Cranial Nerve Monitoring Part II: “What do I have to do if cranial nerves are being monitored?”

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If cranial nerve (CN) monitoring is planned for a craniotomy surgery, which specific cranial nerve(s) do I as the neuroanesthesiologist most need to know will be monitored before intubation?

A) CN III, IV, and VI
B) CN V
C) CN VII
D) CN IX
E) CN X
F) CN XI
G) CN XII
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Choice C

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Choice D

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The vagal nerve and its branches are at risk with numerous procedures, including during skull base, neck, and chest surgeries. The most easily and commonly placed monitor for recurrent laryngeal nerve monitoring is the neural integrity monitor (NIM) electromyogram (EMG) tracheal tube, so plans for CN X monitoring should be recognized before intubation.

(Prior to electrodes being integrated onto specialized ETTs, gold-foil surface electrodes were positioned around the ETT.)

If a neural integrity monitor (NIM) electromyogram (EMG) endotracheal tube is being used, placement with methods such as direct laryngoscopy, video laryngoscopy, or fiberoptic intubation would all be acceptable. However, be aware that airway topicalization in preparation for awake fiberoptic intubation, such as with nebulized or transtracheal lidocaine or superior laryngeal nerve blocks, may interfere with monitoring.

Also, NIM tracheal tubes are not MRI compatible.


Other techniques besides use of a NIM endotracheal tube have also been described to monitor CN X, and these include endolaryngeal thyroarytenoid electrode placement (via visualization with direct laryngoscopy), percutaneous cricothyroid electrode placement or placing a commercial available adhesive set of electrodes on a Salem sump (OGT/NGT) and passing it under direct vision into the esophagus until the electrodes are next to the vocal cords.


Besides the specialized endotracheal tube for CN X monitoring, which other cranial nerve electrodes would the neuroanesthesiologist most likely be responsible for placing?

A) CN VII
B) CN IX
C) CN XI
D) CN XII
E) CN IX and XII
Placement of CN VII electrodes is external in two paired muscle groups that are usually easily accessible and these electrodes often would be placed by the intraoperative monitoring team.
Choice B

The efferent portion of the glossopharyngeal nerve innervates the stylopharyngeus muscle, and so electrodes are placed in the soft palate. With proximity to the airway, the anesthesiologist would usually place electrodes for CN IX monitoring. But, there is a better answer...
For spinal accessory cranial nerve monitoring, electrodes are placed in the trapezius muscle, which is usually easily accessible and these electrodes often would be placed by the intraoperative monitoring team.
Choice D

The hypoglossal nerve innervates the genioglossus muscle. With proximity to the airway, the anesthesiologist would usually place electrodes for CN XII monitoring. But, there is a better answer...
Choice E

The efferent portion of CN IX innervates the stylopharyngeus muscle. So, a needle electrode pair is placed in the posterior pharyngeal muscles/soft palate halfway between the uvula and the posterior tonsillar pillar.¹

Pre-bent subdermal needle electrodes can be placed via clamping with a straight hemostat with visualization obtained by direct laryngoscopy (although use of a Crowe–Davis retractor for a more difficult airway recently also has been reported).²

The hypoglossal nerve innervates the genioglossus muscle. So, a needle electrode pair is placed in the lateral aspect of the anterior third of tongue.¹

An alternative percutaneous method exists, in which electrodes are placed submentally overlying genioglossus muscle.²

Practical “routine” for neuroanesthesiologist with planned CN IX, X, XII monitoring:

- Intubate with endotracheal tube (ETT) with embedded electrodes for CN X monitoring. Secure ETT to side of anticipated CN IX and XII electrode placement.
- Place esophageal temperature probe ± orogastric tube, as indicated.
- Intra-orally place recording electrodes for CN IX and then CN XII (visualization via direct laryngoscopy usually).
- Place soft bite block on contralateral side of ETT and CN IX and XII recording electrodes.