Prosthetics and Orthotics

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13 January 2017

Prosthetics and Orthotics: National and international landscape

- Over 1 million hip and knee replacements per annum worldwide
- Most very successful (<5% revision at 10 years)
- Success informs popularity/confidence in procedure
- “Operation of the Century” Lancet, 2007 on hip replacement
- Fitted in younger patients, who are living longer (ageing population) and are more obese
- Therefore current joint replacements are challenged
- Revision operations are expensive/less successful than primary
- Other joint replacements lack success/numbers of hips/knees
- Two main challenges – wear and infection
- Established global market in both Prosthetics and Orthotics, with established international research societies

nanoLAB

Prosthetics and Orthotics: Current strengths, Newcastle groups

- Orthopaedics: Northern Retrieval Registry, based at Freeman Hospital
- Collaboration between hospitals in NE and MSE, Newcastle University
- Understand why replacement joints fail
- Mainly hips and knees
- Also spinal implants (**MAG**netic **E**xpansion **C**ontrol) rods for children
- MSE - work on bioceramic implants for bone and osteochondral defects
- Orthotics – 3D printing, based at MSE, with Peacocks Medical Group
- SLS Foot and Ankle lab based at Freeman
- Dr Kia Nazapour “restore function to individuals with sensorimotor deficit”, artificial limbs
- Infection, biofilms, Dr Vicky Chen, MSE
- Strong links – engineering, medical school, regional hospitals

Prosthetics and Orthotics: Future Research Opportunities

- For joint replacements: reduce wear and infection, therefore reduce overall health costs
- Analysis of failed implants – hence Northern Retrieval Registry
- For all implants – cost reduction
- Innovations more likely in finger, toe, ankle, wrist, elbow etc implants
- Devices which address unmet clinical need
- Seamless integration between medical imaging sources from MRI/CTs/Ultrasound and CAD design software via smart segmentation algorithms
- Design tools for adding tailored porosity to specific implant areas
- EPSRC Healthcare Technologies

