Increased medial meniscus extrusion in varus alignment with positive correlation to joint contact pressure.
Conflict of interest

Investigation performed at

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No conflict of interest to declare.
Introduction

• Medial meniscus extrusion (MME) is a dynamic phenomenon and depended on age, BMI and activity \(^{1,2,3}\)

• **MME** is considered an indirect sign of meniscus pathology \(^{4,5,6}\)

• Increased MME (> 3mm) is associated with loss of meniscus function and **progression of joint degeneration** \(^{7,8}\)

➢ Effect of **lower limb alignment** remained unclear!
Purpose

to investigate the MME across varus and valgus alignment
and to correlate it with joint contact pressure

Hypotheses

Varus alignment would result in a significant higher MME along with a higher joint contact pressure in the medial compartment
Methods

I. Knee aligned in neutral (0°), varus (2°, 4°) and valgus (2°, 4°) and 0° knee flexion

II. Ultrasonographic evaluation of the medial meniscus with a 13.5 MHz linear transducer (MSK Ultrasound, Arthrex Inc., Florida, US)
Results

Ultrasound medial meniscus extrusion and Tekscan pressure distribution at A) 4° varus and B) 4° valgus.

* $p < 0.01$ significant compared to the previous alignment.

<table>
<thead>
<tr>
<th>Alignment</th>
<th>Medial meniscus extrusion (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>unloaded</td>
<td>0.0</td>
</tr>
<tr>
<td>4° valgus</td>
<td>1.0</td>
</tr>
<tr>
<td>2° valgus</td>
<td>2.0</td>
</tr>
<tr>
<td>neutral</td>
<td>3.0</td>
</tr>
<tr>
<td>2° varus</td>
<td>4.0</td>
</tr>
<tr>
<td>4° varus</td>
<td>5.0</td>
</tr>
</tbody>
</table>
Changes of lower limb alignment resulted in a shift of A) peak contact pressure and B) mean contact pressure between the medial and lateral compartment.
Peak contact pressure and mean contact pressure are significantly correlated with increased medial meniscus extrusion!

\[
\text{PCC} = 0.559; \ p < 0.001
\]

\[
\text{PCC} = 0.468, \ p < 0.01
\]
Conclusion

1. Varus alignment resulted in a **higher medial meniscus extrusion**
2. Medial meniscus extrusion was **significantly correlated** with
   a. Peak contact pressure
   b. Mean contact pressure
3. Neutral and valgus alignment **reduced meniscus extrusion** below a pathological extend
4. Varus alignment alongside increased MME might contribute to **medial compartment overload** in incipient osteoarthritis


Thank you!