A NEW DESIGN FOR THE LATERAL OXFORD UNICOMPARTMENT KNEE REPLACEMENT

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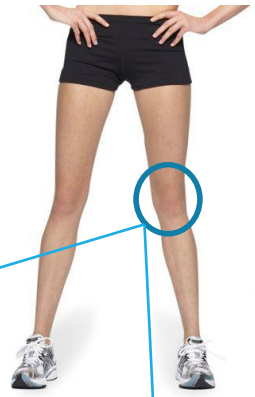
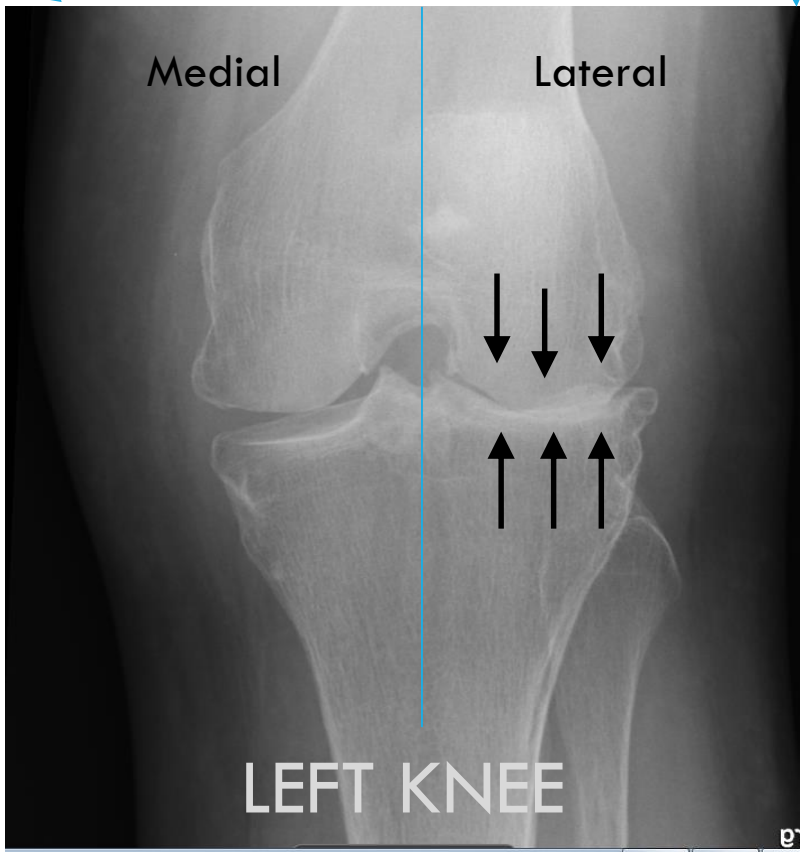
LATERAL KNEE OSTEOARTHRITIS (OA)



- *Loss of articular cartilage → pain.*
- By 2035: 8.3mill 45/older could have Knee OA (UK)(1).
  - *→ n~31k lateral UKRs.*
- *Gold Standard treatment → surgery*
  - *UKR is superior to Total Knee Replacement (TKR)(2,3,4).*



