The Effect of Bone-Bruise Lesions on Pain in Patients With Traumatic Knee Injury

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Clinical Scenario

Traumatic knee injuries affect numerous physically active individuals each year. Damage to subchondral bone, often termed bone bruise, is frequently detected on magnetic resonance imaging (MRI) during the diagnosis of traumatic knee injury. Little is known regarding the effects of bone bruises on pain in individuals with traumatic knee injury. Understanding the presentation of self-reported pain in those with and without bone bruise at initial evaluation may elucidate whether additional treatment considerations are necessary to achieve successful clinical outcomes.

Focused Clinical Question

Is there evidence to support a difference in self-reported pain between individuals with a bone bruise and those without bone bruise after traumatic knee injury?

Summary of Search, “Best Evidence” Appraised, and Key Findings

- We searched the literature for studies of level 3 evidence or higher in accordance with the Oxford Centre for Evidence Based Medicine. Level 1 evidence is well-designed research with limited investigator bias. Level 2 studies are moderately designed research studies with investigator bias, and level 3 studies include those that are retrospective.
- The search of the literature returned 32 possible studies for inclusion; 2 studies met the inclusion criteria and were included.1,2
- Both studies used a prospective cohort design. There was conflicting evidence to support the hypothesis that self-reported pain differed because of the presence of bone bruise in patients with traumatic knee injury.

Clinical Bottom Line

There is conflicting evidence to support the idea that self-reported pain differs with the presence of bone bruise in patients with traumatic knee injury.

Strength of Recommendation: The grade of recommendation for this study is a grade of D: Self-reported pain in patients with traumatic knee injury differs with the presence of bone bruise. According to the Centre of Evidence Based Medicine, a grade of D is reserved for level 5 evidence or, in our case, conflicting evidence of any level.

Search Strategy

Terms Used to Guide Search Strategy

- Patient/Client group: traumatic knee injury
- Intervention/Assessment: bone bruise or marrow edema
- Comparison: traumatic knee injury without bone bruise or marrow edema
- Outcome: pain

Sources of Evidence Searched

- MEDLINE
- CINAHL
- SPORTDiscus
- Cochrane Library
- Additional resources obtained via review of reference lists and hand search

Inclusion and Exclusion Criteria

Inclusion

- Studies including patients with a history of traumatic knee injury
- Studies using MRI for diagnosis of traumatic knee injury
- Studies confirming the presence of bone bruise via MRI
• Studies measuring self-reported pain
• Level 3 evidence or higher
• Limited to English language
• Limited to the last 10 years (2000–2009)

Exclusion
• Studies failing to compare traumatic-knee-injury patients with and without bone bruise
• Studies including participants with history of non-traumatic knee injury
• Studies failing to measure self-reported pain

Results of Search
The 2 relevant studies1,2 we identified are categorized in Table 1 based on criteria identified in the levels of evidence as summarized by the Centre for Evidence Based Medicine in 1998.

Best Evidence
The 2 studies identified as the best evidence and selected for inclusion in the CAT are described in Table 2. These studies were selected because they were graded with a level of evidence of 3 or higher, included patients with traumatic knee injury, diagnosed the presence of bone bruise on MRI, and measured self-reported pain.

Implications for Practice, Education, and Future Research
Both studies included in this CAT assessed self-reported pain in patients who suffered traumatic knee injury with or without bone bruise. There was conflicting evidence regarding whether or not bone bruise had an effect on self-reported pain in patients with traumatic knee injury. It should be noted that there were important differences in assessing self-reported pain when comparing these studies. First, Johnson et al2 used a 10-cm visual analog pain scale to determine self-reported pain at each assessment. Johnson et al2 reported that patients with bone bruise had higher self-reported pain scores than patients without bone bruise. It should be noted that this study reported the average pain score over the 4-week assessment period and did not report pain scores for each of the assessment intervals (weeks 1, 2, 3, and 4).2 Furthermore, Johnson et al2 limited their study to patients with isolated anterior cruciate ligament rupture. Patients with any other knee derangements were excluded.2

Boks et al1 found no significant differences in self-reported pain between patients with and without bone bruise. Self-reported pain was assessed using a 10-point rating scale; patients completed the pain scale on the day of the MRI.1 That study included all patients suffering traumatic knee injury who reported to primary-care clinics during the recruiting period.1 It should be noted that those authors included patients with multiple knee derangements (ligamentous, meniscal, osteoarthritis), which confounds a direct comparison with the other study included in this CAT.1

Validity of these studies was determined using the STROBE statement for cohort studies. During the appraisal, points were given if each item on the checklist was clearly identified in each of the studies. If an item on the checklist was not relevant or applicable to the study design, it was not included in the critical appraisal. The STROBE score for Johnson et al2 was 17/27. Descriptions of eligibility criteria and methods for selecting participants were not included by Johnson et al.2 In addition, there was no report of sources of bias, for example, how the study size was determined and how missing data were addressed.2 Documentation of nonparticipation at each stage and limitations was also not available.2 The STROBE score for Boks et al1 was 24/26. There was no explanation of how quantitative variables were handled in analyses.1 Also, reasons for nonparticipation were given but were not provided for each stage of the study.1

Given the conflicting evidence presented in this CAT, the clinical presentation of bone bruises is not fully understood. Based on the results of Johnson et al,2 clinicians should assess self-reported pain during evaluation and treatment of traumatic knee injuries. Understanding the patient’s self-reported pain could help the clinician develop an appropriate treatment protocol. For example, non-weight-bearing status may be manipulated if pain is an indication of bone bruise. However, this is not supported by the findings of Boks et al,1 indicating that future research is needed to further investigate the clinical consequences of bone bruise in patients with traumatic knee injury.

