

**International Society for Prosthetics and Orthotics UK National Member Society**



## Winter Bulletin



### Chair's Report ~ Christmas 2011



Seasons greetings to you all! It is the time of year when carols are sung, Christmas trees are decorated, wreaths are hung and everyone rushes around planning for the festivities soon to come... It is also time for our ISPO UK Christmas bulletin.

It has been a busy first year... mainly involved in organising the scientific meeting, representing ISPO at a number of different meetings and we have updated our constitution in line with that of the international committee.

Our 2011 annual scientific meeting was held on the 7<sup>th</sup> and 8<sup>th</sup> October 2011 in London for the first time in many years at the W12 Conference Centre in Hammersmith. It was a well attended and very successful meeting and I will compile a report for the next bulletin.

Planning for the 2012 Trent International Symposium being held on the 21<sup>st</sup>- 23<sup>rd</sup> May 2012 is well underway and I hope that you have the date in your diary. The programme offers a good variety of speakers and topics and is on course to be a highly successful meeting as in previous years. I would encourage those of you working in the field of upper limb prosthetics to attend what will be an excellent meeting and an opportunity to network with both national and international colleagues.

At the end of November I attended a workshop run by NHS North West on prosthetics and orthotics workforce and education. There were representatives present from a number of different bodies including the British Healthcare Trades Association, the Associate Parliamentary Limb Loss Group and the Centre for Workforce Intelligence. Presentations were made on the purpose of the workshop by the Assistant Director of Education and Commissioning, NHS North West; the Service Perspective by BHTA and the Patient Perspective by APLLG. There was a great deal of discussion regarding the current workforce – methods for collecting robust data on the current workforce, risks, factors that may influence service demand in the future and pre-registration

education. Another meeting will be convened in the summer 2012. The outcomes of the group are stated below:

- An enhanced understanding of current workforce risks and opportunities
- An agreed and sustainable way forward to collating workforce intelligence
- An enhanced understanding of current issues related to pre-registration education
- An agreed and sustainable approach to employer and patient engagement in pre-registration education
- An overview of the wider/non-registered workforce and education issues
- An overview of the academic/clinical academic workforce and any issues
- An understanding of the various roles of the stakeholders within the new organisational architecture
- An agreed approach to national collaborative working into the future

Planning for our collaborative event for 2012, our 40 year anniversary, with both BAPO and BACPAR is well underway. This will be the first time all three organisations have come together to meet colleagues working in the field of prosthetics and orthotics, reflect on the past 40 years of ISPO UK and to share practice and new innovations. The president of ISPO, Jan Geertzen has agreed to join us and will be a keynote speaker. Potential dates for your diary for the meeting are 27<sup>th</sup> and 28<sup>th</sup> September 2012 but as soon as we have the dates finally confirmed we will e-mail all the members and will be publishing them widely, as this will be an event not to be missed! If you have any ideas for the programme or key speakers then please do contact me by e mail. Calling all more long term members of ISPO UK – if you have any old photographic evidence of past ISPO UK activities then please do contact me at: [laura.burgess@imperial.nhs.uk](mailto:laura.burgess@imperial.nhs.uk). I hope to put together a collection for the meeting as we celebrate our ruby anniversary.

May I wish you and your families a very Merry Christmas and a happy, healthy and successful New Year in 2012!

Laura Burgess  
Chair ISPO UK NMS

# International Society for Prosthetics and Orthotics UK National Member Society annual conference, W12 conference centre, London 2011

## Presenters and Abstracts

### GUEST SPEAKERS



**Sue McLellen**

Sue is Chief Operating Officer, London Specialised Commissioning Group. As a former Trust and PCT Chief Executive, and with almost 40 years experience of NHS management in both the north east of England and London, encompassing acute, community and mental health providers as well as PCT and specialized services commissioning Sue has a wealth of knowledge and experience to draw upon

in what is probably her most challenging role to date. The London SCG is a joint committee of the 31 PCTs in London, established to commission specialised services for London residents. Specialised services are high cost and low volume, defined in the Specialised Services National Definition Set (SSNDS). The challenge for the SCG is to ensure, through the commissioning process, that these services are safe and sustainable as well as providing good outcomes and experiences for patients and representing value for money. For the last year Sue has also led the Policy Convergence transition workstream on behalf of the 10 SCGs in England, in preparation for the single commissioning of a range of specialised services by the NHS Commissioning Board (subject to the outcome of the Health and Social Care Bill). This work includes the development of service specifications and commissioning policies for all services contained in the SSNDS, for use by commissioners consistently across England.



**Saeed Zahedi**

Professor Saeed Zahedi OBE, Fellow of the Institute of Mechanical Engineers is Technical Director and head of R&D at Blatchford and Endolite. He is a visiting Professor at University of Surrey Biomedical Engineering and Bournemouth school of computing and design, external examiner at Dundee and Strathclyde with 33 years of experience in area of lower limb prosthetics. He is a 2011 nominee for Prince Philip Designer prize, finalist of 2010 Royal Academy of Engineering McRoberts award. His work includes

commercialisation of the first Microprocessor knee and first hydraulic ankle, leading to 4 Queens Award for technological achievement, the Prince of Wales award for innovation, and Millennium product. A member of ISO, CEN and IEC Working Group, he has won several prizes for best scientific paper in Prosthetics and Orthotics, including 4 Blessma in recent years, IMechE special need in 2004 and as far back as ISPO Forchheimer prize in 1989 for his PhD work conducted at Strathclyde University. He is the author and presenter of over 100 papers, books, scientific publication and over 25 patents, and plays an active role in AOPA. He currently works with his team on future integrated prosthesis.



**Jason Highsmith**

M. Jason Highsmith, DPT, CP, FAAOP is a dual licensed Prosthetist and Physical Therapist. He is jointly appointed as an Assistant Professor at the School of Physical Therapy & Rehabilitation Sciences at the University of South Florida (USF) and a prosthetic/amputee rehabilitation researcher at the James Haley VA Patient Safety Center. Currently he is a PhD candidate in the USF's Medical Science program.



### **Keith Jones**

Keith Jones is a Consultant Vascular Surgeon at the St George's Vascular Institute and Kingston Hospitals and works closely with the Douglas Bader Unit. Keith trained in London having obtained his FRCS 1996, and in specialising in Vascular Surgery developed a particular interest in lower limb arterial surgery. He became a Consultant at King's and then moved to St George's as the lead for lower limb arterial surgery and the subsequent limb salvage work was recognised by the inaugural Ilegx team award. He has a large clinical work load in Diabetic limb salvage and is a regular lecturer on distal bypass and amputation surgery.

### **Dishan Singh**

Mr Dishan Singh studied medicine at Manchester Medical School graduating in 1983. He obtained Fellowship of the Royal College of Surgeons of England in 1988 and then proceeded to specialist orthopaedic training at the Royal London Hospital and the Royal National Orthopaedic Hospital during which he spent one year on a research fellowship from the British Orthopaedic Association to study the effects of free radicals on joint inflammation and prosthetic implant loosening. He was in 1995 appointed as a Clinical Senior Lecturer, within the UCL Institute of Orthopaedics & Musculoskeletal Science with clinical commitments at the Royal National Orthopaedic Hospital and Barnet General Hospital. He took leave in 1996 to do a foot and ankle fellowship in Texas, USA and, on his return, set up with John Angel the foot and ankle unit of the Royal National Orthopaedic Hospital where he now works full time and is director of the unit. He is also an Honorary Senior Lecturer in Orthopaedics at the Royal Free & University College Medical School, University of London. Mr Dishan Singh is heavily involved in training and set up the first foot and ankle fellowship in England with over a dozen of past fellows now in post as consultant orthopaedic surgeons with an interest in foot and ankle surgery. More recently, he has become involved in the training and regulation of the profession of physician assistants, a new profession in the United Kingdom.

