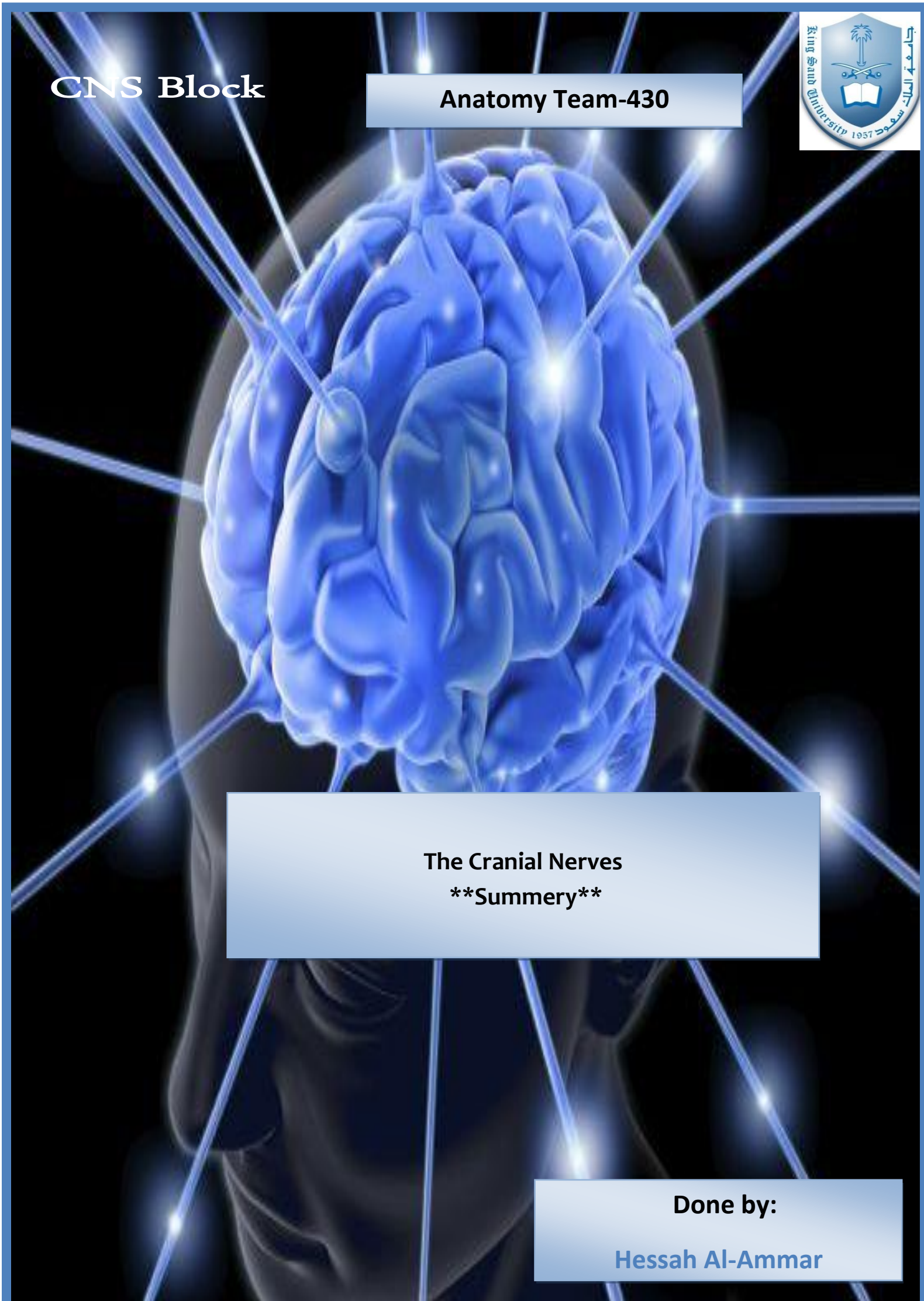
CNS Block

Anatomy Team-430



The Cranial Nerves
Summery

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General information about cranial nerves

Each cranial nerve contains:

- sensory fibers (sensory nerve)
- or motor fibers(motor nerve)
- or both (mixed nerve)

now what are these sensory and motor fibers:

1- sensory fibers:(4 types)

1- general somatic afferent(GSA):

receives general sensation of pain .temperature –proprioseptive –touch (p.t.p.t) form skin – sk ms (not from viscera)

2- general visceral afferent(GVA):

receives general sensation of pain .temperature –proprioseptive –touch (p.t.p.t) form viscera

*sympathetic or parasympathetic .

