

An independent retrieval centre helping surgeons, patients and manufacturers understand why medical devices fail



ANNUAL REPORT DECEMBER 2014

We are the leading global provider of analysis of failed orthopaedic implants: our specialist team shares its world class expertise with healthcare leaders in hundreds of leading units in 22 countries, including over 70% of English hospitals. We have collected 6000 components and published 50 full journal articles since we began in 2007.

We help the NHS, the government and regulatory bodies improve quality of care by explaining the reasons why some patients suffer from a failed hip replacement.

We do this by conducting forensic investigations into failed implants and compare findings to patients with well functioning implants.

Our reports and online public portals help hospitals and health improvement bodies to monitor practice, inform patient choices about their place of care, and build public confidence in NHS orthopaedic care.

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Who we are

The London Implant Retrieval Centre (LIRC) was set up in 2008 by two consultant orthopaedic surgeons, Professor Alister Hart and John Skinner. It is based at the Royal National Orthopaedic Hospital, Stanmore, London, UK. 205 UK consultant surgeons and surgeons from 22 countries have contributed over 6000 failed hip components.

Directors^{1,2}: Alister Hart, John Skinner, Gordon Blunn

Managers: Gwynneth Lloyd (UK and patient group)², Elizabeth Ellis (Depuy ASR Global Recall Program)², Dr Harry Hothi (Stryker Modular Neck Program)²

Researchers

Reshid Berber², Anna Panagiotidou², Kevin Ilo², Shiraz Sabah², Robert Whittaker², Adam Hexter¹, Asaad Asaad², Anna Di Laura²

Statisticians

Erica Cook¹, Luigi Palla⁸

Engineers

Prof Phillip Noble⁴, Dr Jay Meswania², Dr Paul Bills⁵, Prof Liam Blunt⁵, Radu Racasan⁵

Technicians

Siva Mahindan², Bob Skinner²

Imaging Hub

Johann Henckel¹

Consultant Radiologists:

Dr Michael Khoo¹, Dr Keshthra Satchithananda⁶, Dr Adam Mitchell⁷

Key surgeon collaborators

Martyn Porter³, Keith Tucker¹³, Sarah Muirhead-Allwood¹, Young Min Kwon⁹, Antti Eskelinen¹⁰, Daniel Kendoff¹¹, Thorsten Gerkhe¹¹, Doug Padgett¹², Richard Carrington¹, Jonathan Miles¹

Histopathology:

Prof Adrienne Flanagan²

¹Royal National Orthopaedic Hospital, Stanmore, UK

²University College London, UK

³Wrightington, UK

⁴Baylor College, Houston, USA

⁵EPSRC centre for advanced metrology, UK

⁶Kings College, London, UK

⁷Imperial College London, UK

⁸London School of Hygiene and Tropical Medicine, UK

⁹Massachusetts General, Boston, USA

¹⁰COXA, Tampere, Finland

¹¹ENDO-Klinik, Hamburg, Germany

¹²Hospital for Special Surgery, New York, USA

¹³Norfolk and Norwich, UK

The impact of our research

The LIRC aims to improve the regulation of medical devices through research into the mechanism of failure of orthopaedic implants. Our initial work focused on the largest medical device disaster in history: metal-on-metal (MOM) hip replacements. The research, led by Professor Alister Hart and John Skinner was so successful, that it directly affected UK and US health policy, industry, clinical practice and patient health, resulting in a change in the regulation of all medical devices by the US Food and Drug Administration and the UK Medicines and Healthcare Products Regulatory Agency (MHRA).

The research looked at which surgical, implant and patient factors caused the failure of MOM hip replacements which were used in 1.5 million patients before virtually all types were withdrawn. As a result of the team's work, stimulation of the first global retrieval programme for medical implant has been initiated — including a Johnson & Johnson-funded analysis programme — and the development of a change in the MHRA protocol used to monitor all UK MOM hip patients.

These have led to improvements in the quality of patients' lives after redo surgery, and supported litigation cases worth billions of dollars. This has also led to the creation of information resources by charities and regulatory bodies which have been disseminated through BBC Health Online, and the newspaper Daily Telegraph, Daily Mail and Guardian.

Changes to International Health Policy

Findings of the research identified a level of 7 parts per billion as an important cut-off in the blood levels of metal ions between poor and well-functioning hips, informing clinical guidance globally. Currently this standard was chosen by the MHRA to monitor all MOM patients across the UK.

International health regulatory agencies and professional bodies (including the FDA, Australian Therapeutic Goods Association, American Association of Orthopaedic Surgeons, British Hip Society, and Arthritis Research UK) have used our research to create recommendations for over 1.5 million patients worldwide.