NEWCASTLE SURGICAL TRAINING CENTRE

Healthcare at its very best - with a personal touch

ATOS Triple Scan System

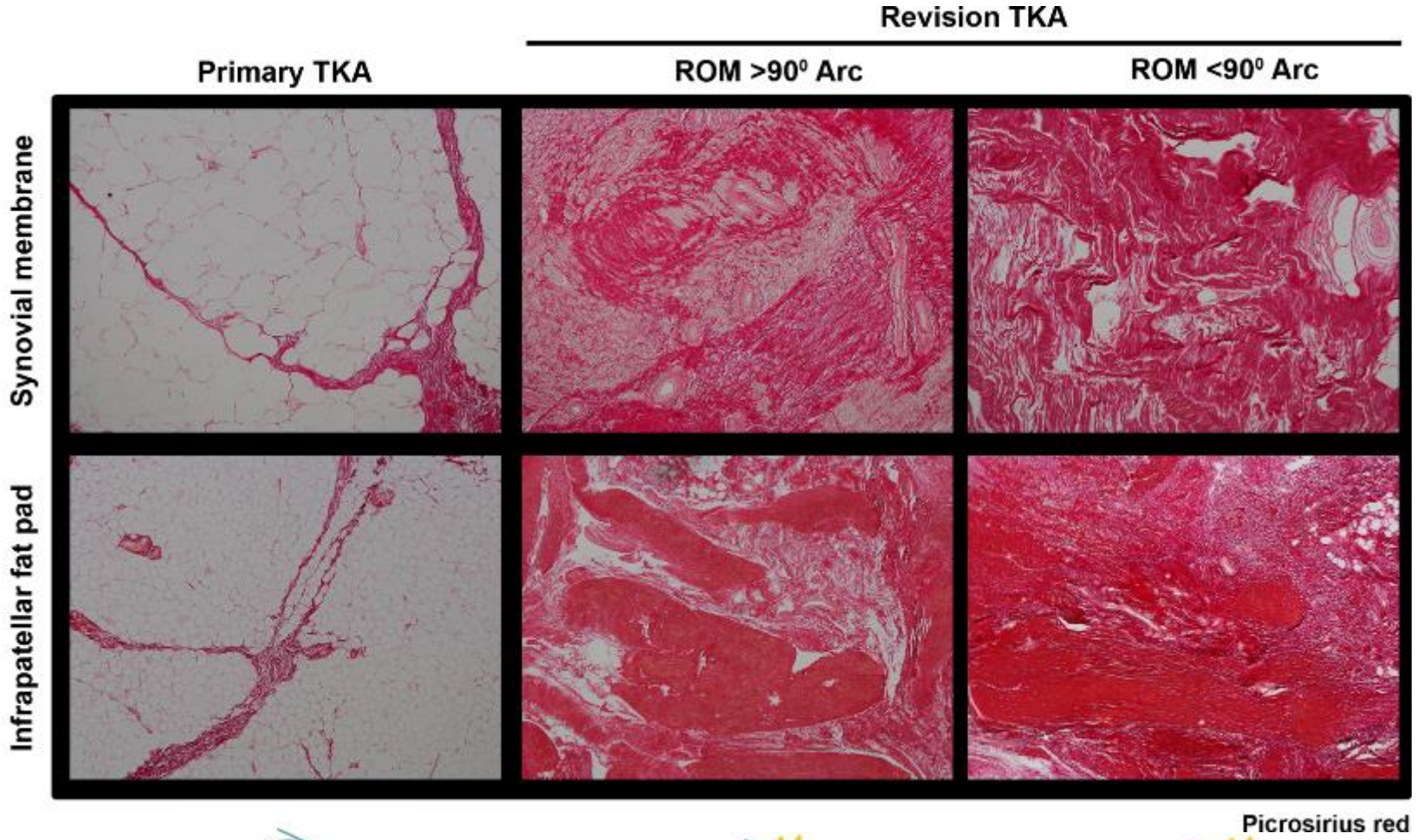
- Optical measuring system
- Custom made Ti shells
- Thin TiO_2 coating applied to shell
- Shell internal surface measured prior to and post implantation
- Accuracy of the order of 5-10 µm

Immunobiology of cobalt

Helen Lawrence, David Deehan, John Kirby, Alison Tyson-Capper
Freeman Hospital & Newcastle University, UK

