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The Association Between Obstructive Sleep Apnea and Cotton-Wool Spots in Diabetic Retinopathy

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Disclosures

- No financial disclosures.
- The view(s) expressed herein are those of the author(s) and do not reflect the official policy or position of Brooke Army Medical Center, Wilford Hall Ambulatory Surgical Center, the U.S. Army Medical Department, the U.S. Army Office of the Surgeon General, the Department of the Army, the Department of the Air Force and Department of Defense, or the U.S. Government.

Purpose

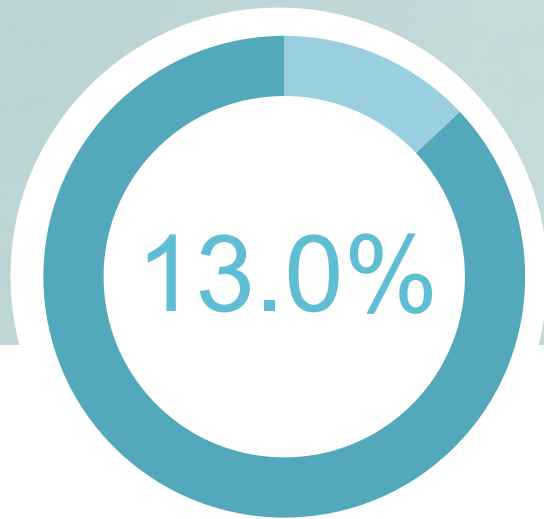
To report the relationship of obstructive sleep apnea (OSA) and cotton-wool spots (CWS) seen in patients with diabetic retinopathy (DR).

Methods

- A random sample of patients diagnosed with DR between January 1, 2015 and December 31, 2018 were selected from billing codes.
- Dilated funduscopy exam findings and medical history were confirmed via chart review.

