**Policy Statement**

Carotid endarterectomy is a surgical procedure designed to prevent emboli from or occlusion of a common carotid artery bifurcation containing a significant atheromatous plaque. Candidates for CEA include patients with transient ischemic attacks (TIA’s) and/or strokes. The percentage of blockage is confirmed with imaging and the Vascular Surgeon performs the procedure. EEG recording is done during CEA surgery to monitor intracranial circulation during the procedure, particularly during the clamping and unclamping of the carotid arteries.

**Purpose of Policy**

To provide guidelines for EEG monitoring for this procedure performed in the operating room suite with sterile technique and under general anesthesia.

**Monitoring Technologist:** ABRET registered EEG technologist with Medical Director Supervision

**Procedure**

**EEG Technique:**

I. **HOOK UP**
   A. The hook up for intra-op monitoring is most commonly done in the holding area of the O.R. Communication with the Outpatient O.R. staff of In-patient nursing staff is very important to allow the needed time for patient preparation and EEG baseline.

   B. USING THE INTERNATIONAL 10-20 ELECTRODE PLACEMENT WITH COLLODION TECHNIQUE, PLACE A SET OF ELECTRODES ON THE PATIENT BEFORE GOING INTO THE OPERATING ROOM SUITE, USING THE NICOLET VOYAGEUR HEADBOX DESIGNED FOR O.R. USE.

   C. The standard monitoring montage unless otherwise specified by the Neurologist, is the longitudinal A-P bipolar chain montage. A1 (M1) and A2 (M2) electrodes must always be included with a digital EEG system. A shoulder to shoulder EKG lead must also be included.

   D. Electrodes must be gelled with electrolyte and impedance’s checked on the impedance screen of the digital machine. Impedances should be equal, less than 5 kilohms and greater than 1 kilohm.
E. After hook-up is completed, there is a 10-15 minute baseline EEG taken with the parameters to be used during the Carotid Intraoperative Monitoring.

**MONITORING MONTAGE AND PARAMETERS**

FP1-F3
F3-C3
C3-P3
P3-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F7
F7-T3
T3-T5
T5-O1
FP2-F8
F8-T4
T4-T6
T6-O2
FZ-CZ
CZ-PZ
A1-A2
EKG

CAL = 50uv
SENS = 7uv/mm or 5uv/mm
HF = 70 Hz
LLF = 1Hz or .5Hz (Nicolet)
60 Hz = (out)
Speed = 15mm/sec.

F. The EEG electrodes are then secured for transporting the patient in the O.R. and the EEG instrument is put into the hallway outside the O.R. suite to be used.

G. The technologist then goes to the anteroom to change into surgical scrubs, shoe-covers and mask.

H. The EEG instrument and cables are cleaned thoroughly with hospital approved disinfectant.

II. SET-UP OF EQUIPMENT IN THE O.R. SUITE

A. Position the EEG instrument in a space, which allows traffic to move around it. The technologist should be adjacent to the head of the patient and facing the anesthesiologist and the surgeon if possible.

B. Plug the machine into a Safety Power Pack, which plugs into the special O.R. outlets.

C. Tape the cables down to the floor with heavy water proof tape.

D. Turn on the EEG instrument and fill in all the information screens, calibrate the instrument and select the Carotid protocol and montage.

E. When the patient arrives in the O.R. Suite, the electrode headbox is secured to a non-moving part underneath the surgical table. The patient cable is then connected to the headbox.
III. MONITORING TECHNIQUE
A. Select the impedance screen on the Digital instrument and check the impedances, re-gelling the electrodes if needed. Start recording and inform the Anesthesiologist that you will need at least 3 minutes of recording before induction. Documentation of times, events, blood pressure, heart rate and body temperature are all recorded on an EEG intraoperative monitoring log sheet.

B. Prior communication with the anesthesia group is necessary to verify that the general anesthesia used will be kept at .5 minimal alveolar concentrations (MAC). The most common combination is nitrous oxide and oxygen with halothane, enflurane, isoflurane and Fentanyl.

C. At induction the patterns may display a burst suppression or FIRDA. This should level out with a symmetrical beta background for monitoring if the pre-induction baseline was symmetrical.

D. There are many anesthesia effects on the EEG but the most common to recognize are the Sub-MAC widespread anteriorly maximum rhythmic (WAR) pattern and the Supra-MAC patterns of spike/wave and burst-suppression.

E. Any sudden changes occurring on the EEG during monitoring should be reported to the anesthesia group to verify any increase or decrease in inhalants or drops in blood pressure.

F. During the prepping and draping of the patient, the technologist must be protective of the electrode set-up by reminding the surgical staff to avoid splashing betadine or saline solution on the electrodes. Always use sterile technique when it is necessary to go near the surgical staff or surgical table.

G. Once the surgery is started there will be Bovi (electrical) artifact, which will necessitate pausing the monitoring. Intermittent monitoring when the bovi is not in use is necessary to maintain the monitoring baseline.

H. The technologist will have communicated to the surgeon a need to be notified 30 minutes before CLAMP so they are able to page the Neurologist/Electroencephalgrapher for the clamping event.

I. Clamp time is logged and annotated with B/P, HR and temperature readings. Ischemic changes will most commonly appear within 20 sec to 1-min post clamp. These are seen as a drop off of the fast activity on the ipsilateral side and replaced with slow frequencies.

J. Any lateralized changes are reported to the surgeon. That physician will decide if the placement of a shunt is needed.

K. If the clamping is uneventful with no changes then monitoring is continued as before until the unclamping.

L. The unclamping should be uneventful, but if there are any lateralized ischemic changes, the surgeon must be notified immediately.
M. Monitoring is continued throughout the closing and through Emergence when the pattern will display widespread persistent slowing (WPS), WAR, or FIRDA until the patient is awakened and faster activity returns.

N. The patient is checked for speech and bilateral deficits before going into the recovery. The monitoring is stopped unless the surgeon or neurologist orders further monitoring in the recovery room.

O. All equipment is removed from the O.R. suite and the patient’s electrodes are removed in recovery room.

P. All data is documented, logged and put on the review station for the electroencephalographer to read and dictate his report.

Refer to American Clinical Neurophysiology Society Guidelines 2006.