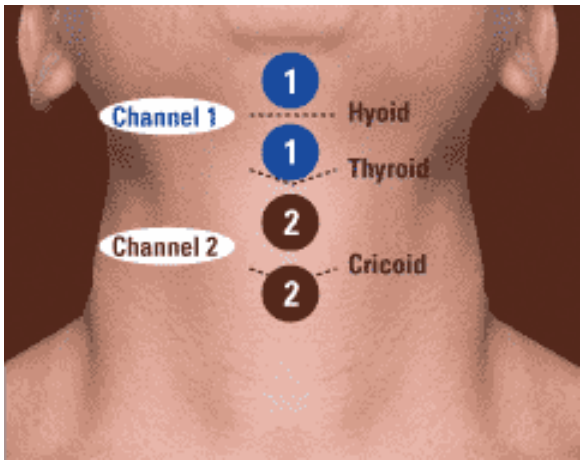
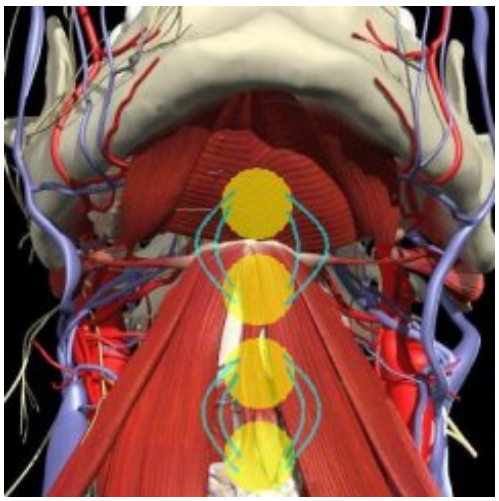
Electrode Placements

Placement 1

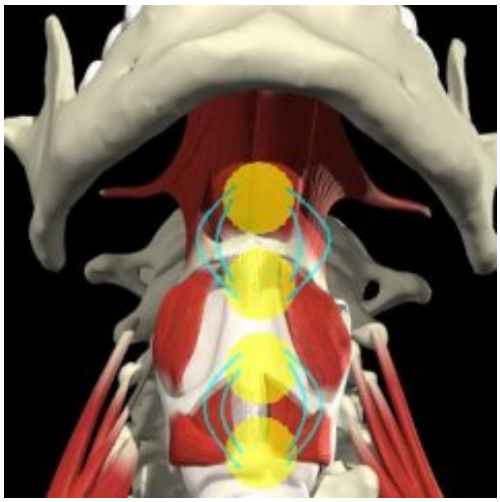


- All electrodes aligned vertically along midline
- First electrode is placed well above hyoid bone
- Second electrode is placed just below first one, above the thyroid notch
- 3rd and 4th electrode placed at equal distances below first two electrodes
- Bottom electrode should not end up below cricoid cartilage

