Macular oedema in retinal vein occlusion – resolution with topical carbonic anhydrase inhibitor

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INTRODUCTION

We present a case of a patient with a hemi-retinal vein occlusion (HRVO) and cystoid macular oedema (CMO) whose CMO resolved after being commenced on a topical carbonic anhydrase inhibitor (CAI). A literature review was conducted to explore the physiological processes behind this observation and the potential therapeutic effect of CAIs in RVO-related CMO.

CASE

An 80-year-old woman presented with left superior HRVO and extensive CMO requiring intravitreal anti-VEGF injections. Presenting visual acuity was 35 ETDRS letters left eye. Her CMO resolved with 4-weekly ranibizumab injections. However, the patient's follow-up appointment was delayed. She was seen in the glaucoma clinic 8 weeks after an injection. At this interval there was significant worsening of her CMO. At that visit she was commenced on brinzolamide drops for primary open-angle glaucoma. After two months of brinzolamide (i.e. 4 months since her last injection), she attended the injection clinic again. Her OCT demonstrated a major improvement in CMO such that intravitreal injections were paused. She did not require further injections after ~18 months of follow-up since commencing brinzolamide.

DISCUSSION

CMO is the most common cause of vision loss in patients with RVO. CMO may spontaneously resolve in some patients. However, the patient in this case had been on intravitreal treatment for >1 year with worsening CMO at an interval of 8 weeks post-injection. After commencing brinzolamide there was a sustained resolution of her CMO without the need for further injection. This strongly suggests a causative effect of CAIs in the resolution of CMO in this case.

The use of CAIs in CMO secondary to retinitis pigmentosa (RP) is well-established. However, there is a paucity of evidence for the effect of CAIs on CMO in RVO in humans. Animal studies have shown some benefit of CAIs in RVO on electrophysiological parameters and pre-retinal oxygen tension [1-3] providing plausible mechanisms by which CAIs may impact on CMO.

Possible mechanisms of action of CAIs in resolving CMO include:

- Preferentially blocking carbonic anhydrase on the basolateral RPE membrane, acidifying the subretinal space and enhancing the action of the RPE pump [4].
- Increasing retinal and choroidal blood flow (and hence retinal oxygenation)
    - Reducing IOP and increasing retinal artery perfusion pressure [5,6]
    - Direct vascular effects (independent of IOP reduction) e.g. relaxing pre-capillary pericytes to increase capillary blood flow [6-8]

CONCLUSION

To the best of our knowledge, this is the first reported case of resolution of CMO following RVO with the use of topical CAI.

This potential therapeutic effect is still insufficiently explored in humans and further study is warranted. In the absence of strong evidence of efficacy, topical CAI may represent a reasonable low-risk/potential gain treatment option for patients where more established treatments (e.g. intravitreal therapies, laser) are unsuitable.

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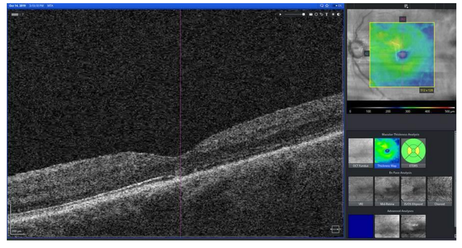


FIG 1. OCT during 4- weekly anti-VEGF injections; October 2019 (VA left eye 67 letters)

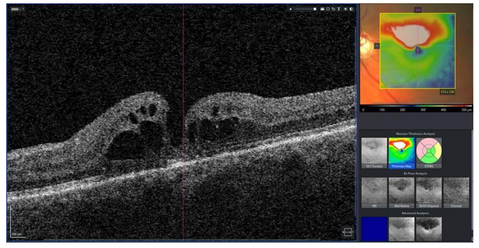


FIG 2. CMO return after the 8-week hiatus; started on CAI due to glaucoma; December 2019 (VA left eye 68 letters)

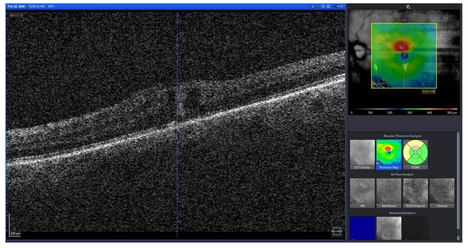


FIG 3. OCT 2 months after starting CAI, 4 months post-injection; February 2020 (VA left eye 65 letters)

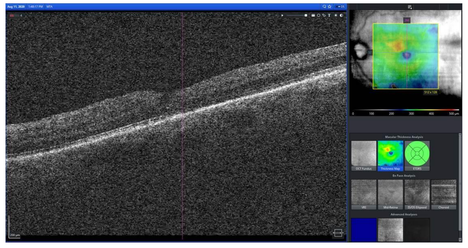


FIG 4. OCT images from August 2020 (VA left eye 62 letters)

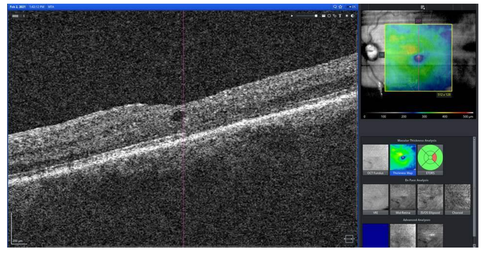


FIG 5. OCT 14 months since start of CAI (16 months post-injection); February 2021 (VA left eye 60 letters)