Future research should include well-designed prospective cohort studies that investigate not only the effect of bone bruise on pain but also self-reported function and other clinical indicators of function in those with and without bone bruise. Johnson et al2 investigated differences in effusion, gait, and range of motion between groups. They reported statistically significant differences in all clinical measures between those with and without bone bruise.2 Therefore, function may be a better indicator than pain when determining the clinical significance of a bone bruise. This CAT should be reviewed in 2 years to determine whether additional best evidence has been published that may change the clinical bottom line for this specific clinical question.

### Table 1 Summary of Study Designs of Articles Retrieved

<table>
<thead>
<tr>
<th>Level of evidence</th>
<th>Study design</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>2b</td>
<td>Cohort</td>
<td>Boks et al1</td>
</tr>
<tr>
<td>2b</td>
<td>Cohort</td>
<td>Johnson et al2</td>
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</tbody>
</table>
**Table 2  Characteristics of Included Studies**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Boks et al(^1)</th>
<th>Johnson et al(^2)</th>
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<tbody>
<tr>
<td><strong>Participants</strong></td>
<td>132 patients (72 women and 60 men, mean age 40.6 y) with a history of traumatic knee injury less than 5 wk before their physician visit. Traumatic knee injury was defined as a sudden impact or wrong movement of the knee. Patients were excluded if there were contraindications for MRI, severe trauma that required immediate hospitalization, or identification of a fracture on radiographs. After consenting to participate, subjects underwent MRI. They were then divided into 2 groups, those with bone bruise (44 women, 35 men; mean age 43.1 y) and those without bone bruise (28 women, 25 men; mean age 36.9 y).</td>
<td>40 patients with MRI-diagnosed isolated ACL rupture within 1 wk of injury. Patients were divided into 2 groups: ACL rupture with bone bruise (20 patients, 7 men and 13 women, average age 18 y) and ACL rupture without bone bruise (20 patients, gender not reported, average age 19 y). Patients were excluded if there were other knee derangements besides ACL sprains or nongeographic bone bruise documented on MRI.</td>
</tr>
<tr>
<td><strong>Assessment investigated</strong></td>
<td>Presence of bone bruise on T2-weighted images</td>
<td>Presence of geographic bone bruise and acute ACL rupture on MRI</td>
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<td><strong>Outcome assessment</strong></td>
<td>Pain intensity was assessed for each patient on the day of the MRI. Pain intensity was determined using a numeric pain-rating scale from 0 (no pain) to 10 (unbearable pain).</td>
<td>At weeks 1, 2, 3, and 4, all patients were evaluated to determine the presence and size of bone bruise; range of motion; achievement of normal, unaided ambulation; and visual analogue-scale pain score. Pain was measured using a 10-cm horizontal line with one end labeled no pain (0) and the other labeled pain as bad as it could be (10).</td>
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<tr>
<td><strong>Results</strong></td>
<td>Mean pain score at baseline was 4.15 in patients with bone bruise and 3.88 in patients without bone bruise (difference 0.28, ( P = .45 )). Gender was statistically related to pain score (( P = .007 )). Adjustment for confounding pain variables resulted in a slightly higher difference in pain score between patients with and without bone bruise (difference 0.34, ( P = .38 )). For subjects without osteoarthritis, the unadjusted difference was 0.23 (( P = .56 )).</td>
<td>Patients with a bone bruise had higher visual analogue-scale pain scores (6.1) than patients without bone bruise (2.9). Patients with a bone bruise had larger joint effusions (4.6 cm) than those without bone bruise (3.9 cm). Patients with a bone bruise needed a longer time to achieve a nonantalgic gait without external aids (4 wk) than those without bone bruise (2.8 wk). Patients with bone bruise took longer to achieve equal range of motion (3.8 wk) than those without bone bruise (2.7 wk). Differences between groups were statistically significant.</td>
</tr>
<tr>
<td><strong>Level of evidence</strong></td>
<td>2b</td>
<td>2b</td>
</tr>
<tr>
<td><strong>Validity score</strong></td>
<td>STROBE 24/26</td>
<td>STROBE 17/27</td>
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<td><strong>Conclusion</strong></td>
<td>There was no statistical difference in pain scores between patients with and without bone bruise. There was no clinically relevant difference in pain scores between patients with and without bone bruise.</td>
<td>Differences between groups were statistically significant. The authors reported an increase in loss of joint homeostasis in ACL patients with a bone bruise compared with those without a bone bruise.</td>
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References
