The Orbit

Description

The orbit is a pyramidal cavity with its base anterior and its apex posterior (Fig. 11.18). The **orbital margin** is formed above by the frontal bone, the lateral margin is formed by the processes of the frontal and zygomatic bones, the inferior margin is formed by the zygomatic bone and the maxilla, and the medial margin is formed by the processes of the maxilla and the frontal bone.

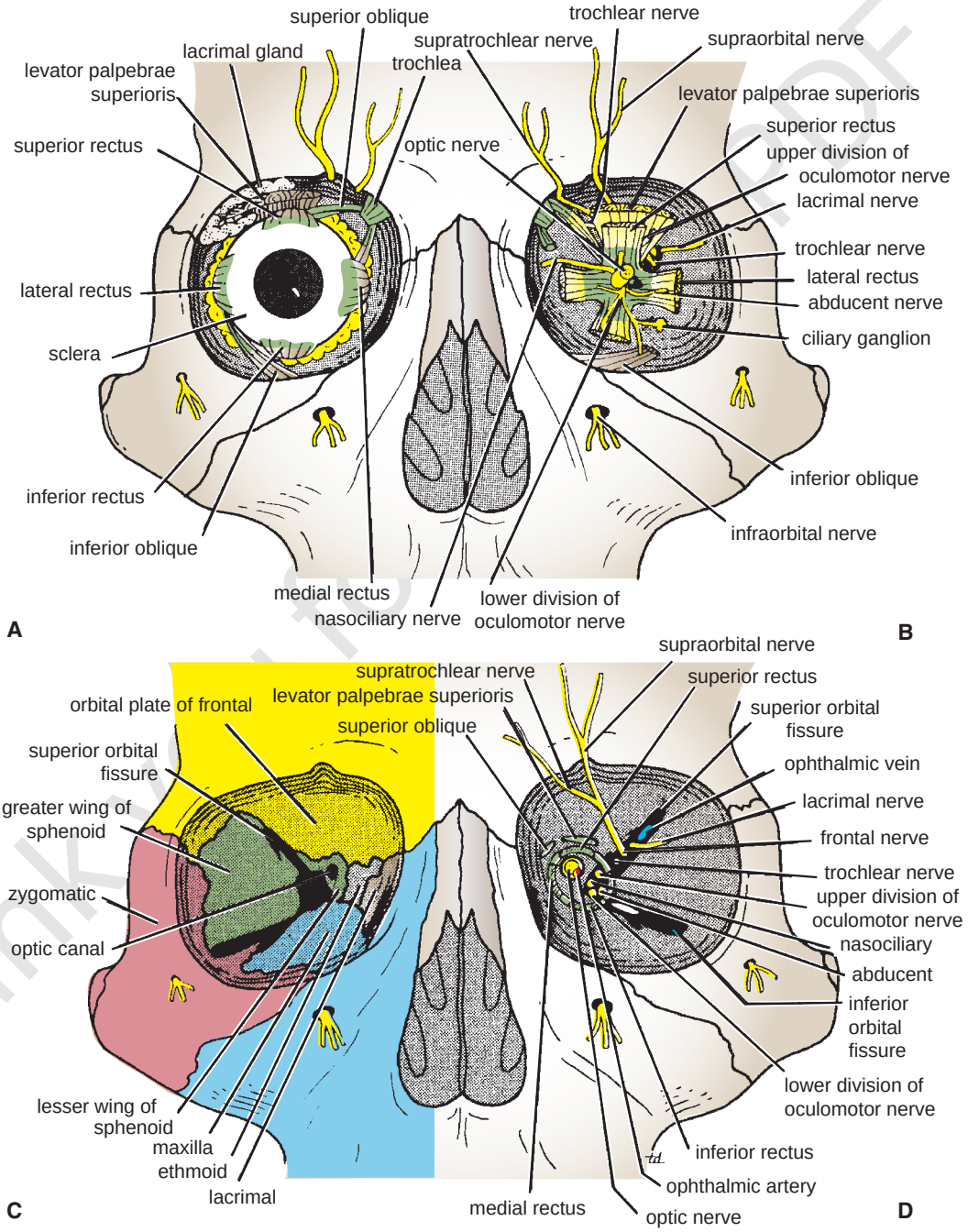

FIGURE 11.18 **A.** Right eyeball exposed from in front. **B.** Muscles and nerves of the left orbit as seen from in front. **C.** Bones forming the walls of the right orbit. **D.** The optic canal and the superior and inferior orbital fissures on the left side.