Muscles reached

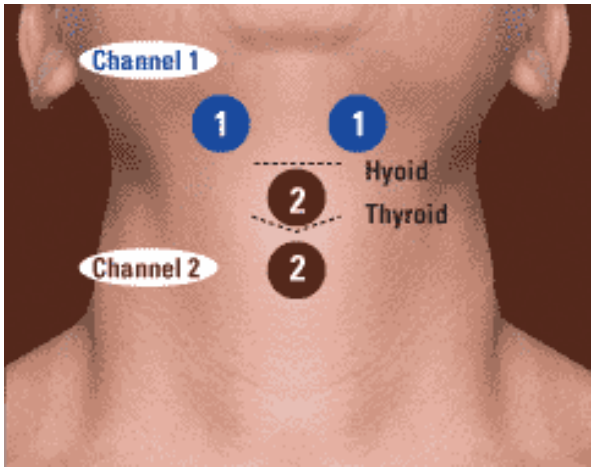


Superficial: mylohyoid, possibly sternohyoid



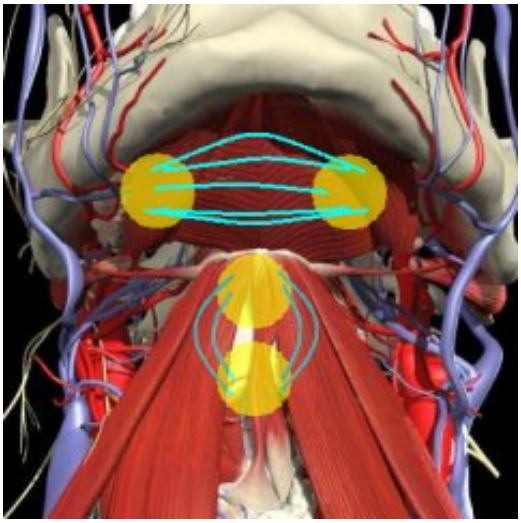
Deeper: geniohyoid, cricothyroid

Placement 2a

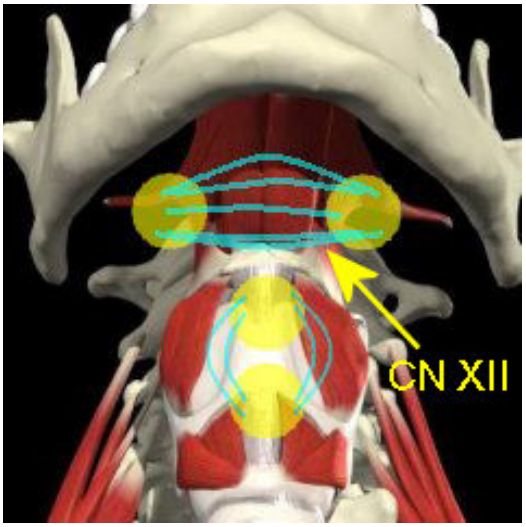


- Channel 1: electrodes aligned horizontally at or above hyoid bone
- Channel 2: electrodes aligned vertically along midline, top electrode at level of thyroid notch, bottom electrode below it

Muscles reached

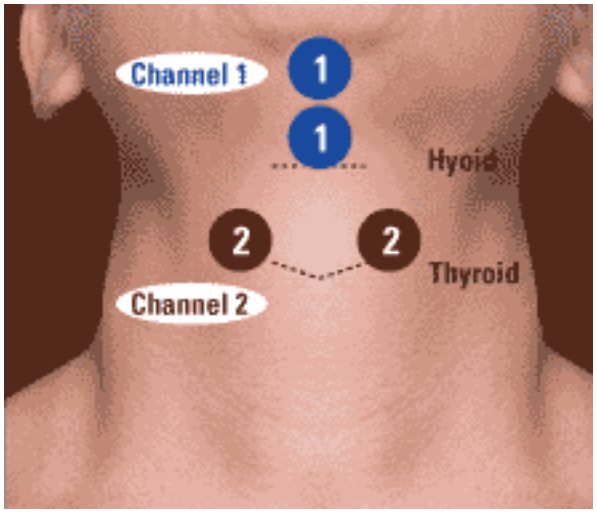


Superficial: mylohyoid, anterior belly digastric



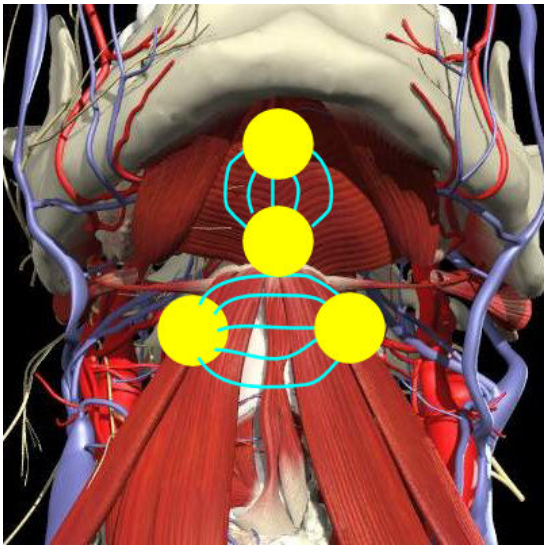
Deeper: geniohyoid, thyrohyoid, cricothyroid, possibly sternohyoid, possibly hypoglossal nerve

Placement 2b

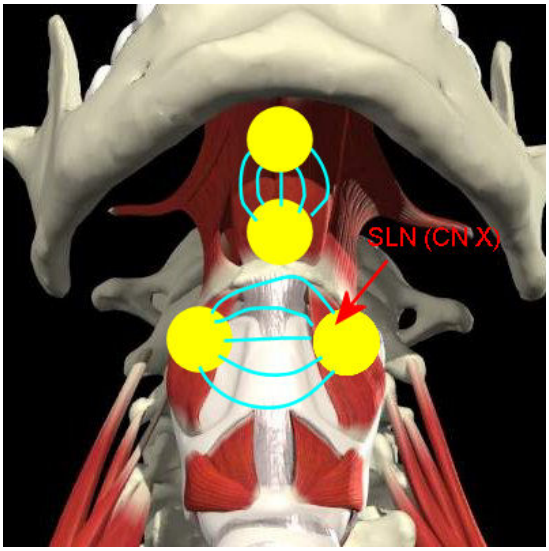


- Channel 1: electrodes aligned along midline, over geniohyoid belly
- Channel 2: electrodes placed at either side of thyroid notch, over thyrohyoid muscle belly

