Bilateral Narrow Angle Glaucoma, Plateau Iris Managed with Combined Cataract Extraction, iStent Implant

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Abstract:
A 66-year-old, Vietnamese female presents with gradual, painless vision loss. Intraocular pressures are 52 OD, 32 OS. Workup confirms chronic narrow-angle glaucoma and plateau iris. Treatment is successful with emergent cataract extraction, iStent placement OU.

Case History:
Patient Demographics:
66-year-old, Vietnamese female

Chief Complaint:
Blurry vision at distance and near, OD>OS
2-3 months, constant, gradual
Negative symptoms: Pain, headaches, nausea, photosensitivity

Ocular History:
No prior eye exam, no previous symptoms

Medical History:
Hypertension (Lisinopril 10mg), hyperlipidemia (atorvastatin 10mg)

Pertinent Findings

Pre-operative

Acuity: 20/150 OD, 20/40 OS, 20/50 OU
BCVA: 20/70 OD, 20/30 OS
IOP: 52 OD, 32 OS via GAT @ 9:28 AM
Pupils: 2+ APD OD
Confrontations:
OD: Significant decrease in field with 360 constriction
OS: FTFC

Anterior Segment SLE:
OD: scattered corneal scarring without edema, shallow chamber, no iris TIDs
OS: scattered corneal scarring without edema, shallow chamber, no iris TIDs

Posterior Segment SLE:
Lens: 3+ NS OD, 2+ NS OS
Optic Nerve Head:
OD- Glaucomatous cupping, superior notch approaching rim
C/d: Vertical 0.90, Horizontal 0.70
OS- Possible early glaucomatous changes
C/d: 0.55/0.55

Gonioscopy Summary:
OD- No structures visible in primary gaze in all quadrants, most open to anterior trabecular meshwork with indentation.
Plateau iris in all quadrants, pronounced in horizontal midline
OS- ATM or PTM in most quadrants, no visible structures temporal
Steep iris approach in multiple quadrants with varying presentation
Angle OCT imaging:
- OD: Significantly narrowed angles OD>OS, convex iris approach.
- OS: Varying angle depth, convex iris approach

Pachymetry (via OCT)
- OD: 430 with high confidence interval
- OS: 408 with high confidence interval

HVF: Unable to perform secondary to patient comprehension (language barrier)

OCT RNFL:
- Averaged thickness: 54 microns OD, 102 microns OS
- OD: Severe thinning S/T/I quadrants
- OS: WNL in all quadrants

OCT MAC:
- Averaged GCC + IPL thickness: 48 microns OD, 76 microns OS
- OD: ONL with severe thinning in all quadrants
- OS: WNL in all quadrants

**Pertinent Findings**

**Post-operative (6 weeks OD, 5 weeks OS)**

- **BCVA:** 20/30 OD*, 20/20 OS, 20/20 OU
  *Patient reports persistent scotoma remaining in central, inferior field

- **IOP:** 13 OD, 14 OS via GAT @ 1:35 PM

**Anterior Segment:**
- OD: Well apposed CE wound, patent iStent
- OS: Well apposed CE wound, patent iStent

**Posterior Segment SLE:**
- Lens: Stable, centered IOL free of opacity OD/OS
- Optic Nerve Head: Stable without significant change

**Gonioscopy Summary:**
- OD: All quadrants open to PTM with some visible SS 360
  - Visible iStent temporal
  - Normal iris approach without pathology
- OS: All quadrants open to SS 360
  - Visible iStent temporal
  - Normal iris approach without pathology

HVF: Unable to perform secondary to patient comprehension (language barrier)

**Angle OCT imaging:**
- OD: Increase in angle depth with iris moving into more conventional position, OD remains more narrow than OS
- OS: Increase in angle depth with iris moving into more conventional position, OD remains more narrow than OS

**Differential Diagnosis**

1) Chronic Narrow Angle (Chronic Angle Closure) Glaucoma
2) Phacomorphic Glaucoma
3) Primary Open Angle Glaucoma
4) Phacolytic Glaucoma
Diagnosis and Discussion

In this particular case, the ability to firmly diagnose was hampered by a series of substantial pertinent negatives. Without transient or intermittent symptoms, evidence of iridolenticular interaction or peripheral anterior synchia, corneal edema, hypermature lenses or pseudoxfoliative material, the lack of expected pathognomonic findings encouraged a broader differential.

