**Trigeminal nerve**

The principal regulator of the sensory modalities of the [head](https://www.kenhub.com/en/library/anatomy/head-anatomy) is the **trigeminal nerve**. This is the fifth of twelve pairs of [cranial nerves](https://www.kenhub.com/en/library/anatomy/the-12-cranial-nerves) that are responsible for transmitting numerous motor, sensory, and autonomous stimuli to structures of the [head and neck](https://www.kenhub.com/en/library/anatomy/regions-of-the-head-and-neck).

While the trigeminal nerve (CN V) is largely a **sensory** nerve, it also mingles in the realm of **motor** supply. Unlike the other cranial nerves, the trigeminal nerve is quite large. It has four nuclei that send fibers to form its tracts and is associated with three separate branches.

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| **Key facts about the trigeminal nerve (CN V)** |
| Type | Mixed (motor and sensory) |
| Nuclei | Motor nucleus of trigeminal nerve Principal sensory nucleus of trigeminal nerve Spinal nucleus of trigeminal nerve Mesencephalic nucleus of trigeminal nerve  |
| Divisions | Ophthalmic nerve (CN V1)Maxillary nerve (CN V2)Mandibular nerve (CN V3) |
| Field of innervation | **Motor:** Muscles of mastication, mylohyoid, anterior belly of digastric, tensor tympani muscles**Sensory:** Scalp, face, orbit, paranasal sinuses, anterior two-thirds of the tongue  |

**Divisions:**

As the name suggests, the trigeminal nerve is a tripartite entity made up of distinct terminal divisions. Each component of the nerve is responsible for a specific region of the [face](https://www.kenhub.com/en/library/anatomy/the-human-face), and transmits specific impulses. The three divisions of the trigeminal nerve are:

* Ophthalmic division (CN V1 or Va),
* Maxillary division (CN V2 or Vb),
* Mandibular division (CN V3 or Vc).

Ophthalmic division (CN V1)

The [ophthalmic branch](https://www.kenhub.com/en/library/anatomy/the-ophthalmic-branch-of-the-trigeminal-nerve) is the first division of the trigeminal nerve. It is a purely **sensory** nerve that carries afferent stimuli of **pain**, light **touch**, and **temperature**. he ophthalmic nerve is the most superior branch of the trigeminal ganglion, and it is exclusively sensory. It provides sensory information to the following structures:

* The [eyes](https://www.kenhub.com/en/library/anatomy/eye-anatomy)
* [Conjunctiva](https://www.kenhub.com/en/library/anatomy/conjunctiva) and orbital contents including the [lacrimal gland](https://www.kenhub.com/en/library/anatomy/lacrimal-gland)
* [Nasal cavity](https://www.kenhub.com/en/library/anatomy/nasal-cavity), [frontal sinus](https://www.kenhub.com/en/library/anatomy/frontal-sinus), ethmoidal cells
* [Falx cerebri](https://www.kenhub.com/en/library/anatomy/falx-cerebri-en)
* Dura mater of the anterior cranial fossa
* Superior parts of the [tentorium cerebelli](https://www.kenhub.com/en/library/anatomy/tentorium-cerebelli-en)
* Upper [eyelid](https://www.kenhub.com/en/library/anatomy/eyelid)
* Dorsum of the nose
* Anterior part of the scalp

### Course and relations

The ophthalmic nerve arises from the anterior edge of the trigeminal ganglion and then extends forward through the lateral wall of the dura mater of the [cavernous sinus](https://www.kenhub.com/en/library/anatomy/the-cavernous-sinus). Superior to the ophthalmic nerve is the [trochlear nerve](https://www.kenhub.com/en/library/anatomy/the-trochlear-nerve-and-the-abducent-nerve), whereas inferolateral to it is the maxillary nerve. Medial to all of these three nerves is located the [internal carotid artery](https://www.kenhub.com/en/library/anatomy/internal-carotid-artery) that goes through the cavernous sinus.