Muscles reached

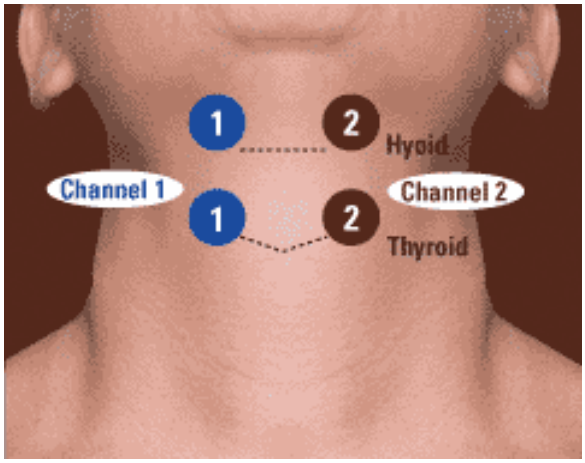


Superficial: mylohyoid, possibly sterno- and omohyoid



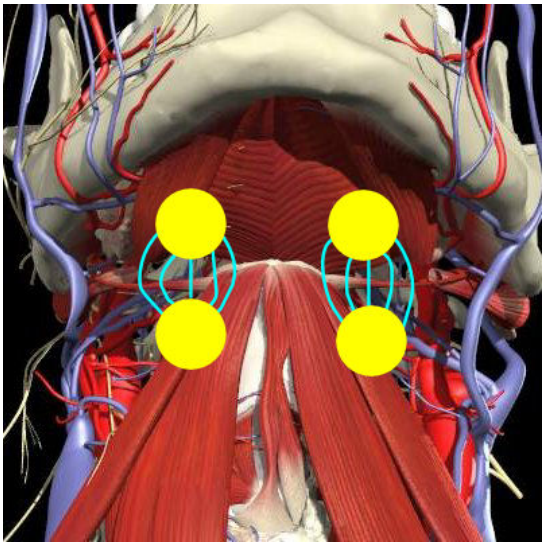
Deeper: geniohyoid, thyrohyoid, possibly superior laryngeal nerve (CN X)

Placement 3a

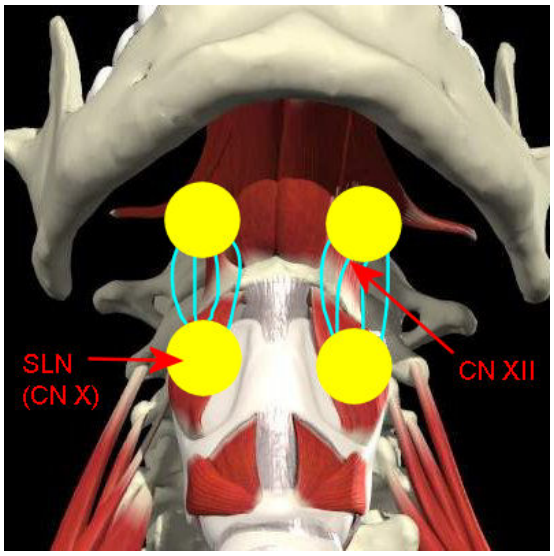


- Channels aligned vertically on either side of midline
- Top electrodes are placed just above hyoid bone
- Bottom electrodes are over the thyrohyoid muscle – at the level of the thyroid notch
- Note: DO NOT place electrodes too far laterally so as not to send current through carotid sinus

Muscles reached

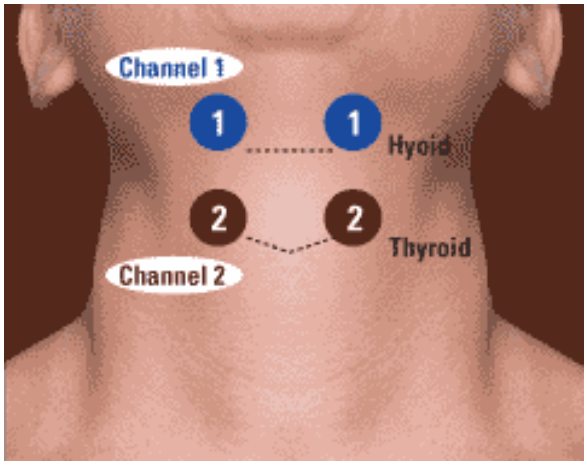


Superficial: anterior belly digastric, possibly sterno- and omohyoid



Deeper: thyrohyoid, possibly geniohyoid, possibly hypoglossal nerve, possibly superior laryngeal nerve (CN X)