Changes to clinical practice and subsequent cost savings

The sensitivity and specificity analysis of blood metal ions (released from the hips) and the MARS (Metal Artefact Reduction Sequence – ie reducing the “shadow” caused by the metal implant that obscures the tissues surrounding the hip implant) MRI interpretation enabled the MHRA to create clinically usable clinical management guidelines. As a result, blood metal ion testing and MARS MRI, which were unavailable in all NHS hospitals in 2006, are now routinely available, and have revolutionised the management of patients with metal-producing hips.

The MARS MRI protocols reduced unnecessary revision procedures (which costs more than £10,000) or delays to revision surgery and therefore prevent irreversible muscle damage. Less delays mean less obstacles to productivity, not just for the NHS and UK economy, but for individual patients.

Subsequent impacts on patient health and wellbeing

A crucial result of the work has been to improve the quality of life of patients suffering from painful hip replacements. By identifying some of the factors that can predict a patient's likelihood of having problems with a MOM hip, such as component position, hip type, and gender, we can reduce the number of patients being at risk of complications.

<http://www.ucl.ac.uk/impact/case-study-repository/hip-replacements>

<https://iris.ucl.ac.uk/research/personal/index?upi=AHART91>

London Implant Retrieval Centre

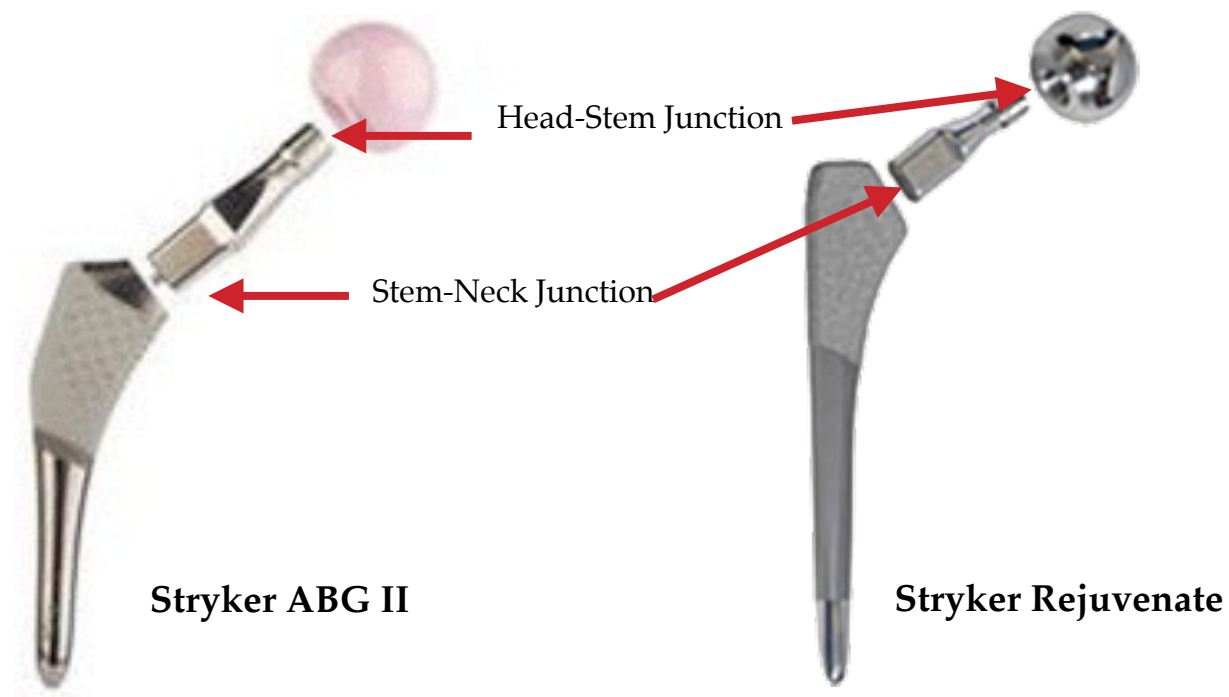
Annual Report December 2014

New projects: Modular Neck Global Program

It is speculated that increasing modularity in hips may increase the risk of failure due to corrosion and material loss at the head-neck and neck-stem junction. Understanding the mechanisms of material loss at the modular neck junction is a key area of research.

In July 2014 we signed a contract with Stryker to provide independent retrieval analysis of failed modular-neck hip implants. The project is in collaboration with Young-Min Kwon (MGH, USA). We are collecting implants together with clinical, imaging and laboratory data to determine a cause of failure. We retain the right to publish all material. Our objectives are as follows:

1. To gain further understanding of the mechanism of failure of modular neck hip prostheses
2. To risk stratify patients with ABGII and Rejuvenate modular neck stems
3. Development of early warning signs and clinical red flags for modular neck hips
4. Evidence to assist decision making for: who, when and how to revise.
5. Development of standardised protocols to minimise duplication/repetition



The findings of these studies would provide critical insights into the mechanism/s involved in failure of modular-neck femoral stems, thereby providing guidance to clinicians and research framework for further efforts to obtain evidence-based knowledge that would be pivotal for accurate and early detection of failure in patients with modular-neck THA and optimise clinical management of these patients.

