INTERNATIONAL LOWER LIMB COLLABORATIVE (INTELLECT) study: A MULTICENTRIC, INTERNATIONAL, RETROSPECTIVE STUDY ON LOWER EXTREMITY OPEN FRACTURES.

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BACKGROUND

- Lower extremity open fractures can be devastating events, best treated by multidisciplinary teams in specialist units.
- In the United Kingdom, there is clear guidance for the treatment of these injuries.
- However, same guidance and audit culture is rare overseas.
- The WHO has stated that trauma is a global problem and a neglected burden in the developing world.
AIMS

➢ To set up an international collaboration including high, medium and low-income countries across the globe
➢ To empower international centres with no previous audit experience to evaluate their results
➢ To provide a comprehensive report on the international approaches to the management of these injuries and outcomes
**Methodology**

- An RSTN-supported, STROBE-compliant, collaborative, international, multi-centric, retrospective study was designed.
- Protocol registered in the Open Science Framework platform.
- Inclusion criteria:
  - Femur, tibia/fibula and foot open fractures treated in 2017-2018.
  - Definitive treatment done at Collaborating Unit.
- REDCap data collection and collaborative model.
RESULTS

- **Interim Analysis: 15th November 2020**

- **2,102 cases submitted. 48 collaborating units in 13 countries.**
  - 28 had not previously audited open lower extremity fracture outcomes

- **Female : Male = 31:69**

- **Mean age = 48 years**
<table>
<thead>
<tr>
<th>Participating Countries</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>United Kingdom</td>
<td>946</td>
<td>45.0%</td>
</tr>
<tr>
<td>Spain</td>
<td>377</td>
<td>17.9%</td>
</tr>
<tr>
<td>Chile</td>
<td>187</td>
<td>8.9%</td>
</tr>
<tr>
<td>Netherlands</td>
<td>150</td>
<td>7.1%</td>
</tr>
<tr>
<td>Mexico</td>
<td>113</td>
<td>5.4%</td>
</tr>
<tr>
<td>Italy</td>
<td>98</td>
<td>4.7%</td>
</tr>
<tr>
<td>Taiwan</td>
<td>58</td>
<td>2.8%</td>
</tr>
<tr>
<td>Argentina</td>
<td>49</td>
<td>2.3%</td>
</tr>
<tr>
<td>Sudan</td>
<td>43</td>
<td>2.0%</td>
</tr>
<tr>
<td>South Korea</td>
<td>31</td>
<td>1.5%</td>
</tr>
<tr>
<td>India</td>
<td>27</td>
<td>1.3%</td>
</tr>
<tr>
<td>Egypt</td>
<td>20</td>
<td>1.0%</td>
</tr>
<tr>
<td>Australia</td>
<td>3</td>
<td>0.1%</td>
</tr>
</tbody>
</table>

![Pie chart showing the distribution of injury types: Road traffic accident 56%, High-energy fall 13%, Low-energy fall 18%, Work-related related injury 7%, Assault 3%, Other 1%]
2,102 OPEN LOWER LIMP FRACTURES

- 208 FEMUR FRACTURES
- 1681 TIBIA/FIBULA FRACTURES
- 213 FOOT SKELETON FRACTURES
2,102 OPEN LOWER LIMB FRACTURES

208 FEMUR FRACTURES

1681 TIBIA/FIBULA FRACTURES

213 FOOT SKELETON FRACTURES

1,889 LONG BONE OPEN FRACTURES
UK – LONG BONES FRACTURES (n=888)

GUSTILO-ANDERSON CLASSIFICATION

- I, II, IIIA: 450
- IIIB: 400
- IIIC: 50

- Seen first at different hospital: 23%
- Direct transfer to specialist centre: 77%
UK – LONG BONES FRACTURES (n=888)

- **Median time to antibiotics:** 1 hours (mean: 4 / SD 15)
- **Median time to debridement:** 15 hours (mean: 20 / SD 43)
  - 80.7% of patients were debrided within 24 hours post injury
- **Median time to fixation:** 2 days (mean: 6 / SD 11)
- **Median time to soft tissue closure:** 5 days (mean: 9 / SD 15)
- **Median inpatient stay:** 15 days (mean: 23 / SD 30)
- **Median follow-up time:** 10 months (mean: 12 / SD 10)
UK – LONG BONE FRACTURES REQUIRING SOFT TISSUE RECONSTRUCTION (N=441)

**Primary reconstruction modality**

<table>
<thead>
<tr>
<th>Modality</th>
<th>Partial flap failure</th>
<th>Total flap failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local flap (N=54)</td>
<td>4 (8%)</td>
<td>1 (2%)</td>
</tr>
<tr>
<td>Regional flap (N=85)</td>
<td>6 (7.1%)</td>
<td>1 (1.2%)</td>
</tr>
<tr>
<td>Free flap (N=193)</td>
<td>10 (5.2%)</td>
<td>14 (7.3%)</td>
</tr>
</tbody>
</table>
UK – LONG BONES FRACTURES (n=888)

- **Wound Infection**: 16.5%
- **Deep Tissue Infection**: 7.6%
- **Non-Union**: 11.7%
- **Amputation**: 5.5%
  - Immediate: 1.5% / Early: 2.6% / Late: 1.4%
- **Median time to full weight bearing**: 63 days (Mean: 84 / SD 83)
2,102 OPEN LOWER LIMP FRACTURES

208 FEMUR FRACTURES

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213 FOOT SKELETON FRACTURES

1,889 LONG BONE OPEN FRACTURES

1. HIGH-INCOME COUNTRIES WITH NATIONAL GUIDELINES
2. OTHER HIGH-INCOME COUNTRIES
3. MIDDLE AND LOW-INCOME COUNTRIES
INTERNATIONAL RESULTS – LONG BONE FRACTURES (N=1889)
INTERNATIONAL RESULTS – LONG BONE FRACTURES (N=1889)

- Ortho-plastic debridement: 43%†
- Wound infection: 13%*, 16%†, 14%‡
- Deep infection: 23%*
- Deep infection: 8%†, 8%‡
- Non-union: 16%*, 12%†, 12%‡, 10%
INTERNATIONAL RESULTS — LONG BONE COMPLEX FRACTURES (IIIB AND IIIC = 624)

➢ Risk factors for deep infection in complex fractures
  ➢ Orthopaedic (17.7%) versus Orthoplastic (10.5%). p-value=0.012
  ➢ Time to debridement. p-value=0.015
  ➢ Time to definitive fixation. p-value=0.008
  ➢ Time to soft tissue cover. p-value<0.001
  ➢ Total Flap Failure. p-value=0.007

➢ Risk factors for amputation
  ➢ Work Related injuries. p-value=0.02
  ➢ Total Flap Failure. Early (p-value=0.013) / Late (p-value=0.016)
LIMITATIONS

- Retrospective study: selection, attrition and detection bias
- Over-representation of UK cases
- Sub-optimal documentation of time to antibiotics, time to full weight bearing status and return to work
- Participating centres may not be a reflection of local standard practice
CONCLUSIONS

- A large-scale international collaborative for retrospective reconstructive / trauma surgery is possible
- Timely and multidisciplinary treatment are associated with better outcomes
  - Countries with national guidelines perform better in this aspect
- Worse outcomes were reported in middle and low-income countries
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