

Effect of Obstructive Sleep Apnea on Surgical Outcomes of Orbital Decompression for Thyroid Eye Disease

Introduction

Thyroid eye disease:

- Thyroid eye disease (TED) is an autoimmune disorder affecting the orbits and periorbital tissues.
- Nearly 50% of patients diagnosed with systemic graves will be affected by TED.
- Intractable adnexal and orbital changes are not uncommon; these cases require either urgent or elective surgical orbital decompression (OD)
- The disease course is extremely variable in terms of how quickly it progresses and how effective treatment options are. Modifiable risk factors (i.e smoking) have been identified which drastically alter the disease course.
- It is not known if concomitant obstructive sleep apnea (OSA) affects the disease course in patients with thyroid eye disease.

Thyroid eye disease and obstructive sleep apnea:

- Both TED and obstructive sleep apnea (OSA) have been independently associated with elevated inflammatory mediators in both serum and tissue
- Systemic inflammation associated with OSA has been implicated in the pathogenesis and aggravation of numerous disease states, as well as an increased risk of post op complications in general

Objective

Specific Aim:

- Understand if patients with concomitant TED and OSA have the same clinical response to orbital decompression as patients with TED and no OSA.

Outcome measures:

- Change in proptosis from baseline (Δ Prop) ; measured in mm
- Improvement in visual acuity (Δ VA) ; measured on LogMAR scale², then converted to Snellen equivalent

Methods

- Single institution retrospective chart review (2010-2021)
- Inclusion criteria:
 - >18 years of age
 - diagnosis of thyroid eye disease and treated with orbital decompression
- Stratified by OSA status at time of surgery:
 - Group "G₀": No OSA at time of surgery
 - Group "G_{OSA}": Documented OSA diagnosis, documented use of CPAP, or "clinical suspicion of OSA¹" determined from chart
- Outcome measures:
 - Proptosis measured in mm
 - Visual acuity measured on LogMAR Scale (Fig. 1)

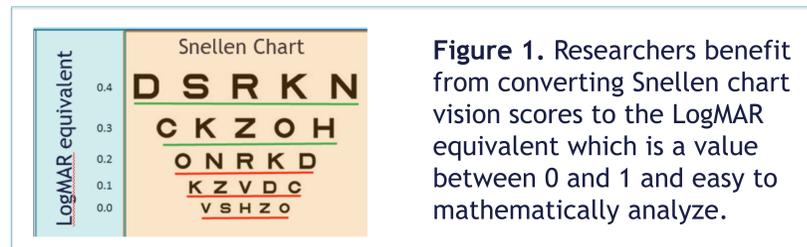
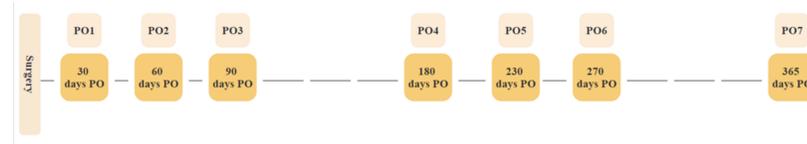


Figure 1. Researchers benefit from converting Snellen chart vision scores to the LogMAR equivalent which is a value between 0 and 1 and easy to mathematically analyze.

- Outcome measures were collected at baseline and at 7 post-operative time points, "PO(1-7)"



Analyses:

- Descriptive stats were conducted
- Paired T-tests were used to quantify Δ Prop and Δ VA for G₀ and G_{OSA} PO(1-7):
 - Δ Prop [G₀] (baseline \rightarrow PO_n)
 - Δ Prop [G_{OSA}] (baseline \rightarrow PO_n)
 - Δ VA [G₀] (baseline \rightarrow PO_n)
 - Δ VA [G_{OSA}] (baseline \rightarrow PO_n)

Key:

¹ defined as STOP-BANG score >3 ; ² Logarithm of Minimum Angle of Resolution

Results: Demographics

- N= 82 patients/138 orbits

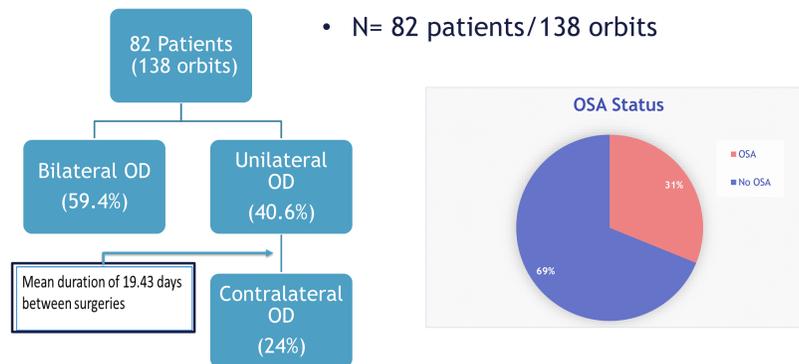


Table 1. Demographic data

Characteristic	N= 138	OSA Group n=43	No OSA Group n=95
Age (years), mean \pm SD		57.12 \pm 13.90	53.66 \pm 16.64
Race (%)			
White		72.1	70.5
Non-White		27.1	29.5
Ethnicity			
Hispanic or Latino		2.3	3.2
Not Hispanic or Latino		97.7	96.8
Gender (%)			
Female		62.8	75.8
Male		37.2	24.2
BMI			
Normal		25.6	37.9
Overweight or Obese		74.4	62.1

