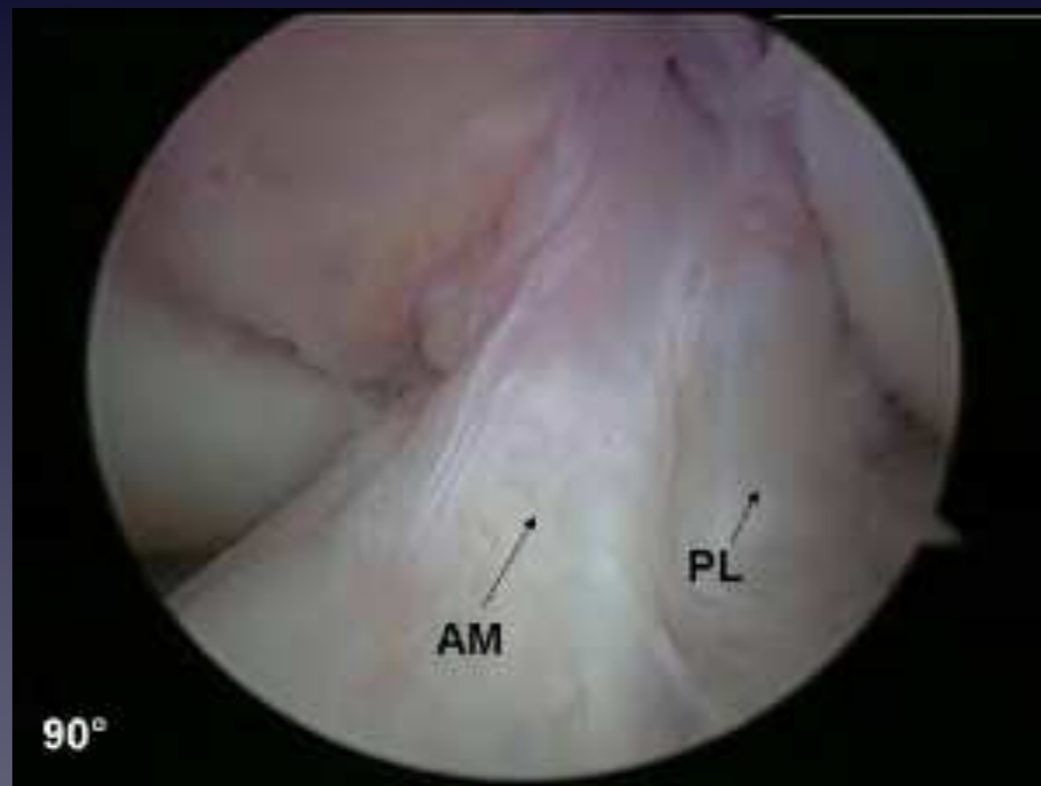


Single, Double & Triple Bundles, Footprints, Robotics: Is It Just Alphabet Soup?



Bryan Reuss, M.D.