After leaving the cavernous sinus, the ophthalmic nerve goes through the superior orbital fissure, where it is usually already divided into its three terminal branches:

* Lacrimal nerve
* Frontal nerve
* Nasociliary nerve

#### **Lacrimal nerve**

This is the most lateral and thinnest branch of the ophthalmic nerve. It extends forward and laterally, across the roof of the [orbit](https://www.kenhub.com/en/library/anatomy/bones-of-the-orbit) and travels towards the [**lacrimal** **gland**](https://www.kenhub.com/en/library/anatomy/lacrimal-gland) that is located in the upper lateral angle of the orbit. Before it reaches the gland, the lacrimal nerve extends to several branches. These branches either terminate in the lacrimal gland, or they pass through the gland and end in the **upper eyelid**.

Just behind the lacrimal gland, the lacrimal nerve extends a **communicating branch for the zygomatic nerve**. Through this anastomosis, the **parasympathetic** fibers from the [pterygopalatine ganglion](https://www.kenhub.com/en/library/anatomy/pterygopalatine-ganglion) reach the lacrimal gland. These fibers originate from the petrosal nerve of the facial nerve.

#### **Frontal nerve**

This is the middle and thickest branch of the ophthalmic nerve. It courses forwards, directly beneath the roof of the **orbit** and superiorly to the superior palpebral levator muscle. Inside the orbit, the nerve extends to both of its terminal branches:

* The supraorbital nerve is the lateral branch of the frontal nerve. It reaches the forehead by passing through the supraorbital notch. At this level, the nerve gives off several palpebral filaments that supply the conjuctiva and the skin of the upper eyelid. It then courses superiorly over the forehead along with the [supraorbital artery](https://www.kenhub.com/en/library/anatomy/supraorbital-artery). Deep to the frontal belly of [occipitofrontalis muscle](https://www.kenhub.com/en/library/anatomy/occipitofrontalis-muscle), the supraorbital nerve splits into two of its own terminal branches; lateral branch and medial branch. The medial branch penetrates the occipitofrontalis muscle, while the lateral passes through the epicranial aponeurosis. In this way, the branches reach the skin of the lower forehead which they provide with sensory innervation.
* The supratrochlear nerve is placed medial to the supraorbital nerve. It courses medially and forward, traveling to the superior medial angle of the orbit. It extends to the superior and inferior branches that innervate the skin of the dorsum of the nose and adjacent skin of the upper eyelid.

**Nasociliary nerve**

This nerve is the medial terminal branch of the ophthalmic nerve. It courses forward and medially, and by crossing over the superior side of the [optic nerve](https://www.kenhub.com/en/library/anatomy/the-optic-nerve) it reaches the **anterior** **ethmoid** **foramen**, where it divides to its own two terminal branches. Along its way, the nasociliary nerve extends to the lateral branches in the following order going from proximal to distal to the root:

* Communicating branch for the ciliary ganglion that extends forward and laterally, and enters the ciliary ganglion.
* Long and short ciliary nerves that penetrate the posterior part of the sclera medially to the optic nerve. In this way, these nerves enter the [eyeball](https://www.kenhub.com/en/library/anatomy/structure-of-the-eyeball) and innervate the sclera and the [choroidea](https://www.kenhub.com/en/library/anatomy/choroid).
* Posterior ethmoid nerve that extends medially through the posterior ethmoid foramen and enters the anterior cranial fossa. As it passes through one of the [foramina](https://www.kenhub.com/en/library/anatomy/foramina-and-fissures-of-the-skull) of the lamina cribrosa, it descends to the roof of the nasal cavity where it innervates the mucosa of the ethmoid cells and [sphenoid sinus](https://www.kenhub.com/en/library/anatomy/the-paranasal-sinuses).

In the area of the anterior ethmoid foramen, the nasociliary nerve extends to its two terminal branches:

* The anterior ethmoid nerve passes through the anterior ethmoid foramen where it reaches the anterior cranial fossa. Soon after that, the nerve goes through one of the foramina of the lamina cribrosa, through which it reaches the anterior part of the roof of the nasal cavity, where it innervates the mucosa of that part.
* The infratrochlear nerve which extends forward and inferiorly to the trochlea travels towards the superior medial angle of the orbit, where it sends its terminal branches for the innervation of the skin of the medial portion of the upper eyelid and the conjunctiva. Branches of this nerve enable the so-called conjunctival reflex.

