Chapter

1

Introduction

There are 12 pairs of cranial nerves emerging from the brain. They pass through skull foramina, fissures, or canals to exit the cranial vault and then distribute their innervation to their respective structures mainly in the head and neck.

The cranial nerves are numbered sequentially with Roman numerals in the order in which they arise from the brain, rostrally to caudally. The following list includes their names and corresponding numbers:

I Olfactory nerve
II Optic nerve
III Oculomotor nerve
IV Trochlear nerve
V Trigeminal nerve
VI Abducent nerve
VII Facial nerve
VIII Vestibulocochlear nerve
IX Glossopharyngeal nerve
X Vagus nerve
XI Spinal accessory nerve
XII Hypoglossal nerve.

Note: Although the cranial nerves and their sensory and parasympathetic ganglia form part of the peripheral nervous system, the optic nerve is really an outgrowth of the brain that emerges from the prosencephalon (not the brainstem, as other cranial nerves) and is therefore not a typical cranial nerve. Moreover, the spinal accessory nerve arises from the cervical spinal cord; thus, there are only 9 pairs of cranial nerves that emerge from the brainstem.

The attachment of the cranial nerves to the brainstem is shown in Fig. 1.1.

FUNCTIONAL COMPONENTS OF CRANIAL NERVES

- The functional component is a part of cranial nerve that performs a specific function, such as:
  a. Motor or efferent component, and
  b. Sensory or afferent component.

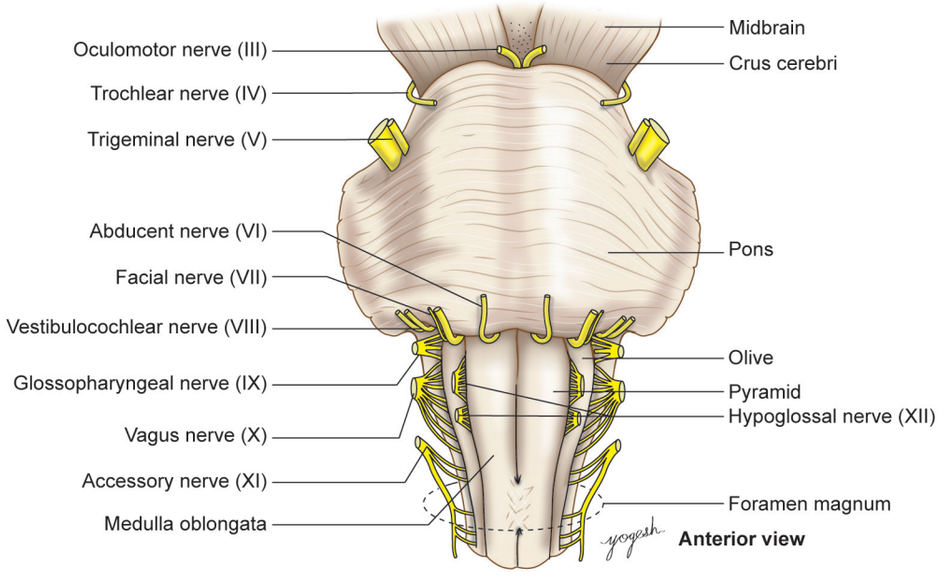

Fig. 1.1: Brainstem: Attachments of cranial nerves

- These are further classified according to function as follows (Figs 1.2 to 1.4):

Efferent (motor) components (Table 1.1)

1. *General somatic efferent* (*GSE*): They supply striated muscles of head that do not originate from pharyngeal arches.
2. *Special visceral efferent* (*SVE*) *or branchial efferent*: They supply striated muscles of pharyngeal arches, trapezius, and sternocleidomastoid muscle.
3. *General visceral efferent* (*GVE*) are preganglionic parasympathetic fibers. They supply glands, smooth muscles of viscera and vessels.