The orbital walls are shown in Figure 11.18.

Roof: Formed by the orbital plate of the frontal bone, which separates the orbital cavity from the anterior cranial fossa and the frontal lobe of the cerebral hemisphere

Lateral wall: Formed by the zygomatic bone and the greater wing of the sphenoid (Fig. 11.18)

Floor: Formed by the orbital plate of the maxilla, which separates the orbital cavity from the maxillary sinus

Medial wall: Formed from before backward by the frontal process of the maxilla, the lacrimal bone, the orbital plate of the ethmoid (which separates the orbital cavity from the ethmoid sinuses), and the body of the sphenoid

Openings into the Orbital Cavity

The openings into the orbital cavity are shown in Figure 11.18.

Orbital opening: Lies anteriorly (Fig. 11.18). About one sixth of the eye is exposed; the remainder is protected by the walls of the orbit.

Supraorbital notch (Foramen): The supraorbital notch is situated on the superior orbital margin (Fig. 11.18). It transmits the supraorbital nerve and blood vessels.

Infraorbital groove and canal: Situated on the floor of the orbit in the orbital plate of the maxilla (Fig. 11.19); they transmit the infraorbital nerve (a continuation of the maxillary nerve) and blood vessels.

Nasolacrimal canal: Located anteriorly on the medial wall; it communicates with the inferior meatus of the nose (Fig. 11.16). It transmits the nasolacrimal duct.

Inferior orbital fissure: Located posteriorly between the maxilla and the greater wing of the sphenoid (Fig. 11.18); it communicates with the pterygopalatine fossa. It transmits the maxillary nerve and its zygomatic branch, the inferior ophthalmic vein, and sympathetic nerves.

Superior orbital fissure: Located posteriorly between the greater and lesser wings of the sphenoid (Fig. 11.18); it communicates with the middle cranial fossa. It transmits the lacrimal nerve, the frontal nerve, the trochlear nerve, the oculomotor nerve (upper and lower divisions), the abducent nerve, the nasociliary nerve, and the superior ophthalmic vein.

Optic canal: Located posteriorly in the lesser wing of the sphenoid (Fig. 11.18); it communicates with the middle cranial fossa. It transmits the optic nerve and the ophthalmic artery.

