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Infection and osteosynthesis: the ICS classification as a guideline for treatment

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I.R.C.C.S. ISTITUTO ORTOPEDICO GALEAZZI

GRUPPO OSPEDALIERO SAN DONATO
Infection and Osteosynthesis

- 2.195 patients
- Prospectic, randomized, double blind
- Osteosynthesis for closed fractures of long bones
- Placebo: 8.3%
- **Prophylaxis (ceftriaxone): 3.6% (p<0.001)**

Infection and Osteosynthesis

- **Gustilo I** 0.5 – 4.0 %
- **Gustilo II** 2.0 – 7.0 %
- **Gustilo III** 10.0 – 25.0 %

• Osteosynthesis: temporary function, while bone healing occurs.

• Bone infection may delay, but does not prevent, in itself, bone healing, provided that the stability of the synthesis is mainatained.

ICS Classification

Infection after osteosynthesis: the conservative surgical treatment
Romanò C.L., Pellegrini A., Tinti G., Meani E.

Profilassi dell’infezione nell’osteosintesi e classificazione “ICS” come guida al trattamento.
Romanò C.L., Zavatarelli A., Tinti G., Meani E.
## Infection after Osteosynthesis

### ICS Classification

<table>
<thead>
<tr>
<th></th>
<th>Type I</th>
<th>Type II</th>
<th>Type III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infection</td>
<td><img src="#" alt="Red" /></td>
<td><img src="#" alt="Red" /></td>
<td><img src="#" alt="Red" /></td>
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<tr>
<td>Callus</td>
<td><img src="#" alt="Green" /></td>
<td><img src="#" alt="Red" /></td>
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<tr>
<td>Stability</td>
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<td><img src="#" alt="Green" /></td>
<td><img src="#" alt="Red" /></td>
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</tbody>
</table>

ICS Type I

Leave the synthesis in situ.
Antibiotic therapy.
Ev. surgical debridment.
Ev. sequestrectomy.
Ev. local antibiotic therapy.
ICS Type II

Leave the synthesis in situ.
Antibiotic therapy.
Physical bone stimulation.
Ev. surgical debridment.
Ev. sequestrectomy.
Ev. local antibiotic therapy.
Dinamization.
Bone substitutes & Growth factors ?
ICS Type III

- Remove and change the synthesis.
- Physical bone stimulation.
- Ev. bone resection.
- Ev. bone transport.
- Ev. bone grafts.
- Ev. segmental prosthesis.
- Bone substitutes & Growth factors?

7 months from trauma
9 months from trauma

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18 months from trauma

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36 months from trauma
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CL Romanò - Infection and Osteosynthesis: the ICS Classification as a Guideline for Treatment
7 months later
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### Clinical results (year 2005 – 2009)

<table>
<thead>
<tr>
<th>ICS Type</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>Total</th>
<th>Raw data</th>
<th>%</th>
<th>Raw data</th>
<th>%</th>
<th>Raw data</th>
<th>%</th>
<th>Raw data</th>
<th>%</th>
<th>Raw data</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>N. patients</td>
<td>93</td>
<td>85</td>
<td>37</td>
<td>215</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Lost to follow-up</td>
<td>6</td>
<td>6</td>
<td>3</td>
<td>15</td>
<td></td>
<td>6,5</td>
<td></td>
<td>7,1</td>
<td></td>
<td>8,1</td>
<td></td>
<td>7,0</td>
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<tr>
<td>Mean follow-up (years)</td>
<td>3.4 ± 1.2</td>
<td>3.6 ± 1.3</td>
<td>3.3 ± 1.2</td>
<td>3.4 ± 1.3</td>
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<tr>
<td>Bone healing</td>
<td>82</td>
<td>68</td>
<td>33</td>
<td>183</td>
<td></td>
<td>94,3</td>
<td></td>
<td>86,1</td>
<td></td>
<td>97,1</td>
<td></td>
<td>91,5</td>
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<tr>
<td>No infection recurrence</td>
<td>81</td>
<td>72</td>
<td>33</td>
<td>186</td>
<td></td>
<td>93,1</td>
<td></td>
<td>91,1</td>
<td></td>
<td>97,1</td>
<td></td>
<td>93,0</td>
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<tr>
<td>Tybe B hosts</td>
<td>24</td>
<td>18</td>
<td>14</td>
<td>56</td>
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<td>27,6</td>
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<td>22,8</td>
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<td>41,2</td>
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<tr>
<td>Type C hosts</td>
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<td>14</td>
<td>11</td>
<td>37</td>
<td></td>
<td>13,8</td>
<td></td>
<td>17,7</td>
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<td>32,4</td>
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<td>18,5</td>
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<td>Complications</td>
<td>7</td>
<td>6</td>
<td>9</td>
<td>22</td>
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<td>24,3</td>
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<td>10,2</td>
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<td>Grade change</td>
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<td>12</td>
<td>0</td>
<td>16</td>
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<td>13,9</td>
<td></td>
<td>0,0</td>
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<td>7,4</td>
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</tr>
</tbody>
</table>

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Bone and joint infections in adults: a comprehensive classification proposal

Carlo Luca Romano · Delia Romano · Nicola Logoluso · Lorenzo Drago
Conclusions

1. Bone and joint infections are an heterogeneous group of diseases

2. Infection after osteosynthesis is a challenging complication and requires:
   1. Classification
   2. Targeted management
   3. Specialized centers and teams