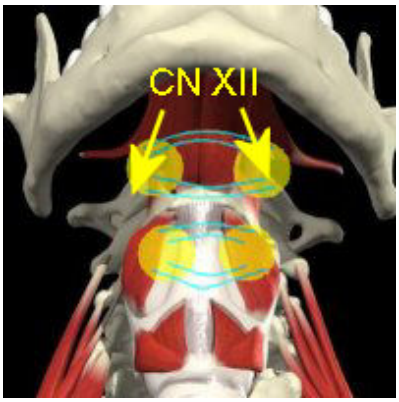
Placement 3b



- Electrodes channel 1 aligned horizontally at or above hyoid bone
- Top electrodes are placed just above hyoid bone
- Bottom electrodes are over the thyrohyoid muscle – at the level of the thyroid notch
- Note: DO NOT place electrodes too far laterally so as not to send current through carotid sinus

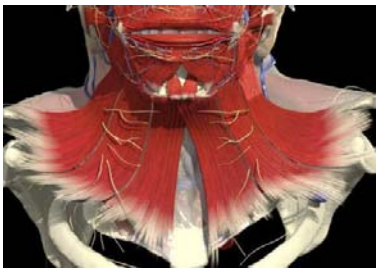
Muscles reached

Superficial: mylohyoid, anterior belly digastric, possibly sterno- and omohyoid

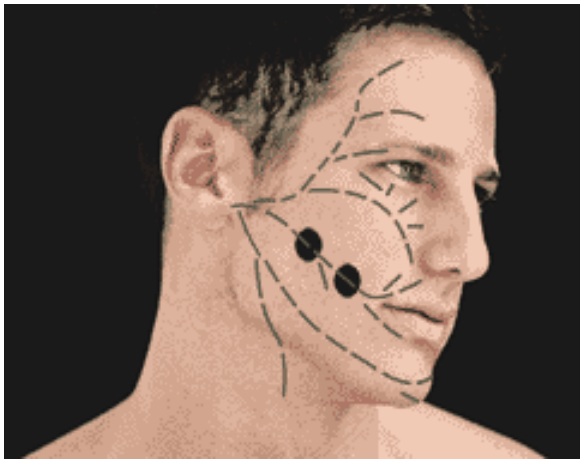


Deeper: geniohyoid, thyrohyoid; middle pharyngeal constrictors (not depicted) *may* be stimulated as well with sufficient intensity; if top electrodes are placed far enough apart the hypoglossal nerve may be reached as well

Note: with any of the placements with a paramedian electrode placement, the platysma may be recruited. If this presents too much of a nuisance factor or interferes with treatment, try adjusting the position of the electrodes.

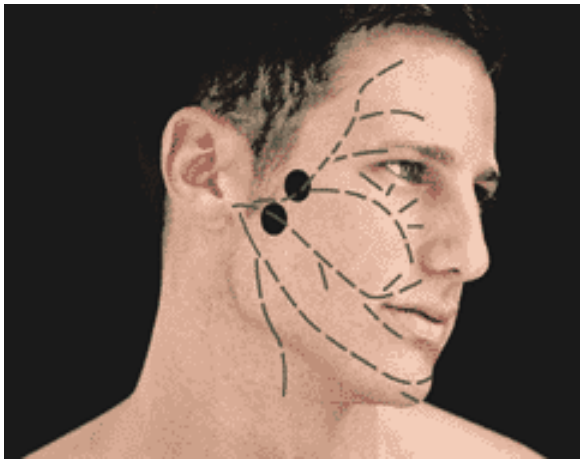


Placement 4a

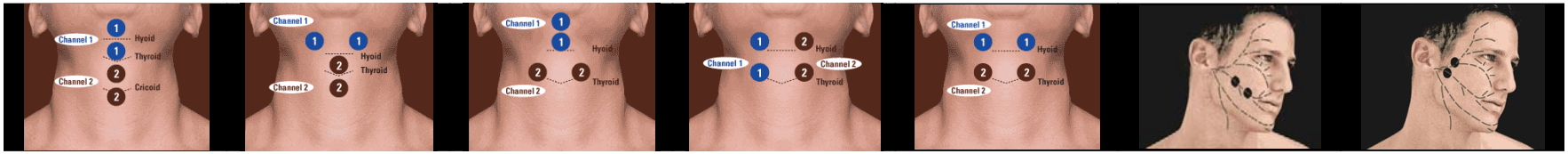


- Electrodes are placed over buccal branch of facial nerve
- Channel may be placed bilaterally
- Second channel may be placed superior to hyoid (as in top channel of placement 3b) to facilitate recruitment of CN XII
- Alternatively, 2nd channel may be placed on opposite side to increase facilitation of oropharyngeal sling