Mr Dishan Singh is a past –president of the British Orthopaedic Foot and Ankle Society and is a referee for many international orthopaedic journals. He is an advisor to the National Institute for Health and Clinical Excellence (NICE) and is a specialist advisor to BMJ Clinical Evidence. He has authored several text books and is currently editing the foot and ankle section of the European textbook of Orthopaedics and Trauma. He was instrumental in the introduction of modern foot and ankle surgery techniques (such as Scarf osteotomy, Weil osteotomy and pes cavus correction to the United Kingdom and has also innovated on surgical techniques himself. He has also set up a multi-disciplinary approach to patient care within the foot and ankle unit where patients are seen not only by doctors but also by nurses and therapists during their journey.



### **William Munro**

Willie Munro has been a qualified Orthotist for 30 years, 15 of which has been spent in working with diabetic foot disease in West Central Scotland. He is a clinical associate at the National Centre for Prosthetics and Orthotics at the University of Strathclyde and has taught at both undergraduate and post graduate level "A rationale approach to the treatment of diabetic foot disease". Willie is a member of the Scottish diabetic foot action group which is currently working on competencies for orthotists and podiatrists working in diabetic foot care and on pressure relief guidelines. He is also on the editorial board of the Diabetic Foot Journal.

### **Helen Scott**

Helen Scott is a team leader and clinical specialist physiotherapist based at Westmarc, a regional prosthetic service in Glasgow, Scotland. She has worked with lower limb amputees in various settings for over 25 years. She is particularly interested in measuring rehabilitation outcomes, the treatment and prevention of long term overuse injuries, instrumented gait assessment and multidisciplinary treatment planning for complex patients and more recently, the treatment of paediatric amputees.



**Andrew Boulton, MD, DSc (Hon), FRCP**

Professor Boulton graduated (with honours) from the University of Newcastle-upon-Tyne Medical School and subsequently trained in Sheffield and Miami prior to accepting an appointment at the University of Manchester. Professor Boulton has authored more than 400 peer-reviewed manuscripts and book chapters, mainly on diabetic neuropathy and foot complications. Among his many awards, his contribution to worldwide care of the diabetic foot was honored by receiving the American Diabetes Association's Roger Pecoraro Lectureship, the EASD Camillo Golgi prize and he was the first recipient of the international award on diabetic foot research. He was also the 2008 recipient of the ADA's Harold Rifkin award for distinguished international service in the field of diabetes. Professor Boulton was the founding Chairman of the Malvern diabetic foot meetings which have been held every two years since 1986 and are now internationally known.

He was also the founding chair of the Diabetic Foot Study Group of the EASD, and was previously Chairman of Postgraduate Education and then programme chair, for the European Association for the Study of Diabetes (EASD). He is a former editor of *Diabetic Medicine*, and is currently an associate editor of *Diabetes Care*. He was chair of the ADA Foot Care Interest Group from 2005-2007. He is currently Vice-President and director of international postgraduate education for the EASD.



Title: **Commissioning of P & O Services**

Presenter: **Sue McLellen**  
Chief Operating Officer, London Specialised Commissioning

This presentation will cover the development of the service specification and commissioning policy for SSNDS 5 services.



Title: **Why we need to know more about Prosthetic Feet**

Presenter: **Professor Saeed Zahedi, Technical Director, Chas A Blatchford & Sons Ltd, Basingstoke**

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Lower limb amputee rehabilitation is, arguably, the most challenging task for today's P&O professionals. With recent advances in technology facilitating independent living for young, amputee soldiers missing both lower limbs and an upper limb has become a real possibility. With the introduction of new regulatory framework, selection of the best prosthetic device for the amputee is now a legal requirement for every professional. A prosthetic foot is the common component for all levels of major lower limb amputation. The critical characteristics of foot and ankle function, as the interface between prosthesis and ground, have now been determined to produce optimum function of the entire prosthesis. With over 30 types of feet currently available, from a range of over 300 designs, produced in the past 3 decades, there is a real need to review our understanding of the underlying biomechanical principles in amputee locomotion. This will result in a review of our opinion and the criteria used in appropriate selection of the prosthetic foot. Comfort, stability and efficiency for the amputee remain the goals for designers of prosthetic devices. To achieve these aims, the role of the prosthetic foot and ankle in reducing compensatory movements required by the amputee in order to participate in today's life style choices, will be discussed together with current and future trends of prosthetic feet technology. We are at an early stage of a renaissance in the field of prosthetics taking the first steps towards an integrated prosthesis.

Title: **Investigation into the Effects of Prosthetic Prescription on Patients' Activity and Quality of Life. A Comparison Between Echelon and Esprit Feet**

Presenter: **Mr Alan McDougall (prosthetist) BSc (Hons)**

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### **Aim**

The Echelon foot is a carbon fibre foot with independent toe and heel springs and a hydraulic self aligning ankle, this allows the foot to adjust to slopes allowing the amputee to stand safely and with stability on slopes. The aim of this study was to quantify and measure the claims of this foot and how this will impact on the patient's activity and quality of life by comparing the Echelon foot to the Esprit foot.

### **Method**

A group of ten patients (five trans-tibial and five trans-femoral) were selected to trial two different feet; the Esprit (a carbon fibre foot with independent toe and heel springs and a rigid ankle), and the Echelon (a carbon fibre foot with independent toe and heel springs and a hydraulic self aligning ankle). Each patient had a blind trial of the feet and wore each for a month. During this month the patient's activity was measured with a long term activity monitor (LAM) which gave an average number of steps per day and an average cadence. After using each foot for a month the patients were asked to complete a Prosthesis Evaluation Questionnaire (PEQ), which is a validated questionnaire, measuring prosthetic related quality of life over a month period.

### **Outcomes**

The results from the LAMs showed no significant change in either average steps per day or average cadence for each foot.

The PEQ demonstrated that all patients were much happier with their prosthesis whilst using the Echelon foot, especially when walking outdoors, the trans-tibial patients scored the Echelon foot 11% higher while the trans-femoral patients scored the Echelon foot 76% higher.

### **Conclusion**

The use of the Echelon foot is of benefit to both trans-tibial and trans-femoral patients but especially trans-femoral patients. However it may not increase an established amputee's activity.

**This author won the Limbless Association prize**

Title: **Effects of a hydraulic ankle on gait function and symmetry in unilateral lower limb amputees**

Presenter: **Alan R De Asha, Post Graduate Research Student**

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Other Authors: Dr Louise Johnson and Dr John G Buckley, from University of Bradford, and Prof Jai Kulkarni and Drs R. Bose, G. Bavikatte, and A. McKendrick, from the Disablement Services Centre UHSM NHS Trust, Manchester.