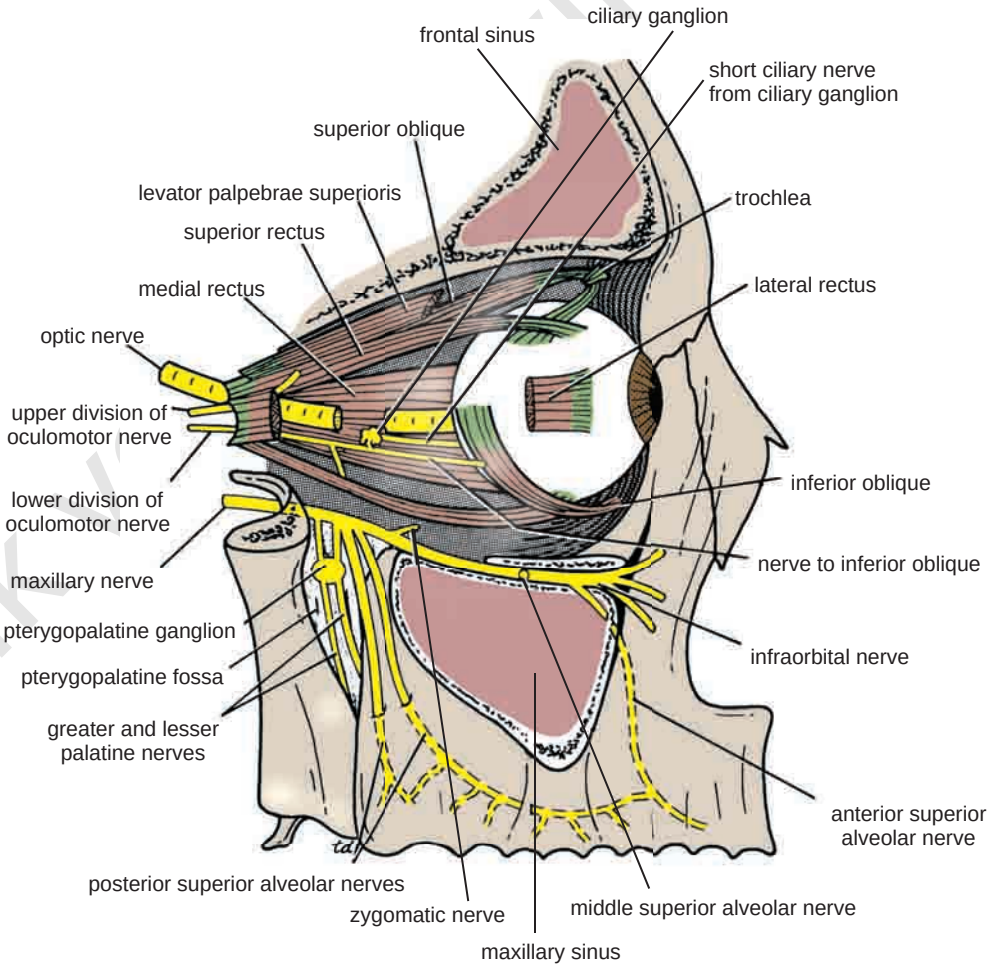

FIGURE 11.19 Muscles and nerves of the right orbit viewed from the lateral side. The maxillary nerve and the pterygopalatine ganglion are also shown.

Orbital Fascia

The orbital fascia is the periosteum of the bones that form the walls of the orbit. It is loosely attached to the bones and is continuous through the foramina and fissures with the periosteum covering the outer surfaces of the bones. The **muscle of Müller,** or **orbitalis muscle,** is a thin layer of smooth muscle that bridges the inferior orbital fissure. It is supplied by sympathetic nerves, and its function is unknown.

Nerves of the Orbit

Optic Nerve

The optic nerve enters the orbit from the middle cranial fossa by passing through the optic canal (Fig. 11.20). It is accompanied by the ophthalmic artery, which lies on its lower lateral side. The nerve is surrounded by sheaths of pia mater, arachnoid mater, and dura mater (Fig. 11.25). It runs forward and laterally within the cone of the recti muscles and pierces the sclera at a point medial to the posterior pole of the eyeball. Here, the meninges fuse with the sclera so that the subarachnoid space with its contained cerebrospinal fluid extends forward from the middle cranial fossa, around the optic nerve, and through the optic canal, as far as the eyeball. A rise in pressure of the cerebrospinal fluid within the cranial cavity therefore is transmitted to the back of the eyeball.

Lacrimal Nerve

The lacrimal nerve arises from the ophthalmic division of the trigeminal nerve. It enters the orbit through the upper part of the superior orbital fissure (Fig. 11.18) and passes forward along the upper border of the lateral rectus muscle (Fig. 11.20). It is joined by a branch of the zygomaticotemporal nerve, which later leaves it to enter the lacrimal gland

