Panorama of Intra- and Peri-articular Injury after Knee Joint Hemarthrosis - Data From Sub-acute MR imaging findings in 1145 Consecutive Acute Knee Injuries

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Disclosures:

Introduction: Acute posttraumatic effusion of the knee joint indicates hemarthrosis and is highly suggestive of a significant knee injury, also in knees with normal radiographs [1]. Acute phase clinical examination of such knees is difficult and a lack of accuracy in assessment is well documented [2]. Magnetic resonance imaging (MRI) may be considered as a noninvasive gold standard for assessing post trauma knee joint derangement and is increasingly used to aid clinicians in determining diagnoses and planning treatment [3]. Still, the MRI based panorama of structural injury following acute knee trauma and hemarthrosis is not well understood. We here present a unique and large cohort of consecutive acute knee injuries assessed with sub-acute MRI to describe the distribution of injuries and injury combinations following traumatic knee joint hemarthrosis.

Methods: During 2002 to 2008, all patients with rapid intra-articular swelling following knee joint injury seen at the Emergency department of Helsingborg Hospital were referred to sub-acute MRI. Patients triaged to a sub-acute knee specialist team out-clinic were also included. In total, 1145 unique knee injuries were included in this study. Two different MRI scanners were used: a 1.5 T imager (Gyroskan, Philips Intera) and a 1.0 T imager (Impact, Siemens), both with a circular polarized surface coil. A T2-weighted turbo spin-echo sequence (TSEPdT2) and a T2-weighted turbo short-tau inversion recovery sequence (TSTIRT2) were obtained in the coronal and sagittal views. Images were reviewed by dedicated senior radiologists and structural injury was classified in the normal clinical setting. Patients were prospectively registered and medical records and MRI reports were reviewed by 2 investigators. The following criteria were employed to confirm eligibility for inclusion in the study: traumatic knee joint hemarthrosis as documented by rapid onset of swelling (<6 h) or confirmed by aspiration of blood; MRI performed within 6 weeks of injury. Structural injury as visualized on MRI is presented and related to time of occurrence (over the year), age, sex and activity at injury. We used descriptive statistics and present medians (25th and 75th percentiles). Comparisons between groups were made using the Pearson X2 test for dichotomous variables and the Mann-Whitney U-test for continuous variables (age).

Results: The median time from injury to MRI was 8 (25th and 75th percentiles, 5 and15) days. 64% of the injured knees were in men (mean age 27±SD 11 years) and 36% in women (28± 13 years) with the majority (72%) of all injuries occurring during sport activities. 52% of the patients had an anterior cruciate ligament (ACL) injury and 55% of these were combined with at least one meniscal tear (Table 1). The majority of knees, except for patella dislocations, suffered from a combination of structural injuries with an isolated ACL tear being found in only 17% of knees with ACL rupture (Table 1). Patella dislocation was the most frequent injury in patients aged under 16 years for both males (39%) and females (43%). The annual incidence of ACL injury and patella dislocation was 71 per 100 000 inhabitants aged 10 to 64 years and 88 per 100 000 inhabitants aged 10 to 16 years, respectively.

Discussion: Due to Scandinavian health care organization, this study can be considered population-based rather than institution-based and our results may thus mirror the panorama of knee traumatology in a Scandinavian general population. With a significant intra- or periarticular structural injury visualized on MRI in over 90% of more than 1100 cases, this study strongly supports the impact of traumatic knee joint hemarthrosis as a determinant of significant knee joint trauma. When primary diagnosis is identified, high level of suspicion of associated injuries should exist, especially in ACL injured knees. The annual incidence of patella dislocation in this study is twice as high as in previous reports suggesting that this diagnosis may be overlooked in clinical practice [4].

Significance: Lack of accuracy in clinical diagnosis and small sample sizes limits the quality of epidemiological conclusions drawn from many studies. This MRI based study present findings from a large population-based cohort and thus provides solid estimations of the true occurrence of different knee injuries as well as the coexistence of associated injuries. For example, our data suggest that a lateral patella dislocation may be twice as common as previously reported and an ACL tear is rarely an isolated phenomenon. Prospective follow up of the study cohort opens perspectives on improved knowledge of long term consequences of different types of injury to the knee joint. It also provides an excellent base for the understanding of injuries that were not immediately treated surgically due to the lack of clinical symptoms.

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Table 1. Distribution of structural injury as visualized on MRI and the relation to gender (n=1145)

<table>
<thead>
<tr>
<th>Injury</th>
<th>Total (n)</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1145</td>
<td>731</td>
<td>414</td>
</tr>
<tr>
<td>ACL</td>
<td>599</td>
<td>364 (61%)</td>
<td>235 (39%)</td>
</tr>
<tr>
<td>MCL</td>
<td>323</td>
<td>205 (63%)</td>
<td>118 (37%)</td>
</tr>
<tr>
<td>Patella dislocation</td>
<td>199</td>
<td>122 (61%)</td>
<td>77 (39%)</td>
</tr>
<tr>
<td>Meniscal tear</td>
<td>474</td>
<td>331 (70%)</td>
<td>143 (30%)</td>
</tr>
<tr>
<td>ACL + meniscal tear</td>
<td>331/599 (55%)</td>
<td>217/364 (60%)</td>
<td>114/235 (48%)</td>
</tr>
</tbody>
</table>

The majority of injuries occur in combination and consequently the sum of diagnoses rises above 100%.

ACL = Anterior cruciate ligament; MCL = Medial collateral ligament

Table 2. The number of injuries and injury combinations as visualized on MRI (n=1145)

<table>
<thead>
<tr>
<th>Injury</th>
<th>Isolated</th>
<th>In combination with</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ACL</td>
<td>PCL</td>
</tr>
<tr>
<td>ACL (n=599)</td>
<td>99 (17%)</td>
<td>-</td>
</tr>
<tr>
<td>PCL (n=33)</td>
<td>7 (21%)</td>
<td>16  (48%)</td>
</tr>
<tr>
<td>MCL (n=323)</td>
<td>60 (19%)</td>
<td>230 (71%)</td>
</tr>
<tr>
<td>LCL (n=65)</td>
<td>3 (5%)</td>
<td>58 (89%)</td>
</tr>
<tr>
<td>Patella dislocation (n=199)</td>
<td>166 (83%)</td>
<td>2 (1%)</td>
</tr>
<tr>
<td>Diagnosis</td>
<td>Count</td>
<td>Percentage</td>
</tr>
<tr>
<td>----------------------</td>
<td>-------</td>
<td>------------</td>
</tr>
<tr>
<td>Meniscal tear (n=474)</td>
<td>103</td>
<td>22%</td>
</tr>
<tr>
<td></td>
<td>331</td>
<td>70%</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>3%</td>
</tr>
<tr>
<td></td>
<td>107</td>
<td>23%</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>6%</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>4%</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>117</td>
<td>25%</td>
</tr>
</tbody>
</table>

The majority of injuries occur in combination and consequently the sum of diagnoses rises above 100%

ACL = Anterior cruciate ligament; PCL = Posterior cruciate ligament; MCL = Medial collateral ligament; LCL = Lateral collateral ligament

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