Objective, continuous measurement of sedentary behaviour and glucose in people with Type 2 Diabetes

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Introduction

• Substantial benefits of leading an active lifestyle following diagnosis of Type 2 diabetes have been identified¹
• Reducing sedentary time has been shown to be effective in the management of blood glucose levels irrespective of physical activity levels²
• Regular breaks in sedentary behaviour with light intensity walking are associated with reduced variability in glucose³
• Little research has examined daily levels of glucose and sedentary behaviour in those with Type 2 diabetes using objective and continuous measurements in a free living context

Aims

To explore levels of sedentary behaviour in those with Type 2 diabetes, and investigate the relationship between daily levels of sedentary behaviour and daily mean glucose in people with Type 2 diabetes using objective and continuous measurements

Methods

• Ten participants with Type 2 diabetes managed with diet, Metformin or DPP4 inhibitors were recruited
• Participants completed a demographic questionnaire and wore an activPAL accelerometer and a FreeStyle Libre continuous glucose monitor for 3-14 days
• Participants were also required to document their sleep, food and medication in diaries
• Average proportion of time spent sedentary and daily mean glucose during the waking day were calculated.
• A multiple linear regression was calculated to explore the relationship between sedentary time, age, BMI, and daily mean glucose

Results

• 10 adults with a mean age of 63.5±9.4 years participated
• Mean BMI was calculated as 30.8±6.9 kg/cm²
• Participants spent 67.5% of their waking day sitting/lying (Figure 1)
• Daily mean glucose was calculated as 7.7±1.8mmol/l
• Regression analysis suggested a significant effect (F(3,105) = 16.52, p <0.01) for sitting/lying time, age and BMI on daily mean glucose (R² = 0.30)
• Daily mean glucose increased significantly (p <0.01) with increased sedentary time, BMI and age. With daily mean glucose increasing by 5.14mmol/l for each percent of daily sitting/lying, 0.16mmol/l for each increasing year of age and 0.21mmol/l for each increasing BMI unit

Discussion and Conclusions

• Average sitting/lying time was higher than has previously been reported
• Percentage sitting/lying time, age and BMI were identified as significant predictors of higher daily mean glucose in people with Type 2 diabetes
• Results suggest that increased sedentariness is associated with increased daily mean glucose in those with Type 2 diabetes

Recommendations

• Future analysis should focus on examining the relationship between daily sedentary behaviour and glucose in a larger sample size
• Patterns in sedentary behaviour and resultant patterns in glucose should also be examined

References

¹Umpierre et al. (2011). Physical activity advice only or structured exercise training and association with HbA1c levels in type 2 diabetes: a systematic review and meta-analysis. Jama. 305.17,1790-1799
²Dunstan et al. (2012). Breaking up prolonged sitting reduces postprandial glucose and insulin responses. Diabetes care. 35.5, 976-983.
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Example of activPAL and FreeStyle Libre Devices

Proportion of time spent sitting/lying, standing and stepping

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<thead>
<tr>
<th></th>
<th>Sitting/Lying</th>
<th>Standing</th>
<th>Stepping</th>
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<tbody>
<tr>
<td>Proportion (%)</td>
<td>67%</td>
<td>24%</td>
<td>9%</td>
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