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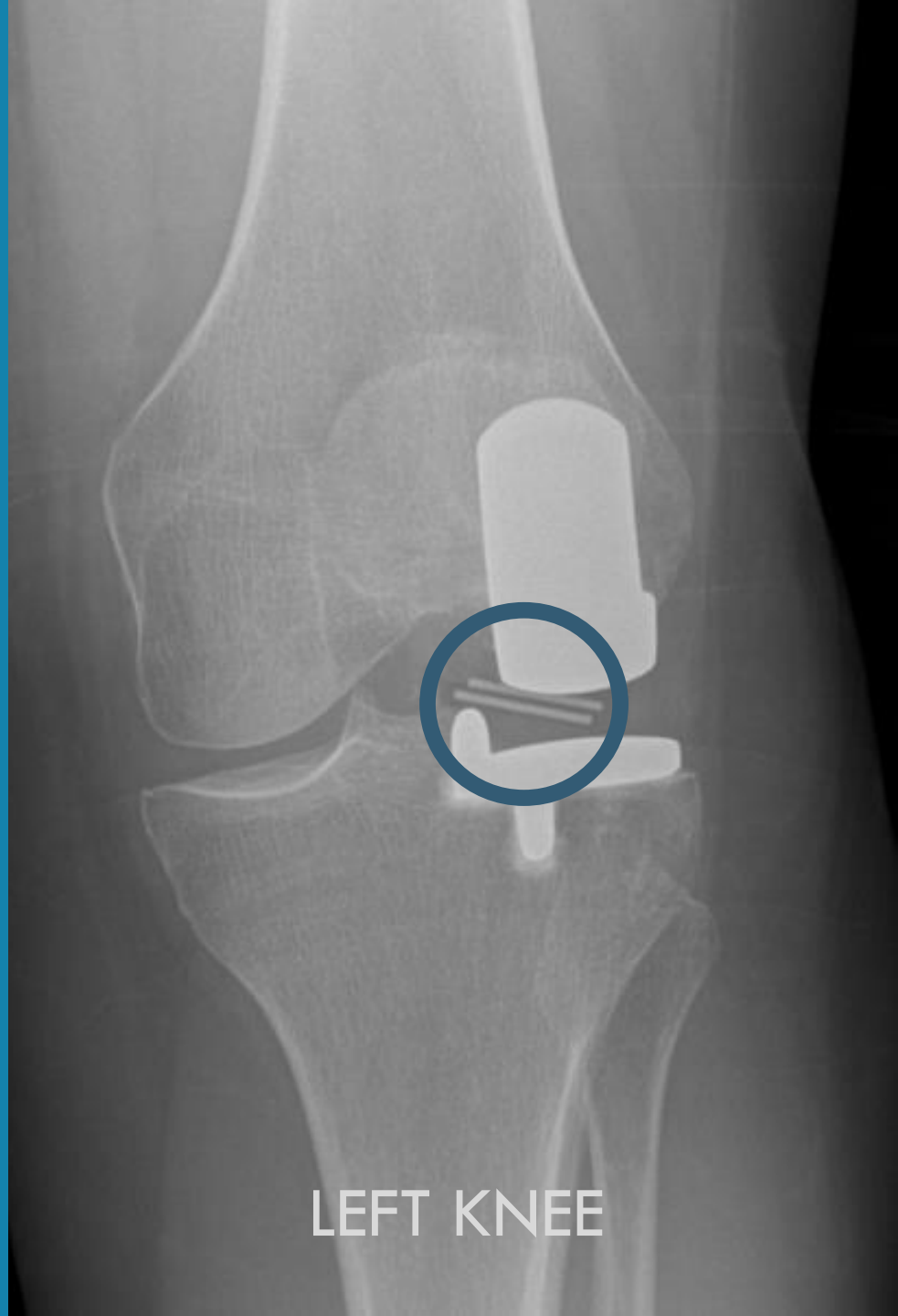
PROBLEM

Dislocation of the mobile bearing

- Higher in the lateral (outer) than medial (inner)
- →Revision surgery
- Medial dislocation most common clinically
- Occurs with the knee in flexion



NEED STATEMENT

A way to reduce or eliminate bearing dislocation in adult patients suffering from end-stage lateral compartment knee osteoarthritis requiring a knee replacement to prevent revision surgery.

SOLUTION

- A new UKR implant for lateral compartment disease that satisfies the following user needs:

  - Retains functionality and performance of current design
  - Retains safety profile of the current design
  - Must be made from biocompatible material
  - Must be possible to manufacture
  - Must be sterilisable
  - Must not alter surgical technique significantly
  - Must reduce dislocation of the mobile bearing

PROJECT PROGRESS

Understanding the problem	Incidence of dislocation Mechanical rig Computational model
Concept generation	IP landscape search Brainstorming solutions
Concept refinement	Initial prototyping Dislocation testing
Final concept selection	Testing in cadaveric knees Kinematic testing

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Understanding the problem

Concept generation

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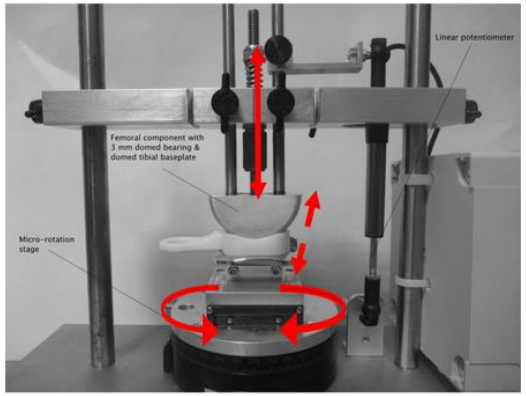
Final concept selection

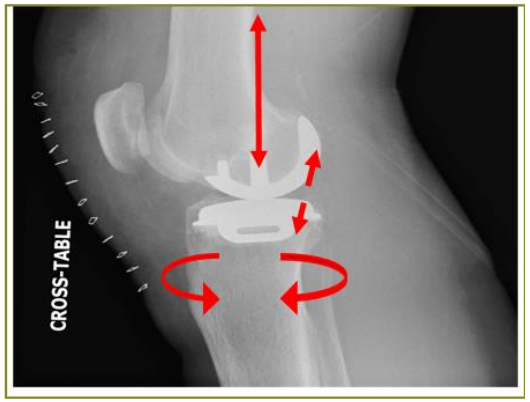
PROJECT PROGRESS

- *Understand bearing dislocation further*
  - ✓ *Bearing dislocation characterised*
    - *Medial most likely*
  - ✓ *Risk of dislocation*
    - *Risk increases with vertical distraction and mediolateral translation*
  - ✓ *Method of testing new solutions*

