Surface Degradation Linked to Actuator Pin Fracture in Magnetically Controlled Growth Rods (MCGRs)

Vasiliki C. Panagiotopouloua, Stewart Tucker, Harry S. Hothia, Alexander Gibson, John A. Skinner, Alister J. Hart, Thomas Ember, Julian J. H. Leong,

Institute of Orthopaedics and Musculoskeletal Science
University College London

The Royal National Orthopaedic Hospital, Stanmore

Great Ormond Street Hospital for Children, London

Guy's and St Thomas NHS Foundation Trust, London

Disclosures

Stewart Tucker

Consultancy agreement and royalty agreement with Nuvasive

(not related to the Magec system)

Growing Rod Options

- Single Rod Constructs
- Double Rod Constructs eg domino, Shilla
- Hybrid eg. VEPTR
- MAGEC, Phenix (Magnetic Growing Rods)

Complications of growing-rod treatment for EOS
Analysis of 140 patients

S Bess, B Akbarnia et al
JBJS November 2010

177 complications in 140 patients

Complication rate of 126%

Single Growing Rods

N Farooq, S. K Tucker, H. Noordeen. Spine 2010

- 88 patients wth single submuscular growing rods
- Cobb Angle Improvement – 73 > 44° at final follow up
- T1-S1 height gain: 3.37cm (1.04cm per year)
- 60 complications
  - 16 cases of anchor failure
  - 31 rod fractures
  - 11 cases developed sup or deep infection

The Magnetic Growth Rod MAGEC™

- Obviates the need for repetitive surgery
- Outpatient lengthening
- Decreases Morbidities
- Decreases stress on parents and patients
- Reduces cost