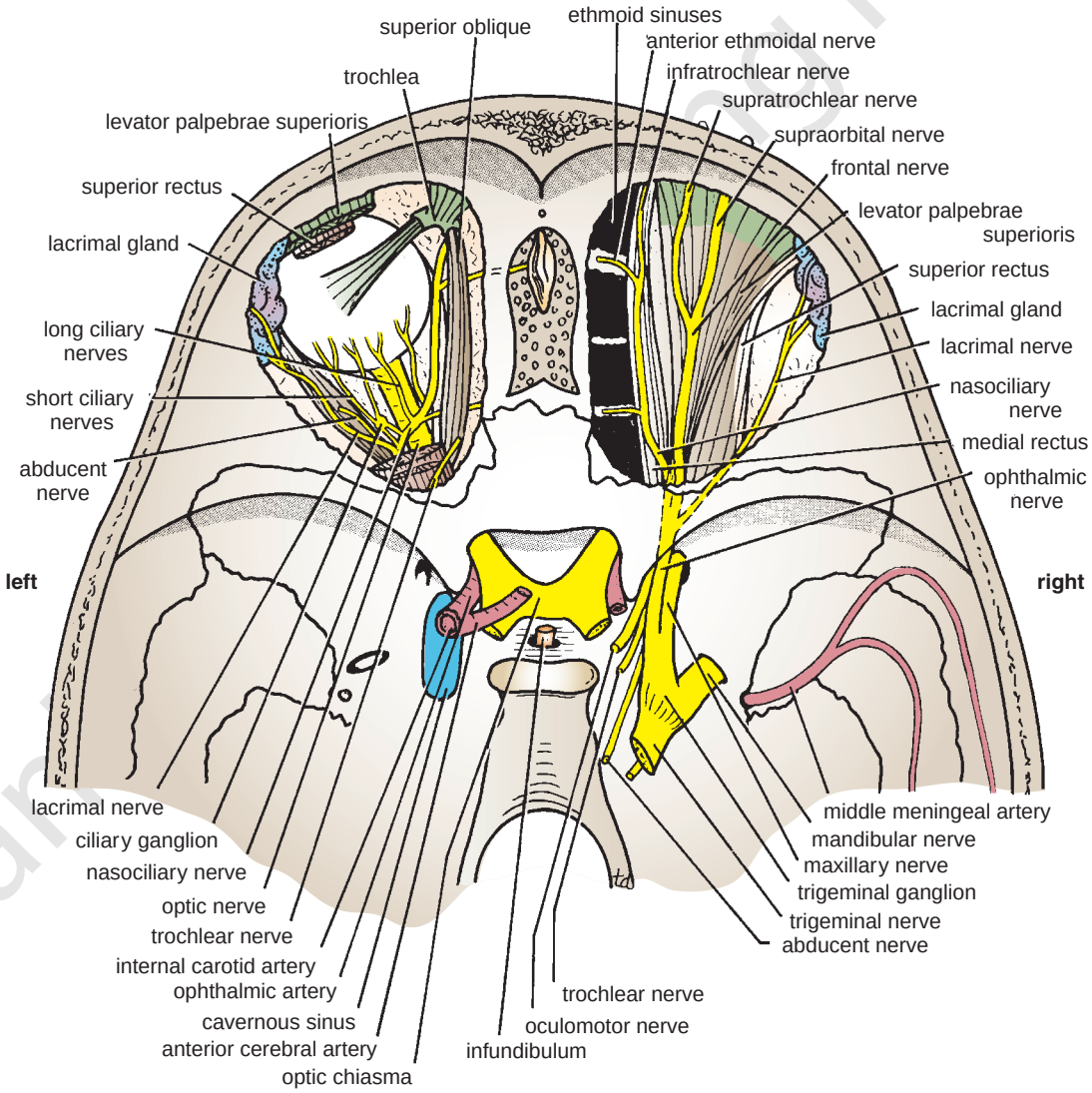

FIGURE 11.20 Right and left orbital cavities viewed from above. The roof of the orbit, formed by the orbital plate of the frontal bone, has been removed from both sides. On the left side, the levator palpebrae superioris and the superior rectus muscles have also been removed to expose the underlying structures.

(parasympathetic secretomotor fibers). The lacrimal nerve ends by supplying the skin of the lateral part of the upper lid.

Frontal Nerve

The frontal nerve arises from the ophthalmic division of the trigeminal nerve. It enters the orbit through the upper part of the superior orbital fissure (Fig. 11.18) and passes forward on the upper surface of the levator palpebrae superioris beneath the roof of the orbit (Fig. 11.20). It divides into the **supratrochlear** and **supraorbital nerves** that wind around the upper margin of the orbital cavity to supply the skin of the forehead; the supraorbital nerve also supplies the mucous membrane of the frontal air sinus.

Trochlear Nerve

The trochlear nerve enters the orbit through the upper part of the superior orbital fissure (Fig. 11.18). It runs forward and supplies the superior oblique muscle (Fig. 11.20).

Oculomotor Nerve

The **superior ramus** of the oculomotor nerve enters the orbit through the lower part of the superior orbital fissure (Fig. 11.18). It supplies the superior rectus muscle, then pierces it, and supplies the levator palpebrae superioris muscle (Fig. 11.18).