Ongoing, major projects: Corrosion of Implants

Retrieval analysis at the LIRC has revealed that corrosion can occur on virtually all metallic surfaces in a hip implant. The LIRC is at the forefront of research into understanding the mechanisms and severity of corrosion and is uniquely placed to put clinical meaning to the corrosive damage observed; this is demonstrated by the acceptance of over 20 abstracts to the annual meetings of the American Academy of Orthopaedic Surgeons and the Orthopaedic Research Society for presentation in March 2015.

Key projects related to implant in corrosion include:

- Understanding the role of the bearing type in taper corrosion and material loss.
- Investigating the significance of cell-induced corrosion as a mechanism of material loss.
- Developing protocols for quantifying the affect of corrosion on material loss at the modular stem-neck and cup-liner junctions.

There is increasing evidence of a relationship between implant corrosion and raised cobalt ion levels in pre-revision whole blood samples. Current research is investigating the significance of this as a method of detecting implant corrosion in vivo, particularly in hips with non-MOM bearing systems.



Ilo et al. Corrosion of Metal Modular Cup Liners
AAOS 27th March 2015, 4:30 PM (Podium)

Di Laura et al. Cell Induced Corrosion
Current PhD Project

Whittaker et al. Head-Sleeve Corrosion
Current Research

Hothi et al. Influence of Stem Type on Taper Material loss
AAOS 27th March 2015, 4:00 PM (Podium)

Panagiotopoulos et al. Characterising Taper Junction Wear
AAOS 27th March 2015, 4:24 PM (Podium)

Panagiotidou et al. Effect of Impact Assembly on Corrosion of Modular Hip Tapers
AAOS 27th March 2015, 5:42 PM (Podium)

Hothi et al. One-Third of 395 Failed MOM-THR Hips have Severely Corroded Tapers
ORS 29th March 2015, 09:15 AM (Podium)

Ilo et al. MOM-THR: Does Increasing Modularity Effect Clinical Outcome
AAOS 27th March 2015, 4:06 PM (Podium)

Hothi et al. Corrosion of Cemented Stems
ORS 27th March 2015, (Poster)

Collaboration with the NJR, Hiplink

We had a simple research question: does the National Joint Registry (NJR) database contain the hips that we have received and is the data accurate that it holds on them?

This question is important because errors in revision data on the NJR will have a powerful effect on failure rates. This is one of the most topical and controversial subjects in medicine. The UK are on the verge of releasing surgeon-level detail of the data held on the NJR, the world's largest database of hip and knee replacements. The LIRC holds the world's largest collection of hips that should be recorded on the NJR.

Our first paper on this subject has been accepted for publication in BJJ in January 2015. We plan future detailed studies on combined NJR-LIRC database

In addition to the fact that the LIRC holds a retrieved hip, the other indisputable data includes: component type, size, and identification numbers.



The validation of data on the National Joint Registry for England, Wales and Northern Ireland using primary metal-on-metal hip arthroplasties at the London Implant Retrieval Centre: A STUDY USING THE NJR DATASET. S. A. SABAH, J. HENCKEL, E. COOK, R. WHITTAKER, H. HOTH, Y. PAPPAS, G. BLUNN, J. A. SKINNER, A. J. HART . BJJ. 97-B, No. 1, JANUARY 2015

Collaboration networks: UK and Global

108 UK hospitals have contributed implants

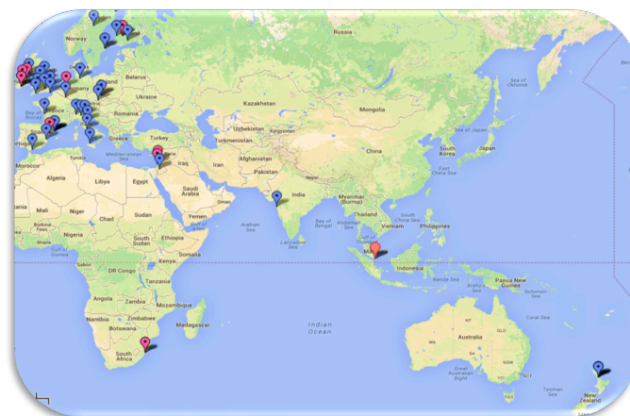
Addenbrooke's
Airedale General
Arrowe Park
Bedford
BMI Alexandra, Cheadle
BMI Blackheath
BMI Chaucer
BMI Goring Hall
BMI Runnymede
BMI The Beaumont
BMI The Harbour
BMI The Meriden
BMI Thornbury
Bradford Royal Infirmary
Calderdale Royal
Charing Cross
Cheltenham General
Chesterfield Royal
Claremont
Clifton Park
Conquest
Derriford
Dewsbury District
Doncaster Royal Infirmary
Duchy (Spire)
Ealing
Euxton Hall
Grantham and District
Guy's
Heatherwood
Hereford County
Hillingdon
Horder Healthcare
Hospital Of St Cross
Huddersfield Royal Infirmary
Hull and East Riding
King Edward VII
Sister Agnes Kings Mill
Leighton
Lister
Llandough
Maidstone District General
Manor
Medway Maritime
Mount Stuart
Nevill Hall
Norfolk & Norwich
North Devon District
North Middlesex
Northern General
Nuffield Health
Bournemouth Nuffield
Health Brighton Nuffield