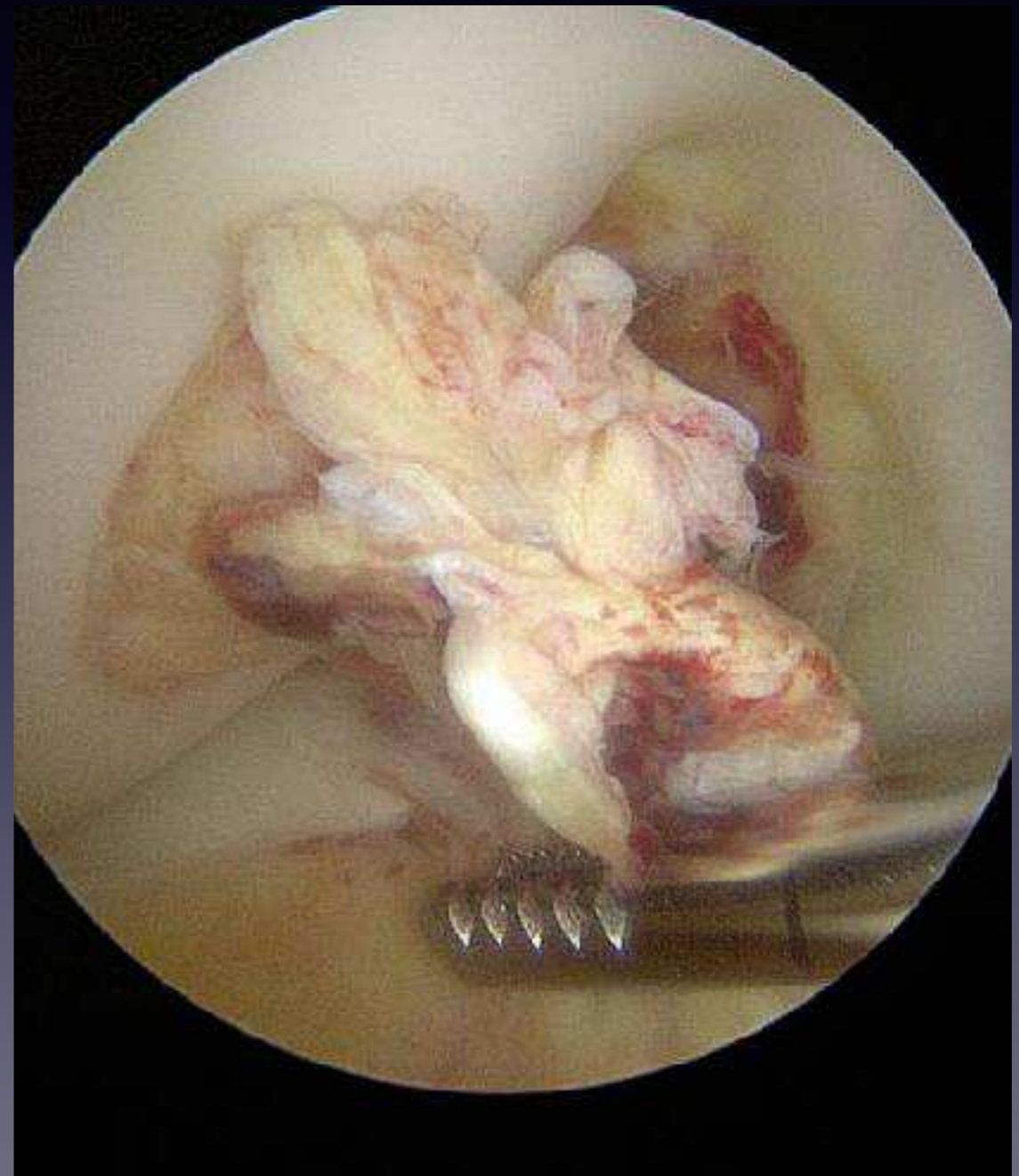






ACL Reconstruction

- **Restore stability and function**
- **Reduce chance of further injury**
- **Improve chance to get back to previous activity**



Tunnel placement

The key is :