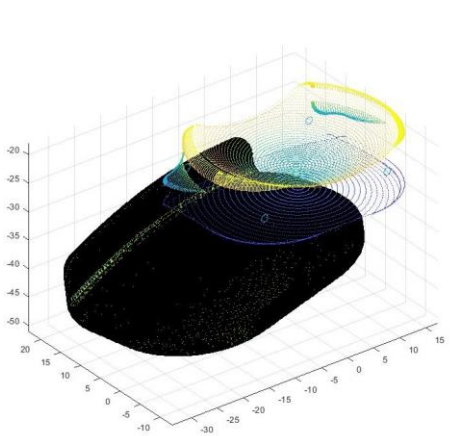
- *Brainstormed implant design ideas*
  - ✓ *23 new implant ideas*
  - ✓ *Iterated: 4 designs*

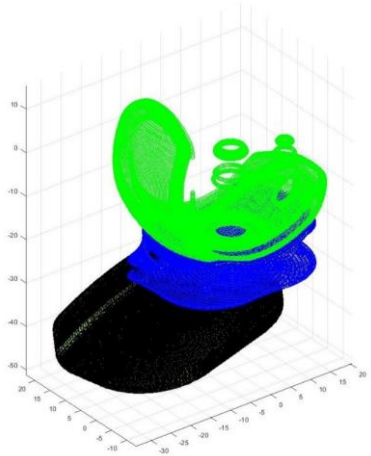
Mechanical rig





Computational model





PROJECT PROGRESS

Understanding the problem

- Incidence of dislocation
- Mechanical rig
- Computational model

Concept generation

- IP landscape search
- Brainstorming solutions

Concept refinement

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Understanding the problem

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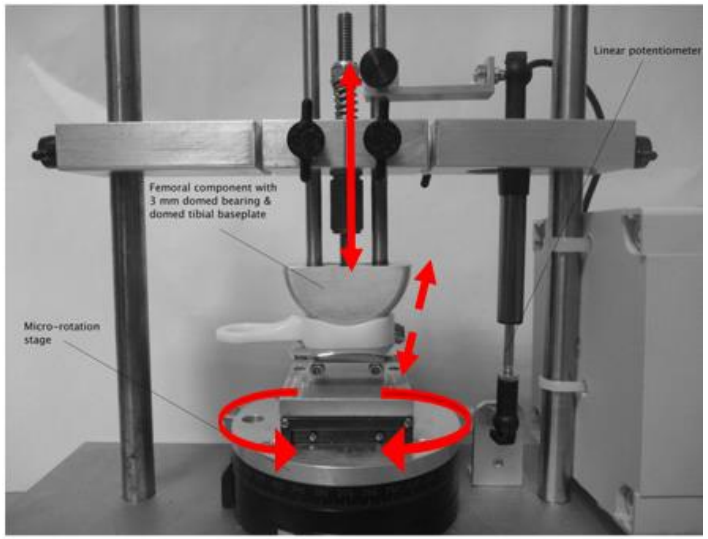
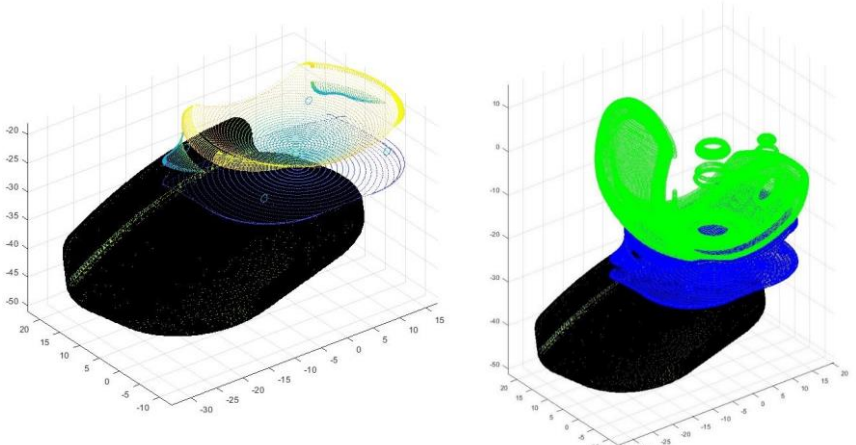
PROJECT PROGRESS

- *4 ideas require testing:*

  - ✓ *Prototyping in plastic & metal*

  - ✓ *Testing dislocation performance in the mechanical rig and computational model*





PLANNED TESTING

- *Cadaveric testing*
- *Temporary intra-op testing: 10-20 people*
- *Pilot cohort study in at least 200 patients.*
  - *1-3 centres*
  - *Goal: prove dislocation rate <1%*

- *No in patient RCT unless geometrical changes are expected to impact functionality and performance of the device.*

QUESTIONS FOR THE PANEL

- Does this seem like a reasonable plan?
- What problems can you foresee that I can potentially mitigate?
- Any advice on how to implement the IDEAL model in my project?

REFERENCES

1. Keel data report, Arthritis Research UK, 2013.
2. van der List, J.P., et al., *Patients with isolated lateral osteoarthritis: Unicompartmental or total knee arthroplasty?* The Knee, 2016. **23**(6): p. 968-974.
3. Wilson, H.A., et al., *Patient relevant outcomes of unicompartmental versus total knee replacement: systematic review and meta-analysis.* BMJ (Clinical research ed.), 2019. **364**: p. l352.
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