Health Cambridge Nuffield
Health Exeter Nuffield
Health Guildford Nuffield
Health Warwickshire
Nuffield Health Wessex
Nuffield Health York
Park Hill
Peninsula
Princess Royal
Queen Alexandra
Queen Mary's Sidcup
Queens Medical Centre
Royal Berkshire
Royal Bournemouth
Royal Cornwall (Treliske)
Royal Derby
Royal Devon & Exeter
Royal Hallamshire
Royal Surrey County
Scarborough General
SOTC, Haywards Heath
Southampton General
Southlands
Southmead
Spire Bristol
Spire Bushey
Spire Cambridge Lea
Spire Clare Park
Spire Dunedin

Spire Portsmouth
Spire Southampton
St Albans City
St Anthonys
St Michael's
Stepping Hill
Sussex Orthopaedic NHS
The Elective Orthopaedic Centre
The Great Western
The London Clinic
The North East NHS
The Princess Grace
The Queen Elizabeth
The Royal National Orthopaedic (Stanmore)
Tunbridge Wells
Torbay
University College
Coventry
University Aintree
Warwick
West Suffolk
Wexham Park
William Harvey (Ashford)
Wrightington
Wycombe
York
Ysbyty Gwynedd

25 countries have contributed ASR hips to our Global ASR retrieval program:

Australia
Austria
Belgium
Croatia
Czech Republic
Denmark
Dubai
Finland
France
Germany
India
Ireland
Israel
Italy
Netherlands
New Zealand
Portugal
Russia
Singapore
South Africa
Spain
Sweden
Switzerland
Turkey
UK



6 world renowned hospitals take part in our international MDT to decide management of patients with MOM hips

Royal National Orthopaedic, Stanmore, UK
Wrightington, UK
Massachusetts General, Boston, USA
COXA, Tampere, Finland
ENDO-Klinik, Hamburg, Germany
Hospital for Special Surgery, New York



Visitors to the LIRC: local and international

We were lucky to have eminent visitors to the LIRC in 2014.

Keith Tucker (NJR, Beyond Compliance)

Derek McMinn (inventor of the BHR)



Luigi Zagra (Galeazzi clinic, Milan, Italy)



Prof Martyn Porter, Wrightington, UK
Prof Michael Morlock, Hamburg, Germany
Dr Li Dong Song, Jilin University, China
James Browne, University of Virginia, USA
Joshua Carothers, New Mexico, USA
Prof Philip Noble, Houston, Texas
Tadhg O'Sullivan, Waterford, Ireland

International meeting on follow up of patients with MOM hips Sept 2014

The management of patients with metal on metal (MOM) hip and revision of MOM hips will be a significant problem for decades to come. There is ongoing debate and uncertainty about local and systemic adverse effects of these bearings.

A meeting was held on the 26th September 2014 in the UK, with 29-invited faculty, each an expert within their field, and 100 delegates. Key subject areas were critically reviewed and a delegate vote was used to produce an expert opinion statement.

Expert opinion and voting resulted in a variety of new recommendations for follow-up.

Conclusions

Key changes to current guidance have been highlighted amongst an international expert faculty representing various stakeholders in the management of MOM hip patients and has highlighted areas where evidence base is still lacking.

This meeting will be repeated in autumn 2015.



3D printed model of a patient with a MOM hip and pelvic pseudotumour deviating the iliac artery

Expansion of students undertaking higher degrees

Reshid Berber

Work on MDT; imaging of implants; outcome of revision surgery
Funded by LIRC

Anna Panagiotidou

Taper testing
Funded by ORUK

Kevin Ilo

Modular Neck hips
Funded by JRI

Robert Whittaker

Component size mismatch and taper sleeve corrosion
Funded by LIRC

Asaad Asaad

Monitoring of patients with hip arthroplasty
Self funded

Anna Di Laura

Corrosion of modular implants
Funded by Stryker

BSc students

BSc and MSc Students

2015

Callum Aughterson, Harman Khatkar, Stefanos Koutsouris, Matthew Mort, Rita Rajani