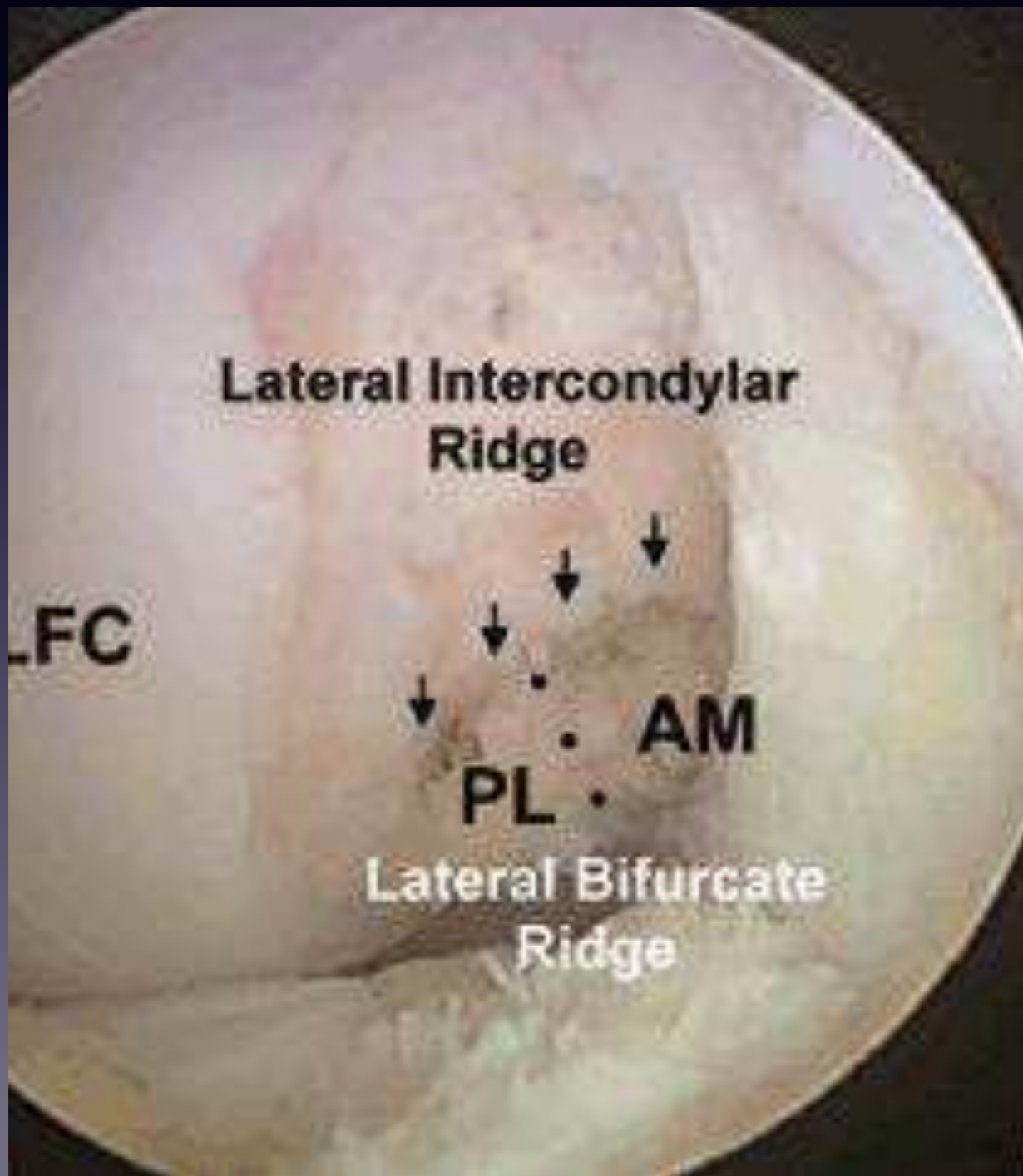


Location, Location, Location

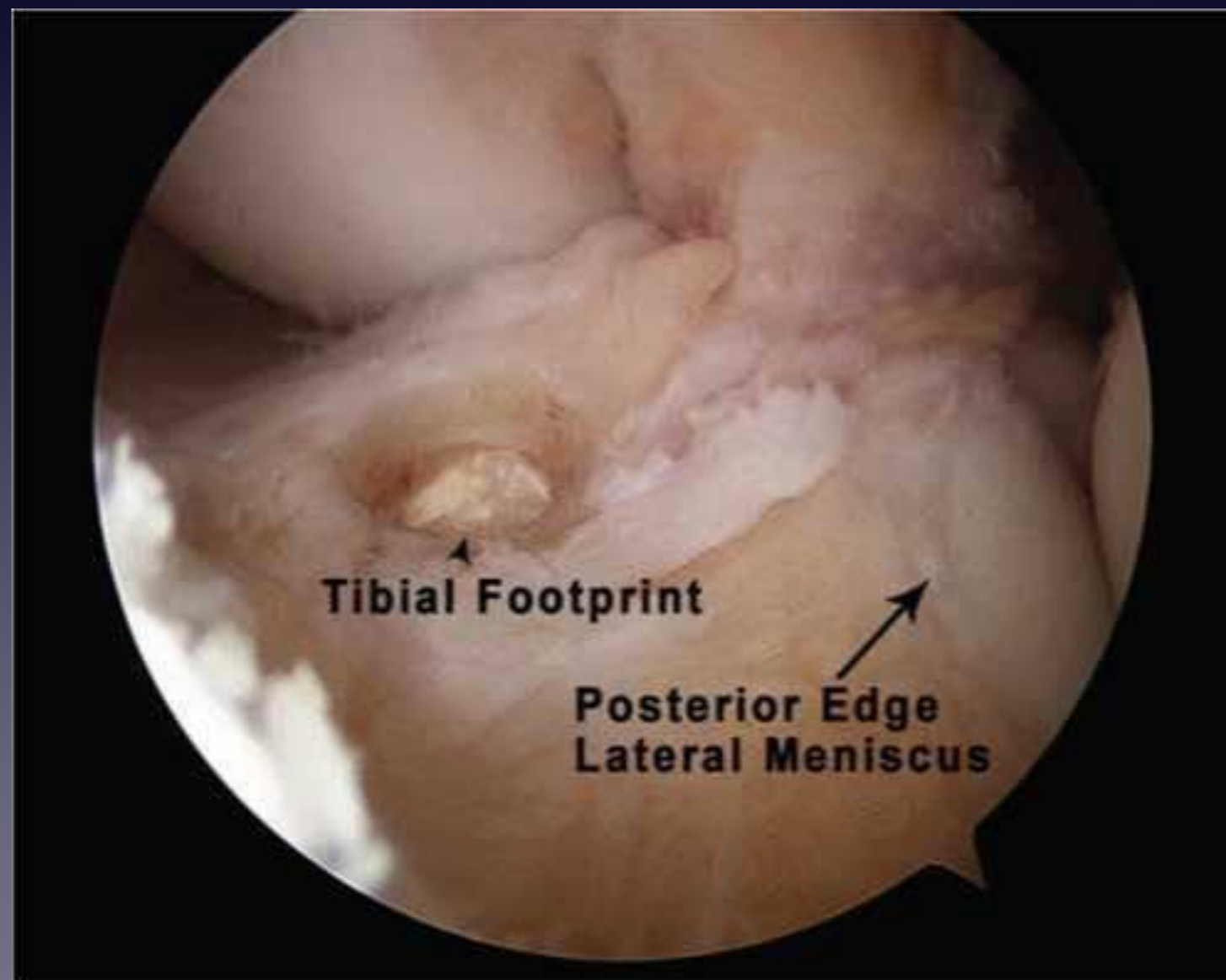
-Lord Samuel



ACL Femoral Footprint



Tibial Footprint



Tunnel Malposition

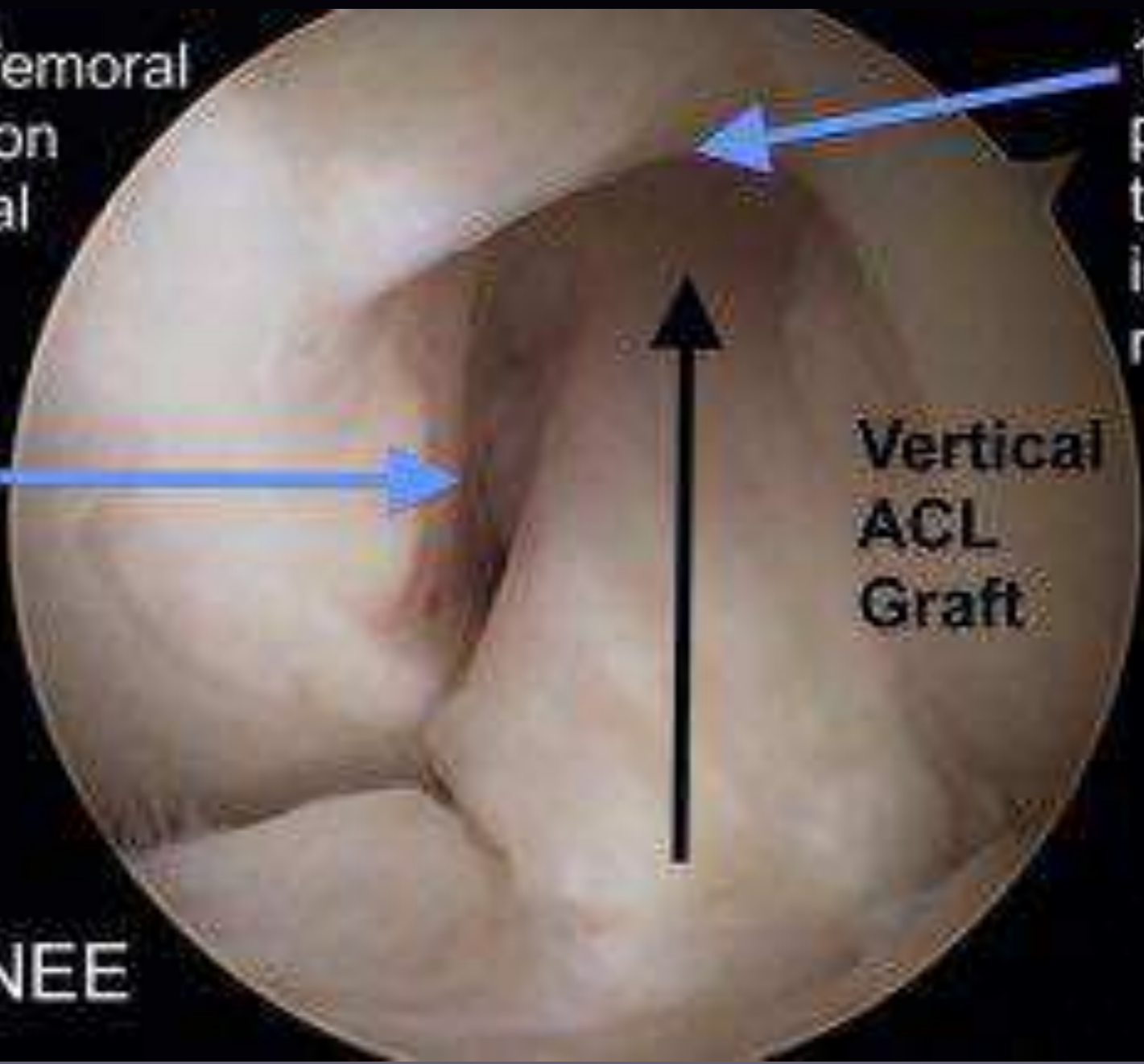


Anatomical femoral tunnel location on the medial wall of the lateral femoral condyle

12 o'clock position at top of intercondylar notch

Vertical ACL Graft

RIGHT KNEE



Lachman



Lachman

(Vertical graft/AM bundle restoration)



