The association between diabetic retinopathy and other complications of diabetes

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Diabetes is associated with a variety of complications

- Diabetes and its complications account for more than 2 million deaths every year
- These impose substantial economic costs on:
  - Patients and their families
  - Healthcare systems
  - National economies (e.g. due to loss of work or wages)
- Together with preventing and delaying the onset of diabetes, early detection and management of complications are important for reducing the health and economic burden of diabetes

Could a greater awareness of diabetic eye disease enable the early detection and management of other diabetic complications?
The role of the Vision Academy
The role of the Vision Academy

• Currently, there is a lack of communication between the various healthcare professionals involved in the treatment of patients with diabetes

• A literature search was performed to examine the relationship between DR and other microvascular and macrovascular complications of diabetes, with the aim of opening up important communication channels between diabetologists and ophthalmologists in order to improve the coordinated care of patients with diabetes

DR, diabetic retinopathy.
DR and microvascular complications of diabetes
Nephropathy: Literature review findings

DR increases the likelihood of having or developing nephropathy\(^1\)–\(^3\)

- DR is a significant independent predictor for progression to micro- or macro-albuminuria\(^1\)
  - However, it is unclear whether albuminuria predicts development of DR\(^4\)–\(^6\)

- DR is also linked with declining GFR\(^3,7\)
  - The severity of DR at baseline can predict the rate of decline in estimated GFR\(^3\)

*Follow-up in 537 patients with type 1 diabetes and normal urinary albumin levels at baseline. DR, diabetic retinopathy; GFR, glomerular filtration rate.

Neuropathy: Literature review findings

**DR is associated with cardiac autonomic neuropathy (CAN)**\(^1,2\)

- The risk of CAN is increased in the presence of DR\(^1\)
- In patients with T2DM, the stage of DR is independently associated with CAN\(^2\)

**DR is associated with diabetic peripheral neuropathy (DPN)**\(^3–6\)

- DR is a significant risk factor for DPN, which leads to hospitalization more frequently than other complications of diabetes\(^3,7\)
  - The risk of DPN is greater in patients with proliferative DR than in those with early stage DR\(^4\)

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DR and macrovascular complications of diabetes

DR, diabetic retinopathy.
Cerebrovascular complications: Literature review findings

DR is a strong predictor of stroke\(^1\)–\(^4\)

- Even in mild-to-moderate forms, DR was identified as an independent risk factor for stroke\(^2,3\)
  - Severe DR independently increased the risk of cerebral infarction and cerebral hemorrhage in patients with T1DM\(^4\)
  - A large prospective study in patients with T2DM found DR to be associated only with small artery ischemic stroke\(^5\)

DR, diabetic retinopathy; T1DM, type 1 diabetes mellitus; T2DM, type 2 diabetes mellitus.

Cardiovascular complications: Literature review findings

DR is associated with subclinical atherosclerosis\(^1\)–\(^3\)

- The presence of DR was independently associated with carotid intima media thickness and carotid plaques in patients with T2DM\(^3\)–\(^5\)

DR is an independent risk factor for cardiovascular disease\(^6\)–\(^9\)

- In patients with T2DM, DR was associated with an increased risk of CHD-related events/deaths\(^10,11\)

<table>
<thead>
<tr>
<th>DR (number at risk)</th>
<th>Incident CHD events</th>
<th>Fatal CHD events</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number (%) of events</td>
<td>Multivariate HR (95% CI)</td>
</tr>
<tr>
<td>Absent (n=1,242)</td>
<td>153 (12.3)</td>
<td>1.0</td>
</tr>
<tr>
<td>Present (n=214)</td>
<td>44 (20.6)</td>
<td><strong>1.99 (1.33–3.00)</strong></td>
</tr>
</tbody>
</table>

Table adapted from Cheung et al. 2007\(^11\)

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Peripheral vascular complications: Literature review findings

**DR is associated with peripheral arterial disease (PAD)**

- Patients with proliferative DR are more likely to have an abnormal ABPI than patients with non-proliferative DR.

**Impact of DR severity on ABPI**

<table>
<thead>
<tr>
<th>ABPI Level</th>
<th>Patients (%)</th>
</tr>
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<tbody>
<tr>
<td>Normal</td>
<td>79.5</td>
</tr>
<tr>
<td>Low</td>
<td>28.1</td>
</tr>
<tr>
<td>High</td>
<td>56.1</td>
</tr>
</tbody>
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**Proliferative DR**

**Non-proliferative DR**

**DR is associated with soft tissue complications**

- DR is an independent risk factor for foot ulceration, and a key risk factor for lower extremity amputation.

- Similarly, patients who have non-healing foot ulcers or who have had lower extremity amputations are high risk of developing and progressing DR.

ABPI, ankle-brachial pressure index; DR, diabetic retinopathy; PAD, peripheral arterial disease.

Session summary

- A literature review of 81 studies in >400,000 patients found that DR can be a predictor of numerous microvascular and macrovascular complications of diabetes

- Conversely, some systemic complications of diabetes are linked to a higher risk of developing or progressing DR

- These findings demonstrate the need for prompt referral and screening for DR and other complications of diabetes, and highlight the need for a coordinated approach to diabetes management