2014

Matthieu Durrand-Hill (1st class, John Scales prize winner); Gareth Chan (1st Class); Wenyu Quak (1st Class); Emma Derby (MSc); Andreas Panagiotopoulos (Msc)

2013

Elizabeth Robinson (1st class, John Scales prize winner); Tom Parsons (2.1, project prize winner), Garima Govind (2.1), Millie Rhead (2.1), Rebecca McMillan (2.1), Kai Hartshorn (2.1)



2012

Imran Siddiqui (BHS prize winner)

2011

Adam Hexter (1st Class), Ee Kew

2010

Ashley Matthies, Will Ibotson, Dan Candoux-Hudson,

2009

Kevin Ilo, James Masters (1st Class), Humza Osmani

2008

Shiraz Sabah (1st Class); Ash Bandi; Jonathan Lenihan (1st Class)

2007

John Adam (1st Class)

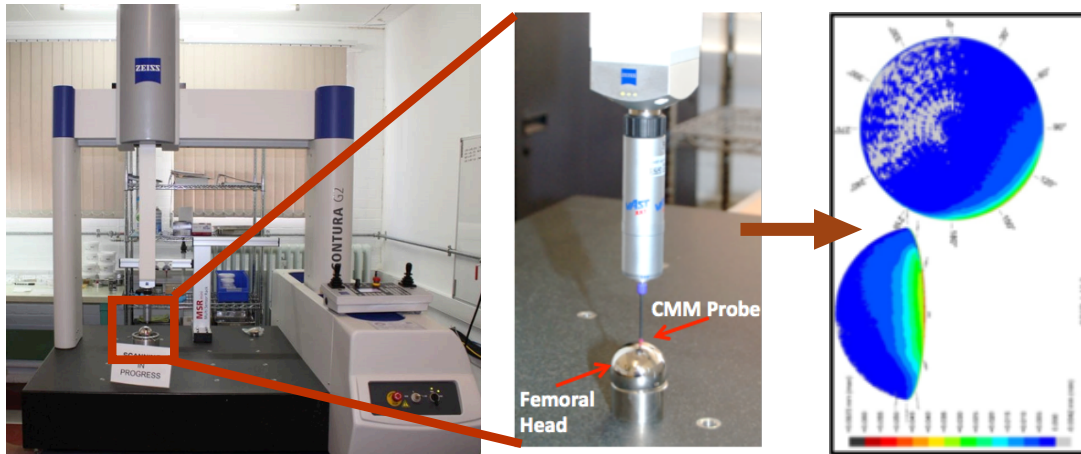
2006

Payam Tarassole, Pranai Buddhev

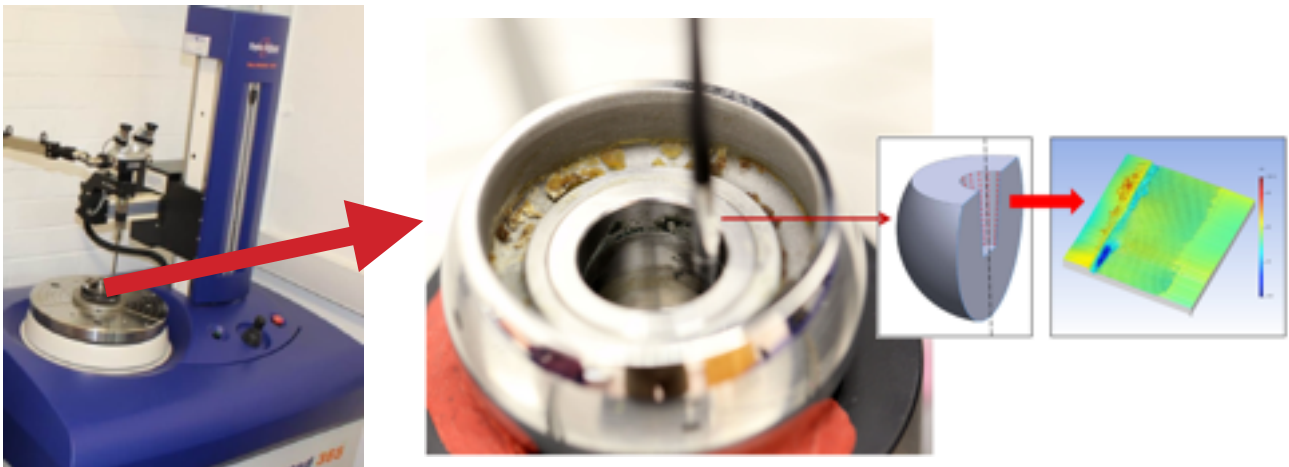
2005

Tom Hester (1st Class)