6th Advanced Hip Resurfacing Course
Ghent, Belgium
30th May 2014

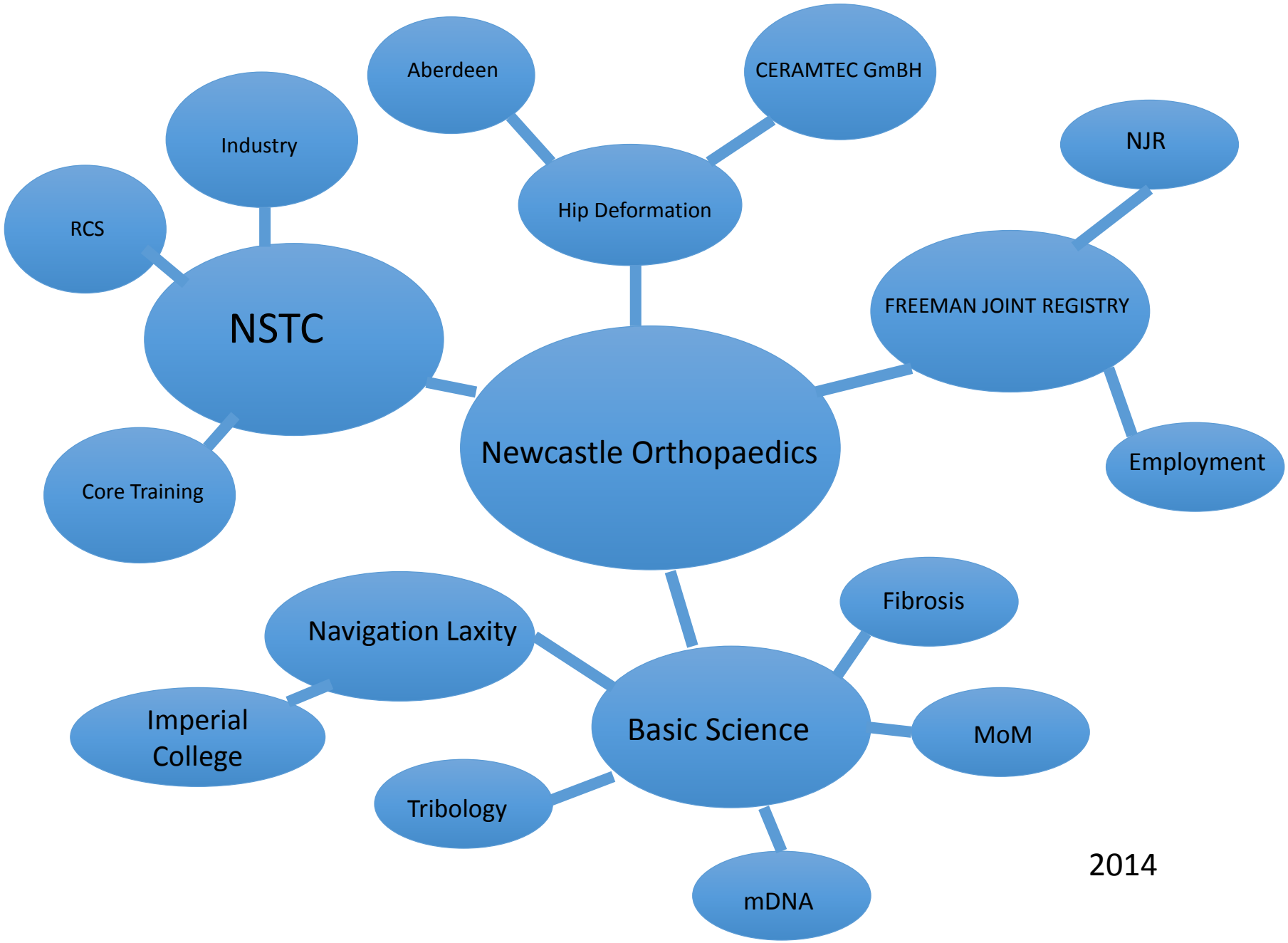
What does scar tissue look like?



Data collection and analysis

(Stryker eNdtrac ASM Knee Navigation System, Michigan USA)

- **Dynamic data collection:** from an optical tracking system used for computer navigated surgery.
- **Laxity was quantified:** as the range of motion of the tibia in relation to the fixed femur – for varus/valgus, anterior drawer, internal/external rotation.
- **Statistics:** Mixed effect modelling was used to quantify the effects of each "intervention" (PS-TKA implantation and popliteus resection) and flexion as well as inter knee variation on laxity.
- **Data representation:** mean ± SD for 8 knees (n=8).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CERAMTEC GmBH
Industry
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RCS
Hip Deformation
NSTC
FREEMAN JOINT REGISTRY
Newcastle Orthopaedics
Core Training
Employment
Fibrosis
Navigation Laxity
Imperial College
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Tribology
mDNA

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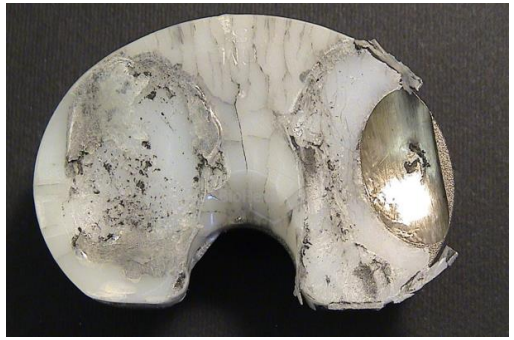

The Bone & Joint Journal
Formerly known as *JBJS (Br)*

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The immunobiology of cobalt

demonstration of a potential aetiology for inflammatory pseudotumours after metal-on-metal replacement of the hip

H. Lawrence, D. Deehan, J. Holland, J. Kirby, A. Tyson-Capper
DOI: 10.1302/0301-620X.96B9.33476 Published 2 September 2014

Testing & Validation