Introduction. Traditional prosthetic ankles have limited or no mechanical movement. Recently, components which allow the prosthetic 'ankle' to plantar- and dorsi-flex hydraulically have been developed. The purpose of this study was to investigate the effects of using a hydraulic ankle compared to a fixed ankle upon gait function and symmetry during over-ground walking in unilateral trans-tibial (TT) and trans-femoral (TF) amputees.

Methods: Ten active amputees (6TT,4TF,mean age  $43.9 \pm 13.1$  years, height  $1.77 \pm 0.07$  m, mass  $84.4 \pm 11.8$  kg) completed 10 over-ground walking trials at their self-selected speed whilst wearing their habitual foot-ankle device and while using a hydraulic ankle (Endolite 'Echelon'). The order in which devices were tested was randomized across participants. Segmental and ground reaction force (GRF) data were recorded using an 8 camera motion capture system (Vicon) and two floor-mounted force platforms (AMTI). Analysis focused on determining differences in lower limb kinematics and temporal factors.

Results: When using a hydraulic ankle prosthetic limb step length increased from 0.70m to 0.73m for TTs ( $p=0.004$ ) and from 0.64m to 0.67m for TFs\*. Stride length increased significantly for both TTs ( $p=0.037$ , TFs  $p=0.046$ ). Peak hip flexion, prior to initial contact, increased in all participants on the prosthetic side ( $4.6^\circ$ TT; $p=0.046$ ,  $4.9^\circ$  TF\*) and as a result the differences between sides (hip asymmetry) reduced from  $1.5^\circ$  to  $0.95^\circ$  (TT) and from  $4.0$  to  $2.45^\circ$  (TF). There were no significant changes in hip extension during terminal stance/pre-swing. Peak plantar-flexion, occurring during loading response, increased by  $3.2^\circ$  in TTs ( $p<0.001$ ) and  $1.3^\circ$  in TFs when using the hydraulic ankle with no significant change in plantar-flexion velocity. There were no significant changes in the magnitudes of GRFs in early or late stance, however the centre-of-pressure passed anterior to the base of the prosthetic shank earlier in stance phase for all participants when using the hydraulic ankle (22% from 32% TT;  $p=0.028$ , 23% from 24% TF\*).

(\*non-statistically significant difference. Data collection still on-going)

Discussion: The increased and damped plantar-flexion that occurred when using the hydraulic ankle meant the prosthetic foot could be placed further forward at initial contact. The resulting increase in step length occurred without an accompanying increase in magnitude of the braking component of the GRF. The increase in hip flexion on the prosthetic side improved gait symmetry. The more rapid progression of centre-of-pressure (which is more reflective of able-bodied gait) when a hydraulic ankle was used, together with the increased plantar-flexion, may explain why participants indicated the feeling of a 'flat-spot' or having to 'climb over' the foot was absent and why they were able to increase prosthetic step length. Although data collection is still ongoing these preliminary findings suggest there are potential benefits using a hydraulic ankle for active amputees.

Title: **What do Lower Limb Amputees Think of Their Cosmesis?**

Presenter: **Dr Nicola J Cairns, Research Associate**

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Despite the many advances made over the past thirty years in lower limb prosthetic components<sup>1</sup>, the design of Polyurethane (PU) cosmeses which provide an aesthetic finish has not changed. This is surprising because there are obvious problems with current cosmeses; they are known to lose their original shape as the material degrades and often rupture. Furthermore they are known to influence the function of knee and ankle components. Despite these limitations, the information about cosmesis use is largely anecdotal and the scientific literature has no customer feedback studies routinely used for other consumer products<sup>2</sup>. Consequently knowledge of the satisfaction of lower limb amputees with their cosmeses and the design factors they consider priority is lacking. The aim of this study was to develop and use a questionnaire to ascertain the satisfaction for a sample population of lower limbs amputees in the U.K. with their cosmeses and to establish what they consider to be important design features for future improvements.

The questionnaire (Strathclyde University ethics approval) was developed in consultation with manufacturers, clinicians and amputees. The questions asked for satisfaction and importance of nine features; colour, shape, touch, fit under clothes, cosmesis bending, impact on joints, waterproofing, cleaning, and durability. A combination of categorical, continuous rating, numerical scale and open ended questions was used. The questionnaire was posted to Murray Foundation members (registered charity) and distributed in prosthetic appointments (provided by project partners: Chas A Blatchford Ltd and Pace Rehabilitation Ltd); 296 and 100 postal and appointment questionnaires respectively. The response data was frequency counted to determine the number of respondents in each demographic subcategory. The continuous scale satisfaction scores were converted to a number (0-100); mean values and standard deviations were then calculated. The top three importance ratings were scored and frequency counted.

The response rate was 39%. The sample population was 69% male, 67% and 27% were trans-tibial and trans-femoral amputees respectively and 78% were aged between 45 and 70. Mean satisfaction ranged between 44 (cleaning) and 61 (impact on joints); scores of less than 70 are regarded as poor and should be improved<sup>2</sup>. Higher satisfaction scores were reported by trans-tibial compared to trans-femoral amputees and men compared to women, although statistical significance was not calculated. The feature rated most important (total sample population) was shape matching, followed by unhindered joint movement and natural fit of clothes over the cosmesis. Shape matching remained the most important for all demographic subcategories except for trans-femoral amputees, aged 44 or younger and those at the highest activity level; unhindered joint movement was the top priority for these respondents.

The results indicate that lower limb amputees are currently dissatisfied with their cosmeses and that design improvements would be welcome. The importance ratings indicate that redesign efforts should focus on improving the cosmesis shape and reducing the influence the cosmesis has on the workings of the prosthetic joints. It may also be useful to conduct statistical analyses on the data to ascertain statistically significant correlations between the demographics and satisfaction level or importance rating.

1. Laferrier JZ, Gailey R. Advances in lower-limb prosthetics technology. *Physical Medicine and Rehabilitation Clinics of North America* 2010;21:87-110.

2. Hill N, Brierley J, MacDougall R. *How to Measure Customer Satisfaction*. 2nd ed. Hampshire: Gower Publishing Limited; 2003.

## This author won the BLESMA prize

Title: ***Audit on the care of the sound foot in diabetic amputees at D.S.C. Medway Maritime Hospital, Gillingham***

Presenters: **Drs Afaq Saulat and Eiman Abdelgardir, SpRs in Rehab Medicine**

Incidence of diabetic foot amputations is on rise in UK. Diabetic amputees do receive education about footwear and care of their feet. However due to ongoing problems with stump pain, medication and anxiety about mobility using prosthesis, they forget to care about their sound foot. The Podiatry services are patchy in distribution and not always available in a nearby centre. NICE issued guidance in 2004 about foot surveillance and care of diabetic feet.

The aim of this audit was to evaluate the care of the sound foot in regards to podiatry care, annual diabetic check-up and education about care of the sound foot as well as education about footwear.

Thirty diabetic amputees were assessed in a period of 9 months at DSC Medway Hospital. Of these a total of 3/12 (25%) patients in the high risk group and 3/6 (50%) patients in the intermediate risk group had no provision for foot care. Documentation for foot care was absent in 6/30 (20%) patients. We require 100% input from professional foot care team as well as documentation recording status of the sound foot in order to delay amputation of the contralateral foot thus maintaining quality of life for the amputee. We sent letters to the patients' GPs requesting that they refer the patient to professional foot care services. A repeat audit was done the following year to assess how many of these patients have seen podiatry services. Of the 30 patients, 25 were eligible for treatment (two were transferred and 3 had passed away). Of the 16 who answered a telephone survey, 9 had been receiving foot care (52%). This is still far off from the 100% standard set previously by the NICE guidelines.

