Incidental Ct Findings In Acute Orbital Diseases

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Learning objectives

To describe incidental CT findings and potential pitfalls that may be observed when imaging acute orbital diseases caused by trauma or infection.
Background

Calcifications and post-treatment changes are unexpected findings sometimes seen when imaging acute orbital diseases, and may represent potential pitfalls to the radiologist.

CT is the first diagnostic test in the study of these conditions, yielding great information for the recognition and measurement of calcifications and foreign bodies, including globe prostheses.
Seven bones conjoin to form the orbital structure: frontal, sphenoid, ethmoid, lacrimal, maxilla, zygoma, and palatine. The major nerves and vessels to the orbit and globe enter through 3 openings: the optic canal, superior orbital fissure and the inferior orbital fissure.

The orbital content includes the eyeball, extraocular muscles, blood and lymph vessels, nerves, connective tissue, fat, and the lacrimal system.

The extraocular muscles are: medial rectus, superior rectus, lateral rectus, inferior rectus, superior oblique, inferior oblique and levator palpebrae muscle.

The eyeball is composed of three layers: sclera, choroid and retina. There are three chambers of fluid: anterior chamber (between cornea and iris), posterior chamber (between iris, zonule fibers and lens) and the vitreous chamber (between the lens and the retina). The first two chambers are filled with aqueous humor whereas the vitreous chamber is filled with a more viscous fluid, the vitreous.

Certain calcifications and post-treatment changes are some of the incidental findings and potential pitfalls that may occur in the study of acute orbital diseases. They show typical CT features that allow easy recognition.

The most common orbital calcifications are: phthisis bulbi, optic drusen, trochlear calcification and scleral plaques.

The phthisis bulbi is an atrophic scar with disorganization of the eyeball, and is the sequela of a wide variety of pathologic ocular processes. Among the main causes of phthisis bulbi are trauma, infection and other inflammatory processes, chronic retinal detachment, radiation, persistent hyperplastic primary vitreous and retinoblastoma. The eyeball is not functioning. (Fig. 1, 2)

Optic drusen are abnormal globular concretions of protein and calcium salts which accumulate in the optic nerve and usually become visible after the first decade of life. They occur in both eyes more often than just one. Although drusen can be identified in childhood, they are small and non-mineralised. As such drusen are rarely identified in the paediatric patient, although a region of slight increased density and swelling may be evident on thin section scans (Fig. 3)

Trochlear calcifications: The trochlea is a cartilaginous structure that crosses the superior oblique muscle tendon and its sheath. They may occur in adults as aging-related normal variants or may be seen in young patients with diabetes mellitus. They typically have a superomedial location within the orbit. (Fig. 4, 5)
Scleral plaques: The scleral calcification occurs in focal sites of senile thinning, at the insertion tendon of the lateral and medial rectus muscles. This thinning and calcification occurs secondary to hyaline degeneration or possibly a mechanical stress produced by the contraction of the rectus muscles, as is common in older people. Posterior scleral calcifications occur in people with hyperparathyroidism, vitamin D intoxication, among other causes; the calcifications in these patients are usually more diffuse and not as localized as those that occur in the tendinous insertions. (Fig. 6)

All these calcifications should not be confused with the presence of intraorbital radiopaque foreign bodies. (Fig. 7, 8)

Post-treatment changes include lens replacement, intraocular injection of silicone, scleral buckles and globe prostheses.

The complex system of lenses is seen on CT as an ovoid structure posterior to the plane of the iris; the anterior surface of the lens is slightly flatter than the posterior surface.

Intraocular lens are structures formed by two part: one is the lens itself and the other is the anchoring device. An important imaging finding of intraocular lens is the absence of contrast enhancement. (Fig. 9, 10)

Scleral buckling is a surgical technique used to repair retinal detachments. The buckling element is usually left in place permanently. The element pushes in, or "buckles," the sclera toward the middle of the eye. This buckling effect on the sclera relieves the pull (traction) on the retina, allowing the retinal tear to settle. The buckle effect may cover only the area behind the detachment, or it may encircle the eyeball like a ring. The buckle holds the retina against the sclera until scarring seals the tear. It also prevents fluid leakage, which could cause further retinal detachment. Scleral buckles come in many shapes and sizes. An encircling band is usually a thin silicone band sewn around the circumference of the sclera of the eye. In rare instances, a metallic clip may be used for scleral buckling. (Fig. 11)

Intraocular silicone injection has been used to fill the vitreous cavity, and is most commonly performed in these entities: proliferative vitreoretinopathy in retinal detachment complicated by ocular trauma, proliferative diabetic retinopathy and cytomegalovirus retinitis. (Fig. 12, 13, 14)

An intraocular silicone injection may be differentiated from an intraocular hemorrhage by measuring the CT attenuation numbers (that of silicone is >100 HU; that of blood, <90 HU).

Multidectector CT (MDCT) usually represents the first imaging test in patients with acute orbital disease since it is widely available, providing sufficient information for the
detection and characterization of the most common entities (particularly useful for the
detection of calcifications and foreign bodies). MRI has a better soft-tissue contrast
resolution than MDCT and better characterizes postoperative changes; however, its use
is contraindicated in the study of ferromagnetic foreign bodies.
**Fig. 0:** Phthisis bulbi is an atrophic scar with disorganization of the eyeball, and is the sequela of a wide variety of pathologic ocular processes.

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Fig. 0: Intraocular lens dislocation.

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Fig. 0: Scleral buckle is the traditional surgical procedure used in repairing a detached retina.

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Conclusion

It is important to distinguish some common findings such as calcifications and post-treatment changes during the study of acute orbital diseases, to obtain a precise radiological diagnosis, avoiding misunderstandings with other pathological findings and thus avoid making unnecessary use of other complementary, more complex tests.
References