

Are Post-Operative Radiographs Predictive of Anatomic Femoral Tunnel Placement in ACL Reconstruction?

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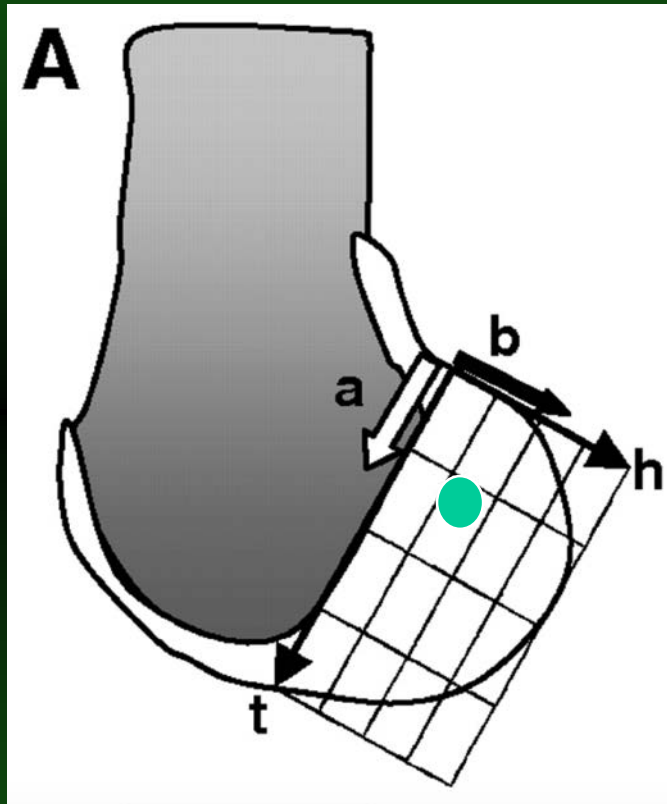
Disclosures

The authors have no relevant financial disclosures

Background

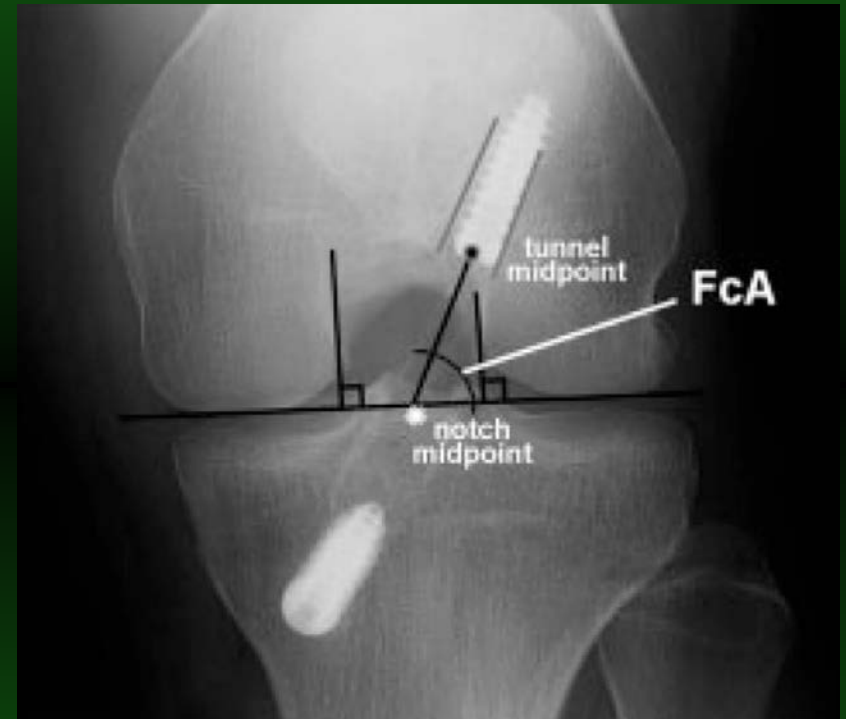
- ACL graft failure occurs in ~ 7% of patients
- Outcomes of revision ACLR are inferior to those of primary ACLR
- When planning revision ACLR, it is essential to know if tunnel placement is accurate
- XR, CT and MRI have been proposed as tools to evaluate tunnel placement

