Cortical Thickness:
A Determinant of Malrotation for Diaphyseal Bothbone Forearm Fractures

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Objective
To determine if measurement of cortical thickness proximal and distal to a both bone forearm fracture provided the necessary information to determine malrotation of the forearm.

Methods
8 cadaveric specimens – the below was performed on each radius and ulna
• Anterior approach, placement of multi-axial correction system (Biomet)
• Transverse osteotomy
• PA and Lateral fluoroscopic views
  • Xrays taken after the osteotomy and after rotation of the distal fragment in 10 degree intervals up to 30 degrees
• Each film evaluated and cortical thickness measured by 5 independent examiners

Results

Results for the radius
• No correlation between degree rotation and bilateral distal cortical thickness
  • PA views (r=-.04, p=0.752 and r=-0.024, p=0.851)
  • Lateral views (r=-0.19, p=0.883 and r=0.045, p=0.715)
• No correlation between degree rotation and bilateral proximal cortical thickness
  • PA views (r=0.003, p=0.981 and r=-0.04, p=0.97)
  • Lateral views (r=-0.003, p=0.983 and r=0.118, p=0.352)

Results for the ulna
• No correlation between degree rotation and bilateral distal cortical thickness
  • PA views (r=-0.11, p=0.933 and r=-0.19, p=0.131)
  • Lateral views (r=-0.02, p=0.88 and r=-0.11, p=0.391)
• No correlation between degree rotation and bilateral proximal cortical thickness
  • PA views (r=0.04, p=0.79 and r=-0.18, p=0.172)
  • Lateral views (r=-0.17, p=0.19 and r=-0.06, p=0.78)

Conclusion
• Cortical thickness is not a reliable measure of malrotation when assessing both bone forearm diaphyseal fractures
• Alternative methods may be more reliable to determine malrotation but further investigation is needed
  • Intraoperative assessment of passive forearm rotation
  • Images to assess radial styloid relationship to biceps tuberosity

Background
• Treatment of both bone forearm fractures (BBFA) in children includes non-op management, closed reduction and casting, ORIF
• Malrotation does not remodel with age
• Multiple studies have demonstrated significant loss of rotational motion with treatment of BBFA fractures
• Langer, Gardner, Ricci – JOT 2010
  • Used the cortical step sign-incongruity of cortical widths on either side of a femur fracture- as a tool for assessing and correcting rotational deformity in femoral shaft fractures
• Found that the cortical step sign is indicative of rotational malreduction

Questions
Could the same principles be applied to both bone forearm fractures? Could the cortical step sign aid in assessment and correction of forearm rotation?

References