## **Ciliary ganglion**

## This ganglion belongs to the [autonomic nervous system](https://www.kenhub.com/en/library/anatomy/autonomic-nervous-system) and is functionally added to the ophthalmic nerve. It is placed in the orbit, on the lateral side of the optic nerve. Like any other autonomic ganglion, the ciliary ganglion has preganglionic and postganglionic fibers. Preganglionic fibers are sensory, sympathetic and parasympathetic. These are:

* Communicating branches to the ciliary ganglion that extend from the nasociliary nerve and carry the sensory and sympathetic fibers to this ganglion. Sensory fibers originate from the sensory root of the trigeminal nerve, whereas the sympathetic fibers originate from the sympathetic internal carotid plexus and its anastomosis with the ophthalmic nerve.
* Oculomotor root provides the parasympathetic fibers from the oculomotor nerve and those fibers synapse with the cells of the ganglion.

Postganglionic fibers are the short ciliary nerves that extend forward while grouped around the optic nerve. They penetrate the posterior part of the sclera and enter the eyeball to which they bring the sensory and the autonomic neuronal fibers. Parasympathetic fibers innervate the [ciliary muscle](https://www.kenhub.com/en/library/anatomy/ciliary-muscle) and the pupil sphincter muscle, whereas the sympathetic fibers innervate the pupil dilator muscle. Both dilatation and constriction of the [pupil](https://www.kenhub.com/en/library/anatomy/pupil) are the mechanisms that take part in the eye accommodation. Also, this specific innervation is the reason why pupils dilate during stress (domination of the [sympathetic nervous system](https://www.kenhub.com/en/library/anatomy/sympathetic-nervous-system)), and narrow when relaxed (domination of the [parasympathetic nervous system](https://www.kenhub.com/en/library/anatomy/the-parasympathetic-nervous-system)).

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| **Key facts about the ophthalmic nerve** |
| Type | Sensory |
| Course | Trigeminal ganglion -> cavernous sinus -> superior orbital fissure -> lacrimal, frontal, nasociliary nerves (terminal branches) -> respective anatomical structures |
| Branches | Recurrent tentorial, lacrimal (communicating branch with zygomatic nerve), frontal (supraorbital and supratrochlear nerves), nasociliary nerves (communicating branch with the ciliary ganglion, ciliary nerves, posterior ethmoid nerves) |
| Innervation | Eyes, conjunctiva, lacrimal gland, nasal cavity, frontal sinus, ethmoidal cells, falx cerebri, dura mater of anterior cranial fossa, superior parts of tentorium cerebelli, upper eyelid, dorsum of nose, anterior part of the scalp |

**The maxillary nerve**

The maxillary nerve is exclusively sensory, although its branches receive certain autonomous fibers that reach the maxillary nerve through the pterygopalatine ganglion.

This nerve carries sensory fibers from:

* The dura mater of the middle cranial fossa
* The mucosa of the [nasopharynx](https://www.kenhub.com/en/library/anatomy/nasopharynx), the palate, the [nasal cavity](https://www.kenhub.com/en/library/anatomy/nasal-cavity) and [maxillary sinus](https://www.kenhub.com/en/library/anatomy/maxillary-sinus)
* The [teeth](https://www.kenhub.com/en/library/anatomy/the-teeth) and the upper jaw
* The skin that covers the side of the nose, the lower [eyelid](https://www.kenhub.com/en/library/anatomy/eyelid), the cheek and the upper lip

### Course and relations

The maxillary nerve arises from the anterior edge of the **trigeminal** **ganglion**. It courses forward through the lateral dural wall of the [cavernous sinus](https://www.kenhub.com/en/library/anatomy/the-cavernous-sinus), inferiorly and laterally to the ophthalmic nerve. The nerve leaves the middle cranial fossa after it passes through the [foramen rotundum](https://www.kenhub.com/en/library/anatomy/foramen-rotundum) and enters the upper part of the [**pterygopalatine** **fossa**](https://www.kenhub.com/en/library/anatomy/anatomy-of-the-pterygopalatine-fossa).

In this fossa, the nerve extends the most of its branches. The fibers of the maxillary nerve leave the fossa by coursing forward through the pterygomaxillary fissure and then enter the **infratemporal** **fossa**. In the infratemporal fossa, the nerve is located adjacent to the maxillary tuberosity. From that position, the nerve turns medially and enters the [orbit](https://www.kenhub.com/en/library/anatomy/bones-of-the-orbit) through the **inferior orbital fissure**, where it is recognized by the name **infraorbital** **nerve**. This nerve represents the terminal branch of the maxillary nerve.