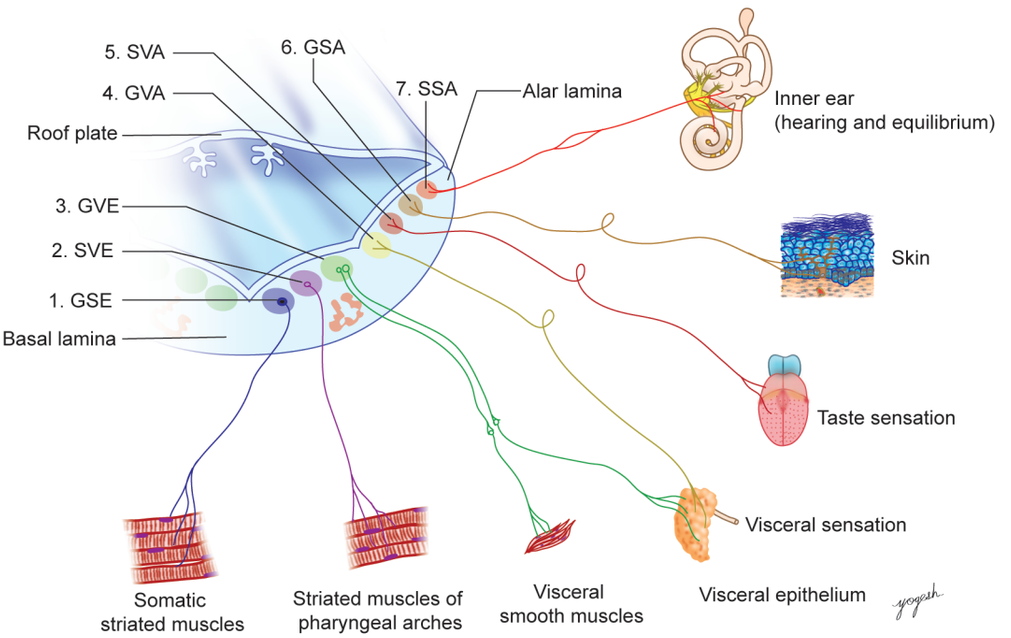

Fig. 1.2: Organization of functional columns of cranial nerve nuclei in brainstem. (GSE: General somatic efferent, SVE: Special visceral efferent, GVE: General visceral efferent, GVA: General visceral afferent, SVA: Special visceral afferent, GSA: General somatic afferent, SSA: Special somatic afferent)

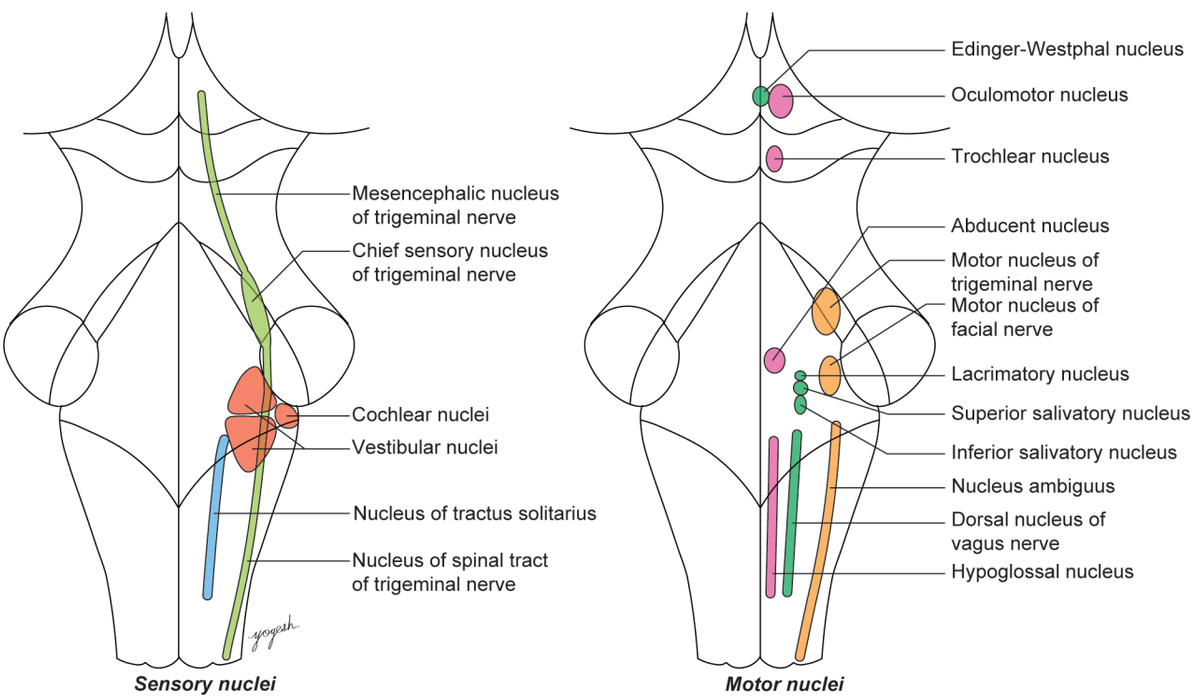

Fig. 1.3: Surface projection of cranial nerve nuclei on the dorsal aspect of the brainstem (posterior view)

