“A Decade of change in Rheumatology: the impact of Musculoskeletal podiatry”

Dr Cathy Bowen

Associate Professor

Faculty of Health Sciences

Centre For Innovation and Leadership

Active Living and Rehabilitation Research Group
Our location

- Just over 1 hour away from central London
- 45 minutes to Heathrow Airport
- 10 minutes to Southampton Airport
- Less than 30 minutes from the New Forest National Park

healthsciences@southampton.ac.uk
Tel +44 (0)23 8059 7979
www.southampton.ac.uk/healthsciences
Presentation Outline

- Breakthrough in knowledge of pathophysiological events in RMDs.
- Major advances in medical management
- Current status of podiatric and foot and ankle research in RMDs
- New approaches to diagnosis.
- Advances in management of RMD foot and ankle pathology
Rheumatology scope

- Rheumatology is concerned with the diagnosis and management of diseases and of painful and functional disorders of the musculo-skeletal system.

- Rheumatic diseases have been conveyed as the commonest cause of work-limiting health problems, long standing illness and sickness absence worldwide (Woolf et al., 2012).

- They are common in all countries and cultures with a consequent substantial burden on health and social care and a major impact on healthcare resources (Woolf et al., 2012).
Rheumatology scope

• In the United Kingdom (UK) 20 million people are reported to experience rheumatic disease, with 15% consulting their General Practitioners (GPs) in 1 year about musculoskeletal symptoms (Coady and Lillicrap, 2011).

• Conditions related to rheumatic disease form 20–25 per cent of a GP’s workload (Coady and Lillicrap, 2011).

• Nearly three in ten of those aged over 75 state they are in chronic pain due to some form of ‘arthritis’ (ArthritisCare, 2012) and often experience a lessened quality of life (Arden and Nevitt, 2006).

• As the baby boom generation evolves, with reduced physical activity and increasing obesity, rheumatic disease and consequent disability will be a prime public health issue (Woolf et al., 2012).
<table>
<thead>
<tr>
<th>Musculoskeletal category</th>
<th>Examples of Rheumatic diseases and conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inflammatory arthritis</td>
<td>Rheumatoid Arthritis; Juvenile Idiopathic Arthritis</td>
</tr>
<tr>
<td></td>
<td><em>Spondylarthopathies</em>: Ankylosing Spondylitis; Psoriatic Arthritis; Reiters Syndrome; Reactive Arthritis</td>
</tr>
<tr>
<td></td>
<td><em>Metabolic</em>: Gout; Pseudogout</td>
</tr>
<tr>
<td>Degenerative or mechanical arthritis</td>
<td>Osteoarthritis</td>
</tr>
<tr>
<td></td>
<td>Spondylosis</td>
</tr>
<tr>
<td>Soft tissue musculoskeletal pain</td>
<td>Tennis elbow; Golfers elbow; Olecranon bursitis; Fibromyalgia</td>
</tr>
<tr>
<td>Back pain</td>
<td>Mechanical lower back pain</td>
</tr>
<tr>
<td></td>
<td>Inflammatory back pain</td>
</tr>
<tr>
<td>Connective tissue disease</td>
<td>Systemic Lupus Erythematosus; Systemic Sclerosis; Dermatomyositis; Polymyositis; Polymyalgia Rheumatica; Vasculitis</td>
</tr>
</tbody>
</table>

Adapted from Arthritis Research UK
http://www.arthritisresearchuk.org/arthritis-information/conditions/arthritis.aspx accessed 12th July 2013
Osteoarthritis (OA)

“OA is experiencing a burgeoning of interest as millions of baby boomers enter into their senior years” (Wilder et al 2005)

“OA is a condition characterised by focal areas of loss of articular cartilage within the synovial joints, associated with hypertrophy of the bone (osteophytes and subchondral bone sclerosis) and thickening of the capsule” (WHO 2003)

http://www.bbc.co.uk/programmes/p00t07qf
Osteoarthritis (OA)
The rheumatoid joint

NORMAL

RA

Synovial membrane

Cartilage

Capsule

Cartilage thinning

Inflamed synovial membrane

Major cell types:
- T lymphocytes
- macrophages

Minor cell types:
- fibroblasts
- plasma cells
- endothelium
- dendritic cells

Synovial fluid

Major cell type:
- neutrophils
WHAT IS RHEUMATOID ARTHRITIS?

