Motor System: Descending Pathways - Corticobulbar

note: “bulb” =

Corticobulbar Tract

origins in cerebral cortex
> much the same as corticospinal tract

pyramidal cells in lamina V of cerebral cortex

face, head and neck regions
of somatosensory cortex

descending pathway
> much like corticospinal tract

collect in white matter beneath cerebral cortex

enter internal capsule,

at points of termination, axons swing out of
CorticoSpinal Tract - CorticoBulbar Tract

terminations in brain stem
> in and around sensory nuclei

> in reticular formation

> in somatic motor nuclei
notes on terminations in brain stem (continued)

> motor nuclei of CNs III, IV, VI (somatic motor) - limited influence
  not considered as a part of Corticobulbar Tract
  do receive input from cerebral cortex, including motor areas

from Frontal Eye Fields, parietal cortex (visually guided movement)
via gaze control centers in midbrain and pons

cerebral cortex
frontal eye fields + parietal cortex

midbrain

pons
gaze control center (vertical)

V nuc

VII nuc

gaze control center (horizontal)

III nuc

IV nuc

VI nuc

notes on terminations in brain stem (continued)

> motor nuclei of CNs V, VII, IX, X, XI, XII (somatic motor) - important influence
> via interneurons
> general rule: bilateral terminations, but ... some exceptions with clinical importance
corticobulbar inputs and results of corticobulbar damage

**for trigeminal motor nucleus (V)**
- bilateral input of corticobulbar fibers; contralateral may predominate (variable)

![Diagram of trigeminal motor nucleus (V)](image)

**effect of corticobulbar damage (cerebral cortex, internal capsule, brain stem)**

for muscles of mastication

**for facial motor nucleus (VII)**
- bilateral input to SMNs for upper part of face; contralateral input to SMNs for lower part of face

![Diagram of facial motor nucleus (VII)](image)

**effect of corticobulbar damage (cerebral cortex, internal capsule, brain stem)**

for muscles of upper face

for muscles of lower face

![Diagram showing side of corticobulbar damage](image)

$X = \text{side of corticobulbar damage}$
corticobulbar inputs and results of corticobulbar damage (continued)

for nucleus ambiguus (IX and X)
bilateral input, but ...
mostly contralateral to SMNs for muscles on each side of soft palate
(these muscles elevate soft palate and uvula)

X = side of 
corticobulbar 
damage

for soft palate and uvula

effect of corticobulbar damage (cerebral cortex, internal capsule, brain stem)
for soft palate and uvula

X = side of lower motor neuron damage

for accessory motor nucleus (XI)
bilateral input, but ..... predominantlly ipsilateral, contralateral or ?
to sternocleidomastoid and trapezius SMNs

X = side of corticobulbar damage 
for SCM 
for trapezius
for hypoglossal motor nucleus (XII)
bilateral input, but...
mostly contralateral to SMNs of genioglossus muscle
each genioglossus (GG) moves the tongue
in an anterior and medial direction;
together, the two GG muscles protrude the tongue

effect of corticobulbar damage
for tongue (genioglossus muscle)

tongue
upon protrusion of the tongue

pseud bulbar palsy
set of clinical signs
difficulty with swallowing, chewing, speaking, moving tongue, facial movements
paresis of affected muscles (no atrophy, no fasciculations)
bilateral loss of cortical input to CNs V - XII
due to multiple bilateral strokes, MS, ALS ....
additional signs of PSB: inappropriate outbursts - laughing, crying
result of corticobulbar and corticospinal damage

lesion of internal capsule on one side
what’s the effect on the following
- muscles of upper face
- muscles of lower face
- muscles of palate - deviation of uvula
- muscles of tongue - deviation of tongue upon protrusion
- upper limbs
- lower limbs

cause:
problem with branches of middle cerebral artery

lesion of cerebral peduncle on one side involving CN III on that side
what’s the effect on the following
- muscles that move the eyes - deviation of gaze
- iris (pupillary light reflex) and eyelid
- muscles of upper face
- muscles of lower face
- muscles of palate - deviation of uvula
- muscles of tongue - deviation of tongue upon protrusion
- upper limbs
- lower limbs

term:
superior alternating hemiplegia
hemiplegia = paralysis of skeletal muscles on one side of the body due to UMN injury

cause:
problem with branches of posterior cerebral artery

lesion of pons on one side involving CNs VI and VII on that side
what’s the effect on the following
- muscles that move the eyes - deviation of gaze
- muscles of upper face
- muscles of lower face
- muscles of palate - deviation of uvula
- muscles of tongue - deviation of tongue upon protrusion
- upper limbs
- lower limbs

term:
middle alternating hemiplegia

cause:
problem with branches of basilar artery

lesion of medulla and pyramid on one side involving CN XII
what’s the effect on the following
- muscles of upper face
- muscles of lower face
- muscles of palate - deviation of uvula
- muscles of tongue - deviation of tongue upon protrusion
- upper limbs
- lower limbs

term:
inferior alternating hemiplegia

cause:
problem with branches of anterior spinal artery