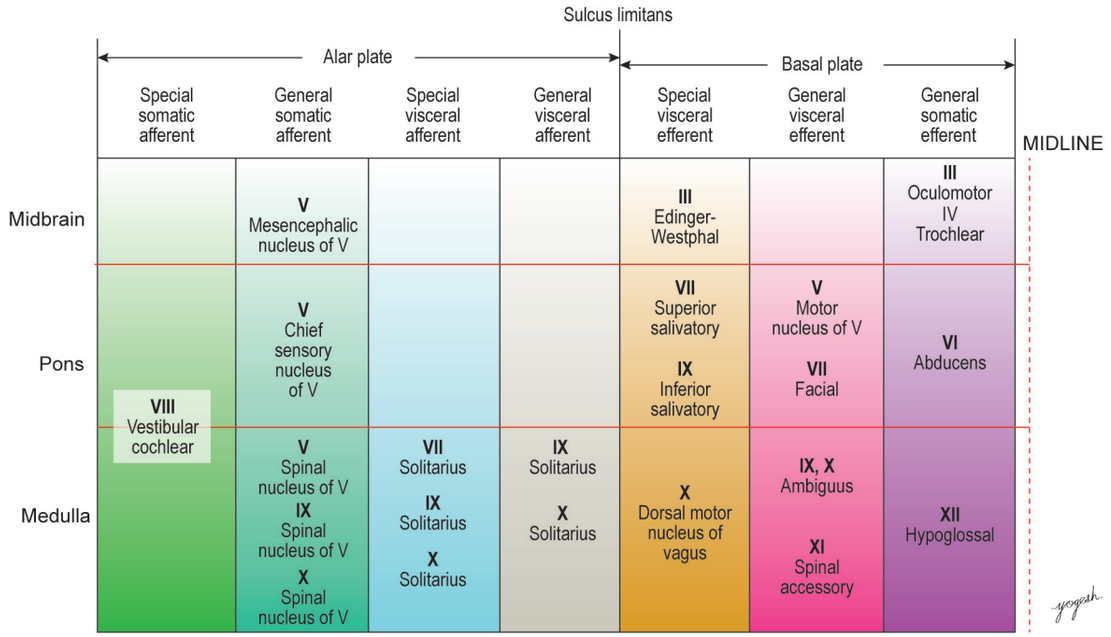

Fig. 1.4: Location of cranial nerve nuclei and their columns

TABLE 1.1: Cranial nerve nuclei: Efferent column

	GSE	*SVE*	*GVE*
Functions	Striated muscles of head	Striated muscles of pharyngeal arches	Parasympathetic fibers
Midbrain	Oculomotor nucleus Trochlear nucleus	–	Edinger-Westphal nucleus
Pons	Abducent nucleus	Motor nucleus of Vth nerve and facial nerve	Superior salivatory nucleus Lacrimatory nucleus
Medulla oblongata	Hypoglossal nucleus	Nucleus ambiguus	Inferior salivatory nucleus Dorsal nucleus of vagus

TABLE 1.2: Cranial nerve nuclei: Afferent column

	GVA	*SVA*	*GSA*	*SSA*
Functions	Visceral sensation	Taste sensation	Proprioception Tactile sensation from head	Auditory and vestibular impulses
Midbrain	–	–	Mesencephalic nucleus of Vth nerve	–
Pons	NTS	NTS (for facial nerve)	Main sensory nucleus of Vth nerve	Vestibular and cochlear nuclei
Medulla oblongata	NTS	NTS (for IX, X nerves)	Spinal nucleus of Vth nerve	–

Afferent (sensory) components (Table 1.2)

1. *General visceral afferent* (*GVA*): They carry visceral sensation via vagus nerve.
2. *Special visceral afferent* (*SVA*): They carry taste sensation.
3. *General somatic afferent* (*GSA*): They carry proprioception, tactile sensation from face and oral, nasal, and pharyngeal mucosa via trigeminal nerve.
4. *Special somatic afferent* (*SSA*): They carry auditory and vestibular impulses.

- Each cranial nerve may carry fibers of one or more components. For example, trochlear nerve carries fibers of somatic efferent column and it supplies muscles developed from cranial somites.
- Oculomotor nerve carries general somatic efferent fibers for extraocular muscles and general visceral efferent fibers for sphincter pupillae and ciliaris muscles.

Note: The cranial nerve should be studied under the following headings: Functional components and nuclei, course and relations, branches and distribution, clinical testing, applied aspects.