RHEUMATOID ARTHRITIS IS A CHRONIC INFLAMMATORY JOINT DISORDER

In England, approximately **580,000** people have been diagnosed with the condition.

Females are up to **4 TIMES** more likely to develop the condition than men.

in the UK live with the condition

RHEUMATOID ARTHRITIS AND THE FOOT

Long standing inflammation leads to structural deformity and soft tissue lesions, which in turn generates areas of pressure that may result in foot ulceration.

Up to **90%** of people with rheumatoid arthritis have some form of disease related foot involvement.

All people with rheumatoid arthritis should have access to foot health services...

Yet **ONLY HALF** of all rheumatology departments report basic foot care services for their patients...

and fewer than **1 IN 10** have formal care pathways or mechanisms for a referral to foot care services.

WHAT CAN BE DONE?

Better integrated NHS primary and acute care would result in earlier diagnosis and treatment of patients with rheumatoid arthritis, ultimately resulting in productivity gains to the economy of **£31 MILLION** from reduced sick leave and lost employment.

Early intervention through the provision of foot orthoses (insoles) has the potential to prevent major functional and structural foot problems.

Through the intervention of foot orthoses, a sustained effect is had on the foot structure and stability of the joints of the foot, thus reducing pain and improving mobility.
Gout in the Foot
Systemic Sclerosis (SSc)

(A) Apical lesion of the left 4th toe with underlying calcinosis (block arrow). (B) X-ray image showing gross calcinosis within the plantar metatarsal area (*), plantar heel (**) and anterior tendons (§). X-ray image reproduced with kind permission from Graham Bowen (Head of Podiatry, Solent NHS Trust).
Dermatomyositis & Polymyositis
Ankylosing spondylitis

Symptoms of ankylosing spondylitis include:

- **Pain and stiffness** in the lower back, buttocks, and hips. The pain can last for weeks, then disappear for months and then return.

- **Fatigue**

- **Heel pain**

- **Eye inflammation**, with redness and pain

http://liberatehealth.us/liberate_condition/ankylosing-spondylitis/ankylosing-spondylitis-full-deck/
Psoriatic Arthritis

SYMPTOMS

Psoriatic arthritis symptoms can be mild and develop slowly or occur suddenly and be severe

- Stiffness, especially in the morning
- Pain and swelling in one or more joints
- Tender swollen tendons
- Swollen fingers and toes
- Changes in fingernails and toenails, such as pitting or separation of nail from the nail bed
- Red, itchy skin

What is it like to be diagnosed with RMD?

http://healthtalkonline.org/peoples-experiences/bones-joints/rheumatoid-arthritis/topics
McGonagle et al Lancet 1998. In Rheumatoid Arthritis it is considered that inflammation starts in the joint lining which is called the synovium. In Psoriatic Arthritis it is recognised that the inflammation may start at the enthesis and then spread to the adjacent bone and synovium and other tissues.
Imaging techniques

Manifestations of rheumatoid arthritis (RA) disease in the forefoot detected radiologically and clinically in patients with RA have recently been highlighted as important.

(van der Leeden, Steultjens et al 2008; Bowen, Culliford et al 2010)
### Kellgren and Lawrence Radiographic Criteria for Assessment of OA*

<table>
<thead>
<tr>
<th>Radiographic grade</th>
<th>0</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classification</td>
<td>Normal</td>
<td>Doubtful</td>
<td>Mild</td>
<td>Moderate</td>
<td>Severe</td>
</tr>
<tr>
<td>Description</td>
<td>No features of OA</td>
<td>Minute osteophyte; doubtful significance</td>
<td>Definite osteophyte; normal joint space</td>
<td>Moderate joint-space reduction</td>
<td>Joint space greatly reduced; subchondral sclerosis</td>
</tr>
</tbody>
</table>

*Radiography does not reliably correlate with symptoms.*

# The Australian Foot Atlas

## Foot Joints Included

<table>
<thead>
<tr>
<th></th>
<th>Joint Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>First metatarsophalangeal joint</td>
</tr>
<tr>
<td>2</td>
<td>First cuneo-metatarsalal joint</td>
</tr>
<tr>
<td>3</td>
<td>Second cuneo-metatarsalal joint</td>
</tr>
<tr>
<td>4</td>
<td>Navicular-first cuneiform joint</td>
</tr>
<tr>
<td>5</td>
<td>Talo-navicular joint</td>
</tr>
</tbody>
</table>

Menz et al. [2007]; Menz et al. 2009
MSUS scanning by a Podiatrist

- A Diasus ultrasound system (Dynamic Imaging Ltd, UK) was used to image the forefoot of all participants to determine the presence of plantar forefoot bursitis.