3- special somatic afferent(SSA):

receives general sensation of balance and vision and hearing

4- special visceral afferent(SVA):

receives general sensation of taste and smell

2- motor fibers:(3 types)

1- general somatic efferent(GSE):

supplies somatic voluntary ms (skeletal ms)

2-general visceral efferent(GVE):

Supplies involuntary ms (smooth and cardiac ms)+ gland

3-special visceral efferent(SVE) :

Supplies special group of ms that derives from branchial arches (pharyngeal arches)

They are:

First arch	➳ muscles of mastication(temporalis , masseter, medial & lateral pterygoid) ➳ the anterior belly of the digastric, ➳ the mylohyoid, ➳ tensor tympani, ➳ tensor veli palatini.	innervated by the trigeminal nerve
Second arch	➳ muscles of facial expression, ➳ the posterior belly of the digastric ➳ , stylohyoid muscle, and ➳ the stapedius ➳ platysma ➳ occipitofrontalis ➳ buccinator	innervated by the facial nerve
Third arch	the stylopharyngeus	glossopharyngeal nerve.
Fourth & Sixth arches	➳ all the muscles of the palate (exception of the tensor palate which is innervated by the trigeminal nerve ➳ all the muscles of the pharynx (except stylopharyngeus which is innervated by the glossopharyngeal nerve, ➳ all the muscles of the larynx ➳ Palatoglossus	innervated by the vagus nerve

Note:

All sensory (GSA-GVA-SSA-SVA) and sympathetic / parasympathetic(GVE) fibers have ganglion on there pathway (before entering the brain stem)

Cranial nerves(2nd-12th) nuclei

	Type of nuclei	nuclei	Type of fibers that it is receive or give	location	Cranial nerves
1	motor nuclei	**Hypoglossal nucleus**	G.	Open medulla	12th
2		**Abducent N**	S.	Caudal pons	6th
3		**Trochlear N**	E.	Mid brain	4th
4		**occulomotor nucleus**		Mid brain	3th
5		**inferior salivatory nucleus**	**G.**	pons	9th
6		Superior salivatory N	**S.**	pons	7th
7		**Dorsal Nucleus of Vagus**	**E.**	Open medulla	10th
8		**Edinger-Westphal nucleus (EWN)**		Mid brain	3th
9		**nucleus ambiguus,**	**S.**	Open medulla	9th 10th 11th (cranial part) اما spinal part (**spinal nucleus)**
10		**Facial motor nucleus**	V. E.	Caudal pons	7th

11		**Trigeminal <u>Motor nucleus</u>**		Pons	5^{th}
12	sensory nuclei	**Sensory Nucleus of Trigeminal nerve**(<u>1-Mesencephalic – 2-Principal (main) sensory</u> **3-Spinal**)	GSA	1-midbrain& restoral pons 2- pons 3- pons, medulla & upper 2-3 cervical segments of spinal cord	5^{th} 10^{th} (spinal)
13		**Cochlear nuclei**	SSA	medulla	8^{th} (cochlear part)
14		**Vestibular nuclei**	SSA	Open medulla – caudal pons	8^{th} (vestibular part)
15		**nucleus of solitary tract**	SVA GVA	Open medulla	7^{th} (SVA) 9^{th} (SVA-GVA) 10^{th} (GVA)
16		**Lateral geniculate nucleus**	SSA	Thalamus	2^{nd}

Note:

All motor nuclei are locating medialy within the brain stem and all sensory nuclei are laterally

Cranial nerves	type	Nucleus	Foramen of exit or exit from skull	ganglion
2th	Sensory (SSA)	**Lateral geniculate nucleus**	**Optic canal**	_____
3th	Motor(GSE\GVE= **parasympathetic**)	**1-occulomotor nucleus** **2-Edinger-Westphal nucleus (EWN)**	**superior orbital fissure**	GVE→cilliary ganglion
4th	Motor(GSE)	**Trochlear N**	**superior orbital fissure**	It is motor and not GVE→ no ganglion ----------
5th	Mixed (GSA\SVE)	***1*-Sensory Nucleus of Trigeminal nerve** (3 parts) 2- **Trigeminal** **Motor nucleus**	opthalamic → **superior orbital fissure** maxillary →foramen rotundum mandibular→foramen ovale	GSA→trigeminal ganglion
6th	Motor(GSE)	**Abducent N**	**superior orbital fissure.**	----------
7th	Mixed(SVE \GVE= parasympathetic\-SVA)	1-**Superior salivatory N** **2-motor nucleus of facial nerve** 3- **nucleus solitarius**	through internal auditory meatus (enter the ear) then Passes through **stylomastoid foramen**	*SVA →geniculate ganglion *GVE to lacrimal ,nasal,palatain glands→ptrygopalatine ganglion *GVE to sub- mandibular ,lingual glands → sub-mandibular ganglion
8th	Sensory(SSA)	1-Cochlear nuclei 2-Vestibular nuclei	**internal auditory meatus.**	Cochlear →spiral ganglion Vestibular→ vestibular ganglion
9th	Mixed(SVE \ GVE= parasympathetic \GVA\SVA)	**1-nucleus ambiguus**, **2-inferior salivatory nucleus** **3-nucleus of solitary tract**	**jugular foramen.**	*GVE→otic ganglion *superior and inferior ganglion
10th	Mixed(SVE\ GVE= parasympathetic \ GSA\GVA)	**1-nucleus ambiguus**, **2-Dorsal Nucleus of Vagus** **Sensory nucleus of trigeminal nerve** **4-nucleus of solitary tract**	**jugular foramen.**	Parasympathetic , superior and inferior ganglion
11th	Motor (SVE)	cranial part: **nucleus ambiguus**, spinal part :**spinal nucleus**	**jugular foramen.**	----------
12th	Motor((GSE)	**Hypoglossal nucleus**	**Hypoglossal canal**	----------

