Spectrum of Imaging Manifestations and Expected Post-Treatment Findings in Thyroid Orbitopathy

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PURPOSE: Thyroid orbitopathy (TO) is the most common extrathyroidal manifestation of thyroid disease. We highlight the range of typical & uncommon presentations as well as expected post-treatment appearance.

APPROACH/METHODS: Patients from our teaching files diagnosed with TO.

FINDINGS/DISCUSSION:

- Patients can be hyper (90%), hypo (5%), or euthyroid (5%).

Pathophysiology

- Uncertain mechanism involves activation of autoantibodies against TSH receptors in extraocular muscles (EOM) & orbital soft tissues.
- Overexpression of TSH receptors → activation of orbital fibroblasts → release of inflammatory cytokines & differentiation into adipocytes → fatty infiltration.
- Initial inflammatory phase → progressive fibrosis → static phase.

Typical findings

- Painless exophthalmos (i.e. proptosis).
- Bilateral symmetric EOM enlargement sparing tendinous insertions in predictable fashion (I'M SLO mnemonic – beginning with inferior rectus)
- EOM > 5 mm generally abnormal but range is wide: medial, 3.3-5.0 mm; lateral, 1.7-4.8 mm; inferior, 3.2-6.5 mm; and superior group, 3.2-6.1 mm.
- Fatty infiltration of extraocular muscles & retrobulbar lipomatosis
- Elevated ADC in EOM can be early finding on MRI.

Coronal CT shows typical bilateral EOM enlargement ("I'M SLO").

Retrobulbar lipomatosis with severe bilateral proptosis.

Coronal fat-saturated postcontrast T1 in 2 different patients shows extensive enhancement of EOM (A) & intraconal fat stranding (B) during the active inflammatory phase.

Uncommon presentations:

- Unilateral (10%)
- Complicated TO in 3-5%: compressive optic neuropathy due to orbital apex crowding → sight loss due to ischemia leading to nerve atrophy; exposure corneal ulceration due to lid retraction.
- Lacrimal gland involvement– rare, may present with worsening dry eyes.

Postcontrast T1s show bilateral proptosis, enlarged EOM with diffuse enhancement (blue arrows) & orbital apex crowding (orange arrows). Note sparing of tendinous insertions.

Left: effacement of perineural fat (arrow) is the most sensitive CT predictor of optic neuropathy, assessed by the **Nugent score** for crowding:

0	No perineural effacement
1	(mild) 1-25%
2	(moderate) 26-50%
3	(severe) > 50%

Right: CT shows orbital fat prolapsing through bilateral superior orbital fissures (arrows)—this finding has shown variable predictive value for optic neuropathy.

Left: Postcontrast T1 shows bilateral lacrimal gland & R>L EOM involvement.

Treatment

- High dose steroids: mainstay for moderate & severe TO
- Surgery: orbital decompression, correction of strabismus & eyelid retraction; usually performed during static phase.
- Orbitotomy: displacement of fat and EOM towards & beyond site of decompression.
- Radiation: Controversial, may help control active disease.

Severe unilateral right EOM enlargement with inferomedial orbital decompression

Bilateral decompression (arrows) with fatty infiltration of inferior rectus muscles.

SUMMARY/CONCLUSION: Clinical presentation & imaging appearance of TO are variable. Patients with moderate & severe orbital crowding are at greatest risk for optic neuropathy & may benefit from steroids & surgical decompression particularly in cases of sight-threatening disease.

References

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