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 funduscopic exam findings and medical history were confirmed via chart review.
Results

Presence of CWS

- Total CWS: 26/200 (13.0%)
- No OSA: 14/162 (8.6%)
- OSA: 12/38 (31.6%)

p = <0.001
## Subgroup Analysis

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

Presence of CWS, Excluding PDR

15.3% Total CWS: 23/150
10.2% No OSA: 12/118
34.4% OSA: 11/32

p = 0.002
CPAP Analysis

No Documented OSA
CWS = 14/162

OSA + Documented CPAP Compliance
CWS = 1/19

OSA, No Documented CPAP Compliance
CWS = 11/19

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:

Other Ophthalmic Manifestations

1. Floppy Eyelid Syndrome
2. Central Serous Chorioretinopathy
3. Non-Arteritic Anterior Ischemic Optic Neuropathy
4. Glaucoma
5. Diabetic Retinopathy
Discussion

• Other studies have found that OSA may contribute to the development and worsened severity of DR.\textsuperscript{8-9}
• Treatment with CPAP may reduce the risk of progressing to severe NPDR or PDR in patients with coexisting OSA and DR.\textsuperscript{10}
• Some researchers recommend screening all diabetics for OSA, as the coexistence of these entities is associated with a high prevalence of microangiopathy.\textsuperscript{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