Results

Presence of CWS



Total CWS: 26/200



No OSA: 14/162



OSA: 12/38

p = <0.001

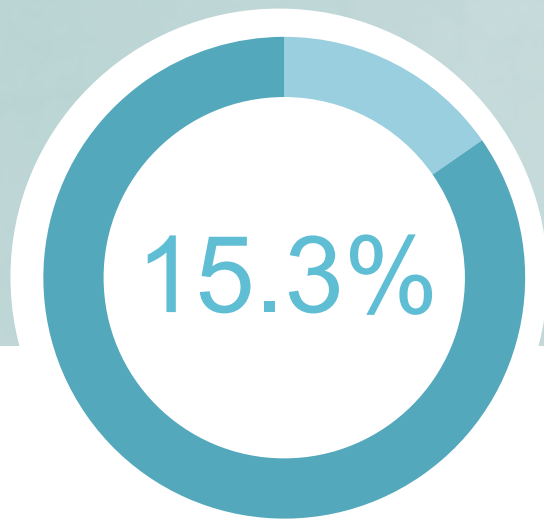


Subgroup Analysis

	No OSA (N = 162)	OSA (N = 38)	p-value	No CWS (N = 174)	CWS (N = 26)	p-value
Age	64.4±12.1	63.4±11.5	p = 0.68	65.2±11.6	57.5±12.3	p = 0.005
Gender (Male)	74 (45.7%)	27 (71.1%)	p = 0.004	87 (50.0%)	14 (53.8%)	p = 0.72
Insulin-Dependent	93 (57.4%)	25 (65.8%)	p = 0.34	101 (58.0%)	17 (65.4%)	p = 0.47
Stage of DR ^s			p = 0.29			p <0.001
Mild NPDR	64 (39.8%)	18 (47.4%)		77 (93.9%)	5 (6.1%)	
Mod NPDR	44 (27.3%)	10 (26.3%)		42 (77.8%)	12 (22.2%)	
Severe NPDR	8 (5.0%)	4 (10.5%)		7 (58.3%)	5 (41.7%)	
PDR	45 (27.9%)	6 (15.8%)		48 (94.1%)	3 (5.9%)	
(+) DME	24 (14.8%)	5 (13.2%)	p = 0.79	25 (14.4%)	4 (15.4%)	p = 0.89
HbA1C	8.1±2.0	8.2±1.8	p = 0.35	8.0±1.9	9.0±2.1	p = 0.03
BMI	28.6±8.1	33.3±5.6	p <0.001	29.4±8.3	30.7±4.2	p = 0.20
Hx of HTN	148 (91.4%)	35 (92.1%)	p = 0.88	159 (91.4%)	24 (92.3%)	p = 0.87
Hx of HLD	141 (87.0%)	32 (84.2%)	p = 0.65	152 (87.4%)	21 (80.8%)	p = 0.38
Smoking			p = 0.07			p = 0.84
Non-Smoker	114 (70.4%)	24 (63.2%)		119 (68.4%)	19 (73.1%)	
Prior Smoker	27 (16.7%)	12 (31.6%)		35 (20.1%)	4 (15.4%)	
Active Smoker	21 (12.9%)	2 (5.2%)		20 (11.5%)	3 (11.5%)	
Hx of CVD	60 (37.0%)	18 (47.4%)	p = 0.24	72 (41.4%)	6 (23.1%)	p = 0.07
Hx of Other BD	15 (9.3%)	4 (10.5%)	p = 0.81	15 (8.6%)	4 (15.4%)	p = 0.30

