INTRODUCTION

Hallux valgus (HV) has been linked to functional disability and increased falls risk in older adults, but mechanisms underpinning this functional disability are unclear. Previous studies have reported conflicting findings regarding plantar pressures in HV. Most plantar pressure studies to date have not considered the severity of HV or the presence of foot pain in their analyses.

STUDY AIM

This study investigated forefoot plantar pressures in adults with mild, moderate, and severe HV compared to controls, while considering age, gender, body mass index and foot pain as covariates.

METHODS

Sixty adults with HV (7 men, 53 women) and 30 controls (5 men, 25 women) were recruited for this study (Table 1). Volunteers were excluded if they had any previous foot or ankle fractures or surgery, hallux limitus, neurological condition, inflammatory disease or a history of falls. This study was approved by the institutional Medical Research Ethics Committee, and all participants gave written informed consent.

To assess weight-bearing, dorsoplantar radiographs were obtained for all participants. The HV angle was measured and radiographs were used to investigate differences between groups, adjusting for age, gender, BMI and foot pain as covariates.

RESULTS

Participant characteristics are outlined in Table 1. A significant reduction in hallux peak pressure and pressure-time integral was evident in moderate (peak pressure -90.8kPa, \(p<0.001\)) and severe HV (peak pressure -106.2kPa, \(p<0.001\)) compared to the control group (Figure 2). This finding was significant after adjusting for covariates, including foot pain. However, our study found no significant differences in forefoot plantar pressures between participants with mild HV and controls (\(p>0.05\)). Furthermore, no significant differences were found between groups in other forefoot regions (\(p>0.05\)).

DISCUSSION AND CONCLUSIONS

- Moderate to severe HV is associated with reduced hallux plantar pressures during walking, which may indicate less effective toe-off.
- Those with mild HV had similar loading patterns to controls, indicating that toe-off may not be affected until HV deformity progresses to a moderate or severe state.
- Future studies are needed to investigate whether early intervention strategies, such as foot orthoses, exercises or manual therapy, can alter deformity and associated functional changes in HV.

Figure 1. Pedar mask indicating 5 forefoot regions for analysis

Figure 2. Peak pressures under the hallux, lesser toes, first metatarsal head (MH1), second metatarsal head (MH2) and metatarsal heads three to five (MH3-5) in participants with mild, moderate and severe hallux valgus compared to controls. * Indicates a statistically significant difference (\(p<0.001\)).

Table 1. Participant characteristics for HV groups compared to controls

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Men</th>
<th>Women</th>
<th>Men</th>
<th>Women</th>
<th>Men</th>
<th>Women</th>
<th>Men</th>
<th>Women</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.25±2.19</td>
<td>44.2±15.3</td>
<td>50.3±14.1</td>
<td>50.3±16.6</td>
<td>55.4±13.8</td>
<td>24.7±4.3</td>
<td>23.6±4.2</td>
<td>28.3±3.9</td>
<td>25.2±4.6</td>
<td>9.8±3.5</td>
<td>21.1±3.0*</td>
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<tr>
<td>5.20±0.14</td>
<td>22.8±3.0*</td>
<td>30.8±2.3*</td>
<td>39.9±5.4*</td>
<td>22.8±3.0*</td>
<td>30.8±2.3*</td>
<td>39.9±5.4*</td>
<td>22.8±3.0*</td>
<td>30.8±2.3*</td>
<td>39.9±5.4*</td>
<td></td>
</tr>
<tr>
<td>3 (0–7)*</td>
<td>MH1, MH2, MH3-5</td>
<td>4 (0–8)*</td>
<td>MH1, MH2, MH3-5</td>
<td>4 (0–8)*</td>
<td>MH1, MH2, MH3-5</td>
<td>4 (0–8)*</td>
<td>MH1, MH2, MH3-5</td>
<td>4 (0–8)*</td>
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</tbody>
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REFERENCES