Two major techniques for evaluating femoral tunnel position on radiographs



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Quadrant Method



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Femoral Tunnel Coronal Angle

Hypothesis

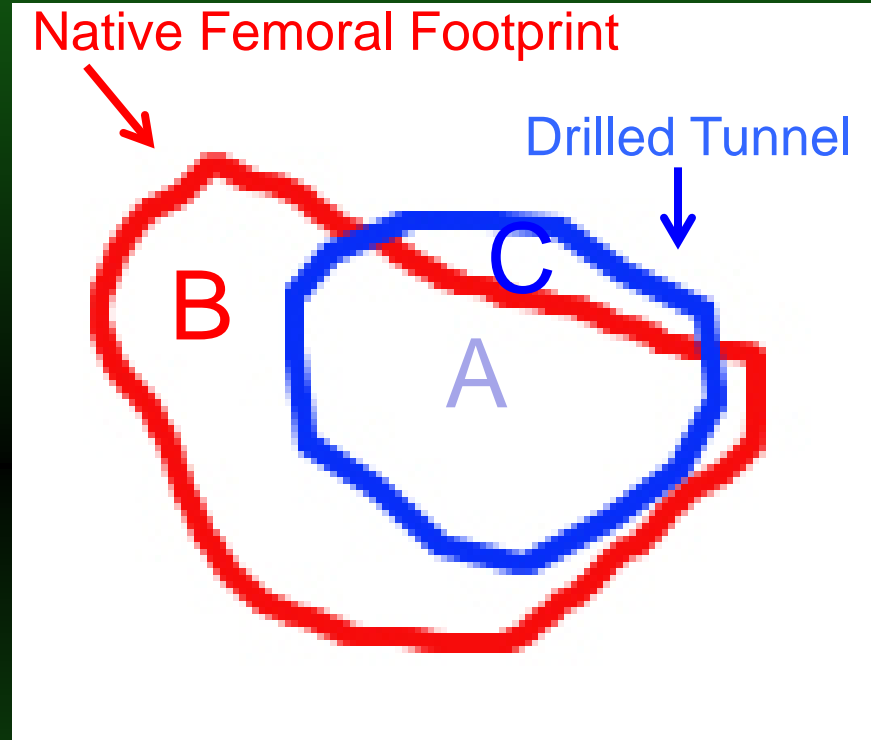
AP and lateral knee radiographs can accurately determine how anatomic femoral tunnel position is after ACLR

Methods

- 12 cadaveric knees
 - 6 transtibial femoral tunnel drilling
 - 6 AM portal femoral tunnel drilling
 - 11mm tibial tunnel, 10mm femoral tunnel
- Native ACL femoral footprint located with image analysis prior to reconstruction
- Position of femoral tunnel compared with native ACL femoral footprint using image analysis



Methods



$$\% \text{ Footprint Coverage} = A / (A+B)$$

$$\% \text{ Accuracy} = A / (A + C)$$

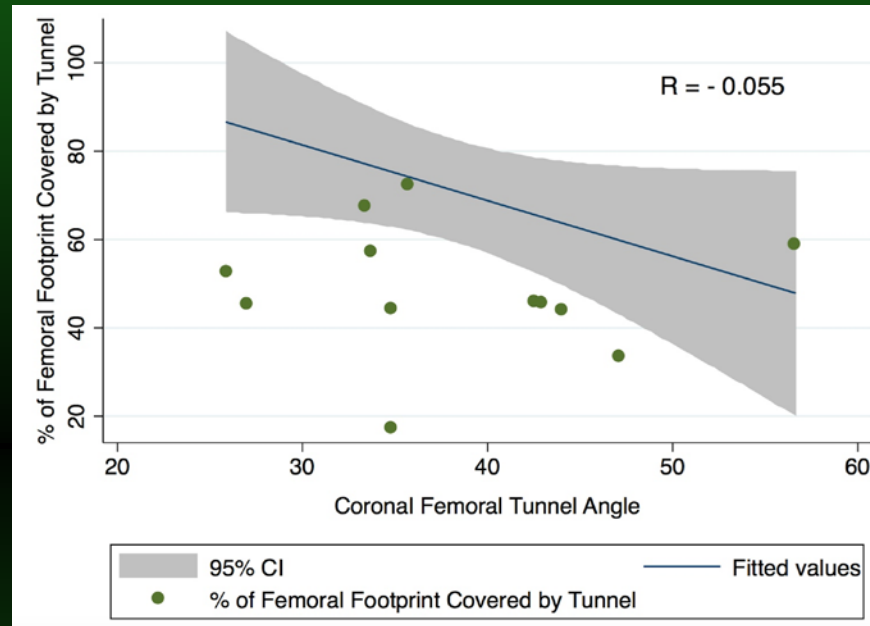
TT and AM have similar tunnel characteristics