### Branches

While coursing through the middle cranial fossa, the maxillary nerve extends to the **meningeal** **branch** that carries the sensory impulses from the dura mater of the middle cranial fossa.

The nerve extends within the pterygopalatine fossa where its branches extend either directly from the body of the maxillary nerve or from its short **pterygopalatine** **nerves** that are added to the pterygopalatine ganglion. Finally, after entering the **orbit**, the maxillary nerve extends to its terminal branch; the **infraorbital** **nerve**.

#### **Zygomatic nerve**

This nerve arises from the maxillary nerve in the **pterygopalatine** **fossa**, and then courses forward and laterally. It passes through the superior portion of the pterygomaxillary fissure and enters the **infratemporal** **fossa**. Soon after that, the zygomatic nerve passes through the **inferior** **orbital** **fissure** and enters the orbit. While inside the orbit, the nerve courses along its lateral wall and then enters the canal present in the [zygomatic bone](https://www.kenhub.com/en/library/anatomy/the-zygomatic-bone).

Like the nerve that extends to two branches inside this canal, the canal itself also has two hallways that correspond to these branches:

* Anterior **zygomaticofacial nerve**
* Posterior **zygomaticotemporal nerve**

These terminal branches of the zygomatic nerve exit the zygomatic canal through the proper foramina named according to the branches: **zygomaticofacial** and **zygomaticotemporal** **foramen**. These will innervate the adjacent parts of the skin. On the lateral wall of the orbit, the zygomatic nerve makes anastomosis with the **lacrimal** **nerve** through their common connective branch. Through anastomosis, parasympathetic fibers from the pterygopalatine ganglion reach the [lacrimal gland](https://www.kenhub.com/en/library/anatomy/lacrimal-gland).

#### **Pterygopalatine nerves**

There are usually 2-3 of these nerves. They arise from the body of the maxillary nerve inside the pterygopalatine fossa. These nerves are short, and they course inferiorly and medially towards the pterygopalatine ganglion. They reach the ganglion from its anterior side and then send 2-3 **sensory** **afferent** branches for the ganglion.

Simultaneously, the pterygopalatine nerves receive 1-2 efferent branches from the ganglion. These **efferent** ganglionic fibers are parasympathetic and through the pterygopalatine nerves, they reach the zygomatic nerve. These pterygopalatine nerves give rise to the many branches, of which the most important are branches for the **nasal cavity** and the **palatine nerves**.

#### **Branches for the nasal cavity**

These branches extend from the nerves and course medially. The majority of these branches leave the pterygopalatine fossa through the **sphenopalatine** **foramen** and then enter the posterior part of the nasal cavity.

One portion of these branches, called **lateral superior posterior nasal (LSPN) branches**, cross forward over the lateral wall of the nasal cavity and provide sensory innervation to the mucosa of the superior and middle nasal concha, whereas the other portion of the branches, called the **medial superior posterior nasal (MSPN)** branches, cross to the medial wall of the nasal cavity, or simply the [nasal septum](https://www.kenhub.com/en/library/anatomy/nasal-septum) which they innervate. The longest branch among the MSPN branches is called the **nasopalatine nerve** that enters the incisive canal where it makes anastomosis with the **incisive** **nerve** of the contralateral side, and with the **greater palatine nerve**.

#### **Palatine nerves**

Palatine branches extend from the pterygopalatine nerves and course inferiorly. Usually, there are three of them: one greater palatine nerve and two of the lesser palatine nerves.

The **major palatine nerve** enters the major palatine canal following the same named artery. It leaves the canal through the **major** **palatine** **foramen** and together with the artery, it courses medially and forwards to end in the area of the **incisive** **fossa** where it makes anastomosis with the contralateral major palatine nerve and with the nasopalatine nerve. The major palatine nerve innervates the mucosa of the **hard** **palate**.

**Minor palatine nerves** descend together with the major palatine nerve through the **pterygopalatine** **fossa**. Then, they separate from it and course posteriorly through the bone canals of the minor palatine nerves to finally reach the **soft** **palate** which they innervate.

