retraining. After rehabilitation the case patient also demonstrated movement patterns that more closely reflect the patterns of patients without knee pathology and these variables were substantially improved compared to her pre-operative levels. Her knee flexion excursion and knee flexion moment in the operated limb were nearly twice that of the TKA patients who did not undergo the specialized rehabilitation (Figure 1) and she demonstrated a 40% reduction in the adduction moment of her non-operated limb. Her knee excursion symmetry ratio (operated/non-operated limb) was 1.0, whereas the symmetry ratio was 0.7 for the other TKA group.

Table 1. Patient characteristics at all time points

<table>
<thead>
<tr>
<th>Case patient</th>
<th>TKA group (SD)</th>
<th>Case patient</th>
<th>TKA group (SD)</th>
<th>Case patient</th>
<th>TKA group (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>KOS (%)</td>
<td>37.14</td>
<td>50.28 (17.43)</td>
<td>32.86</td>
<td>55.9 (13.61)</td>
<td>98.60</td>
</tr>
<tr>
<td>TUG (s)</td>
<td>11.1</td>
<td>10.2 (2.8)</td>
<td>14.1</td>
<td>11.9 (5.5)</td>
<td>9.6</td>
</tr>
<tr>
<td>SCT (s)</td>
<td>21.4</td>
<td>20.1 (9.55)</td>
<td>36.4</td>
<td>26.8 (12.2)</td>
<td>13.1</td>
</tr>
<tr>
<td>6MW (m)</td>
<td>1442</td>
<td>1447 (410)</td>
<td>1073</td>
<td>1139 (337)</td>
<td>1709</td>
</tr>
<tr>
<td>Knee Flexion ROM</td>
<td>115</td>
<td>118 (14)</td>
<td>95</td>
<td>98 (15)</td>
<td>123</td>
</tr>
<tr>
<td>Quadriceps (N/BMI)</td>
<td>11.37</td>
<td>18.7 (2.5)</td>
<td>3.91</td>
<td>10.0 (4.3)</td>
<td>12.30</td>
</tr>
</tbody>
</table>

Results: The average EMG varied significantly with COP in at least one phase of stance in all examined muscles of the less symptomatic leg and in three muscles of the more symptomatic leg. After training, a significant increase in average EMG was observed in most muscles. Most muscles of the less symptomatic leg showed significantly increased peak EMG. Activity duration was shorter for all muscles of the less symptomatic leg (significant in the lateral gastrocnemius) and three muscles of the more symptomatic leg (significant in the biceps femoris). These results were associated with reduced pain and increased function.

Conclusions: COP manipulation influences the muscle activation patterns of the leg in patients with knee osteoarthritis. When combined with a therapy program, muscle activity increases and activity duration decreases.

Bone Biology

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LOAD-INDUCED SUBCHONDRAL BONE THICKENING IN MICE WITH OR WITHOUT ARTICULAR CARTILAGE LESIONS

Purpose: Subchondral bone remodelling is an important characteristic of osteoarthritis (OA) in humans and in animal models. However, the relationship between SCB changes and articular cartilage (AC) degeneration remains controversial. Do they precede or follow AC lesions? To begin answering this question, we analysed changes in SCB thickness in a mouse model of knee joint loading, in which localised AC lesions are generated in the lateral femur where it becomes closely opposed to the tibia during loading.

Methods: Right knees of 8 week-old CBA mice were loaded 3 times each week for 2 (± 3 weeks of normal use with no loads applied) or 5 weeks at a magnitude of 9N as described previously. Micro-CT scanning was performed on left (non-loaded) and right (loaded) knee joints and SCB thickness measured in the posterior half of each condyle using CTan software, and in order to precisely define their spatial relationship to lesions in the lateral femur, in 0.1 mm sections within this posterior half. Paired t-test was used for statistical analysis.

Results: SCB thickness was increased in the regions of the lateral femur which were closely associated with load-induced AC lesions, and no changes were noted in regions remote from these lesions. Joints loaded for 5 weeks showed most obvious thickening in SCB. In addition, SCB thickness was increased in the most posterior region of the lateral tibia, where no AC lesions were induced by the application of mechanical loading, but which was directly in contact with the lateral femur AC during loading. This SCB thickening was again most prominent after 5 weeks of loading.

Conclusions: We have described focal thickening of SCB associated with load-induced AC lesion formation in the lateral femur, as well as thickening of SCB in areas exposed to direct mechanical loads (without cartilage lesions) in the lateral tibia. This indicates that SCB changes can be induced by loading independently of AC lesions, and that altered load distribution associated with the presence of AC lesions acts to enhance load-induced SCB thickening. These data suggest that SCB thickening is due to altered mechanical loads in OA joints.