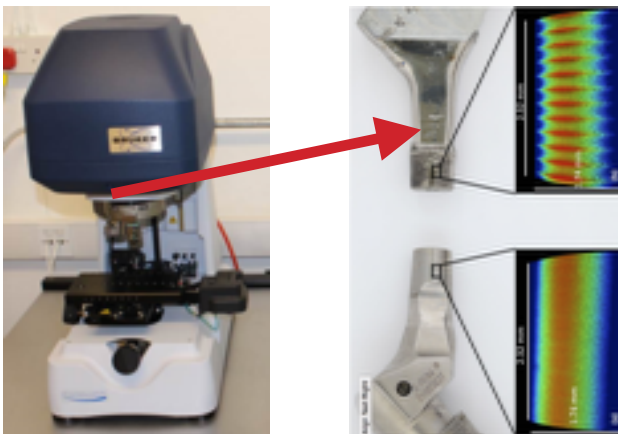
LIRC capability / equipment



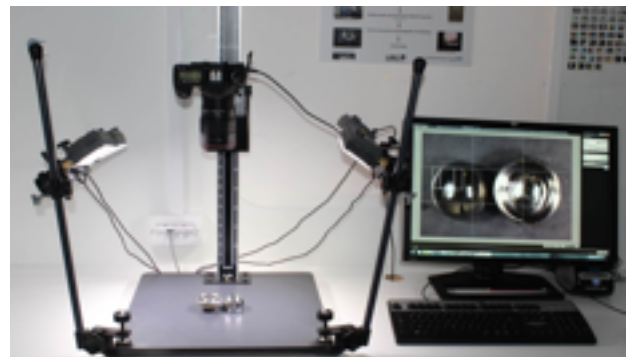
The RNOH charity generously donated £60000 towards the cost of a new coordinate measuring machine (CMM) so that we now have 3 machines.



Our Talyrond roundness measuring machine has been used to measure material loss at the had-stem taper junctions, which has played an important role in understanding failure mechanisms.



Our optical profilometer has enabled us to closely examine the surfaces of our retrieved implants. Using this we have identified the wide differences in surface roughness of current commercially available stem trunnions.



The LIRC has 3 dedicated stations for capturing macroscopic and microscopic images of our implants. We also have use of a scanning electron microscope (SEM).

We have 24 papers accepted for the AAOS and ORS meeting in Las Vegas, March 2015

Podium Talks on ORS Overlap Day (Fri 27th March) in Venetian Ballroom B

4:00 PM

Influence of Stem Type on Material Loss at the Taper of the most Commonly Used Metal-on-Metal Hip in the United States. **Hothi, Whittaker, Meswania, Ilo, Eskelinen, Blunn, Skinner, Hart**

4:06 PM

Metal-on-Metal Total Hip Arthroplasty: Does Increasing Modularity Effect Clinical Outcome. **Ilo, Hothi, Whittaker, Krishnan, Blunn, Skinner, Hart**

4:24 PM

Characterizing Taper Junction Wear Helps Understand the Mechanism of Failure of MOM Hip Replacements. **Panagiotopoulos, Hothi, Whittaker, Bills, Racasan, Blunt, Skinner, Hart**

4:30 PM

Corrosion of Metal Modular Cup Liners. **Ilo, Hothi, Whittaker, Berber, Blunn, Skinner, Hart**

5:42 PM

Effect of Impact Assembly on the Interface Deformation and Fretting Corrosion of Modular Hip Tapers: An In Vitro Study. **Panagiotidou, Meswania, Skinner, Hart, Blunn**

AAOS Posters

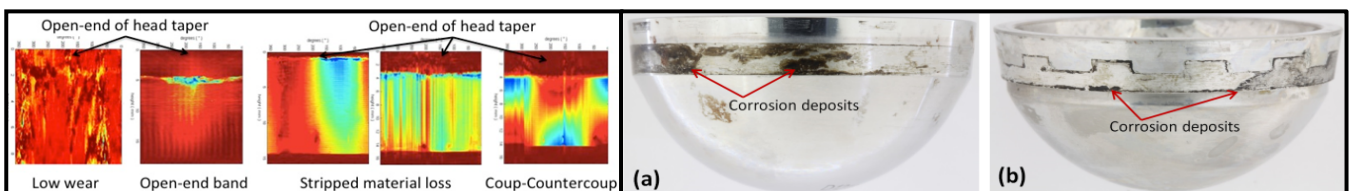
Poster # P027: Sequential MARS MRI After 8-years Follow Up of Well Functioning MOM Replacements. **Derby, Berber, Khoo, Henckel, Sabah, Skinner, Hart**

Poster # P033: Effect of Frictional Torque and Bending Moment on the Fretting Corrosion Behaviour of the Large Diameter Femoral Head. **Panagiotidou, Cobb, Meswania, Skinner, Hart, Haddad, Blunn**