#### **Posterior superior alveolar branches**

There are usually two of these branches where they separate from the body of the maxillary nerve in the infratemporal fossa.

They course forward and inferiorly, cross through the **alveolar** **foramina** on the maxillary tuberosity and enter the **alveolar** **canals**. They make anastomosis with the other teeth branches and form a plexus that innervates the teeth of the upper jaw.

#### **Infraorbital nerve**

This nerve is the strongest branch of the maxillary nerve and is the ending branch. After it crosses through the **inferior** **orbital** **fissure**, it courses forward and medially, over the inferior wall of the orbit. The infraorbital nerve first goes through the infraorbital sulcus and then to the **infraorbital** **canal**. At the anterior side of the maxilla, this nerve exits the infraorbital canal through the **infraorbital** **foramen** and then divides into its many ending branches:

* **External nasal branches** that innervate the skin that covers the side of the nose
* **Internal nasal branches** which provide sensory innervation to the nasal septum
* **Superior labial branches** that innervate the upper lip
* **Inferior palpebral branches** that provide innervation for the lower eyelid

During its pathway through the infraorbital canal, this nerve courses closely to the maxillary sinus. In this part of its path, the infraorbital nerve extends to the following branches:

* **Anterior superior alveolar branches**
* **Middle superior alveolar branch**

These branches, together with the posterior superior alveolar branches, participate in making the plexus that innervates the teeth of the upper jaw.

## **Pterygopalatine ganglion**

This is the parasympathetic ganglion that is located on the posterior wall of the pterygopalatine fossa. It is stuck into the slightly extended anterior foramen of the **pterygoid** **canal**, inferiorly and medially to the body of the maxillary nerve.

**Preganglionic** **fibers** for this ganglion are:

* **Pterygopalatine nerves** that carry sensitive fibers for the ganglion from the maxillary nerve
* The **greater** **petrosal** **nerve**, a branch of the facial nerve, that carries the parasympathetic fibers that synapse within the neurons of the pterygopalatine ganglion
* The **deep** **petrosal** **nerve** that extends from the internal carotid plexus and whose fibers just pass through the ganglion without synapsing with its neurons

Before reaching the ganglion, the greater and deep petrous nerves unite to form a single nerve body. Both of them penetrate the fibrous membrane of the **foramen** **lacerum** on the base of the [skull](https://www.kenhub.com/en/library/anatomy/the-skull) . Soon after they leave the cranium, they unite by forming the **pterygoid canal nerve**. This nerve goes through the pterygoid canal from its posterior to anterior foramen. When the nerve leaves the canal, it enters directly to the pterygopalatine ganglion, bringing both sympathetic and parasympathetic fibers to it.

Postganglionic fibers extend through the short pterygopalatine nerves to join the following branches of the maxillary nerve:

* Zygomatic nerve, and then through the communicant branches to the lacrimal nerve to provide parasympathetic innervation for the lacrimal gland.
* Major palatine nerve and minor palatine nerves, giving them the autonomic fibers for the innervation of the salivary palatine glands of the hard and soft palate.

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| **Key facts about the maxillary nerve** |
| Origin | Trigeminal ganglion |
| Type | Sensory |
| Course | Trigeminal ganglion -> cavernous sinus -> foramen rotundum -> pterygopalatine fossa -> infratemporal fossa -> inferior orbital fissure -> infraorbital nerve (terminal branch) -> respective anatomical structures |
| Branches | **M**eningeal, **z**ygomatic, **z**ygomaticofacial, **z**ygomaticotemporal, **i**nfraorbital, **a**nterior, **m**iddle, and **p**osterior superior alveolar nerves, **n**asopalatine, **g**reater palatine, **l**esser palatine nerves ('**M**y **Z**ippy **Z**ebra **Z**oe **I**s **A** **M**ajestic **P**rincess, **N**aturally **G**orgeous **L**ady') |

**The** **mandibular nerve**

The **mandibular nerve**, or the mandibular division of the [trigeminal nerve](https://www.kenhub.com/en/library/anatomy/the-trigeminal-nerve) (CN V3), is the third division of the trigeminal nerve (CN V) which innervates parts of the [human face](https://www.kenhub.com/en/library/anatomy/the-human-face). It is a mixed nerve, meaning that it contains both motor and sensory fibers.

