reprinted with permission.

Fig. 2 EMLA® Cream application preoperatively Figures 2 to 7 are Reprinted with Permission from "Cervical Plexus Block for Carotid Endarterectomy, P. Sullivan, MD, M. Posner, MD, Editors, University of Ottawa, 1995.

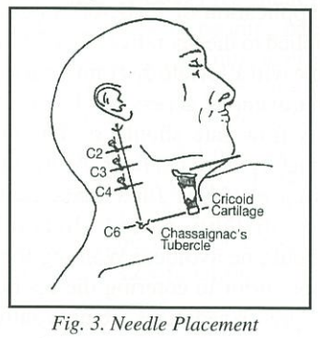


Fig. 3. Needle Placement

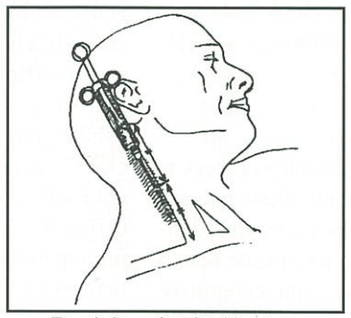


Fig. 4. Superficial Infiltration

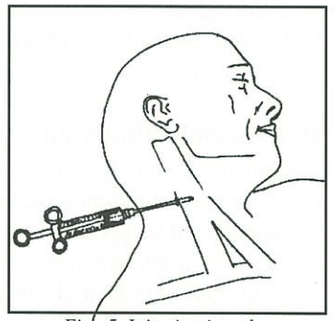


Fig. 5. Injection into the Sternocleidomastoid Muscle

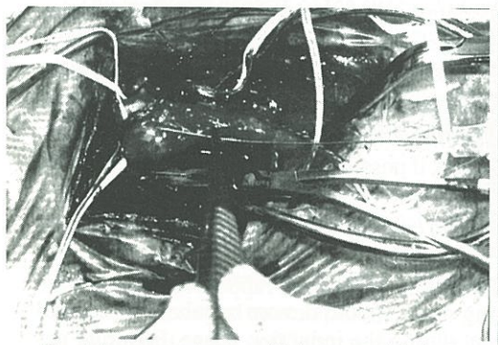
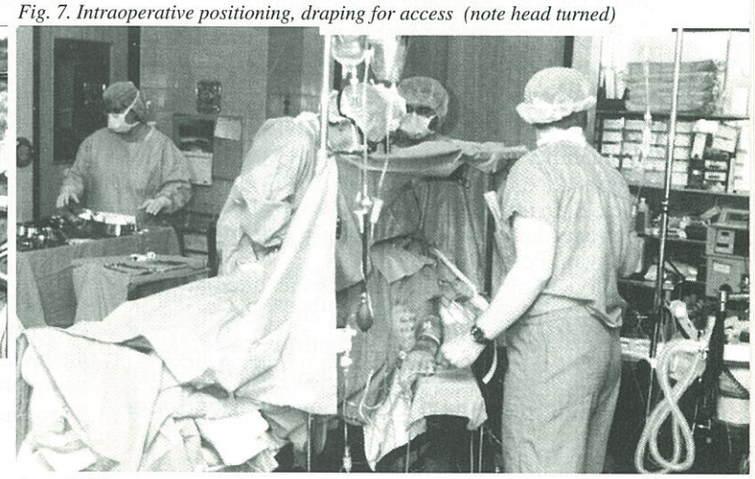


Fig. 6. Intraoperative carotid sinus nerve block at carotid bulb.

Fig. 7. Intraoperative positioning, draping for access (note head turned)



or as a result of retractor pressure during surgical dissection. This would be a concern in patients with a contralateral recurrent laryngeal nerve palsy. Care is taken not to inject the external jugular vein during superficial block as seizures or loss of consciousness occur from intravascular injection of large quantities of local anesthetic. Although uncommonly required, it is imperative to maintain accessability to the patient's airway should emergency intubation be required during block insertion or intraoperatively.

Duration of Block

Masters, Castresana & Castresana (1995) advocate two alternatives to selection of local anesthetic used. One choice is lower concentrations of local anesthetic (Lidocaine or Bupivacaine) with epinephrine using a larger volume. Alternatively, higher concentrations with lower volume without use of epinephrine. The addition of epinephrine prolongs the block and allows lower concentrations of local anesthetic to be used.

Duration of block averages four to six hours. Sullivan and Posner, (1995), report reexploration of the wound for a hematoma which developed in the postoperative period, using only supplemental analgesic for the second operation. The block had originally been established eight hours prior.

Patient Selection Criteria

Patient selection for use of cervical plexus block is based on the preference of the individual patient, anesthetist and surgeon. Contraindications would include patients who are unable to communicate due to language barrier or mental handicap as their cognitive function would be difficult to assess intraoperatively. Generally, patients on antidepressants require monitoring for post anesthetic disorientation.