This audit shows that there is still room for improvement when it comes to management of the residual foot in diabetic amputee patients. Our re-audit did not show any major improvement in uptake in spite of sharing information with primary care services.

**Recommendation:** Patients to take the initiative to see the GP to obtain access to professional foot care services in the community.

Title: **Safety, Bioenergetic and Healthcare Cost Efficacy of the C-Leg Microprocessor Prosthetic Knee: A Review of the Literature**

Presenter: **M. Jason Highsmith, DPT, CP, Assistant Professor**

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**Background:**

More than 357,000 individuals have a trans-femoral level amputation in the U.S. and the majority are attributable to vascular disease. Trans-femoral amputees use a prosthetic knee for ambulation. Prosthetic knees are generally available with or without microprocessor control. The Otto Bock C-Leg microprocessor prosthetic knee controls stance and swing phase and adjusts to the requirements of the prosthesis wearer fifty times per second. Microprocessor regulated stance and swing phase could improve ambulatory functions such as safety and energy efficiency. Such advancements usually come at considerable cost to the healthcare system. Cost effectiveness of such advancements must be assessed. Several studies have evaluated the safety, energy efficiency and cost efficacy of the C-Leg compared to other prosthetic knees.

**Purpose:**

The purpose of this paper was to review the literature and provide a grade of recommendation for patient safety, gait energy efficiency, and cost effectiveness of the C-Leg microprocessor-controlled prosthetic knee for trans-femoral amputees.

**Design:** Review of the Literature.

**Methods:**

Medline (Ovid) and CINAHL (EBSCO) data bases were searched to identify potentially pertinent studies within the 1995-2009 time range. Studies were screened and sorted. Pertinent studies were rated for methodological quality and for risk of bias. Following assessment of methodological quality and bias risk, the level of evidence and a grade of recommendation was determined for each of three categories: safety, energy efficiency, and cost effectiveness.

**Results:**

18 articles were determined to be pertinent: 7 for safety, 8 for energy efficiency, and 3 for cost effectiveness. Methodological quality was low with a moderate risk of bias in the safety and energy effectiveness categories. Studies in cost effectiveness received high scores for methodological quality.

**Conclusion:**

Though methodological quality varied across the selected topics, there was sufficient evidence to suggest increased efficacy of the C-Leg in the areas of safety, energy efficiency and cost when compared with other prosthetic knees for trans-femoral amputees.

**References:**

1. Dillingham TR, Pezzin LE, Mackenzie EJ. Limb amputation and limb deficiency: epidemiology and recent trends in the United States South Med J 2002;95(8):875-83.
2. Kahle JT, Highsmith MJ, Hubbard SL. Comparison of non microprocessor knee mechanism versus C-Leg on Prosthesis Evaluation Questionnaire, stumbles, falls, walking tests, stair descent, and knee preference. J Rehabil Res Dev 2008;45(1):1-14.

Title: **Lower limb arterial intervention, the options and outcomes: What the Vascular Surgeon can do!**

Presenter: **Mr Keith G Jones, FRCS, Consultant Vascular Surgeon, St George's Vascular Institute, London**

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Lower limb arterial insufficiency and the increasing prevalence of Diabetes are major causes of major amputation in the UK. It is widely felt that the rate of amputation is too high. Vascular intervention, be it by angioplasty or bypass surgery, can provide very good functional outcomes. Especially in diabetes distal bypass achieves limb salvage and this technique will be described in detail outlining the importance of early referral, and highlighting the potential results that can be achieved within vascular centres. Despite intervention amputation does remain an endpoint of arterial disease and delay in the decision making has a deleterious effect upon outcome. The indications and vascular recommendations with respect to amputation will be presented, with time for discussion.

Title: **Surgical considerations for diabetic foot problems**

Presenter: **Dr Dishan Singh, MBChB (Orth), Royal National Orthopaedic Hospital, Stanmore, Middlesex**

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Surgery is generally considered for patients who have Charcot neuro-arthropathic problems or foot ulcers who have failed conservative treatment. Recent research has however highlighted the contribution of the gastrocnemius-soleus complex in the pathomechanics of diabetic foot complications and the literature on the role of prophylactic Achilles/gastrocnemius lengthening will be presented.

A multidisciplinary approach to address both the dysvascularisation component and the biomechanical overloading of diabetic ulcers is recommended. Surgery is recommended for osteomyelitis or for aggressive debridement of deep ulcers not responding to treatment. Current trends are for leg preservation rather than foot ablation as far as possible. There have been significant advances in the role of surgery in the stabilization of Charcot joints which have the potential of leaving the patient with a biomechanically disadvantaged foot. The literature and my own experience in the reconstruction of both early and late presentations will be reviewed; the aim is to achieve a plantigrade foot that can be fitted in appropriate footwear.

Title: **Strategies for Offloading and the Management of Friction and Shear in Diabetic Foot Disease**

Presenter: William A Munro, Dip OTC, MBAPO, Glasgow

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Offloading, Pressure and Shear are all terms used regularly in diabetic foot clinics, however it is apparent from the diversity of techniques and devices used that there is a lack of universal understanding of the effects on gait and healing times that they afford. It is therefore important to have service specifications and quality assurance linked to competencies to ensure optimum use of scarce resources.

This presentation will look at fundamental building blocks and the basic elements that will enable the audience to appreciate the principles that underpin the options available for offloading the foot.

Title: **Physiotherapy for the dysvascular and diabetic amputee: what is new in Scotland?**

Presenter: **Helen Scott**  
Team Leader Physiotherapist  
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Every year in Scotland there are 700-800 new amputees of whom 85% have a limb amputated due to Peripheral Arterial Disease with or without Diabetes (Scott et al 2011). There are three new areas of work specifically concerning this patient group: -

1. *Validating the Functional Co-morbidities Index (FCI)* (Groll et al 2005) for use with lower limb amputees. A pilot study using 2009 national data would suggest that the FCI is valid to use with lower limb amputees but it requires modification to improve criterion validity.
2. *Investigating the outcomes after lower limb amputation for Diabetes*. As a total group, diabetic amputees are younger, have more comorbid disease, more are amputated below the knee, more are successfully limb fitted and despite being less mobile six months pre-amputation they are more mobile post-amputation. However, when compared to PAD patients by level, diabetic amputees do the same, if not worse, than their PAD counterparts.
3. *Implementing the Trans-femoral Predictor* (Condie et al 2011). Nationally more trans-femoral amputees (17% of initially fitted) abandon limb fitting within the rehabilitation period than trans-tibial (3% of initially fitted) (Scott et al 2011). A local audit following up TFAs at one year from fitting indicates that within the first year this figure can increase to 25%. This has led to the development of a standardised pre-prosthetic assessment and patient information leaflets explaining the process and outcome.

Condie M.E., Treweek,S.P., Whitehead L., McFadyen A.K. (2011) The trans-femoral fitting predictor (TPF) – A functional measure to predict prosthetic fitting in trans-femoral amputees: validity and reliability. *Arch. Phys. Med. Rehabil.* **92** (8), 1293 – 1297.