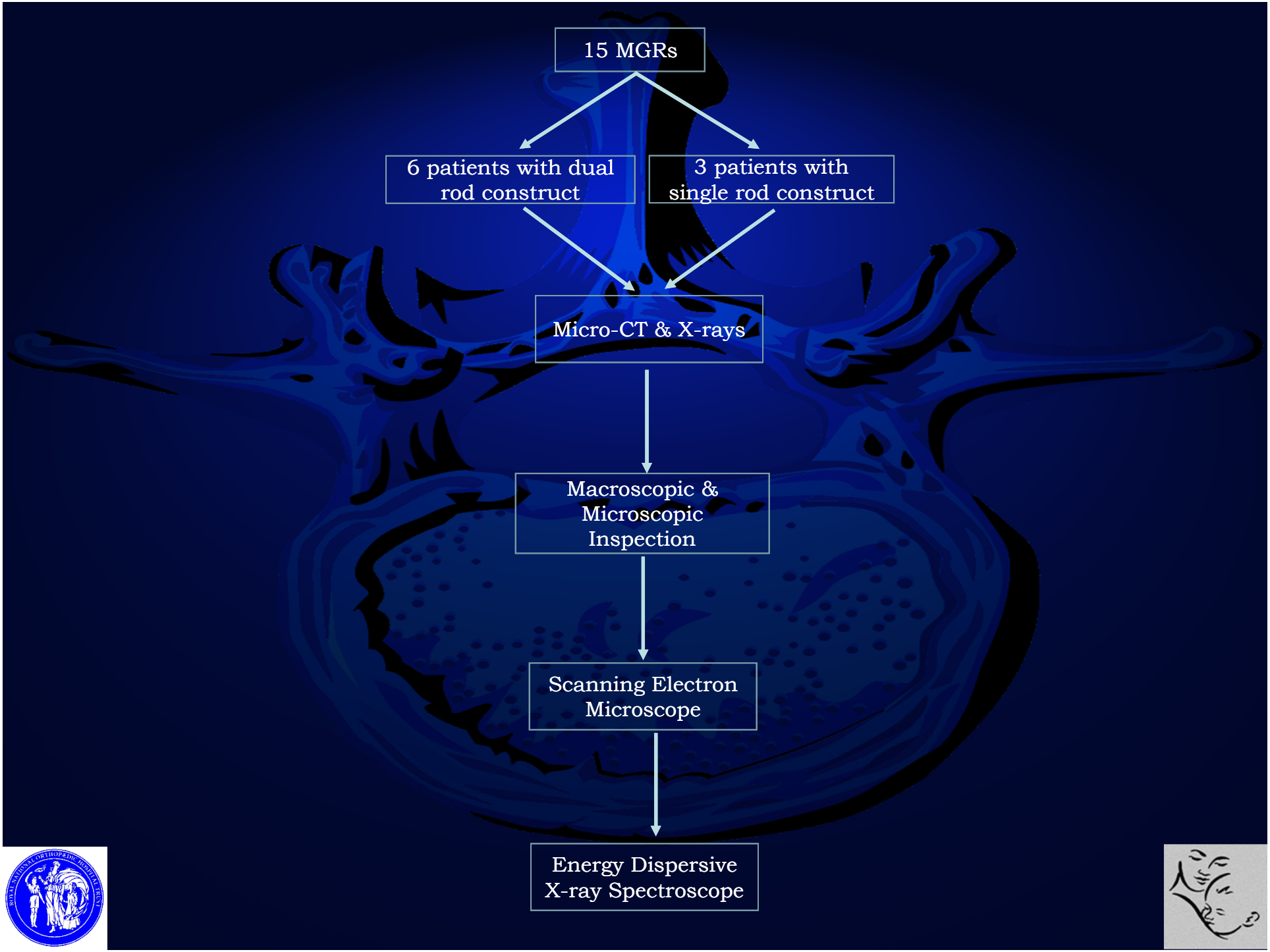
BritSpine 2016

The 'MAGEC" Debate: Trick or Treat

"up to 22% unplanned revision surgeries"

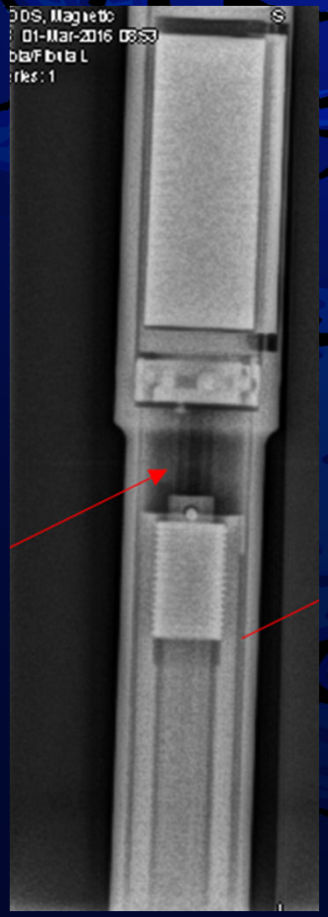
Materials & Methods

- ✓ 9 patients (8F:1M)
- ✓ 15 rods in total
- ✓ Mean age at primary 10.2 years old
- ✓ Reasons for revision:
  - ➢ Metal staining of the skin
  - ➢ Swelling
  - ➢ Progression of scoliosis
  - ➢ Failure of distraction
  - ➢ Final fusion


15 MGRs
6 patients with dual rod construct
3 patients with single rod construct
Micro-CT & X-rays
Macroscopic & Microscopic Inspection
Scanning Electron Microscope
Energy Dispersive X-ray Spectroscope