Results

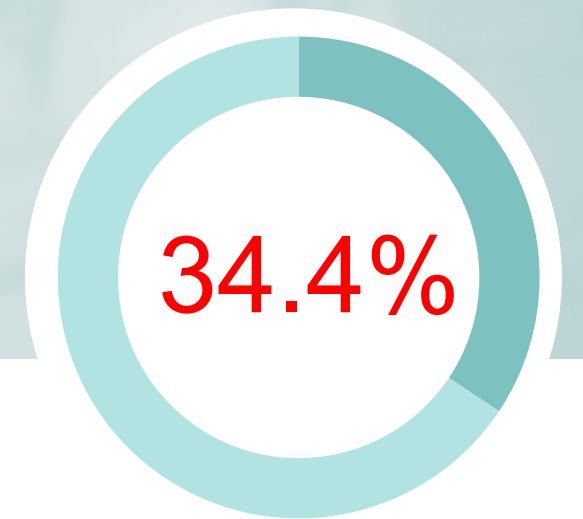
Presence of CWS, Excluding PDR



Total CWS: 23/150



No OSA: 12/118

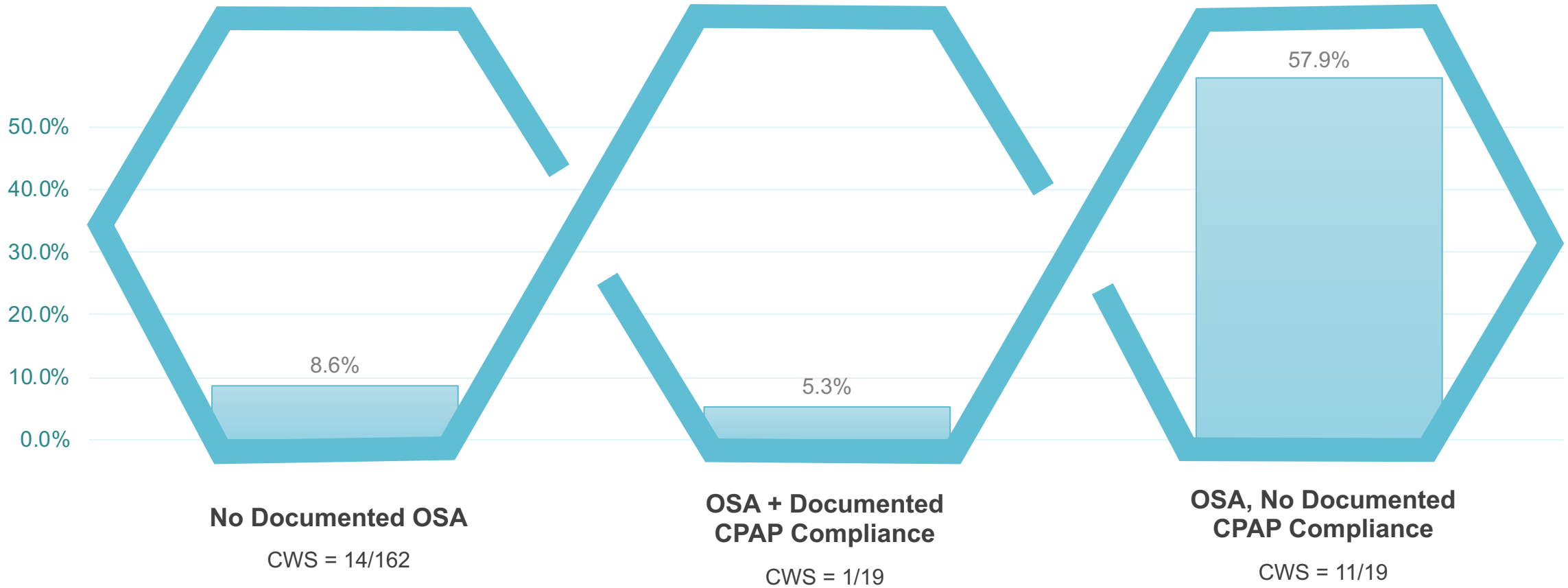


OSA: 11/32

p = 0.002



CPAP Analysis



p < 0.001



Conclusions

- The presence of OSA is associated with CWS in patients with DR.
- Documented CPAP compliance is associated with fewer CWS on examination.

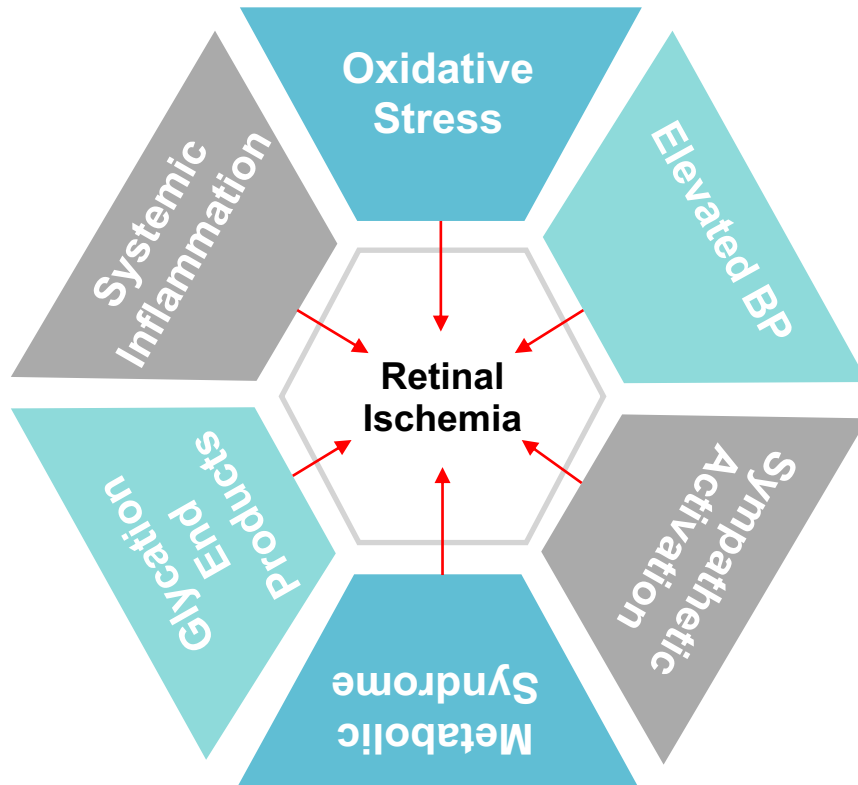


Discussion

- This is the first study to evaluate CWS as part of the spectrum of DR and their association with OSA.
- There is a strong association between CWS in NPDR and a diagnosis of OSA, with patients 3.4 times more likely to exhibit CWS if they had a prior diagnosis of OSA.
- OSA was found to be more prevalent in males and those with a higher BMI, findings that have been extensively described elsewhere.¹
- Decreased CWS in PDR is likely related to prior disease treatment (PRP, intravitreal anti-VEGF medications, etc) that was not accounted for.