**Trigeminal ganglion of Gasser** and exits the skull through the [foramen ovale](https://www.kenhub.com/en/library/anatomy/foramen-ovale). Once it reaches the [viscerocranium](https://www.kenhub.com/en/library/anatomy/the-viscerocranium), it divides into two divisions: anterior and posterior. Both divisions further divide into smaller branches that innervate the structures of the face. More specifically, the mandibular nerve transmits the **sensory information** from the lower third of the face, including the lower lip, [mandible](https://www.kenhub.com/en/library/anatomy/the-mandible), preauricular and [temporal](https://www.kenhub.com/en/library/anatomy/the-temporal-bone) areas, as well as the [meninges](https://www.kenhub.com/en/library/anatomy/meninges-of-the-brain-and-spinal-cord) and anterior and middle cranial fossae. Moreover, it is responsible for **motor innervation** of the [masticatory muscles](https://www.kenhub.com/en/library/anatomy/the-muscles-of-mastication) as well as the muscles that originate from the first [pharyngeal arch](https://www.kenhub.com/en/library/anatomy/the-pharyngeal-arches).

The sensory root of the mandibular nerve originates from the trigeminal ganglion. It has a short course across the middle cranial fossa, after which it exits the [skull](https://www.kenhub.com/en/library/anatomy/the-skull) via the foramen ovale, and enters the [infratemporal fossa](https://www.kenhub.com/en/library/anatomy/infratemporal-fossa).

The motor root originates from the motor nucleus of trigeminal nerve. It passes below the trigeminal ganglion without synapsing with it, and then through the foramen ovale. After traversing the foramen, it joins the [sensory root](https://www.kenhub.com/en/library/anatomy/cranial-nerve-nuclei) of the nerve.

The mandibular division then passes between the [medial pterygoid](https://www.kenhub.com/en/library/anatomy/medial-pterygoid-muscle) and [tensor veli palatini muscles](https://www.kenhub.com/en/library/anatomy/tensor-veli-palatini-muscle). Here it gives off the meningeal branch and the nerve to medial [pterygoid muscle](https://www.kenhub.com/en/library/anatomy/pterygoid-muscles). Soon after, it bifurcates into its two divisions: a smaller anterior division and a larger posterior division.

* The anterior division ramifies and produces motor branches for the masticatory muscles, as well as one sensory branch, the buccal nerve, which innervates the cheek.
* The posterior division divides into three sensory branches: the auriculotemporal, lingual and [inferior alveolar nerves](https://www.kenhub.com/en/library/anatomy/inferior-alveolar-nerve). The latter gives off a motor branch which innervates the anterior belly of the [digastric muscle](https://www.kenhub.com/en/library/anatomy/digastric-muscle) and the [mylohyoid muscle](https://www.kenhub.com/en/library/anatomy/mylohyoid-muscle).

### Meningeal branch

The **meningeal branch**, also known as the **nervus spinosus**, is the earliest branch of the mandibular nerve. Even though it originates outside the skull, the nerve re-enters the [neurocranium](https://www.kenhub.com/en/library/anatomy/neurocranium) by going back through the foramen spinosum. Within the skull, it divides into the branches that accompany the main branches of the middle meningeal artery, innervating the [dura mater](https://www.kenhub.com/en/library/anatomy/dura-mater) of the middle cranial fossa.

### Nerve to medial pterygoid

The **medial pterygoid nerve** emerges from the CN V3 right after the meningeal branch, prior to bifurcating into its two divisions. It gives off a few twigs that innervate the medial pterygoid muscle. The nerve then penetrates the medial pterygoid and reaches the [tensor tympani](https://www.kenhub.com/en/library/anatomy/tensor-tympani-muscle) and tensor veli palatini, which it also innervates.

### Branches of the anterior division

The anterior division of the mandibular nerve gives off one sensory branch (buccal nerve), and three motor branches: masseteric nerve, deep temporal nerves and nerve to [lateral pterygoid](https://www.kenhub.com/en/library/anatomy/lateral-pterygoid-muscle).