Placement 4b



- Electrodes are placed over main trunk of facial nerve
- Second channel may be placed superior to hyoid (as in top channel of placement 3b) to facilitate recruitment of CN XII
- Alternatively, 2nd channel may be placed on opposite side to increase facilitation of oropharyngeal sling



1 **2a** **2b** **3a** **3b** **4a** **4b**

Functional muscle actions	Possible signs & symptoms	Possible VitalStim electrode placements	
Oropharyngeal "sling" - Orbicularis oris - Buccinator - Superior pharyngeal constrictor	- anterior spillage/leakage - premature spillage, residuals - pocketing, holding, stasis - nasal regurgitation	4a	maximum facilitation of synergists when electrodes applied bilaterally
Tongue: bolus manipulation and tongue base retraction - Intrinsics tongue - Extrinsics tongue - Superior pharyngeal constrictor	- AP transit - premature spillage - coating tongue base/post. pharynx - delayed swallow trigger - vallecular pooling	4a 3b	increases sensory input - CN V and VII add bottom channel over CN XII to facilitate tongue muscle recruitment bottom channel facilitates thyrohyoid recruitment
Velopharyngeal seal - Levator veli palatini - Superior pharyngeal constrictor	- nasal regurgitation - residuals - delayed pharyngeal transit	4a	maximum facilitation of synergists when electrodes applied bilaterally
Hyolaryngeal Excursion - Laryngeal extrinsics - Suprahyoid muscles	- decreased hyolaryngeal excursion - penetration, aspiration - voice abnormalities - decreased UES opening - pooling, residuals	2b 1 3a	good facilitation of geniohyoid, mylohyoid and thyrohyoid muscles facilitation supra- and infrahyoid muscles good facilitation of digastric and thyrohyoid muscles
Pharyngeal constriction - Superior pharyngeal constrictor - Middle pharyngeal constrictor - Inferior pharyngeal constrictor - Pharyngeal shortening mm	- penetration, aspiration - piecemeal deglutition - residuals - decreased pharyngeal transit time	3b	electrode placements on attachments of middle (hyoid) and lower (thyroid) pharyngeal constrictors
UES seal opens and closes - Cricopharyngeus - Supra- and infrahyoid mm - Pharyngeal constrictors - Pharyngeal shortening muscles	- delayed opening UES - decreased opening UES, CP bar - premature closure UES - penetration, aspiration - pyriform pooling, residuals	2b 1 3a 3b	focus on hyolaryngeal excursion focus on maximal sensory input focus on hyolaryngeal excursion (TH) focus on pharyngeal constriction

Electrode placement is influenced by multiple factors:

- A very small neck may not offer sufficient room for 4 electrodes, except maybe for placement 2.
- Do not place an electrode directly on a fresh surgical incision.
- Do not allow current to flow through indwelling foreign material (tracheotomy, staples, sutures, etc.)

Procedure for electrode placement:

- Ensure skin is clean, dry and well shaven.
- Clean skin with included cleaning swab or alcohol swab; the included swab improves adhesion and conductivity.
- Maintain head position as neutral as possible.
- Attach electrodes per placements diagrams on previous page.
- Improve contact with bandage or tape if skin sags too much or as required.

Coaching Swallow Attempts during Treatment

- **Swallow hard**
  When recovering from dysphagia individual needs to concentrate on a strong swallow.
- **Swallow fast**
  Timing is as important as strength. Any delay in swallowing can result in aspiration.
- **Swallow in single contractions**
  It is important to clear the pharynx as much as possible to prevent passive aspiration.
- **Swallow; clear throat and swallow again**
  An individual who experiences pyriform sinus pooling with residual can help to clear the pharynx by clearing the throat and swallowing. Clearing the throat helps to clear the pyriform sinuses.

*Carnaby, 2006: Study compared standard low-intensity and high-intensity behavioural interventions with usual care for dysphagia. 306 patients with clinical dysphagia admitted to hospital with acute stroke were randomly assigned to receive usual care (n=102), prescribed by the attending physician; standard low-intensity intervention (n=102), comprising swallowing compensation strategies and diet prescription three times weekly for up to a month; or standard high-intensity intervention and dietary prescription (n=102), at least daily for up to a month.Data show a consistent trend towards more favourable outcomes in dysphagic stroke patients who are assigned a standard programme of **early** behavioural swallowing intervention, including active therapeutic approaches and dietary modification.*