Results : Outcome Measures

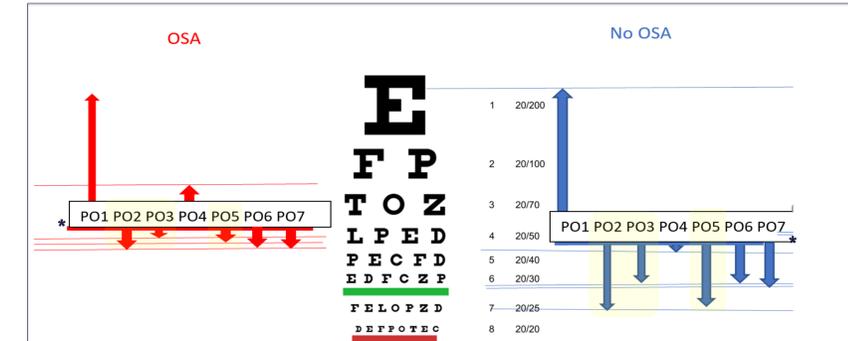


Figure 2: "mean baseline visual acuity" for G_{OSA} and G₀ respectively are represented by the location of the bold horizontal line* along the vertical plane of the Snellen Chart. The arrows extend from mean baseline visual acuity, to the mean visual acuity at PO(n). Yellow highlights the timepoints at which the difference in Δ VA between cohorts is statistically significant (p value < 0.05).

Time Point	Proptosis (mm) OSA Group	P value (of change from baseline)	Proptosis (mm) Non-OSA Group	P value (of change from baseline)
Baseline	24.692		25.629	
PO1	24.167	0.002	23.000	0.004
PO2	21.750	0.018	21.310	0.000
PO3	19.000	0.048	22.810	
PO4	21.010	0.000	21.000	0.008
PO5				
PO6	21.000		20.000	

Figure 3: mean Δ prop was significant at most timepoints for both cohorts.

Discussion & Conclusion

- Patients with OSA and without OSA had comparable baseline measures in VA and proptosis
- As expected, patients experienced significant improvement in mm of proptosis following orbital decompression, irrespective of OSA status
- In this preliminary data, the group of patients with OSA did not recover vision to the same extent as those without. We postulate that this could be related in part to compromised healing associated with relative hypoxia in patients with OSA
- Future studies will have to be conducted in order to understand if OSA is an independent risk factor for worse post-operative outcomes after orbital decompression for TED

Outcome Measure	OSA Group	Non-OSA Group
Proptosis	↓↓	↓↓
Visual Acuity	↑	↑↑↑

References:

- Garrity, J.A. and R.S. Bahn, Pathogenesis of graves ophthalmopathy: implications for prediction, prevention, and treatment. Am J Ophthalmol, 2006. 142(1): p. 147-153.
- Ferlov-Schwensen, C., T.H. Brix, and L. Hegedus, Death by Suicide in Graves' Disease and Graves' Orbitopathy: A Nationwide Danish Register Study. Thyroid, 2017. 27(12): p. 1475-1480.
- Roos, J.C.P. and R. Murthy, Update on the clinical assessment and management of thyroid eye disease. Curr Opin Ophthalmol, 2019. 30(5): p. 401-406.
- Hiremath, A.S., et al., Relationship between difficult tracheal intubation and obstructive sleep apnoea. Br J Anaesth, 1998. 80(5): p. 606-11.
- Chung, A.S., et al., Obstructive Sleep Apnea in Elective Spine Surgery: National Prevalence and Inpatient Outcomes. Global Spine J, 2018. 8(6): p. 550-556.
- Bateman, B.T. and M. Elkermann, Obstructive sleep apnea predicts adverse perioperative outcome: evidence for an association between obstructive sleep apnea and delirium. Anesthesiology, 2012. 116(4): p. 753-5.
- Mentsoudis, S., et al., Perioperative pulmonary outcomes in patients
- Kaw, R., Postoperative Outcomes in Obstructive Sleep Apnea: Matched Cohort Study. Anesthesiology, 2015. 123(1): p. 229-30.
- Liao, P., et al., Postoperative complications in patients with obstructive sleep apnea: a retrospective matched cohort study. Can J Anaesth, 2017. 64(10): p. 1000-1006.
- Yasu, T.S., R. Grewal, and K. Doghrani, Obstructive sleep apnea syndrome and perioperative complications: a systematic review of the literature. Anesthesiology, 2012. 116(4): p. 753-5.