Lachman

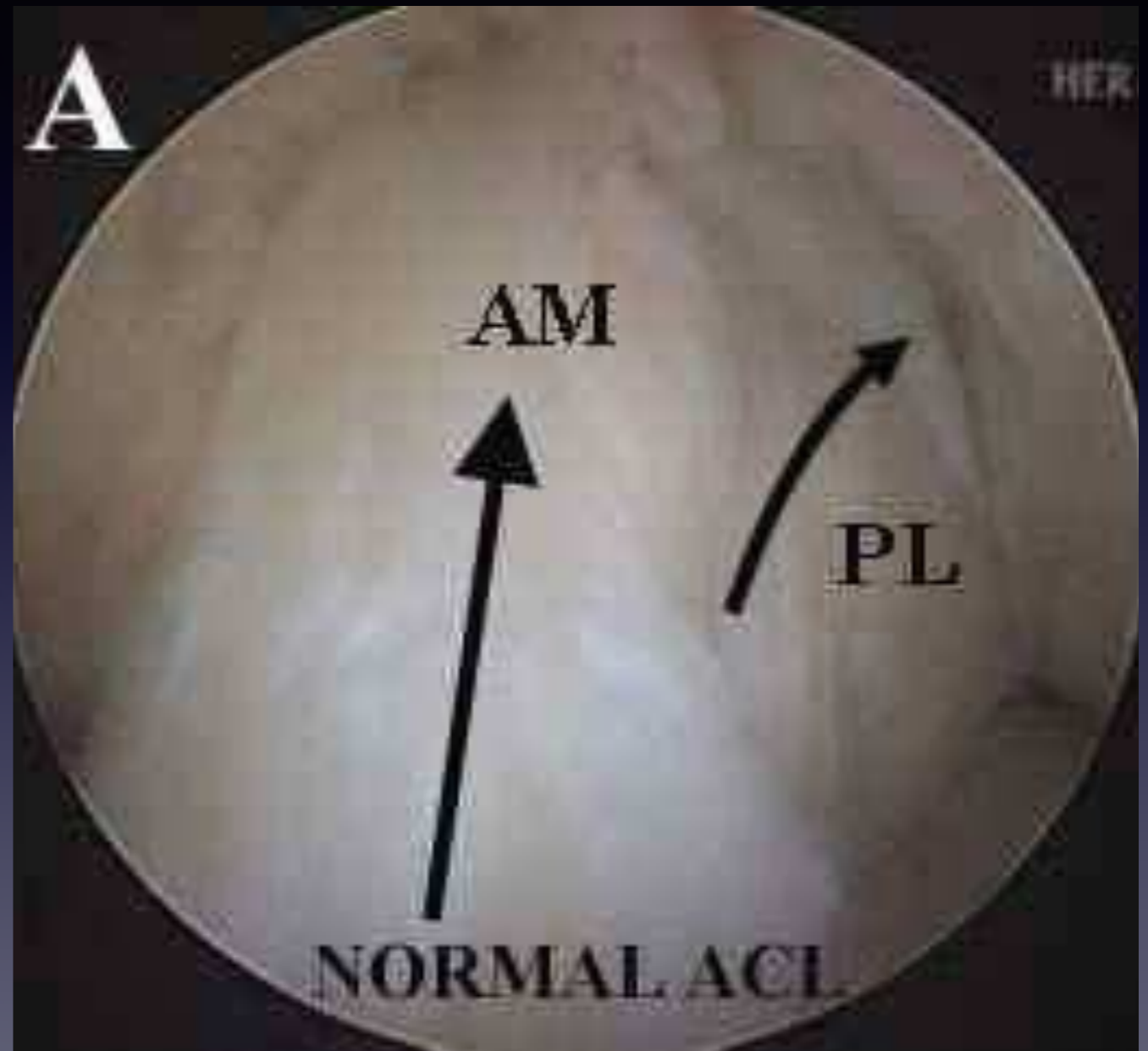


Pivot Shift



Native ACL

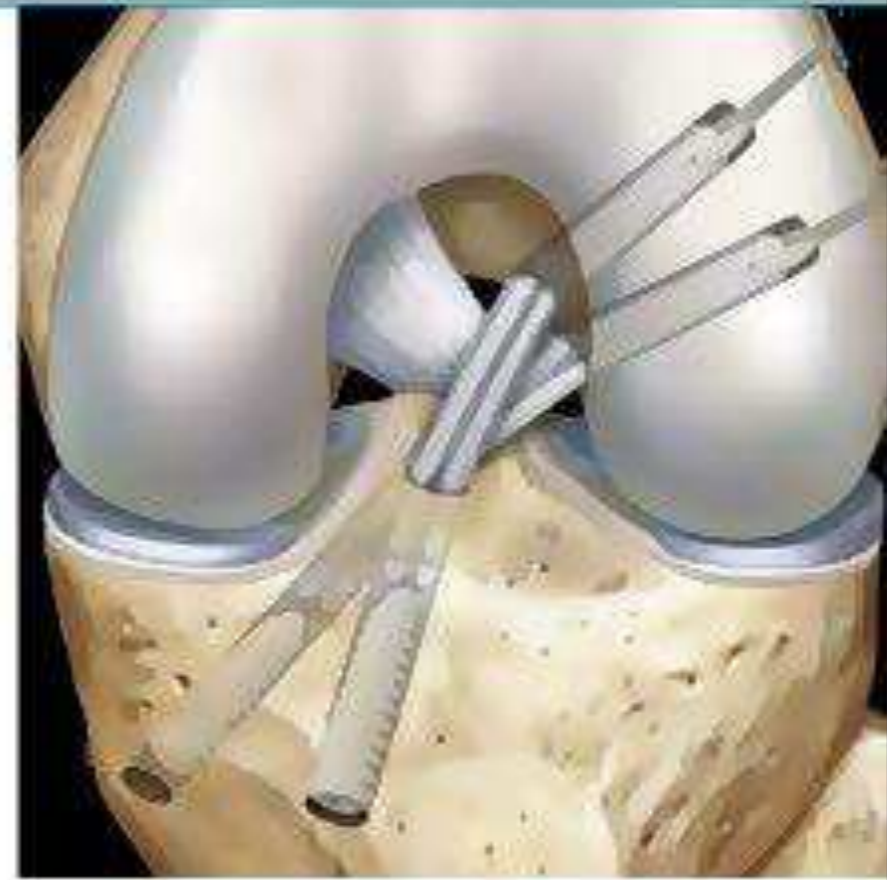
Anterior translation AND
Rotational control