- Reliability of MSUS scanning technique had been previously tested where good agreement between the investigator and expert radiologist was achieved (kappa 0.702)*.

US in podiatric rheumatology

• Soft tissue
• Tendon or ligament pathology
• Arthritis, synovitis, or crystal deposition disease
• Intra-articular bodies
• Joint effusion
• Evaluation of soft tissue masses, swelling, or fluid collection
• Detection of foreign bodies in superficial soft tissue
• Planning and guiding an invasive procedure
• Postoperative and Post procedural evaluation

Metatarso-cuneiform osteoarthritis

c/o pain over top of foot

Probe to Met-cuneiform joint!
MRI in podiatric rheumatology

- Joint synovitis

- Joint erosions

- Intermetatarsal lesions
MRI Research

• ffRAMRIS & ongoing inflammation
• FFB-Score
Forefoot bursae

• Inter-metatarsal soft tissue lesions associated with MTPJ synovitis (p=0.017)

• Plantar fluid lesions associated with elevated CRP (p=0.035)

Application of the podiatric biomechanics to rheumatological conditions?
3mm poron sheet
‘WHAT IS THE IMPACT MSK PODIATRY SERVICES?’
Impact?

- “a marked effect or influence” Oxford English Dictionary.
- “an effect on change or benefit to the economy, society, culture, public policy or services, health, the environment or quality of life, beyond academia” The Research Excellence Framework (REF) 2014
Interventions

• The overall aims for management of foot pathology associated with rheumatic diseases are to relieve pain, maintain function and improve quality of life.

• A paradigm shift in how foot manifestations of rheumatological disease may be managed is proposed for early detection, targeted therapy and tight control of foot disease, mimicking the medical model for exploiting the ‘therapeutic window of opportunity’ (Woodburn et al., 2010).
Who’s at risk of RA?

There are types of people who may be more likely to develop RA. This includes:

- People with a family history
- Women between the ages of 30 and 60 (it occurs later in life in men)
- Smokers
- Patients with gum disease
Biologics

Anti TNFs

- Infliximab (Remicade)
- Etanercept (Enbrel)
- Adalimumab (Humira)
- Certolizumab (Cimzia)
- Golimumab (Simponi)

B-cell depleter

- Rituximab (MabThera)

IL6 inhibitor

- Tocilizumab (RoActerma)

T-cell inhibitor

- Abatacept (Orencia)
<table>
<thead>
<tr>
<th>Stage</th>
<th>Pathologic Process</th>
<th>Symptoms</th>
<th>Physical Signs</th>
<th>Radiographic Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Presentation of antigen to T cells</td>
<td>Probably none</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>T-cell proliferation&lt;br&gt;B-cell proliferation&lt;br&gt;Angiogenesis in synovial membrane</td>
<td>Malaise, mild joint stiffness and swelling</td>
<td>Swelling of small joints of hands or wrists, or pain in hands, wrists, knees and feet.</td>
<td>None</td>
</tr>
<tr>
<td>3</td>
<td>Accumulation of neutrophils in synovial fluid&lt;br&gt;Synovial-cell proliferation without polarisation or invasion of cartilage</td>
<td>Joint pain and swelling, morning stiffness, malaise and weakness</td>
<td>Warm swollen joints, excess synovial fluid, soft tissue proliferation within joints, pain and limitation of motion, rheumatoid nodules</td>
<td>Soft tissue swelling</td>
</tr>
<tr>
<td>4</td>
<td>Polarization of synovitis into centripetally invasive pannus.&lt;br&gt;Activation of chondrocytes&lt;br&gt;Initiation of enzyme (proteinase) degredation of cartilage</td>
<td>Same as stage 3</td>
<td>Same as stage 3, but more pronounced swelling</td>
<td>MRI reveals proliferative pannus: radiographic evidence of periarticular osteopenia</td>
</tr>
<tr>
<td>5</td>
<td>Erosion of subchondral bone. Invasion of cartilage by pannus.&lt;br&gt;Chondrocyte proliferation.&lt;br&gt;Stretched ligaments around joints</td>
<td>Same as stage 3, plus loss of function and early deformity (eg. Ulnar deviation at metacarpophalangeal joints)</td>
<td>Same as stage 3, plus instability of joints, flexion contractures, decreased range of motion, extra-articular complications</td>
<td>Early erosions and narrowing of joint spaces</td>
</tr>
</tbody>
</table>
The Research Excellence Framework (REF) 2014

- Podiatry related submissions can mostly be found in Unit of Assessment 3 ‘Allied Health Professions, Dentistry, Nursing and Pharmacy’.

