ALTERATIONS IN FEMORO-TIBIAL 3D KINEMATICS IN PATIENTS WITH PATELLAR LATERALISATION - A POSSIBLE REASON FOR PERSISTENT PROBLEMS AFTER LATERAL RELEASE?

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Introduction:
In many cases the lateral release is the treatment of choice in patients with patellar lateralisation. However, in a considerable percentage postoperative complaints remain (1). One reason can be that the pathogenesis of the altered patellar kinematics is not only localized in the femoro-patellar joint but caused by an altered femoro-tibial kinematics (2).
The objective was therefore to analyze (a) tibio- and patello-femoral 3D-kinematics in healthy volunteers and in patients with patellar lateralisation pre- and postoperatively and (b) whether changes in femoro-patellar kinematics correlate with alteration in femoro-tibial kinematics.

Materials and Methods:
The knees of 20 healthy volunteers and of 10 patients with patellar lateralisation (20–44y.) were investigated preoperatively and one year after arthroscopical lateral release. Kinematics analysis was performed in an open MR system (0.2T, Magnetom Open, Siemens) at different flexion angles (0°, 30° and 90° of flexion) with external loads being applied. To analyse patello-femoral kinematics a patella-based coordinate system was calculated and femoral reference points were defined full automatically (3) to quantify the position of the patella relative to the trochlear groove (Fig. 1a). To analyse tibio-femoral kinematics a tibia-based coordinate system was calculated and a cylinder fit technique (3) was used to determine the epicondylar axis (Fig. 1b). The coefficient of correlation (r) between both parameters was calculated using the correlation z-test.

Results:
Regarding femoro-tibial kinematics, in the patients group a significant increased internal rotation of the femur relative to the tibia was observed preoperatively at full extension and 30° of flexion (0°: 14,1±2,3° vs. healthy 5,4±3,6°; p<0.01; Fig. 2). Due to this changes the lateral femur condyle was positioned significantly anterior (30°: 7,6±2,3mm vs. healthy: 3,0±1,8mm; p<0.05). During flexion from 30°- 90° a significantly (p<0.05) enlarged external rotation occurred. No significant changes were observed between the pre- and postoperatively data.

With respect to the femoro-patellar kinematics the in the preoperatively investigated knees the patellar tilt and shift were increased in all investigated knee positions, the difference being significant at 90° of flexion (Tilt: 20,7±5,8° vs. healthy: 4,6±3,1°; shift 6,1±3,8 mm vs. healthy: 3,6±3,2mm; Fig. 3). Postoperatively the patellar shift (90°: 3,7±4,5mm) and tilt (90°: 13,8±4,3°) decreased significantly, the latter still being significantly (p<0.05) increased compared to the healthy knees (Tab. 1).

Table 1: Femoro-patellar kinematics (* = significant (p< 0.05) difference compared to the healthy control group)

<table>
<thead>
<tr>
<th></th>
<th>30° flexion</th>
<th>90° flexion</th>
<th>30° flexion</th>
<th>90° flexion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy</td>
<td>6,6±3,4</td>
<td>4,6±3,1</td>
<td>1,4±1,9</td>
<td>3,6±3,2</td>
</tr>
<tr>
<td>Patients preOP</td>
<td>10,9±2,9</td>
<td>20,7±5,6*</td>
<td>1,5±2,1</td>
<td>6,1±3,8*</td>
</tr>
<tr>
<td>Patients postOP</td>
<td>11,9±4,2</td>
<td>13,8±4,3*</td>
<td>2,9±3,5</td>
<td>3,7±4,5</td>
</tr>
</tbody>
</table>

Preoperatively the correlation between femoral rotation and patellar tilt was high at 0° (r: 0,72) and 90° (r: 0,65) of flexion. Postoperatively a high correlation (r=0,75) was only found at 90° of flexion.

Conclusions:
Patients with patellar lateralisation demonstrated considerable differences in femoro-tibial and femoro-patellar kinematics in comparison to the healthy control group. The high correlation between the measured parameters suggests, that there is a strong relationship between altered femoro-tibial and femoro-patellar kinematics. However, the lateral release leads not to changes in the femoro-tibial motion patterns. This could be a possible explanation for the persistent problems and should be considered in therapy.

Literatur

Affiliated Institutions for co-authors
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