Results

Figure 3. Corneal nerve morphology in control subjects and diabetic patients with (DPN) and without neuropathy (DPN(-)). **P<0.001; *P<0.05.

Figure 4. Mean excitability data in controls and in patients with DPN(+) and DPN(-). *P<0.001; **P<0.001; ***P<0.001. (A) DPN(-) vs. DPN(+); (B) DPN(-) vs. Controls; (C) DPN(+) vs. Controls.

Figure 5. Mean excitability data of recovery cycle in control subjects and in patients with DPN(+) and DPN(-). **P<0.01; ***P<0.001. (A) DPN(-) vs. DPN(+); (B) DPN(-) vs. Controls; (C) DPN(+) vs. Controls.

Figure 6. Mean excitability data in controls and in patients with DPN(+) and DPN(-). *P<0.001; **P<0.001; ***P<0.001. (A) DPN(-) vs. DPN(+); (B) DPN(-) vs. Controls; (C) DPN(+) vs. Controls.

Figure 7. Central and WA ranges for a control subject and a DPN(-) and DPN(+) patient demonstrating nerve depletion offering both areas and the WA (onset in DPN(+)).

Table 1. ROC of neuropathy measures for the diagnosis of DPN in type 1 diabetes

<table>
<thead>
<tr>
<th>Variable</th>
<th>AUC</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Cut-off value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEd (mm/s)</td>
<td>0.880</td>
<td>84</td>
<td>78</td>
<td>12.53</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>CNFD (mm/mm²)</td>
<td>0.827</td>
<td>75</td>
<td>78</td>
<td>23.63</td>
<td>0.002</td>
</tr>
<tr>
<td>CNFL (mm/mm²)</td>
<td>0.794</td>
<td>71</td>
<td>83</td>
<td>14.28</td>
<td>0.005</td>
</tr>
<tr>
<td>Peak response</td>
<td>0.765</td>
<td>67</td>
<td>66</td>
<td>12.25</td>
<td>0.14</td>
</tr>
</tbody>
</table>

Conclusions

- Participants with DPN had a significant reduction in corneal nerve fiber density, nerve fiber length and inferior whorl length compared to DPN- and controls.
- Reduction in threshold excitatory parameters in DPN compared to controls is suggestive of reduced nodal and internodal conductances. Superexcitability, a marker of nodal and inter nodal sodium and potassium ion channel function is markedly reduced in DPN compared to DPN- and controls.
- Inferior whorl length had the highest area under curve (0.880) in distinguishing the DPNs from controls and DPN-, with an optimal cut off value of 12.53 mm/mm² (Table 1 and Figure 6).
- Corneal inferior whorl length, nerve fiber density and nerve fiber length were able to diagnose DPN with higher sensitivity than measures of nerve excitability studies.
- The assessment of corneal nerve structure may provide an indication of early nerve damage prior to the onset of clinical signs and symptoms of diabetic peripheral neuropathy. Therefore, this may provide a window of opportunity to intervene and prevent the progression of early neuropathy in type 1 diabetes.

References


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