Groll DL, To T, Bombardier C and Wright JG (2005) 'The development of a comorbidity index with physical function as the outcome.' *J Clin Epidemiology*; **58**; 595-602.

Scott HM, Patel R and Heberton J (2011) 'A Survey of the Lower Limb Amputee Population in Scotland 2009' SPARG, Glasgow (available on-line CSP and SPARG website)

Title: **Use of Axial and Bending Strain Energy in a Dynamic Prosthesis**

Presenter: **Graham Harris**  
Principal Mechanical Design Engineer

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During the gait cycle there is a continuous cycling of energy as the amputee's potential energy is converted into kinetic energy and vice versa. The more efficiently this process is carried out, the less additional energy the amputee needs to supply in order to maintain a walking or running speed.

Recent designs for prosthetic lower limbs have shown the advantages that can be gained by using long leaf springs (often made from Carbon fibre reinforced composite material) to store elastic strain energy from mid stance, which is returned at toe off, hence assisting the amputee through the 3<sup>rd</sup> rocker phase of the gait. Further advances have been made by utilising an independent leaf spring at the heel to perform a similar function during the 1<sup>st</sup> rocker. Because both of these springs deflect under a bending load. The amount of strain energy these springs store varies during the gait cycle depending on the magnitude and position of the ground reaction vector relative to the spring itself. They are generally most effective when the loads are applied near to the ends of the springs.

A vertically aligned, axial spring has the advantage that it can store energy throughout the gait cycle, this not only provides a spring assist during the 2<sup>nd</sup> rocker stage but can also help smooth the transfer of load from heel strike to toe off and attenuate axial and (in the case of the Blatchford VT) torsional shock loads. A further benefit can be gained if the axial element is mounted as close to the socket as possible. This maximises the potential length of the toe spring and reduces the inertia of the limb during swing.

As well as the overall design layout, there are particular questions to be addressed with regard to the relative stiffness of the various spring elements as this effects the overall distribution of the strain energy within the prosthesis. If done correctly, the result should be an efficient energy management system which optimises the energy cycle and helps the amputee through all phases of the gait cycle.

A clinical evaluation and gait analysis to compare the effects and contribution of the various spring elements will be carried out, the results of which should be available for the meeting.

## This author won the BLESMA Prize

Title: **Roll-over characteristics and ankle joint kinetics using low-profile dynamic-response foot with fixed versus hydraulic ankle in trans-tibial amputees**

Presenter: **Steve J Brown**  
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### *Introduction*

Blatchford's low-profile dynamic-response (LDR) foot can be connected to a prosthesis via a fixed (Esprit), compliant (Epirus), or hydraulic (Echelon) attachment. The hydraulic device allows dampened ankle plantar- and dorsi- flexion (9 degree range) during first and second rocker, which should alter ankle kinetics and subsequently how the CoM 'rolls' over the foot. The present study determined changes in roll-over characteristics and ankle kinetics during over-ground walking using a LDR foot with hydraulic compared to fixed ankle.

### *Methods*

Four active TT amputees (age  $37.3 \pm 3.3$  yrs, mass  $74.8 \pm 10$  kg, height  $1.74 \pm 0.04$  m) completed comfortable speed walking trials using an LDR foot with fixed and hydraulic ankle. Which device was tested first was randomized. Roll-over characteristics were assessed by determining ankle-foot 'roll-over' shapes (Hansen et al., 2004 ClinBiomech, 19; 407-414). Stance-phase moments and powers at the pseudo ankle (joint centre determined as that matching intact side) were determined using standard inverse-dynamics modelling.

### *Results*

Radius of roll-over shape was reduced ( $p=0.05$ ) when using the hydraulic compared to fixed ankle. Use of the hydraulic ankle led to the following joint-kinetic changes. The dorsi-flexion moment evident for the first third of stance changed to a plantar-flexion moment earlier (by 9% of stance,  $p=0.018$ ). The dorsi-flexion moment impulse was reduced by 40% ( $p=0.044$ ) and the energy returned during this time was reduced by 68% ( $p=0.035$ ); with peak positive power reduced by 50%. However, there was no difference in the energy absorbed (negative power) during this period. During mid to late stance, there were no significant differences in the peak plantar-flexion moments or peak negative or positive powers or in the timings of when these occurred.

### *Discussion*

The two energy absorption (negative power) and return (positive power) phases at the ankle corresponded to the compression and recoil of the heel and forefoot keels in early and mid-to-late stance respectively. The reduced energy return in early stance when using the hydraulic ankle suggests the device attenuated the 'recoil-effect' of the heel keel during second rocker. As there were no differences in ankle kinetics during mid-to-late stance (third rocker), the reduced roll-over radius, when using the hydraulic ankle, was likely due to the CoM being transferred onto the prosthetic limb in a smoother manner.

Title: **The Diabetic Foot in 2011**

**Infection and Ischaemia: Major Threats to the Diabetic Foot**

Presenter: Andrew J M Boulton, MD, DSc, FRCP  
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Diabetic foot disease remains a major medical, social and economic problem in patients with diabetes as it has been estimated that the lifetime risk of any patient developing a foot problem may be as high as 25%. Infection is common in diabetic foot ulceration and despite many steps forward in recent years, it still remains a clinical diagnosis in daily practice. Thus a superficial wound swab sent to the laboratory is of little help in the management of diabetic foot problems: specimens are best taken from deep in the wound during the debridement process and should be sent urgently to the laboratory for appropriate analysis. The usual signs of infection including purulent discharge, surrounding erythema, oedema, pyrexia, elevated white cell count, etc, are used to judge the presence or absence of infection. Sadly to date there are no good randomized controlled trials to guide us in the choice of antibiotics but international guidelines from the International Working Group on the Diabetic Foot have been published to guide the management of infected diabetic foot lesions. Broad spectrum antibiotics should be initiated until cultures are able to guide more specific therapy. Frequently used agents include Clindamycin and Co-amoxiclav (Augmentin). There is no place for the use of topical antibiotics although occasionally in osteomyelitis, calcium sulphate pellets impregnated with antibiotics such as Tobramycin are used. With respect to the diagnosis of bone infection, probing to bone remains a useful indicator of underlying infection as x-ray changes may be delayed. There is increasing evidence that osteomyelitis confined to a single digit may respond appropriately to antibiotics without the need for surgical intervention.

The presence of ischaemia in the diabetic foot together with infection is a major risk for amputation and aggressive investigation of peripheral vascular disease is indicated as a matter of urgency. Increasingly, distal bypass surgery and angioplasty are being used in the diabetic lower extremity with good results. Early and appropriate management of the infected ischaemic diabetic foot may prevent the need for major amputation.

Title: **Use of lipomodelling to forearm residuum to assist fitting of below elbow prosthesis**

Presenter: **Ganesh Bavikatte**  
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### **Background:**

Congenital absence of the upper limb can be ameliorated by use of a prosthetic device. Regular prosthetic wear can be associated with skin and musculoskeletal problems. Shorter lever arm of the residual stump can cause pain over pressure points, skin ulceration, bursitis and inability to wear the prosthesis. Temporary discontinuation of prosthetic wear is used to facilitate wound dressing and healing. This inevitably leads to limitation of activity and may lead to the amputee not going to work.