ACL Reconstruction Techniques



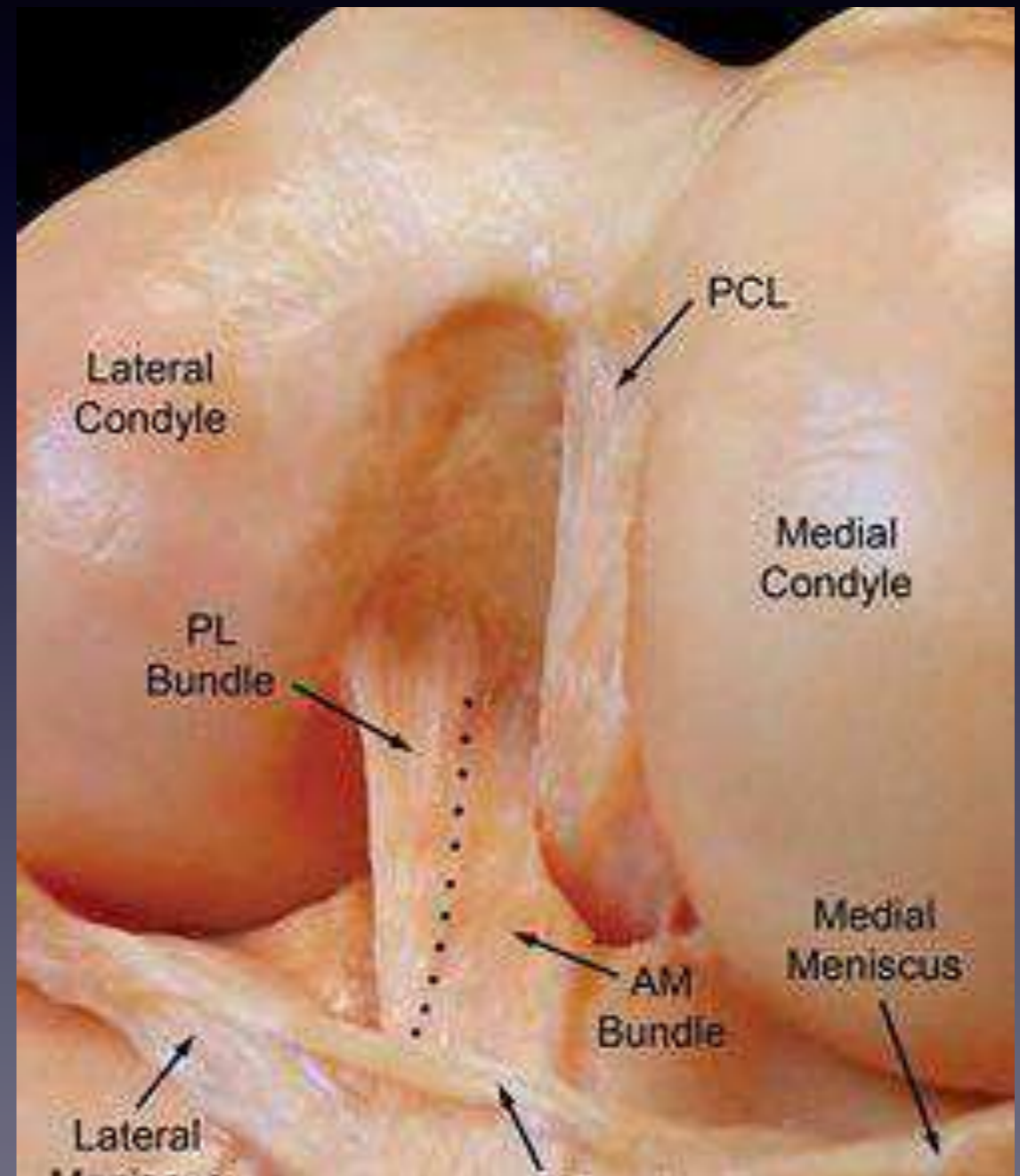
Single Bundle



Double Bundle

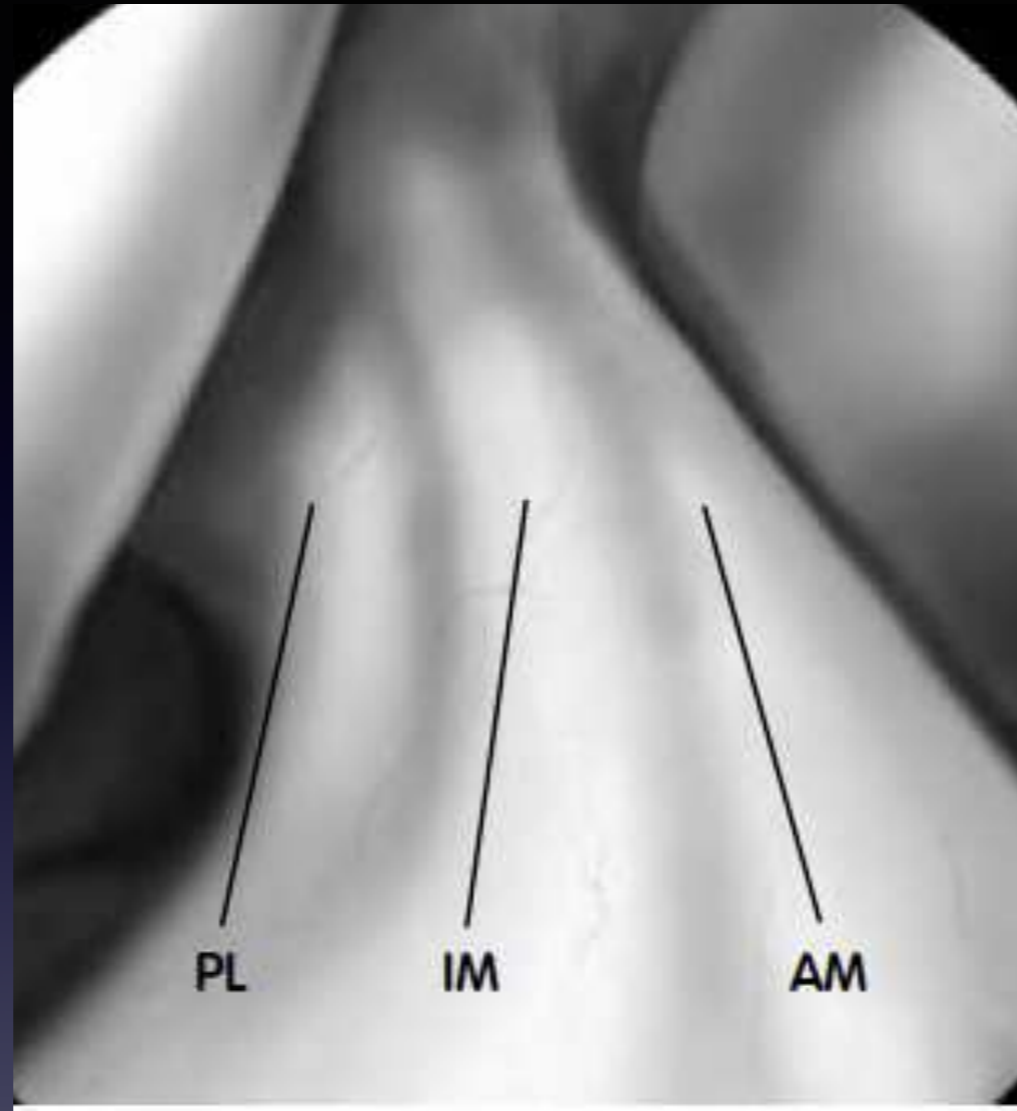
Single vs Double Bundle

- **Robotic studies: Double bundle more accurately restores knee kinematics**



Double-Bundle Reconstruction





Triple-Bundle ACL

- **MRI depiction and 3D visualization of three ACL bundles (Otsubo et al, Clin Anatomy, Dec, 2016): 92%**
- **Radiological evidence for the triple bundle ACL (MacKay et al, Clin Anatomy, 2014): 20%**



Does it matter?

Chen G, Wang S. Comparison of single-bundle versus double-bundle anterior cruciate ligament reconstruction after a minimum of 3-year follow-up: a meta-analysis of randomized controlled trials. *International Journal of Clinical and Experimental Medicine*. 2015;8(9):14604-14614.

