Lower limb alignment highly affects peak pressure in medial meniscus deficient knees

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Nothing to disclose.
Introduction

• Horizontal meniscus tears are common and a first sign of osteoarthritis \(^1\)

• Partial meniscus resection compromises meniscus function and leads to compartment overload \(^2,3\)

• Lower limb alignment influences load distribution within the knee joint \(^4,5\)
Purpose

to investigate the effect of lower limb alignment on peak pressure and contact area in knees with horizontal medial meniscus tears and subsequent leaflet resection

Hypotheses

Varus alignment in combination with partial meniscus resection lead to the highest peak pressure within the medial compartment
Methods

I. Knee aligned in **neutral** (0°), **varus** (1°, 2°) and **valgus** (1°, 2°)

![Diagram showing ball bearing placement and setup with TekScan 4000N knee sensor film](image-url)
Methods

II. Artificial meniscus tear and resections (4 conditions)

A: intact

B: 15 mm horizontal tear (posterior horn)

C: inferior leaflet resection

D: resection of both leaflets

Medial meniscus dissection
Effect of partial meniscectomy

Meniscus condition:
- Intact
- Tear
- One leaflet resection
- Both leaflet resection

Effects on peak pressure (MPa):
- Intact
- Horizontal Tear
- Single leaflet resection
- Double leaflet resection

Mechanical axis:
- 2° valgus
- 1° valgus
- Neutral
- 1° varus
- 2° varus

Peak pressure (MPa):
- 0
- 1
- 2
- 3
- 4
- 5

+ 30%
Effect of alignment

(* p < 0.05)

Medial compartment

Lateral compartment

Peak pressure (MPa)

Mechanical axis

Peak pressure (MPa)

Mechanical axis
Peak pressure within the medial compartment

<table>
<thead>
<tr>
<th>Meniscus condition</th>
<th>Peak pressure within the medial compartment</th>
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<tbody>
<tr>
<td>Intact</td>
<td>+ 75%</td>
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<tr>
<td>Tear</td>
<td></td>
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<tr>
<td>One leaflet resection</td>
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<td>Both leaflet resection</td>
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(* p < 0.05)
Contact area within the medial compartment

- (* p < 0.05 from intact state)
- (° p < 0.05 from tear state)

<table>
<thead>
<tr>
<th>Meniscus condition</th>
<th>Intact</th>
<th>Tear</th>
<th>One leaflet resection</th>
<th>Both leaflet resection</th>
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<tbody>
<tr>
<td>2° valgus</td>
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<tr>
<td>1° valgus</td>
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<tr>
<td>Neutral</td>
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<tr>
<td>1° varus</td>
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<tr>
<td>2° varus</td>
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</table>
1. Varus alignment in combination with meniscus loss lead to the highest peak pressure within the medial compartment

2. Notable biomechanical changes after meniscus resection in
   1. Peak pressure (increase) and
   2. Contact area (decrease)

3. Varus alignment highly increases peak pressure in the medial compartment

4. Only small effects in case of horizontal tear (15 mm) in any alignment

5. Mechanical axis have to be considered in clinical decision making