Poster # P063: 36mm MOM Hips have Similar Taper Material Loss Rates as Larger Diameter Hips from the Same Manufacturer. **Whittaker, Hothi, Meswania, Bills, Racasan, Eskelinen, Blunn, Skinner, Hart**

Poster # P092: Low Dose Computed Tomography in Hip Arthroplasty: A Novel Protocol **Durand-Hill, Henckel, Sabah, Hothi, Whittaker, Klemm, Skinner, Hart**

Poster # P097: Large Diameter Metal-on-Metal Hip Arthroplasty: Modularity Effects Blood Metal Ion Level Ratio. **Ilo, Assad, Hothi, Whittaker, Blunn, Skinner, Hart**



ORS Podium Talk: One Third of 395 Failed MOM-THR Hips have Severely Corroded Taper Junctions: An Elevated Blood Co/Cr Ratio is a Biomarker for this.

We will also present 11 posters at the ORS on the topics of implant modularity and associated corrosion problems, the consequences of manufacturer mixing and matching of components and 3D imaging of the hip.

Patient and Public engagement

Gwynneth Lloyd has led our engagement with patients and the public. She set up a patient group in 2009. Members are patients with problematic artificial hip joints. The majority had no clear explanation and so attended special clinics run by Prof Alister Hart and Gwynneth Lloyd. These patients then donated their implants after they were removed. Gwynneth invited these patients to **open days** at UCL and organised a tour of the laboratory that analyses the hips so the patients could see the importance of their donated hip.



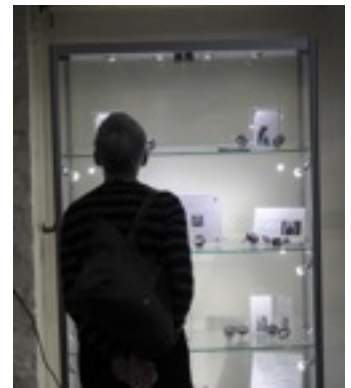
Our focus groups allowed patients to share their experience and help generate patient advice that has been disseminated worldwide and is detailed on the webpages of Arthritis Research UK (one of the most visited pages on their site)

www.arthritisresearchuk.org/arthritis-information/surgery/mom-hip-q-and-a.aspx.

Occasionally patients drop into the research centre **for one to one discussions** about their implant. These are particularly important for those patients that have undergone multiple operations and very long stays (they are some patients that spent 365 days in).



Our **display cabinets** have created a museum for patients and researchers to see the failed implants up close on a daily basis. More recently, Gwynneth has been making ward visits to the patients undergoing redo surgery. She was an orthopaedic nursing sister and so is comfortable undertaking these visits. She has arranged tours of the department for visiting researchers, surgeons, engineers, nurse specialists as well as patients. She has organised donations from patients who want to further our research. Through her public engagement activities, Gwynneth has raised awareness among patients and their families of research in the field of hip replacement and hip revision at the RNOH and the LIRC; offered patients an opportunity to gain some first-hand knowledge into the research; provided opportunities to patients to share their experience with researchers, surgeons, clinicians and other patients; and disseminated our research findings to the public.



We have had some really positive responses from attendees of our open days:

“Just to say thanks for a really wonderful and interesting day again. Once again all your hard work is much appreciated”

“Very good, the Q and A was very useful”

“The highlight of course was being able to handle my own metal on metal hip and compare it to others! It was also interesting speaking to the Laboratory Technician who was very helpful answering all of our questions

Our journal papers

We have published over 50 papers with more than 150 co-authors. There are 5 more in press for 2015. The following were published in 2014.

1. Elizabeth Robinson, Johann Henckel, Shiraz Sabah, Keshthra Satchithananda, John Skinner, Alister Hart: *Cross-sectional imaging of metal-on-metal hip arthroplasties. Can we substitute MARS MRI with CT?*. Acta Orthopaedica. 09/2014;
2. A J Hart, S A Sabah, B Sampson, J A Skinner, J J Powell, L Palla, K J J Pajamäki, T Puolakka, A Reito, A Eskelinen: *Surveillance of Patients with Metal-on-Metal Hip Resurfacing and Total Hip Prostheses: A Prospective Cohort Study to Investigate the Relationship Between Blood Metal Ion Levels and Implant Failure..* The Journal of bone and joint surgery. American volume. 07/2014; 96(13):1091-1099.
3. Saket Tibrewal, Shiraz Sabah, Johann Henckel, Alister Hart: *The effect of a manufacturer recall on the threshold to revise a metal-on-metal hip..* International Orthopaedics 05/2014;
4. Harry A. McKellop, Alister Hart, Sang-Hyun Park, Harry Hothi, Pat Campbell, John A. Skinner: *A lexicon for wear of metal-on-metal hip prostheses.* Journal of Orthopaedic Research 05/2014;
5. Salim K Durrani, Philip C Noble, Barry Sampson, Therese Panetta, Alexander D Liddle, Shiraz A Sabah, Newton K Chan, John A Skinner, Hart J Alister: *Changes in blood ion levels after removal of metal-on-metal hip replacements..* Acta Orthopaedica 04/2014;
6. Imran A Siddiqui, Shiraz A Sabah, Keshthra Satchithananda, Adrian K Lim, Suzie Cro, Johann Henckel, John A Skinner, Alister J Hart: *A comparison of the diagnostic accuracy of MARS MRI and ultrasound of the painful metal-on-metal hip arthroplasty..* Acta Orthopaedica 04/2014;
7. Robert K Whittaker, Adam Hexter, Harry S Hothi, Anna Panagiotidou, Paul J Bills, John A Skinner, Alister J Hart: *Component Size Mismatch of Metal on Metal Hip Arthroplasty: An Avoidable Never Event..* The Journal of arthroplasty 03/2014;
8. T M Parsons, K Satchithananda, R Berber, I A Siddiqui, E Robinson, A J Hart: *Magnetic resonance imaging investigations in patients with problems due to metal-on-metal implants.* Der Orthopäde 01/2014;