Physiologically unsuitable candidates include patients with obesity, respiratory disease, or difficult airway access due to potential for respiratory compromise. Difficulty land marking, rapid desaturation and inability to lie flat contribute to life threatening complications which could preclude use of regional block. Skin infection at the operative site or allergy to local anesthetic also constitutes a contraindication (Sullivan, Posner, 1995).

Cervical plexus block provides an alternative for patients with concurrent carotid and coronary artery disease. For patients with both unstable carotid stenosis and unstable ischemic heart disease, Wilke, Ellis & McKinsey, (1996), mention alternative surgical sequences available. Carotid endarterectomy under cervical block with coronary revascularization to follow avoids the negative inotropic effects of a general anesthetic in patients with limited cardiac reserves.

Nursing Implications

Perioperative nurses must plan interventions that utilize their intuitive assessment and planning skills to meet their patients physiological needs as well as control environmental influences that patients experience during carotid endarterectomy surgery under cervical plexus block. At SBGH a customized nursing care plan has been developed, which incorporates the compassion and technical expertise required to meet the specific needs of patients undergoing carotid surgery by cervical block. (See - *O.R. Nursing Care Plan for Carotid Endarterectomy under Cervical Plexus Block).*

Six phases of care define specific patient needs:

1. Pre-Op: During first contact with the patient, neurologic status should be assessed to have a baseline reference before cross clamp. At this time, reassurance and emotional support should be developed, to alleviate potential patient anxiety. Assurance that a generous topical application of EMLA® anesthetic cream has been applied to the operative site within the specified time frame will alleviate discomfort at injection sites. After intravenous access has been established, intravenous flow rate should be monitored closely at approximately 30 cc per hour. As a Foley is not routinely inserted, excessive fluid intake contributing to bladder distention and discomfort intraoperatively should be avoided. Walking the patient to the bathroom prior to entering the operating room is feasible as pre-op sedatives are not routinely ordered.

2. Establishing the OR Environment: Priorities are temperature and noise control. A warm operating room provides comfort for the apprehensive patient. A calm, unrushed atmosphere should prevail. It is desirable for the circulating nurse to provide the patient with uninterrupted attention during the induction process; therefore, if possible the scrub nurse should be set up prior to patient entry to the operating room. This allows time to comfort the patient and provide a calm relaxed atmosphere.

3. Induction: With good rapport established, the circulating nurse should devote her attention toward the patient during the induction phase. Ensuring patient comfort and providing assistance to the anesthetist by maintaining patient's position and administering narcotic or antihypertensives as directed, assists in expediting the induction process.

4. Draping: Draping should be adapted so that towels do not cover the patient's face. A small laparotomy sheet tented over a raised mayo stand which is taped securely at its base, provides exposure of the patient's face and torso. The anesthetist should have total view of the patient's body to facilitate monitoring motor and neurologic functions during the procedure *(Figure 7)*. Suction tubing should be strategically placed so as **not** to be within the patient's view.

5. Intra-Op: With the procedure under way, the patient's senses become more acute as they lay motionless. As a reminder not to turn their head, a safety strap or tape should be secured over the patient's forehead with face turned toward the anesthetist, facing opposite to surgical side. Under the drapes and lights, the patient may become very warm therefore room temperature and blankets should be regulated accordingly. Extraneous noise should be limited. Encouraging the patient to respond verbally provides a valuable tool to assess for slurred speech and impaired cognitive function due to decreased intraoperative cerebral perfusion. Placing "*Patient is Awake*" signs on the operating room doors inform theater traffic of patient status. Supplies for shunt insertion should be immediately available pending patient manifestations of neurological deficits during cross clamp.

6. Post-Op: Upon completion of the procedure, care should be taken to turn off the operative lights prior to removing the drapes as lights will be directly facing the patient's face. Report to the Recovery Room (or SICU) should include a neurologic status report, conveying the patient's status as "awake and in control of all body functions".

Conclusion

The technical aspects of the surgical procedure do not require modification. An intraarterial monitor is still established upon entry to the operating room. Instrumentation requirements and sequence of surgical events proceeds as documented for removal of carotid artery debris.

On average, the actual operative time has decreased and patients are routinely being transferred to Recovery Room rather than Surgical Intensive Care Unit. Patients are transferred to the ward earlier and regain their independence more rapidly.

Familiarity and confidence with the cervical plexus block technique provides an exciting alternative to carotid endarterectomy surgical management by a coordinated interdisciplinary perioperative team. The anesthetist, who adeptly administers regional anesthetics has an ongoing assessment of the adequacy of cerebral perfusion. The surgeon, lowers patient risks and decreases case cost by not routinely using a shunt. The nurse provides holistic perioperative patient care. Together the team delivers a progressive alternative to carotid endarterectomy surgical management.

At St. Boniface General Hospital, use of cervical plexus block as choice of anesthetic for carotid endarterectomy, provides renewed opportunities for perioperative nurses to couple their compassionate and technical expertise to accomplish successful patient outcomes. ■

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