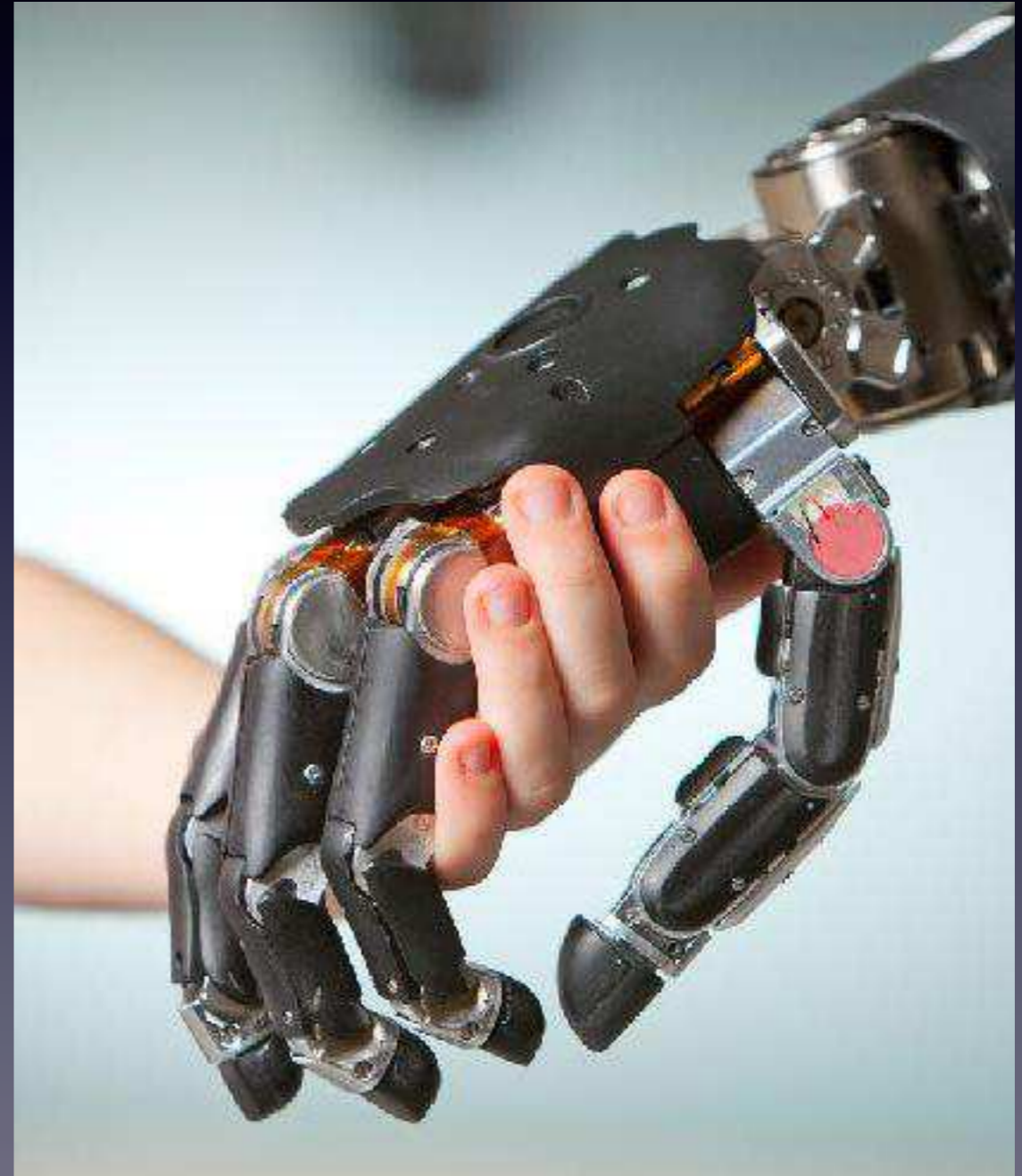
Double vs Single-Bundle

- **DB improves rotational (and often) anterior instability over SB reconstruction**
- **Gap between the two narrows over time**
- **Subjective scores (IKDC) are inconsistent, but generally do not show any significant differences in the long term**



Robotics

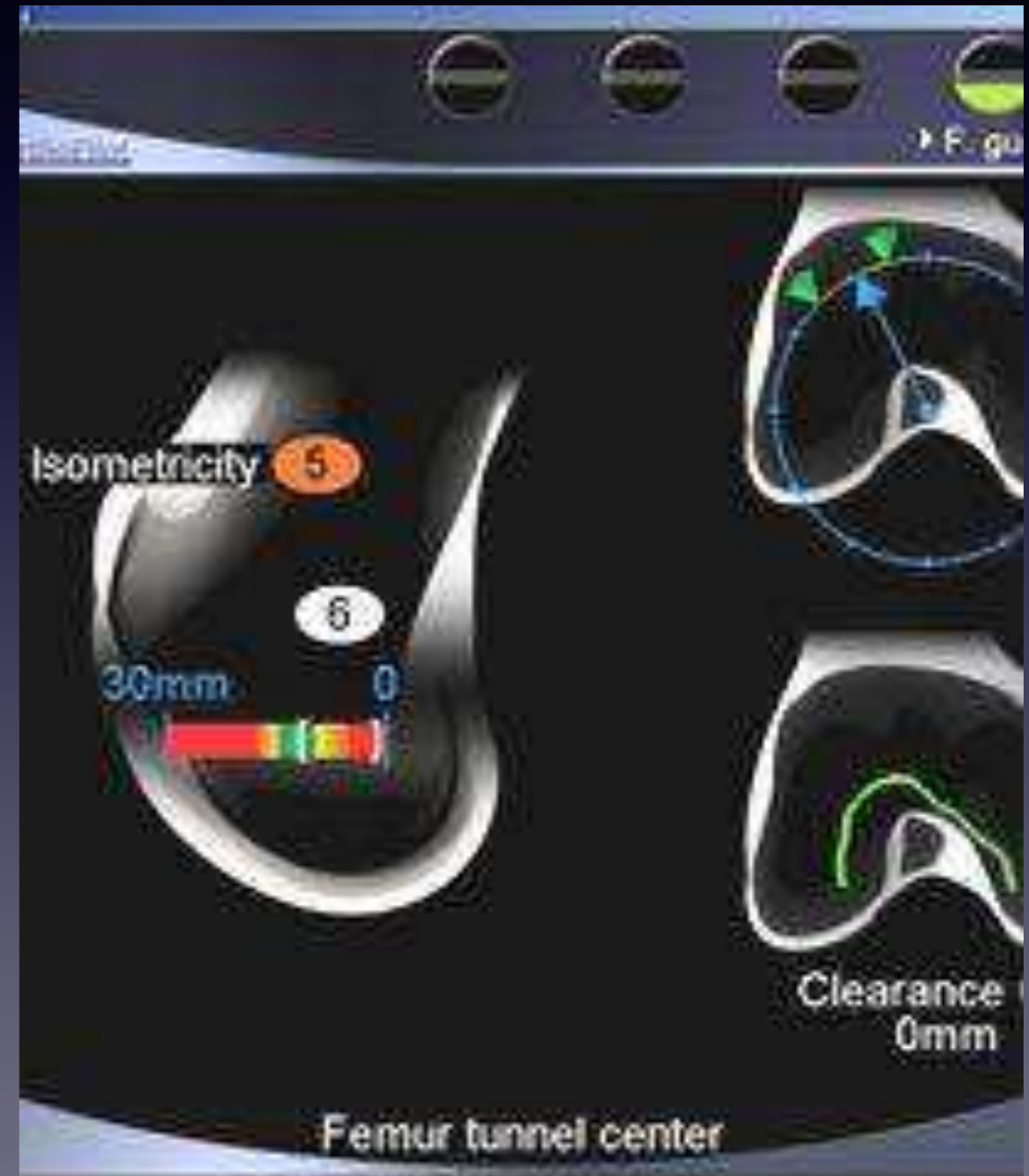
- **Is it necessary for accurate tunnels?**