Our most cited papers with more than 50 citations are listed below

Paper	Google Scholar	Web of science
A J Hart, S Sabah, J Henckel, A Lewis, J Cobb, B Sampson, A Mitchell, J A Skinner: The painful metal-on-metal hip resurfacing.. Journal of Bone and Joint Surgery - British Volume 07/2009; 91(6):738-44.	131	96
A J Hart, T Hester, K Sinclair, J J Powell, A E Goodship, L Pele, N L Fersht, J Skinner: The association between metal ions from hip resurfacing and reduced T-cell counts.. Journal of Bone and Joint Surgery - British Volume 04/2006; 88(4): 449-54.	120	94
F S Haddad, R R Thakrar, A J Hart, J A Skinner, A V F Nargol, J F Nolan, H S Gill, D W Murray, A W Blom, C P Case: Metal-on-metal bearings: the evidence so far.. Journal of Bone and Joint Surgery - British Volume 05/2011; 93(5):572-9.	109	54
A J Hart, P Buddhdev, P Winship, N Faria, J J Powell, J A Skinner: Cup inclination angle of greater than 50 degrees increases whole blood concentrations of cobalt and chromium ions after metal-on-metal hip resurfacing.. Hip international: the journal of clinical and experimental research on hip pathology and therapy 01/2008; 18(3):212-9.	97	54
A J Hart, S A Sabah, A S Bandi, P Maggiore, P Tarassoli, B Sampson, J A Skinner: Sensitivity and specificity of blood cobalt and chromium metal ions for predicting failure of metal-on-metal hip replacement.. Journal of Bone and Joint Surgery - British Volume 10/2011; 93(10):1308-13.	74	42
Alister J Hart, Keshthra Satchithananda, Alexander D Liddle, Shiraz A Sabah, Donald McRobbie, Johann Henckel, Justin P Cobb, John A Skinner, Adam W Mitchell: Pseudotumors in association with well-functioning metal-on-metal hip prostheses: a case-control study using three-dimensional computed tomography and magnetic resonance imaging.. The Journal of Bone and Joint Surgery 02/2012; 94(4):317-25.	70	36
A J Hart, J A Skinner, P Winship, N Faria, E Kulinskaya, D Webster, S Muirhead-Allwood, C H Aldam, H Anwar, J J Powell: Circulating levels of cobalt and chromium from metal-on-metal hip replacement are associated with CD8+ T-cell lymphopenia.. Journal of Bone and Joint Surgery - British Volume 06/2009; 91(6):835-42.	57	41

Acknowledgements and funders

Our first major funding contract was with the British Orthopaedic Association and an industry consortium of nine manufacturers: DePuy, Zimmer, Smith & Nephew, Biomet, JRI, Finsbury, Corin, Mathys and Stryker. All manufacturers signed one contract which gave us freedom to publish all results.

The following have provided further funding:

The Furlong Charitable Research Foundation
British Hip Society
Johnson and Johnson, for the Depuy ASR Retrieval Program
Stryker, for the modular-neck hip global retrieval program
EPSRC
Technology Strategy Board
NIHR portfolio
HM coroner
RNOH Trust Charity
Dunhill Medical Trust
ENDO-Klinik Foundation
The Orthopaedics Charitable Trust Fun
Patient donations

The Depuy ASR Retrieval Program

Johnson and Johnson launched an international competition to run a global ASR hip implant retrieval program. The LIRC won the contract which began in July 2011.

Due to legal sensitivities, Depuy must be “hands-off” all aspects of the work. The reports are sent to patients, surgeons and lawyers acting for both sides if required. The hips can be sent to any other laboratory in the world, at the patients request and without cost to them.