### **Case Report:**

We describe a young patient with congenital transverse upper third forearm deficiency, who was having difficulty in wearing an upper limb prosthesis, due to the stump lacking in soft tissue cover, causing pain and poor function. This resulted in physical and emotional difficulties for the patient. The patient underwent fat graft transfer from abdomen into the limb with a successful outcome, leading to improved comfort and stability of the prosthesis.

### **Discussion:**

Fat grafting was originally described in 1893 by German physician Franz Neuber who used upper arm fat for a facial deformity. Shortly after, in 1895, a similar technique was used in a case of breast augmentation. Through the early part of the 20<sup>th</sup> century fat grafts were used in attempts to correct a variety of soft tissue and cutaneous defects. Further scientific developments in this field have allowed plastic, reconstructive and aesthetic surgeons to offer fat grafting for cosmetic and functional benefits. Fat replacement used for contouring purposes has specific advantages over alternative methods. Fat is an autologous material, readily available, long-lasting, and feels natural.

### **Conclusion:**

With further advances in liposuction procedures and easier aspiration of fat from the body; fat grafting has become more widely available. However, there are not many reported cases of the use of fat grafting in amputees. This case demonstrates the successful use of fat graft to improve functional outcome in an amputee. We feel fat transplants can be used in both congenital and acquired limb loss patients with similar problems with good success rates.

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Lam S M. Fat transfer for the management of soft tissue trauma: the do's and the don'ts. *Facial Plast Surg*. 2010 Dec;26(6):488-93.

Title: **Experiences Fitting the *Bebionic* Hand in Challenging Overseas Environments**

Presenter: **Brian McLaughlin**  
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When a new and technologically advanced product is released it inevitably generates considerable interest throughout the world. This was certainly the case with the ***bebionic*** hand developed by RSL Steeper. However, it has been our experience that despite the interest in the product from around the globe, in certain markets the local clinicians often required a greater level of support and assistance to enable them to fully embrace this new technology.

The ***bebionic*** hand proved to be an instant hit in many countries where the local staff were already experienced in using current myoelectric technology, plus the simplicity of ***bebionic*** control means that patients with standard, proven Myoelectric control can quickly master the hand and all the new hand patterns and functions that are available. In these countries the training and support required to enable the clinician to confidently fit the hand was minimal. However in many other countries the interest in the product was not matched by the experience of the clinical staff and therefore the support required to enable local clinicians to fit the hand was considerable. This resulted in requests to conduct training and assist with fittings in countries throughout Africa, Asia and the Middle East. Fortunately despite the inexperience of the local clinicians the patients that they selected for fitting with the ***bebionic*** hand all proved to be suitable.

This paper will present the challenges of introducing the new ***bebionic v2*** hand into countries where the technology in daily use is often behind our own modern standards. The author will attempt to present his own experience in travelling to these diverse places and will discuss the P&O provision in each country. He will also discuss that whilst many of the local prosthetists lack access to quality equipment they often more than made up for this through their enthusiasm, ingenuity and willingness to learn.

Travelling to these countries has highlighted to the author the ongoing need to continually improve P&O Education and Training throughout the world. At present ISPO plays a crucial role in helping to continually raise the standards of education through its approval process for P&O schools. However there is much more that could be done to improve collaborations between P&O schools, NGOs, industrial partners and local clinics. As the number of people throughout the world who could benefit from access to quality Prosthetic and Orthotic treatment continues to rise, it is essential that P&O Education and Training also continue to improve.

Title: **Biomechanical effects of extrinsic rearfoot posting in functional foot orthotics**

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Customised foot orthotics (FOs) are purported to have a range of beneficial effects including pain relief, redistribution of pressure and correction of alignment (Hodge et al., 1999). One design variable in the prescription of these devices is the addition of an extrinsic rearfoot post, a feature which can be angled medially or laterally and is intended to control movement of the calcaneus during the early part of the stance phase of gait (Hunter et al., 1995). It has been suggested that through this mechanism, biomechanical changes in the ankle and knee during walking can be achieved.

This study aims to investigate whether introducing incremental changes in this feature will produce a consistent trend of change in the user's biomechanical responses - analogous to the "dose-response" type measurements found for drug treatments - and to determine the magnitude of these changes.

Eight participants were recruited, four healthy controls and four subjects with a flexible valgus rearfoot deformity of greater than 4° during relaxed standing. Computer aided design (CAD) models for a pair of customised FOs were produced from a 3D surface scan of the subject's feet using OrthoModel software (Delcam Ltd, Birmingham). These devices were then manufactured and checked for comfort and fit. The CAD design was subsequently altered to produce nine additional FO designs (for one randomly chosen foot) with posting levels varying in 2° steps from 6° laterally to 10° medially. All devices were then manufactured using a low cost 3D printing system (RapMan V3.1; BFB Ltd, Clevedon, UK).

After wearing the original pair of orthoses for one week, participants came to the gait laboratory for biomechanical assessment. Kinetic and kinematic measurements of the lower limbs were made along with electromyographic (EMG) recordings from selected lower limb muscles during walking for each orthotic condition.

Linear changes in peak rearfoot eversion were observed ( $R^2=0.95$ ) across the tested orthotic conditions, equivalent to a mean reduction in peak rearfoot eversion of 0.33° for every 2° posting step medially. Similar results were seen for the ankle eversion moment, with a linear trend ( $R^2=0.78$ ) describing a reduction in peak eversion moment of approximately 3% for every 2° of medial posting. There were no consistent trends in peak EMG activity for tibialis anterior or peroneus longus. No significant differences were seen between groups.

These results provide preliminary guidelines for personalized FO prescription based on 3D gait assessment. Further research is required to determine if the observed short term biomechanical changes translate into variation in long term clinical outcomes and in order to establish the level of personalisation required for effective FOs.

#### **Acknowledgements**

This work was funded through the European Commission Framework Seven Program (grant number NMP2-SE-2009-228893) as part of the A-Footprint project ([www.afootprint.eu](http://www.afootprint.eu)).

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2. Hunter S, Dolan MG, Davis JM. Introduction to orthotic therapy. In: Frey R (ed) *Foot orthotics in therapy and sport*. Champaign: Human Kinetics, 1995; p.1-9.

Title: ***A Systematic Literature Review Comparing Ankle-Foot Orthoses and Functional Electrical Stimulation in the Treatment of Patients with Multiple Sclerosis***

Presenter: **Emma Davidson**  
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**Aims and Objectives:** Multiple Sclerosis (MS) is a degenerative neurological condition affecting up to 85,000 people in the United Kingdom, with an estimated 2,500 new cases diagnosed annually<sup>1</sup>. The aim of this research was to review all available literature on the use of Ankle-Foot Orthoses (AFO), and Functional Electrical Stimulation (FES) for treatment of gait difficulties in patients with MS, and to compare for specific outcome measures. The quality of baseline information on both the patients and interventions was also assessed as this is essential to enable trials to be comparable and clinically applicable.

**Methodology:** An extensive search which was carried out using the electronic databases; Embase, Medline, CSA Illumina, Amed, The Cochrane Library, Science Direct, ISI Web of Knowledge and The Knowledge Network, produced 2,459 potentially relevant results. From this, 442 papers were considered relevant by title, with 166 papers relevant after further reading of their abstracts. From these full texts sourced only 14 experimental papers were considered appropriate for critical appraisal in the literature review. These 14 trials were scored using the SIGN guidelines and critically appraised using the SIGN GRADE system.