The **inferior ramus** of the oculomotor nerve enters the orbit in a similar manner and supplies the inferior rectus, the medial rectus, and the inferior oblique muscles. The nerve to the inferior oblique gives off a branch (Fig. 11.19) that passes to the ciliary ganglion and carries parasympathetic fibers to the sphincter pupillae and the ciliary muscle (see below).

Nasociliary Nerve

The nasociliary nerve arises from the ophthalmic division of the trigeminal nerve. It enters the orbit through the lower part of the superior orbital fissure (Fig. 11.18). It crosses above the optic nerve, runs forward along the upper margin of the medial rectus muscle, and ends by dividing into the **anterior ethmoidal** and **infratrochlear nerves** (Fig. 11.20).

Branches of the Nasociliary Nerve

- The **communicating branch to the ciliary ganglion** is a sensory nerve. The sensory fibers from the eyeball pass to the ciliary ganglion via the short ciliary nerves, pass through the ganglion without interruption, and then join the nasociliary nerve by means of the communicating branch.
- The **long ciliary nerves,** two or three in number, arise from the nasociliary nerve as it crosses the optic nerve (Fig. 11.20). They contain sympathetic fibers for the dilator pupillae muscle. The nerves pass forward with the short ciliary nerves and pierce the sclera of the eyeball. They continue forward between the sclera and the choroid to reach the iris.
- The **posterior ethmoidal nerve** supplies the ethmoidal and sphenoidal air sinuses (Fig. 11.20).
- The **infratrochlear nerve** passes forward below the pulley of the superior oblique muscle and supplies the skin of the medial part of the upper eyelid and the adjacent part of the nose (Fig. 11.16).
- The **anterior ethmoidal nerve** passes through the anterior ethmoidal foramen and enters the anterior cranial fossa on the upper surface of the cribriform plate of the ethmoid (Fig. 11.20). It enters the nasal cavity through a slitlike opening alongside the crista galli. After supplying an area of mucous membrane, it appears on the face as the **external nasal branch** at the lower border of the nasal bone, and supplies the skin of the nose down as far as the tip (see page 580).

Abducent Nerve

The abducent nerve enters the orbit through the lower part of the superior orbital fissure (Fig. 11.18). It supplies the lateral rectus muscle.

Ciliary Ganglion

The ciliary ganglion is a parasympathetic ganglion about the size of a pinhead (Fig. 11.19) and situated in the posterior part of the orbit. It receives its preganglionic parasympathetic fibers from the oculomotor nerve via the nerve to the inferior oblique. The postganglionic fibers leave the ganglion in the **short ciliary nerves,** which enter the back of the eyeball and supply the sphincter pupillae and the ciliary muscle.

A number of sympathetic fibers pass from the internal carotid plexus into the orbit and run through the ganglion without interruption.

Blood Vessels and Lymph Vessels of the Orbit

Ophthalmic Artery

The ophthalmic artery is a branch of the internal carotid artery after that vessel emerges from the cavernous sinus (see page 599). It enters the orbit through the optic canal with the optic nerve (Fig. 11.20). It runs forward and crosses the optic nerve to reach the medial wall of the orbit. It gives off numerous branches, which accompany the nerves in the orbital cavity.

Branches of the Ophthalmic Artery

- The **central artery of the retina** is a small branch that pierces the meningeal sheaths of the optic nerve to gain entrance to the nerve (Figs. 11.25 and 11.26). It runs in the substance of the optic nerve and enters the eyeball at the center of the **optic disc.** Here, it divides into branches, which may be studied in a patient through an ophthalmoscope. The branches are end arteries.
- The **muscular branches**
- The **ciliary arteries** can be divided into anterior and posterior groups. The former group enters the eyeball near the corneoscleral junction; the latter group enters near the optic nerve.
- The **lacrimal artery** to the lacrimal gland
- The **supratrochlear** and **supraorbital arteries** are distributed to the skin of the forehead (see page 581).

Ophthalmic Veins

The **superior ophthalmic vein** communicates in front with the facial vein (Fig. 11.9). The **inferior ophthalmic vein** communicates through the inferior orbital fissure with the

pterygoid venous plexus. Both veins pass backward through the superior orbital fissure and drain into the cavernous sinus.

Lymph Vessels

No lymph vessels or nodes are present in the orbital cavity.