| | Transtibial (n = 6) | AM portal (n = 6) | P-value (unpaired 2-tail t-test) |
|-------------------|------------------------|----------------------|-------------------------------------|
| % Coverage | 45.5 +/- 8.1 | 51.9 +/- 19.7 | 0.48 |
| % Accuracy | 62.1 +/- 8.9 | 80 +/- 24.9 | 0.13 |

No statistical difference between TT and AM groups

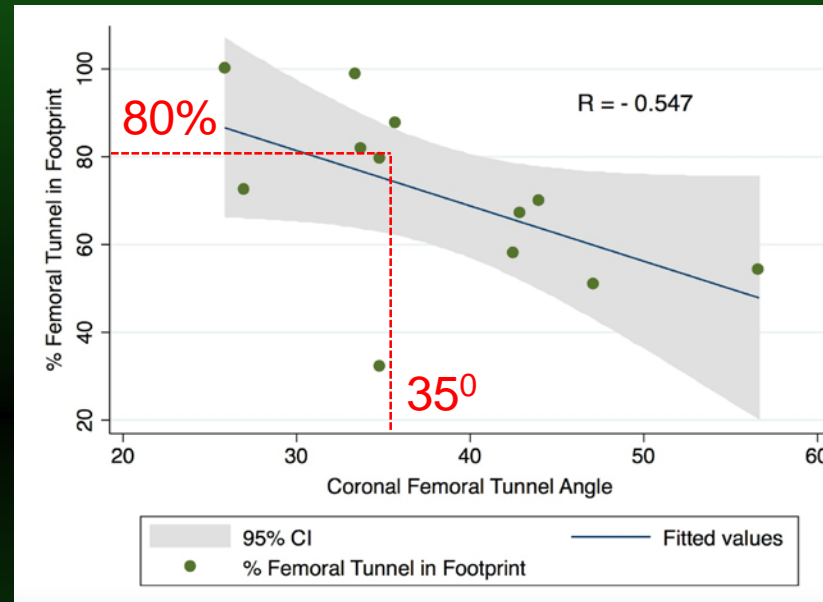
Trend towards greater accuracy with AM portal drilling

Coronal Femoral Tunnel Angle does not predict % Coverage



- Coronal Femoral Tunnel Angle does not correlate with % Coverage
 - Pearson correlation coefficient $R = -0.055$
 - Univariate linear regression model, $p = 0.86$

Coronal Femoral Tunnel Angle has negative correlation with % accuracy



- More vertical tunnels had lower % accuracy
- Pearson correlation coefficient $R = -0.547$
- Univariate linear regression model, $p = 0.06$

Lateral radiographs do not predict % Coverage or % Accuracy

| | Anatomic on lateral XR (n = 10) | Non-anatomic on lateral XR (n = 2) | P-value (univariate linear regression) |
|------------|---------------------------------|------------------------------------|--|
| % Coverage | 46.6 +/- 14.1 | 59.11 +/- 18.8 | 0.3 |
| % Accuracy | 70.7 +/- 21.1 | 72.8 +/- 21 | 0.9 |

Conclusions

1. Lateral radiographs (using quadrant method) do not accurately assess femoral tunnel placement in cadaveric model
2. Coronal femoral tunnel angle on AP radiographs correlates with % accuracy of femoral tunnel:
 - Vertical tunnels have lower % accuracy
 - *All tunnels with > 80% accuracy had coronal angle < 35°*
3. Sample size too small to make firm conclusions about TT vs. AM, but statistically similar in this study

References

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