Results

- 5 (33%) had fractured pins

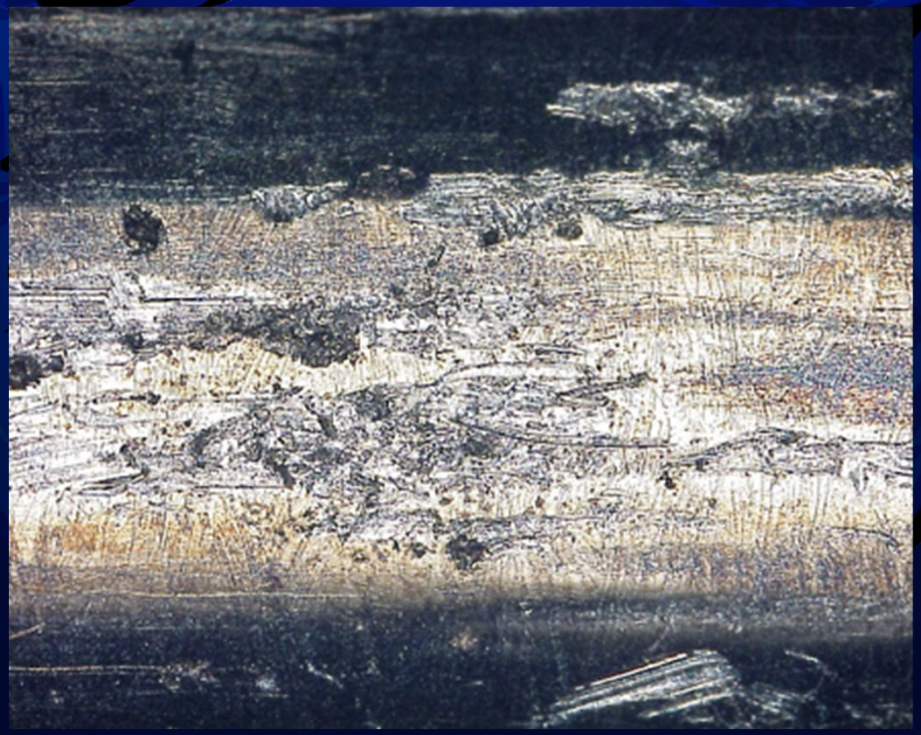


Results

- All rods had surface damage on the actuator part, but damage appeared greater if pin fractured

Microscopic inspection

All implants showed signs of pitting and fretting at the area of the revealed rod during elongation

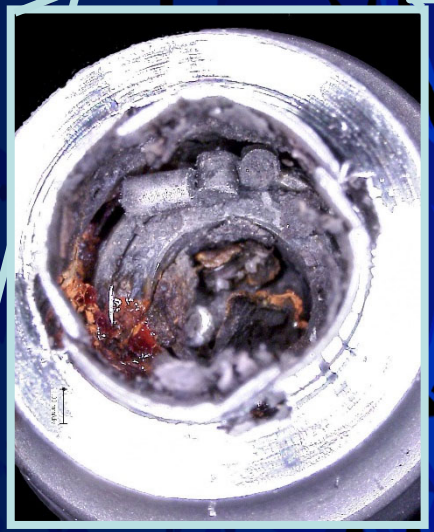


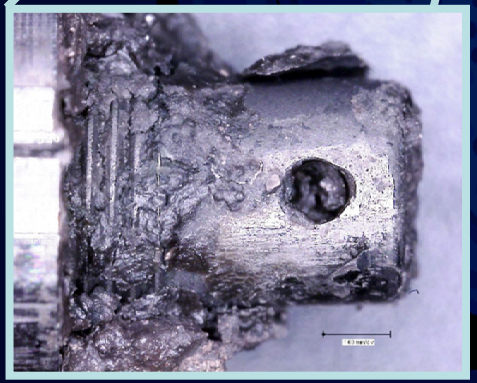
Results

- We sectioned two rods:
  - one with pin fracture
  - one with intact mechanism

  to understand how they perform in situ


A130501-07





Conclusion

Proposed mechanism of failure:

Body fluid ingress results in corrosion of the internal mechanism.

This corrosion can result in pin fracture.

Distraction ability of the implant is lost

Greater surface degradation

Variable levels of metallosis

Revision surgery is required

Generations of MAGEC® Rods

Generation 2: 2015 -

Modification 2: 2012 – 2016

Modification 1: 2010 - 2012

Generation 1: 2009 - 2011

Concern

There are currently many implanted Magec rods, without the latest modifications of increased corrosion resistance and pin strength

It can be anticipated that a percentage of these rods will fail, due to the mechanisms described, necessitating revision surgery

For more information

Visit our website www.lirc.co.uk

Follow us on Twitter @The_LIRC

Join the 2016 LIRC conference