Bilateral, asymmetric, severely narrowed angles, apparent via both gonioscopy and OCT imaging, supports the logic that angle anatomy is playing a large factor in the elevated IOP, which also presented bilaterally but with asymmetric presentation worse in the right eye. This substantiated the final diagnosis of chronic narrow angle glaucoma. That, in conjunction with the cataract being much more severe in the right eye, indicated that cataract extraction would be the appropriate first step in managing both the glaucoma and the reduced acuity. A configuration in which continuous lens growth shortens anterior chamber length, positioning the anterior lens anterior to Schlemm’s canal offers an mechanism for elevation. This slight displacement causes forward traction on the ciliary body via the zonules, which causes, in turn, displacement of the uveal tract and crowding of Schlemm’s canal and trabecular meshwork.

Anterior segment imaging has emerged as a powerful diagnostic and management tool, and was critical in diagnosis and treatment in this presented case. A list of potential quantitative parameters including anterior chamber angle, anterior chamber angle depth, trabecular-iris angle, angle opening distance, and trabecular iris surface area gives researchers an opportunity to confirm the increase in angle depth observed following cataract extraction while exploring the correlation with angle anatomy and intraocular pressure. This correlation is particularly significant in narrow angle or chronic angle closure glaucoma, as it consistently demonstrates a stronger relationship than open-angle glaucomas. The eventual prospect of this information would allow optometrists and ophthalmologists to access predictive models of changes in angle and IOP following cataract surgery.

The medical decision-making and therapeutic results of this case are also largely impacted by the availability of iStent implants. The function of the device allows aqueous humor to drain directly from the anterior chamber to Schlemm’s canal, avoiding the resistance of the trabecular meshwork completely. Recently published meta-analysis comparing iStent implantation following lens extraction versus lens extraction on its own showed a mean decrease of IOP from baseline of 4% in phacoemulsification, while addition of an iStent implant increased the reduction to 9% from baseline, and two iStents reduced it to 27% below baseline. Meanwhile individual studies show reduction in baseline IOP’s of upwards of 30%, and elimination of ocular hypotensives at 6 month follow-ups in as many as 74% of open-angle glaucoma patients, extending to 42% of primary open angle glaucoma patients at 4 year follow-up. There are no available studies examining closed-angle or narrow-angle glaucoma patients and the post-operative benefits of a combined phaco/iStent procedure. Still, with the well-documented safety of iStent implants,
reduced post-op visits and low rate of need for revision, the option was an excellent use of aggressive medical therapy in a patient with cost, compliance concerns.

**Treatment and Management**

**Pre-operative**

Initial therapy required Betimol 0.5%, Simbrinza and eventually Pilocarpine 2% to reduce IOP's to safe levels. This regiment reduced to 30mmHg OD, 26mmHg OS.

**Post-operative**

By the end of post-operative course OD/OS, the IOP was reduced to 13 mmHg OD and 14 mmHg OS. This reduction indicates an incredibly successful combination procedure, with a 75% reduction of IOP OD and a 56.2% reduction OS.

**Conclusion**

Anterior segment OCT imaging was a valuable tool in monitoring this patient's risk of closure while also providing an apparent mechanism for the elevated IOP's. In addition, it provided an excellent example of the changes in angle depth following cataract extraction in a patient with chronic narrow angles.

By comparing pre and post-operative findings, this case study also provides strong support for the benefits of both cataract extraction and iStent implementation in narrow-angle glaucoma patients. The expected decrease in pressure is related to both the pre-operative angle anatomy and pre-operative pressure. Generally speaking, the more narrow the angle and the higher the IOP, the more dramatic the improvement. In addition, implementation of iStent insertion in combination with cataract extraction is strongly supported in literature as a viable and safe treatment for primary open angle glaucoma. This case provides valuable indication for use in narrow angle patients as well as there is currently no reliable standard to fully compare the results, as a study assessing IOP reduction in narrow-angle glaucoma patients undergoing a combined phaco/iStent procedure has not been published.

Based upon the patient’s post-operative visual complaints it is likely that central vision has already been impacted in the right eye secondary to advanced glaucomatous damage. However without reliable field-testing and a severely depressed RNFL and GCC analysis OD, it will be very difficult to monitor slow progression in that eye. Because of this, IOP monitoring will be critical, along with OCT and funduscopy OS, to determine potential for progression. With such thin corneas, additional treatment is likely indicated in most expected progression models. Further topical IOP lowering treatment will be necessary should progression be suspected at any future follow-up.
**Bibliography**