**Keywords:** Multiple Sclerosis, MS, Ankle-Foot Orthosis, AFO, Ortho\*, Splint, Brace, FES, Functional Electrical Stimulation, Rehabilitation, Function, Gait

**Results:** Of the 14 papers reviewed only one was a direct comparison trial<sup>2</sup>. Walking speed was the most reported outcome measure with 10 trials regarding an increase as a key measure of success. Of these 10 trials six exclusively assessed FES with five of these reporting increases in walking speed after a period of FES use compared to baseline or walking unaided. The three AFO trials produced less conclusive results, with only one study reporting a significant increase in walking speed with AFO. The direct comparison trial found that half of the small sample walked significantly faster with FES compared to AFO and no device, whilst the other half demonstrated no effect from either intervention. Energy expenditure was the second most highly reported outcome measure with three of the FES trials and one AFO reporting a significant decrease in energy expenditure. Other spatiotemporal outcome measures such as cadence, step length and walking distance were poorly reported with only one paper documenting results for each. This was also the case for kinematics and kinetics especially in the stance phase of gait, resulting in a lack of clear understanding of the effects on quality of gait.

**Conclusions:** This literature review has highlighted the low quality of evidence available, leading to the conclusion that considerably more research is required of an elevated standard to provide strong clinical evidence for current practice. There were several limitations within the trials reviewed such as the lack of baseline information regarding both the patients and interventions provided. Without this clinical information appropriateness of prescription cannot be accurately assessed. More emphasis needs to be placed on quality of gait rather than just speed. A study addressing the effects of both interventions on the stance phase will highlight limitations and strengths of both interventions.

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2. Sheffler LR, Bailey SN, Chae J. Spatiotemporal and kinematic effect of peroneal nerve stimulation versus an ankle-foot orthosis in patients with multiple sclerosis: a case series. Physical Medicine and Rehabilitation. 2009;1:604-11.

Title: **Designing customized foot and ankle-foot orthoses – beyond the state of the art**

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This paper will highlight issues with the current methods of customized foot and ankle orthotic manufacturing and examines the feasibility of using the latest computer aided design (CAD) software combined with additive manufacturing (AM) for the production of these devices. A novel AFO device with variable sagittal plane stiffness is presented as a case study to help illustrate this approach, including results from its pre-clinical testing.

AM processes have enabled the production of low volumes of customized components with low lead times since the early 1980s and allow geometrically complex objects to be manufactured without the relative increases in cost associated with traditional manufacturing methods. The design freedom this brings means that previously unviable orthotic devices that are highly personalized to treat the patient can be developed and made available using a mass customization model.

Previous research suggests that the feasibility of the AM approach has been established, however this work has failed to fully exploit the potential of the technology. In this paper, we present a number of new orthotic concepts with supporting engineering and clinical research. These concept devices provide examples of how to control the properties of the orthoses using unconventional means such as variable wall thicknesses and integrated structures within the orthotic device rather than traditional methods.

To develop a novel AFO device, the leg of a healthy volunteer was cast and the positive cast scanned to generate a computer model of the leg. The scan data was then used in the CAD design of the device in 3-matic software (Materialise, Leuven, Belgium).

The AFO design was comprised of two principle components, the foot and the shank component joined by a hinge aligned with the ankle axis such that dorsiflexion/plantarflexion was possible. An adjustable gas spring was installed in the posterior side of the AFO to give resistance to plantarflexion, and the position of the spring relative to the axis of rotation could be changed, thus changing the resistance moment applied. The design freedom provided by the CAD software ensured that the external components could be placed very accurately in the design.

Once the AFO design was completed, the form fitting components were manufactured from Nylon-12 using AM. After fitting and a wear in period, gait analysis was carried out with the subject wearing the novel AFO. Kinetic and kinematic data were recorded with the device set at three varying stiffness levels.

Results indicated that by varying the stiffness of the device controlled changes could be made to sagittal plane gait patterns at the knee, ankle and hip. The quality of fit and comfort achieved was good.

The results from the project so far demonstrate the potential and preliminary feasibility of AM for the design and fabrication of orthotic devices. It is hoped that future work will demonstrate the ability for this approach to provide clinicians with novel and effective tools for treating their patients.

#### Acknowledgements

This work was funded through the European Commission Framework Seven Program (Grant number NMP2-SE-2009-228893) as part of the A-FOOTPRINT project ([www.afootprint.eu](http://www.afootprint.eu)).

Title: **A survey of multiple limb amputees secondary to meningitis/septicaemia**

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**Background:**

Purpura fulminans in meningitis /septicaemia resulting in amputation is uncommon, however those who are affected often require multiple limb amputation. This devastating illness poses challenges in medical, prosthetic and social rehabilitation and raises ethical questions about early aggressive medical management.

**Aim:**

To assess the medical, prosthetic and long term social participation issues in this group of patients.

**Subjects, Setting & Method:**

16 patients who had amputation secondary to meningitis/septicaemia were identified from the electronic database at a regional DSC. Notes were reviewed for; medical complications, amputations, skin grafts, long term complications and revision surgery, prosthetic type and use and current social participation.

**Results:**

Ages ranged from 5 months to 43 years with time since amputation from 1 to 22 years. All patients had at least 2 limbs amputated (a total of 49 amputations in the group of 16 patients). Prosthetic challenges included fixed flexion deformity, keloid and hypersensitive scarring, breakdown of grafts, damage to epiphyseal growth plates, overgrowth of tibia and contractures. Long-term medical complications included seizures, nasal scarring, adrenal and pancreatic insufficiency, hearing loss, cognitive problems and depression. Of the 8 adults, 5 returned to work or re-trained. (All had bilateral trans-tibial amputations and 3 also had partial hand amputations). Of the 8 children, 5 are independently mobile with their prostheses and all have reached their expected developmental milestones.

**Conclusion:**

In spite of the degree of mutilation, the majority of patients achieved a good level of independence and do remarkably well with co-ordinated and timely multidisciplinary team input.

Title: **Cross sectional survey of the Scope and Effectiveness of the Pre amputation Consultation**

Presenter: **Dr Ramesh Munjal MS FRCS**

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**Aims:** The specific aims of the study were to identify:

1. Whether the full MDT rehabilitation team was involved in consultation?
2. Information was provided with regards to the post amputation rehabilitation process and estimated time scales
3. If patients were informed of what to expect post amputation and impact on their future life

**Objectives:**

1. Examine the overall effectiveness of the pre amputation consultation
2. Identify if the consultation allowed patient participation.
3. Pre amputation consultation impacted on the patient's decision to proceed with amputation or to avoid it.

**Methods:** Data was collected from 45 patient notes between the periods Jan 2008 - Feb 2010. Patient questionnaire was designed specifically to capture desired information and sent to 40 patients to elicit information of their experience during consultation. Telephone reminder was done for patients who did not return the questionnaire. 23 patients returned the completed questionnaire.

**Results:** In this cohort 78 % of the patients were males. 31% of the patients had severe chronic pain as the reason for pre amputation consultation. Another 24% had chronic osteomyelitis following long standing trauma.

