Introduction

RUST and mRUST Scores

The radiographic union score for tibias (RUST) and modified RUST (mRUST) are radiographic scoring systems designed to enable identification of union in tibias.

RUST is scored 4-12, and mRUST is scored 0-18. The scores are based upon the degree of callus formation in each tibial zone. Figure 3 demonstrates how to score RUST and mRUST. The literature suggests RUST and mRUST are reliable measures of predicting union, as they have both demonstrated high inter and intra-observer reliability in several studies.

Methods and Materials

Ethical Approval

Data collection for the service evaluation was carried out in line with Keele Medical School’s ethics committee and RUSH audit department’s guidelines. No patient data was removed from the hospital site, and no patient data is identifiable from the data collected. All data was collected by Alexander Collingwood (AC) and stored on hospital computer.

Patient Database

The patient database was formed using a prospective list of patients managed with the IOS fixator cross referenced with theatric databases. The final database comprised 69 patients managed with IOS external fixator 2010-2017 at RUSH.

Results and Discussion

Results

The descriptive statistics of the RUST and mRUST scores for fractures following management with IOS. The range of scores was 4-11 (RUST) and 4-14 (mRUST). Our mean scores for fractures at union was 7.8 (RUST) and 9.9 (mRUST), lower than the scores suggested to indicate union by Litrenta et al (2015).

Table 1

<table>
<thead>
<tr>
<th>Score</th>
<th>Mean</th>
<th>SE</th>
<th>SD</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>RUST</td>
<td>7.8</td>
<td>0.5</td>
<td>1.3</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>mRUST</td>
<td>9.9</td>
<td>0.2</td>
<td>2.1</td>
<td>4</td>
<td>14</td>
</tr>
</tbody>
</table>

Discussion

A plot of the percentage of fractures removed too early or too late revealed depending upon RUST or mRUST score revealed that using the score system at union (Litrenta et al, 2015) indicated union would result in 16% of fractures left on too long and 7% left on too soon using RUST and similar figures for mRUST. Using the mean RUST and mRUST values identified at union in our study, a RUST score of 7.8 would result in 22% removed too early and 32% too late, a mRUST score of 9.9 would result in 29% of fractures removed too early and 10% removed too late.

Patient Database

The patient database was formed using a prospective list of patients managed with the IOS fixator cross referenced with theatric databases.

Results

A retrospective evaluation of the RUST and mRUST scores in a cohort of with known fracture stiffness.

Table 1

<table>
<thead>
<tr>
<th>RUST</th>
<th>mRUST</th>
</tr>
</thead>
<tbody>
<tr>
<td>No value</td>
<td>No value</td>
</tr>
</tbody>
</table>

Figure 3 Boxplots illustrating significant difference between our mean values for RUST and mRUST and the values Litrenta et al (2015) presented in equal axes (1st box, left: RUST vs Ho, 95% confidence interval for the mean)

Discussion

Although we defined mean scores for RUST and mRUST using fractures known to have achieved union and our results were significantly different to the scores proposed by Litrenta et al (2015), we do not believe the RUST and mRUST scores are indicative of union. Our findings suggest that RUST and mRUST are not reliable indicators of union, with wide ranges of scores being attributed to fractures with the same degree of stiffness and a high percentage of external fixators being removed too late or on too long at any given RUST or mRUST score. Our findings align with McClelland et al (2006) and Davis et al (2004), that radiographic assessment of a fracture guided by cal- lux formation is not a reliable means of identifying union.

References