Neuro-orbital imaging in glaucoma clinic

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Introduction

- Glaucoma is one of the most common ophthalmology conditions worldwide, affecting over 3·5% of the adult population (2017).
- In some patients, glaucoma, especially with good intraocular pressure (IOP) control can mimic or shadow underlying life-threatening conditions.
- Differentiating between glaucoma, space occupying lesions (SOL) of the visual pathway and compressive/other types of neuropathy might be difficult .
- The most common indications for neuroimaging in a glaucoma cohort vary in the literature and include enlarged cupping (mainly with laminar thinning), unilateral (asymmetric) disease and progressive field loss despite good IOP control.

Purpose:

To investigate the incidence of different pathologies in patients with normal tension/well controlled open angle glaucoma using neuro -orbital imaging referrals/outcomes.

Design:

Prospective, observational case series.

- Participants: Data of 513 Ophthalmology patients referred for neuro-orbital imaging within one year in a district general hospital was analysed.
- 79% of all participants had magnetic resonance imaging (MRI, 1.5 Tesla (Siemens Symphony, Erlangen, Germany)) , 21% computerized tomography (CT, Revolution CT ES , GE Healthcare (United Kingdom); these were ppatients noncompliant with MRI). Patients, who were referred from glaucoma clinic had only MRI.
- Thirty-two patients were referred to neuro-imaging from glaucoma clinic. Mean age - 58.7 years ±22.1; female-59%, male-41%.
- All patients had full ophthalmic assessment, Humphrey visual fiels test (HVF), Optical Coherence Tomography (OCT, Carl Zeiss Meditec, Germany for both) and Goldmann applanation tonometry.
- Initial glaucoma diagnosis was based on glaucomatous optic nerve damage (localized/diffuse neuroretinal rim thinning, rim notching, excavation, and/or RNFL defect) associated with typical, reproducible standard automated perimetry defects.
- Mean IOP in glaucoma group was 12±5.7mmHg

Results:

- Out of 513 patients referred for imaging, four patients (0.78%) refused to have a scan. 6.34% of all imaging referrals were glaucoma-related (Figure 1).
- 18.27% of the patients scanned had positive findings (Figure 2).

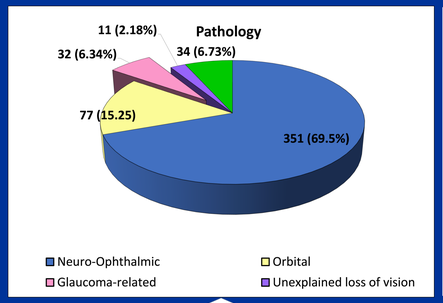


Figure 1: A diagram showing the structure of pathology when neuro-orbital imaging was indicated.

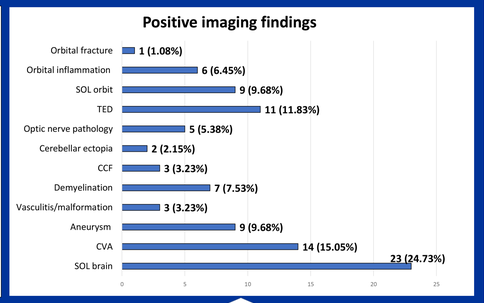


Figure 2: A diagram showing positive neuro-imaging findings. SOL=space occupying lesion, TED=thyroid eye disease, CCF=carotid-cavernous fistula, CVA=Cerebrovascular accident.

- 18.27% of the patients scanned had positive findings (PF). Structure of the positive findings is shown in Figure 2.
- PF in glaucoma group (Figure 3) were present in patients with visual field (VF) loss disproportional to nerve changes, intraocular cup /disc asymmetry and colour vision loss in glaucoma group.

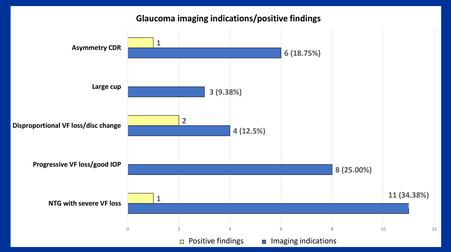


Figure 3: Indications (blue bars) for neuro-imaging and positive finding (yellow bars) in patients with glaucoma. NTG=normal tension glaucoma, VF=visual field, IOP=intraocular pressure, CDR=cup to disc ratio.

