Vision and Gait parameters associated with fall risk in glaucoma patients

Aleksandra Mihailovic
FIGS Party
October 8th, 2016
Falls - significant public health issue

Leading cause of accidental death in older adults

80% of injury-related hospitalizations in elderly

2020 → $55 billion in US
Any fall
Injurious fall

Significant portion of study population had a fall or injurious fall

Cumulative Incidence of Falls

Follow-up time (months)
- Falls rate ratio

<table>
<thead>
<tr>
<th>Factor</th>
<th>Falls/year</th>
<th>Falls/step</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 dB worse IVF</td>
<td></td>
<td></td>
<td>0.45</td>
</tr>
<tr>
<td>5 years older</td>
<td></td>
<td></td>
<td>0.28</td>
</tr>
<tr>
<td>Male vs. female</td>
<td></td>
<td></td>
<td>0.16</td>
</tr>
<tr>
<td>Af Amer vs. white</td>
<td></td>
<td></td>
<td>0.02</td>
</tr>
<tr>
<td>1+ comorbid illness</td>
<td></td>
<td></td>
<td>0.26</td>
</tr>
<tr>
<td>6+ vs. &lt;6 meds</td>
<td></td>
<td></td>
<td>0.96</td>
</tr>
</tbody>
</table>

- Decreases rate of falls: 0.2
- Increases rate of falls: 1.8

- Decreases rate of falls: 0.4
- Increases rate of falls: 2
Peripheral vision likely the most important visual predictor of falls

VF loss, but not VA →
higher rate of falls

Several studies suggesting glaucoma associated with ↑ falls
Impact of 5 dB ↓ / 5 pts missed

- Better-eye: Total
  - Falls/step ratio: 0.9 - 1.5
  - p value: 0.01
- Better-eye: Superior
  - Falls/step ratio: 0.9 - 1.5
  - p value: 0.02
- Better-eye: Inferior
  - Falls/step ratio: 0.9 - 1.5
  - p value: 0.02
- IVF: Total
  - Falls/step ratio: 0.9 - 1.5
  - p value: 0.03
- IVF: Superior
  - Falls/step ratio: 0.9 - 1.5
  - p value: 0.03
- IVF: Inferior
  - Falls/step ratio: 0.9 - 1.5
  - p value: 0.04
- Peripheral: Total
  - Falls/step ratio: 0.9 - 1.5
  - p value: 0.02
- Peripheral: Superior
  - Falls/step ratio: 0.9 - 1.5
  - p value: 0.11
- Peripheral: Inferior
  - Falls/step ratio: 0.9 - 1.5
  - p value: 0.005
Gait maybe an important reversible risk factor for falls

Better than static balance (no falls when standing still)

Several gait features associated with falls

Interventions to improve gait $\rightarrow$ fewer falls
Gait characteristics of walking

Base width: DL
Step length: AX
Stride length: AG
Association between fall rates and gait

1SD increase in

<table>
<thead>
<tr>
<th>Variable</th>
<th>Falls rate ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Velocity</td>
<td></td>
<td>0.007</td>
</tr>
<tr>
<td>Stride velocity</td>
<td></td>
<td>0.01</td>
</tr>
<tr>
<td>Double support pct*</td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Step time</td>
<td></td>
<td>0.03</td>
</tr>
</tbody>
</table>

* Decreases rate of falls
  - 0.6 to 1.0
  - Falls/step
  - Falls/year

* Increases rate of falls
  - 1.4 to 1.8
  - Falls/step
  - Falls/year

*pct=percent cycle time
Association between fall rates and gait variability

1SD increase in

<table>
<thead>
<tr>
<th>1SD increase in</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single support time CoV*</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Step time CoV</td>
<td>0.001</td>
</tr>
<tr>
<td>Double support time CoV</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>0.33</td>
</tr>
<tr>
<td></td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>0.23</td>
</tr>
</tbody>
</table>

*CoV=coefficient of variation
Loss of inferior peripheral vision is associated with the increased fall rates in individuals with glaucoma.

Several gait parameters are associated with the increased fall rates in individuals with glaucoma.

Falls prevention interventions could be directed at gait modification.

Gait parameters may serve as an early marker to gauge success of falls prevention efforts.
Questions and Answers

Thank you for listening!