* The buccal nerve courses between the heads of the lateral pterygoid. It then descends over the masseter and anastomoses with the buccal branches of the facial nerve (CN VII). It innervates the skin of the cheek and buccal mucosa.
* The masseteric nerve passes anterior to the [temporomandibular joint](https://www.kenhub.com/en/library/anatomy/the-temporomandibular-joint), providing a branch that innervates it. Then, it courses posterior to the tendon of the temporalis muscle and terminates by perforating the [masseter](https://www.kenhub.com/en/library/anatomy/masseter-muscle), which it also innervates.
* The deep temporal nerves consist of one anterior and other posterior branch. The anterior branch usually originates from the buccal nerve, while the posterior branch is given off directly from the anterior division of the mandibular nerve. Both of them innervate the temporalis muscle.
* The nerve to lateral pterygoid originates from the anterior trunk and enters the lateral pterygoid muscle to innervate it.

### Branches of the posterior division

The posterior division is mostly sensory, giving off three main branches:

#### **Auriculotemporal nerve**

The auriculotemporal nerve originates from a small loop composed of two roots that encircle the middle meningeal artery. The superior, somatosensory root carries fibers from the mandibular nerve (CN Viii) which pass through the otic ganglion without synapsing. The inferior, parasympathetic root receives postganglionic fibers derived from the [glossopharyngeal nerve](https://www.kenhub.com/en/library/anatomy/the-glossopharyngeal-nerve) (CN IX) which arise in the otic ganglion; these fibers are destined for the [parotid gland](https://www.kenhub.com/en/library/anatomy/the-parotid-gland) only. Both roots unite with each other to form a single trunk that courses deep to the lateral pterygoid muscle and posterior to the temporomandibular joint. It continues within the posterosuperior surface of the parotid gland where several small **parotid branches** arise (supplying parasympathetic/secretomotor branches to the parotid gland) before ascending over the zygomatic bone to give off several branches which include:

* **anterior auricular nerves** (supply auricle anterior to the external acoustic meatus i.e. the tragus)
* **nerve to external acoustic meatus**
* **branch to tympanic membrane** (supplies external surface, along with greater auricular nerve)
* **superficial temporal branches** (supply skin of posterior part of temporal region)

#### **Lingual nerve**

The [lingual nerve](https://www.kenhub.com/en/library/anatomy/lingual-nerve) passes deep to the lateral pterygoid, where it unites with the chorda tympani. It courses over the medial pterygoid towards the ramus of mandible. It provides the sensory innervation to the anterior ⅔ of the [tongue](https://www.kenhub.com/en/library/anatomy/tongue), floor of the [oral cavity](https://www.kenhub.com/en/library/anatomy/the-oral-cavity) and mandibular [gingiva](https://www.kenhub.com/en/library/anatomy/gingiva).

#### **Inferior alveolar nerve**

The **inferior alveolar nerve** descends deep to the lateral pterygoid muscle. It passes between the ramus of mandible and the sphenomandibular ligament to reach the inferior alveolar foramen. Prior to entering the inferior alveolar foramen, it gives rise to the nerve of mylohyoid muscle, of which a muscular branch to the anterior belly of digastric muscle is given off. These nerves provide motor innervation to the mylohyoid and anterior belly of the digastric muscle respectively, which are responsible for elevating the hyoid and the complex movements of the jaw (speaking, swallowing, chewing, and breathing). The inferior alveolar nerve resumes its course to reach the mandibular canal. Within the canal, it continues as the mental nerve, which is considered as the terminal branch of the inferior alveolar nerve. The mental nerve then passes the mental foramen of mandible to emerge on the face and innervate the lower lip.

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| **Key facts about the mandibular nerve** |
| Origin | Trigeminal ganglion (of Gasser) |
| Type | Mixed: motor, sensory and autonomic fibers |
| Pathway | Trigeminal ganglion (middle cranial fossa) -> foramen ovale -> infratemporal fossa |
| Branches | **Direct branches (prior to bifurcation)**Meningeal branch of mandibular nerveBranches of mandibular nerve to otic ganglionNerve to medial pterygoid muscle → Nerve to tensor veli palatini,nerve to tensor tympani**Anterior division**Buccal nerveMasseteric nerveDeep temporal nervesNerve to lateral pterygoid muscle**Posterior division**Auriculotemporal nerveLingual nerveInferior alveolar nerve → nerve to mylohyoid muscle → muscular branch to anterior belly of digastric muscle |