Ophthalmic Effects of OSA

Proposed Hypothesis:²



Other Ophthalmic Manifestations

1. Floppy Eyelid Syndrome³
2. Central Serous Chorioretinopathy⁴
3. Non-Arteritic Anterior Ischemic Optic Neuropathy⁵
4. Glaucoma⁶
5. Diabetic Retinopathy⁷⁻⁸



Discussion

- Other studies have found that OSA may contribute to the development and worsened severity of DR.⁸⁻⁹
- Treatment with CPAP may reduce the risk of progressing to severe NPDR or PDR in patients with coexisting OSA and DR.¹⁰
- Some researchers recommend screening all diabetics for OSA, as the coexistence of these entities is associated with a high prevalence of microangiopathy.¹¹
- Further research is needed to determine the ophthalmologist's role in the screening, diagnosis, and management of OSA and its potentially fatal complications.

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References

1. Lee W, Nagubadi S, Kryger MH, Mokhlesi B. Epidemiology of Obstructive Sleep Apnea: a Population-based Perspective. *Expert Rev Respir Med.* 2008;2(3):349-364.
2. Kimura H, Ota H, Kimura Y, Takasawa S. Effects of Intermittent Hypoxia on Pulmonary Vascular and Systemic Diseases. *Int J Environ Res Public Health.* 2019;16(17).
3. Idowu OO, Ashraf DC, Vagefi MR, Kersten RC, Winn BJ. Floppy eyelid syndrome: ocular and systemic associations. *Curr Opin Ophthalmol.* September 2019.
4. Wu CY, Riangwiwat T, Rattanawong P, Nesmith BLW, Deobhakta A. Association of obstructive sleep apnea with central serous chorioretinopathy and choroidal thickness: A Systematic Review and Meta-Analysis. *Retina.* 2018;38(9):1642-1651.
5. Yang HK, Park SJ, Byun SJ, Park KH, Kim J-W, Hwang J-M. Obstructive sleep apnoea and increased risk of non-arteritic anterior ischaemic optic neuropathy. *Br J Ophthalmol.* 2019;103(8):1123-1128.
6. Lee SSY, McArdle N, Sanfilippo PG, et al. Associations between Optic Disc Measures and Obstructive Sleep Apnea in Young Adults. *Ophthalmology.* 2019;126(10):1372-1384.
7. Shiba T, Takahashi M, Matsumoto T, Hori Y. Sleep-Disordered Breathing Is a Stronger Risk Factor for Proliferative Diabetic Retinopathy than Metabolic Syndrome and the Number of Its Individual Components. *Semin Ophthalmol.* 2019;34(2):59-65.
8. Zhu Z, Zhang F, Liu Y, et al. Relationship of Obstructive Sleep Apnoea with Diabetic Retinopathy: A Meta-Analysis. *BioMed Res Int.* 2017;2017:1-5.
9. Leong WB, Jadhakhan F, Taheri S, Chen YF, Adab P, Thomas GN. Effect of obstructive sleep apnoea on diabetic retinopathy and maculopathy: a systematic review and meta-analysis. *Diabet Med J Br Diabet Assoc.* 2016;33(2):158-168.
10. Altaf QA, Dodson P, Ali A, et al. Obstructive Sleep Apnea and Retinopathy in Patients with Type 2 Diabetes. A Longitudinal Study. *Am J Respir Crit Care Med.* 2017;196(7):892-900.
11. Kakhniashvili T, Nikoleishvili L, Sherozia E, Shakarishvili R, Kurashvili R. High microangiopathy prevalence in obstructive sleep apnea comorbid type 2 diabetes patients. *Georgian Med News.* 2018;(282):91-95.