Computer-assisted planning and robot-assisted Surgery in ACL Reconstruction

Petermann et al, Op Tech Orthop, 2000

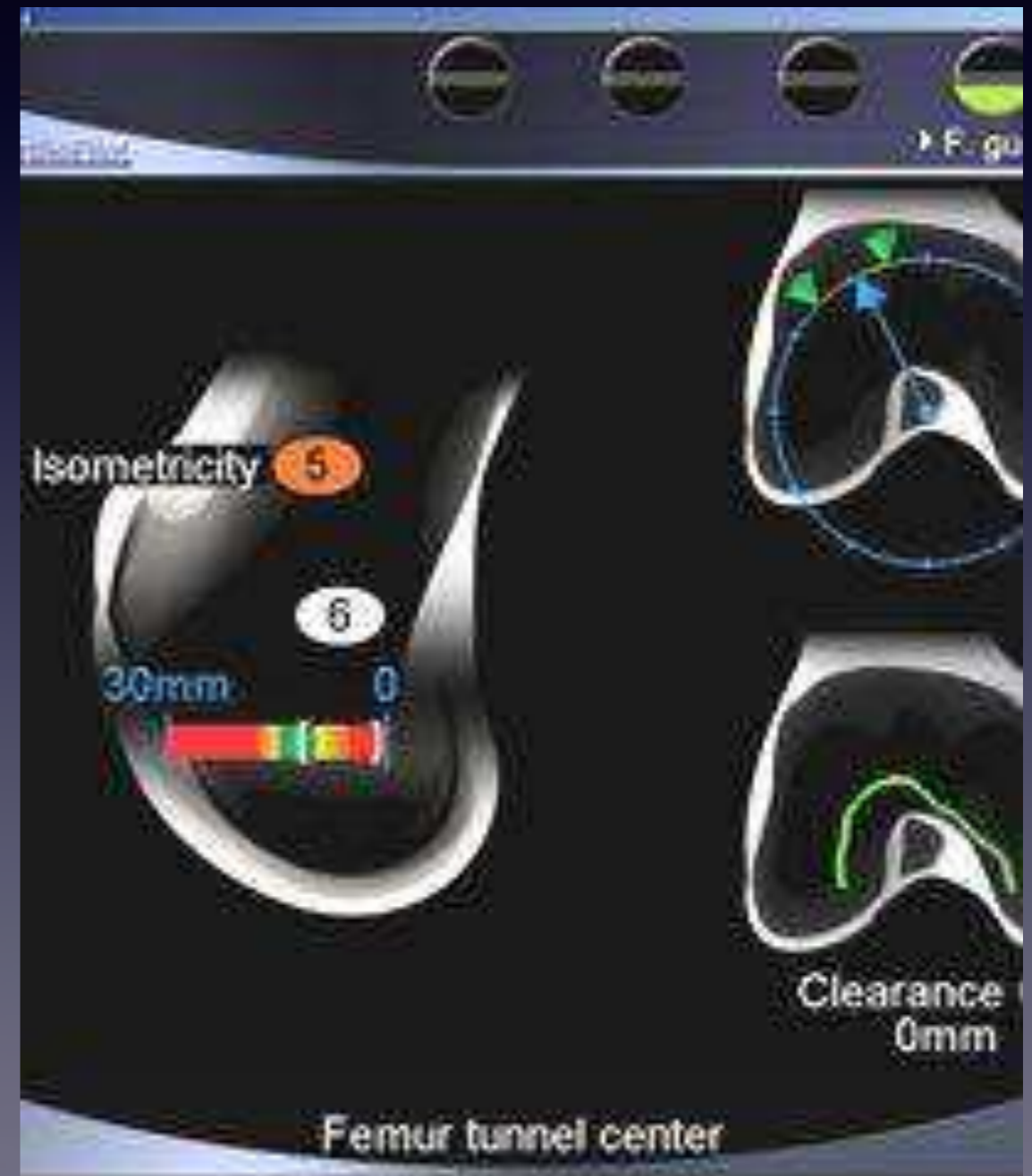
- Reliably prevented notch and wall impingement
- Went as far as to say, “that robot-assisted ACL recon has become the standard care.”



Precision of ACL tunnel placement using traditional vs robotic techniques

Burkhart et al, Comput Aid Surg, 2001

- Robotic had more consistent tunnels, but overall accuracy no better than the most experienced surgeons



Robotic ACL- Reconstruction

- **No studies have shown clinically significant improvement in long term outcomes after ACL Reconstruction**



Robotics

- Essential....
- ...or creepy?



Summary

- **Optimal outcomes derive from optimal positioning**
- **Respect and achieve anterior AND rotational stability**



Thank-you

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