Assessment of bone healing during antegrade intramedullary rod femur lengthening using radiographic pixel density

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I have no conflict of interest
Introduction

Intramedullary (IM) rods extraordinary innovation

Restricted weight bearing until sufficient bone healing

Healing is subjective
1) assess the progression of bone healing at the regenerate site

2) define a threshold pixel density value for bone healing
Methods

- 32 patients
- Minimum 1-year follow up
- 22 (69%) male
- 10 (31%) female
- Mean age 26 years (range, 12 to 48 years)
Pixel density = 2.43
Pixel density = 2.55
PDR = \text{Density regenerate} \div \text{Density adjacent cortex} \\
PDR = \frac{2.43}{2.55} = 0.95
Medial cortex

Lateral cortex

Anterior cortex

Posterior cortex
Bone Healing Progression

Weeks following end of distraction

PDR

- Medial (Blue)
- Lateral (Red)
- Anterior (Green)
- Posterior (Purple)
- Overall (Teal)

BL 1 to 8 9 to 26 26+
Bone Healing Progression

Weeks following end of distraction

PDR

- Medial
- Lateral
- Anterior
- Posterior
- Overall

8.5 weeks
**Results**

Mean distraction 41.7 mm

Clinical bone healing at 8.5 weeks

<table>
<thead>
<tr>
<th>Cortex</th>
<th>PDR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lateral</td>
<td>0.84</td>
</tr>
<tr>
<td>Medial</td>
<td>0.89</td>
</tr>
<tr>
<td>Anterior</td>
<td>0.92</td>
</tr>
<tr>
<td>Posterior</td>
<td>0.98</td>
</tr>
</tbody>
</table>

Overall **PDR was 0.90** vs 0.82 at previous visit (p<0.001)

NO correlation with sex, age, laterality, or distraction length
Conclusion

- PDR objective measurement to monitor bone healing and establish threshold value for bone union
- Rapid, objective, and easy
- Less experienced surgeons
- Aid to senior orthopedists
- Clinical research
Thank You

www.HSS.edu/LimbLengthening
Thank You