Hypothesis/aims of study

**Dynamic Elasticity:**
- A mechanism for acutely regulating detrusor wall tension
- Reversible strain softening
  - Lost via repeat passive filling and emptying
  - Regained after active voiding
- Identified by comparative-fill urodynamic studies (UDS) in individuals with overactive bladder (OAB)

**Objective:**
- Test the hypothesis that individuals with detrusor overactivity (DO) exhibit less dynamic elasticity than those without DO

Study design & methods

- Individuals with and without urgency based on ICIQ-OAB surveys (question 5a ≥3 and 0, respectively)
- Vesical pressure (P\textsubscript{ves}) data were collected during repeat fill-and-empty UDS
- Initial fill-active void cycle determined cystometric capacity (CCap)
- DO identified by a neurourologist
- Dynamic elasticity was quantified by comparing three fills (Fig 1, Fills 1-3):
  - Fill 1: “before strain softening”
    - baseline after an active void
  - Fill 2: “after strain softening” (i.e. after passive emptying)
    - quantify degree of dynamic elasticity
  - Fill 3: “after active voiding”
    - quantify dynamic elasticity was recovered after active voiding
- Average P\textsubscript{ves} calculated for the filling range from 0% to 40% CCap (Fig 1, blue lines)
- These values were normalized to the average P\textsubscript{ves} for Fill 1 (Fig 2)

Results

- UDS data from 21 participants were analyzed (Table 1)
- 9/10 participants without DO exhibited dynamic elasticity
  - Decrease in P\textsubscript{ves} during a fill subsequent to passive emptying (Fig 2, Fill 2, *)
  - P\textsubscript{ves} return to baseline during a fill subsequent to active voiding (Fig 2, Fill 3).
- Only 3/11 participants with DO exhibited dynamic elasticity (Fig 2).
- Absence of dynamic elasticity was significantly associated with the presence of DO (Fisher’s exact test, p<0.01).
- Dynamic elasticity was shown in all 5 healthy participants without OAB or DO

**Table 1:** Association of dynamic elastic to detrusor overactivity

<table>
<thead>
<tr>
<th></th>
<th>Dynamic elasticity shown</th>
<th>No dynamic elasticity shown</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detrusor overactivity</td>
<td>3</td>
<td>8</td>
<td>11</td>
</tr>
<tr>
<td>Non-detrusor overactivity</td>
<td>9</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>12</strong></td>
<td><strong>9</strong></td>
<td><strong>21</strong></td>
</tr>
</tbody>
</table>

**Figure 2:** Average P\textsubscript{ves} during filling from 0 to 40% CCap during fills 2 and 3 normalized

Interpretation of results and concluding message

- Contractile activity reverses loss in dynamic elasticity due to a fill-passive empty cycle
- Patients without DO show a loss in dynamic elasticity in Fill 2 that was restored by the active voiding contraction following Fill 2
- Patients with DO show no loss in dynamic elasticity in Fill 2 a decrease in average P\textsubscript{ves}
  - DO during Fill 1 prevented the decrease in P\textsubscript{ves}
  - DO during Fill 2 restored the decrease P\textsubscript{ves} during that particular fill
- DO may alter the bladder’s mechanism for acutely regulating elasticity, possibly contributing to OAB
- Quantification of dynamic elasticity could lead to patient sub-typing and targeted OAB treatments