Cranial nerves	function	Lesion
2nd	• Vision	Lesion results in: visual field defects and loss of visual acuity, a defect of vision is called anopsia. • A lesion of the right optic nerve→ loss of vision in the right eye • A lesion of the optic chiasm → bitemporal hemianopsia. • A lesion of the right optic tract & right optic radiation→ contralateral homonymous hemianopsia. • A lesion of both visual cortices → complete blindness
3th	• Elevation of the upper eyelid, • Turning the eye upward, downwards and medially, • Constricting the pupil, • Accommodating the eyes.	• Lateral squint • Ptosis • Diplopia • Pupillary dilatation • Loss of accommodation • Impaired downward & outward movement of the eye ball on the damaged side.
4th	• Rotates the eye ball downwards and laterally	• Lesion results in diplopia & inability to rotate the eye infero-laterally. • The eye deviates; upward and slightly inward. • Person has difficulty in walking downstairs
5th	• *Carrying general sensations from face. • *Supplying muscles developed from the 1st pharyngeal arch, (8 muscles).	• trigeminal neuralgia or tic douloureux • Usually involves maxillary & mandibular nerves, rarely in the ophthalmic division.
6th	• Rotates the eye ball laterally.	• Medial squint • A nuclear lesion may also involve the axons of the facial nerve, causing paralysis of all the ipsilateral facial muscles.
7th	• carrying taste sensation from anterior 2/3 of the tongue. • supplying muscles developed from the 2nd pharyngeal arch. • parasympathetic secretory fibers to submandibular, sublingual, lacrimal, nasal & palatine glands.	• Bell's Palsy = **paralysis of muscles of facial expressions**
8th	• Vestibular part: balance of body (position & movement of the head) • Cochlear part: hearing	• Lesion of vestibulocochlear nerve →deafness (Disturbnce of cochlear nerve functions), tinnitis, vertigo, dizziness, nausea, nystagmus, loss of balance and ataxia (Disturbnce of vestibular nerve functions) • most common lesion is Acoustic neuroma

9th	• **supply stylopharygeus** • **supply parotid gland.** • **supply the taste buds on posterior third of tongue.** • **recive visceral sensation from mucosa of posterior third of tongue, pharynx, auditory tube and tympanic cavity, carotid sinus**	• **dysphonia, dysphagia and absence of the gag reflex.** • **examples of this lesion:** **1. Lateral medullary syndrome** **2. Tumors**
10th	• **innervate cardiac muscle, smooth muscles and glands of viscera.** • **innervate muscles of pharynx and larynx(6th -4tharches) .** • **Sensation from viscera in neck, thoracic and abdominal cavities** • **sensation from auricle, external acoustic meatus and cerebral dura mater**	• ***causes hoarseness or loss of voice, impaired swallowing, GI dysfunction, blood pressure anomalies (with CN IX),** • ***examples of this lesion: 1. Lateral medullary syndrome** • **2. Tumors**
11th	• **Movements of the soft palate, larynx, pharynx.** • **Controls the movements of neck**	• **Difficulty in swallowing and speech** • **Inability to turn the head and raise the shoulder** • **Winging of scapula**
12th	• **Controls the movements and shape of the tongue during speech and swallowing**	• **Loss of tongue movements** • **Difficulty in chewing and speech** • **The tongue paralyses, atrophies, becomes shrunken and furrowed on the affected side (LMN paralysis)** • **On protrusion, tongue deviates to the affected side** • **If both nerves are damaged, person can't protrude tongue**