- PF correlated with field loss disproportional to disc change (p=0.01), disc asymmetry and normal IOP with severe field loss (p=0.035 for both).

Conclusions:

There should be a low threshold for reconsideration of the diagnosis/assessment of additional pathology in patients attending a glaucoma clinic.
A study with a larger number of participants is required for accurate development of neuro-orbital imaging strategy in this cohort of patients.

Results: 1.Patients with positive findings in the glaucoma group with visual field (VF) loss disproportional to nerve changes:

Patient 1

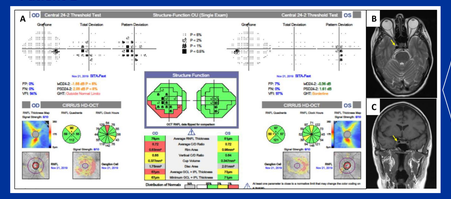
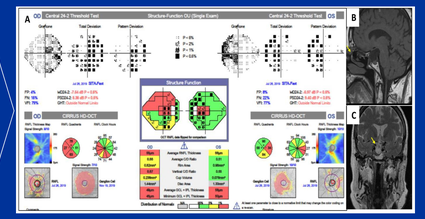


Figure 4: HVF results, OCT of the disc and thickness of the ganglion cells layer (GCL, A); axial T2 (B) and coronal T1 (C) MRI scans of the brain. Yellow arrow=ectatic internal carotid artery (ICA). CF, 53 years old, IOP 15 mm both eyes (BE, at the day of OCT and HVF), right eye showed advanced cupping (CDR 0.85) with relatively preserved field. MRI showed an ectatic right ICA at the level of the cavernous sinus partially compressing optic nerve (ON).

Patient 2

Figure 5: HVF, OCT of the disc and thickness of the GCL (A); sagittal T1 (B) and coronal T2 (C) MRI scans of the brain. Yellow arrow=sellar, partial cystic mass measuring 22x20x40 mm. CF, 79 years old, IOP 16 mm right (RE) and 17 mm left eye (at the day of OCT and HVF), BE showed advanced retinal nerve fibre layer (RNFL) and GCL thinning with relatively mild/moderate temporal field loss. MRI showed a cystic mass extending into the sella with displacement of the optic chiasm and compression over the 3rd ventricle.



2.Patient with positive findings with intraocular asymmetry of CDR:

Patient 3

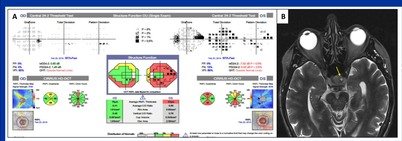


Figure 6: HVF results, OCT of the disc and thickness of the ganglion cells layer (GCL, A); axial T2 (B) MRI scan of the brain.
CF, 74 years old, IOP 14 mm BE (at the day of OCT and HVF), right eye CDR 0.4; LE CDR 0.85, HVF showed blind spot enlargement with nasal step. MRI showed a cyst within the left lobe of the pituitary (yellow arrow) and extrinsic compression of the ON by ICA on the left.

3.Patient with positive findings of severe field loss despite good IOP:

Patient 4

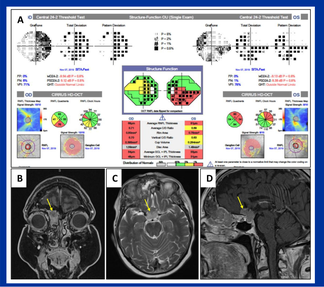


Figure 7: HVF results, OCT of the disc and thickness of the GCL (A); coronal T1 (B), axial T2 (B) and sagittal T1 (D) MRI scans of the brain. CF, 76 years old, IOP 12 mm BE, moderate cupping with CDR 0.7 RE and 0.6 LE, RNFL and GCA thinning. HVF showed temporal field loss in the RE and superior–temporal field loss with centrocecal scotoma in the LE. MRI showed a suprasellar lesion arising from the pituitary gland. It is compressing the optic chiasm and extending along the ON There is an avidly enhancing lesion extending to the floor of the anterior cranial fossa which is likely to represent a meningioma. The two masses lie adjacent to each other.