- 3 key podiatry centres provided Impact case studies, all of which interestingly related to musculoskeletal podiatry: University of Salford, Glasgow Caledonian University and University of Leeds.

- [http://impact.ref.ac.uk/CaseStudies/](http://impact.ref.ac.uk/CaseStudies/)
• Research by the Salford team has accelerated innovation of footwear and foot orthotic products to increase mobility, independence and quality for life for a wide range of users.

• Glasgow Caledonian University researchers have dramatically changed the manufacture of custom ankle-foot and foot orthoses through additive manufacturing (3D printing) combined with improved design personalisation.

• University of Leeds have driven improvements in musculoskeletal foot care services through their ‘FASTER’ (Foot and Ankle STudiEs in Rheumatology) clinical trials and a national survey that directly informed NICE guidelines on foot care in arthritis (NICE 2009).
Foot and Ankle Research programme
Dr Cathy Bowen (research lead) email: cjb5@soton.ac.uk

The Clinical Problem:
Recently, The World Health Organisation declared that irrespective of age, disease, pain severity or disability, exercise should be at the core of non-drug treatments for arthritis. We noticed a problem with this in that to be able to complete recommended exercise such as daily walking, your feet need to be free from pain. We were concerned about this because our patients said that they were forcing themselves to walk through their foot pain in order to manage their hip or knee arthritis or other problems such as heart disease.

Research we are doing aims:
✓ to define how arthritis affects the feet, ankles and lower limbs,
✓ to provide more detailed information that will help clinicians and patients understand how to target treatment
✓ to better manage an individual's arthritis.

What we are finding:
➢ More people who have arthritis have foot pain or foot symptoms than was previously known.
➢ Foot symptoms appear to be very high in people who have conditions such as lupus and rheumatoid arthritis.
➢ About 40% of people waiting for knee surgery have foot pain and one third of people with osteoarthritis suffer with foot pain.
➢ Unfortunately what we also found was that very few of these people had treatment or advice from a podiatrist.

From our experiments we have also found that foot arthritis can remain even after drug treatment and that this may be a complicated vicious circle affected by the way a person walks. We found that the early signs of foot arthritis are not always easily detected but using diagnostic ultrasound this was much simpler.

So far we have made significant impact of this work in changing clinical practice as we have introduced musculoskeletal imaging of the foot to podiatrists and other clinicians involved in foot care. Podiatrists are being made more aware of how ultrasound can improve their diagnoses in a more timely manner allowing them to begin treatments for their patients’ foot arthritis much earlier.
Final thoughts

- A large percentage of the world population suffer with some form of arthritis, yet it is surrounded by many myths and this may be why people who have arthritis do not seek medical advice.

- The foot is an often neglected area of investigation and clinical attention.

- Now reflect on your own knowledge and ensure that you are offering the best treatments for your patients with arthritis based on the ever changing current evidence.
Useful website resources for people with rheumatic diseases

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arthritis Care</td>
<td><a href="http://www.arthritiscare.org.uk/">http://www.arthritiscare.org.uk/</a></td>
</tr>
<tr>
<td>Arthritis Research UK</td>
<td><a href="http://www.arthritisresearchuk.org/">http://www.arthritisresearchuk.org/</a></td>
</tr>
<tr>
<td>Raynaud’s and Scleroderma Association</td>
<td><a href="http://www.raynauds.org.uk/">http://www.raynauds.org.uk/</a></td>
</tr>
<tr>
<td>National Ankylosing Spondylitis Society</td>
<td><a href="http://www.nass.co.uk/">http://www.nass.co.uk/</a></td>
</tr>
<tr>
<td>The Psoriasis Association Lupus UK</td>
<td><a href="https://www.psoriasis-association.org.uk/">https://www.psoriasis-association.org.uk/</a></td>
</tr>
</tbody>
</table>

Research has shown that people with rheumatic diseases often have shared common information needs that should be considered as essential components of foot health education (Alcacer-Pitarch et al., 2011, Firth et al., 2012, Graham et al., 2012a, Hendry et al., 2012, Harrold et al., 2012, Harrold et al., 2010).