Radiographic Risk Factors for Interprosthetic Femur Fractures

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Introduction

• Total Hip Arthroplasty (THA) and Total Knee Arthroplasty (TKA) are common
  • ~ 2.5 million Americans with THA
  • ~ 4.7 million Americans with TKA
  • ~ 1 million new THA and TKA yearly
  • Over 300,000 people >65 years old hospitalized for hip fractures yearly in US

• Increased incidence of arthroplasty → Increased incidence of ipsilateral TKA and THA → Greater Survivorship and activity → Increased risk of falls and fracture

• Incidence of Interprosthetic Fractures (IP) likely to increase over time
Incidence of Periprosthetic Fractures\textsuperscript{6,7,8}

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>THA</td>
<td>0.1% - 6%</td>
</tr>
<tr>
<td>TKA</td>
<td>0.3% - 5.5%</td>
</tr>
</tbody>
</table>
Introduction

• Limited clinical data evaluating potential risks for fracture
  • Interprosthetic distance, Cortical Width, Medullary Diameter

• Bone strength and cortical width may be more predictive than interprosthetic distance$^{4,5}$
Hypothesis

A difference in cortical width and medullary diameter will exist between two groups of patients; those sustaining interprosthetic femur fractures, and those with ipsilateral implants and intact femurs.
Materials and Methods

• CPT codes to identify patients undergoing treatment of periprosthetic femur fx
• CPT codes used to find cohort having undergone ipsilateral THA/TKA
• Chart review for age, sex, diagnosis of osteoporosis
• Intact femoral isthmus identified
  • Medullary Diameter (MD) & Cortical Width (CW) measured using PACS
• Independent Sample T-test performed
  • Mean MD, CW, and ratio of MD/CW
• P<0.05
Cortical width measured at isthmus by summing the thickness of medial and lateral cortices.
Medullary diameter also measured at isthmus
# Results

<table>
<thead>
<tr>
<th></th>
<th>Interprosthetic Fractures (n=23)</th>
<th>Intact Cohort (n=25)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td>82</td>
<td>72</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td>Female 18, Male 5</td>
<td>Female 17, Male 8</td>
</tr>
<tr>
<td><strong>Cemented Implant</strong></td>
<td>6 (26%)</td>
<td>1 (4%)</td>
</tr>
<tr>
<td><strong>Dx of Osteoporosis</strong></td>
<td>7 (30%)</td>
<td>6 (24%)</td>
</tr>
</tbody>
</table>
# Results

<table>
<thead>
<tr>
<th></th>
<th>Interprosthetic Fractures (n=23)</th>
<th>Intact Cohort (n=25)</th>
<th>P-value</th>
<th>95% of difference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cortical Width (mm)</strong></td>
<td>Mean 12.26, SD 2.55</td>
<td>Mean 16.74, SD 3.9</td>
<td>&lt;0.0001</td>
<td>(-6.42, -2.55)</td>
</tr>
<tr>
<td><strong>Medullary Diameter (mm)</strong></td>
<td>Mean 21.3, SD 4.15</td>
<td>Mean 14.81, SD 3.19</td>
<td>&lt;0.0001</td>
<td>(4.34, 8.62)</td>
</tr>
<tr>
<td><strong>MD:CW</strong></td>
<td>Mean 1.86, SD 0.76</td>
<td>Mean 0.96, SD 0.41</td>
<td>&lt;0.0001</td>
<td>(0.55, 1.25)</td>
</tr>
</tbody>
</table>
### Results

<table>
<thead>
<tr>
<th></th>
<th>CW Intraclass Correlationb</th>
<th>95% Confidence Interval</th>
<th>MD Intraclass Correlation</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lower Bound</td>
<td>Upper Bound</td>
<td>Lower Bound</td>
</tr>
<tr>
<td>Single Measures</td>
<td>.669</td>
<td>0.362</td>
<td>0.845</td>
<td>.871</td>
</tr>
<tr>
<td>Average Measures</td>
<td>.801</td>
<td>0.532</td>
<td>0.916</td>
<td>.931</td>
</tr>
</tbody>
</table>
Conclusion

- Cortical Width and Medullary Diameter may be predictive of increased risk for interprosthetic fractures of the femur
- Radiographic measures may help identify at risk patients for inclusion in fracture prevention programs and treatment of osteoporosis
- Age-dependent risk – increased survivorship, aging population
- Few patients in either group had been given a formal diagnosis of osteoporosis
  - May indicate need for increased surveillance
Limitations

- Radiographs not calibrated
- Unable to measure interprosthetic distance
- Retrospective review
References


Thank You
Medicine of the Highest Order