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BLOOD PERFUSION AND BONE FORMATION BEFORE AND AFTER MINIMALLY INVASIVE PERIACETABULAR OSTEOTOMY ANALYSED WITH PET COMBINED WITH CT
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Purpose: A new minimally invasive technique for periacetabular osteotomy (PAO) has been developed in our institution. The osteotomized acetabular fragment is reoriented three dimensionally in order to achieve a better acetabular coverage. Bone healing is believed to be completed eight weeks after surgery and from that time the patients are allowed to fully weight-bear on the operated leg. Sufficient blood perfusion is held to be essential to successful bone healing after PAO. It is never examined in vivo how blood perfusion to the acetabular fragment is affected by...
PAO and whether perfusion contributes to new bone formation in the acetabular fragment. The purpose of this study was to quantify blood perfusion and bone formation before and after PAO analysed by Positron Emission Tomography (PET) combined with Computed Tomography (CT).

**Methods:** Twelve dysplastic patients (nine women) were included consecutively in the study all operated by the senior author. Median age was 33 (23-55) years. Initially, two patients were PET scanned in a pilot study to test our models for calculation of the physiological parameters. The following ten patients had their hip joints PET/CT scanned immediately before PAO and 3–4 weeks after. Due to patients moving on the scanner bed while scanning, data of sufficiently high quality was only available for six out of ten. [0-15]-water was used to quantify blood perfusion and [F-18]-fluoride was used to produce quantitative images interpreted as new bone formation in around the acetabular fragment. The perfusion [ml blood/min/ml bone] was determined from a one-compartment model, with the parameters: K1, k2 and the delay. The fluoride-clearance per volume bone (Kf) [ml blood/min/ml bone] was determined by applying Patlak graphical analysis to the fluoride scan, fitting the data from 45 to 90 min.

**Results:** The blood perfusion on the operated acetabulum before surgery was 0.07±0.02 ml/min/ml, and after surgery 0.19±0.03 ml/min/ml (p<0.001). Blood perfusion on the non-operated acetabulum was 0.07±0.02 ml/min/ml before PAO and 0.07±0.02 ml/min/ml after surgery (p=0.47). The fluoride-clearance per volume bone on the operated acetabulum was 0.02±0.01 ml/min/ml preoperatively, and 0.06±0.01 ml/min/ml postoperatively (p<0.001). Fluoride-clearance on the non-operated acetabulum was 0.01±0.01 ml/min/ml before PAO and 0.02±0.01 ml/min/ml after PAO (p=0.49).

**Conclusions:** Blood perfusion and new bone formation increased significantly in the acetabular fragment demonstrating that blood perfusion to the acetabular fragment is not critically compromised after minimally invasive PAO a.m. Soballe. Three to four weeks after PAO, bone formation in the acetabular fragment on the operated side had increased significantly. This is the first paper applying PET/CT to quantify blood perfusion and bone formation before and after PAO.

**197 SMOOTHENING OF PERIARTICULAR BONE: BLOCKADE OF THE HEDGEHOG PATHWAY INHIBITS OSTEOYPHYTE FORMATION IN ARTHRITIS**

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**Purpose:** Osteophyte formation is a common phenomenon in arthritis. Bone formation by endochondral ossification is considered a key pathophysiologic process to form osteophytes. We hypothesized that inhibition of Smoothened (Smo), a key component of the hedgehog pathway inhibits osteophyte formation as the hedgehog pathway mediates endochondral ossification.

**Methods:** We induced arthritis in 8 weeks old C57/BL6 mice by serum transfer (KxBN model). Mice were then treated by daily administration of either vehicle or LDE 223, a specific small molecule inhibitor for Smo, over 2 weeks starting at the onset of disease. Clinical course of arthritis, histological and molecular changes of bone in the affected joints as well as systemic bone changes were assessed.

**Results:** Serum transfer induced arthritis led to severe osteophyte formation within 2 weeks of onset. Blockade of Smo inhibited hedgehog signaling in vivo and also significantly inhibited osteophyte formation, whereas the clinical and histopathologic signs of arthritis were not affected. Also, systemic bone mass did not change. Smo inhibitor particularly blocked the formation of hypertrophic chondrocytes and collagen type X expression.

**Conclusions:** Our data indicate that blockade of hedgehog signaling by targeting Smo specifically inhibits osteophyte formation in arthritis without affecting inflammation and without eliciting bone destruction at the local and systemic level. Blockade of Smo may thus be considered as a strategy to specifically influence the periosteal bone response in arthritis associated with bone apposition.