All the patients saw both doctor and nurse but only 38 % saw the prosthetist and only 5% saw the physiotherapist at the first consultation. Pre amputation consultation was both useful and effective as 51% underwent amputation after their consultation. 13% of these patients stated that the consultation resulted in the decision to go ahead with amputation. In contrast, 49% of patients decided not to undergo amputation after consultation. In total the consultation affected 62% of the patient's decision to undergo or decline surgery.

Majority of patients who went on to have the amputation had the procedure within two months of the pre amputation consultation indicating a good coordination with surgical teams.

About 94% of patients indicated that they understood the purpose of consultation and the explanations given and 88% reported that they were able to make an informed decision. 66% reported that the complications of amputation were explained. 69% of patients were unsure of what life would entail post amputation and only 50% of patients acknowledged being given information of the rehabilitation process including timescales. 75% reported that their concerns were addressed in the consultation.

**Recommendations**

1. The prosthetic rehabilitation team should be collectively present during the consultation but this will mean increasing consultation time.
2. Good record keeping- It came to light that physiotherapists write their notes separately and it was not picked up in the notes survey. The prosthetist saw more patients but did not always write in the medical notes which can be improved.
3. Patients often have difficulty in remembering everything discussed during consultation. Therefore written information may be better in the form a summary of the consultation or copy of the letter sent to the referrer.
4. All patients where there is a doubt about the need or outcome of amputation should be referred for pre-amputation consultation.
5. Special emphasis should be given on the effect of amputation on ADL and QOL.

Title: **Increased outdoor safety for lower limb amputees through self-aligning ankle-foot prosthesis using advanced biomimetic design**

Presenter: **Nadine Stech**  
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Although there have been many improvements and modernizations in prosthetics, standard prosthetic feet mostly rely only on the mechanics and toe and heel springs to enable appropriate functionality. Modern composite prosthetic feet provide a certain range of movement however they aren't able to compensate for slopes and uneven ground satisfactorily. The self-aligning ankle-foot-prosthesis which consists of a viscoelastic hydraulic damping unit controlling the resistance of plantar flexion and dorsiflexion and composite springs has enabled a completely new range of movement possibilities and comfort.

General review of over 3000 fittings has provided sufficient feedback to establish the benefit of self-alignment. This study aims to address especially the abilities of the self-aligning in the outdoor situation. Outdoor situations are often characterized through non optimal conditions such as unevenness, slopes, slippery surface or sudden situational changes. Therefore this paper will present first the biomechanics of gait stability and second the experimental studies are presented. Several trials have been done using both internal and external sensors to measure the effects of different outdoor situations.

The results showed that the effect on the bending moment is crucial for the understanding of the success as it tends to mimic the bending moment of a normal subject. This indicates a better load distribution within the socket and also improved stump-interface comfort. Furthermore the foot compensates small disturbances such as unevenness so that the bending moment of the disturbed foot resembles to the bending moment of undisturbed level walking. Also the knee angle is unaffected by the unevenness. Only a slightly lower velocity indicates the unevenness. An almost similar effect can be seen when having to avoid small obstacles with a sidestep or a curve around it. Through the bigger range of movement available within the ankle-foot prosthesis comfortable standing, even on slopes, can be seen as the compensation of the surface happens mainly in the ankle-foot prosthesis so that compensational effects in knee, hip and the upper part of the body can be reduced drastically.

In conclusion the self-aligning ankle-foot prosthesis provides a more natural acting prosthesis that enhance the amputee's ability to manage difficult situations in a better way as it reacts and interacts intuitively with the ground. This fact provides additional reliability on the artificial leg especially in outdoor situations that can't be predefined to 100%. The impact of ankle function on knee stability is demonstrated clearly on amputee descending slopes. Hence more safety is provided which enables the amputee to walk without concentrating and worrying about each successive step and gives him a new range of freedom and comfort.

Title: **The effects of walking with rocker-soled shoes – evidence in the literature**

Presenter: **Dr Stephen Hutchins**

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### *Aims and Objectives*

The aims and objectives of this presentation are to analyse the evidence available demonstrating the effect of different rocker sole profiles in altering plantar foot pressures and also their effect on the kinetics and kinematics of gait, temporal and spatial parameters, alteration to joint motion and their effect on lower limb muscle activity.

### *Method*

A literature search was performed in all relevant journals including those available in Pubmed, Scopus, Cinhal, Emed, and Recal Legacy. Key words used were rocker, sole, profile, lower limb, and shoe. A total of 63 publications were finally selected.

### *Results*

Very little evidence exists in peer-reviewed journals which demonstrate the effects rocker profiles have on gait parameters. The evidence to date suggests that they have more effect at the ankle compared to the more proximal lower limb joints. However, their effects on plantar pressures is well documented, but the definitive rocker profile which can optimally unload the forefoot has not yet been designed. The most effective rocker sole profile in offloading the forefoot currently documented is the traditional angled rocker sole. Rocker soles may additionally increase lower limb muscle activity – especially the gastrocnemius.

### *Conclusion*

More research is required to more clearly understand how rocker profiles may be designed to alter specific gait parameters for specific patient groups. Rocker-soled shoes are capable of altering joint motion and muscle activity, and more research is required to more fully understand how these effects can be predicted when designing specific rocker profiles for patients with conditions such as diabetes and peripheral vascular disease.

Title: ***The efficacy of a three-curved rocker sole in reducing the intensity of calf pain in subjects with intermittent claudication***

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Dr Richard Jones, Senior Lecture in Biomechanics, University of Salford.

#### Aims and Objectives:

To develop a rocker sole profile which reduced the sagittal plane moments acting at the lower limb joints during stance phase of gait whilst simultaneously reducing the range of motion at the ankle. The objective was to place the gastrocnemius muscle in a more advantageous position to reduce the intensity of claudication pain during ambulation, and to feasibly enable an increase in the pain free walking distance of claudicants.

#### Methods:

Twelve healthy volunteer subjects initially walked with two footwear test conditions (a control shoe, and a pair which had been adapted with a three-curved rocker sole) under gait laboratory conditions. This was done to compare the effect of the rocker soled shoes on gait kinetics, kinematics and other gait parameters plus EMG activity whilst walking at a self-selected comfortable speed. A pilot study was subsequently performed by eight volunteer claudicants in a hospital setting to assess the effect of the rocker sole on their intensity of calf pain and their pain-free walking distance. Statistical analysis was performed using a repeated measures ANOVA.

#### Results:

The gait laboratory testing demonstrated that the three curve rocker shoes significantly reduced the sagittal plane moments acting at the ankle, and placed the ankle into a relatively plantarflexed position whilst simultaneously reducing its range of motion. The EMG data produced inconclusive results. Subsequent walking trials with volunteer claudicants demonstrated that walking with the three-curve rocker soled shoes significantly increased their pain-free walking distance before experiencing sudden claudication pain and also significantly reduced their calf pain once claudicating.

#### Conclusions:

Specifically-designed rocker soled shoes have the ability to significantly alter gait kinetics and kinematics and other gait parameters for the benefit of claudicants and other patient groups. The three-curve rocker sole may also prove useful in the treatment of Achilles tendonitis or other conditions requiring alteration to calf muscle performance during gait.

**Minutes of 35<sup>th</sup> Annual General Meeting of the  
ISPO UK National Member Society  
held at the W12 Conference Centre, London  
on Friday 7<sup>th</sup> October 2011**

**1 Apologies for Absence**

Apologies were received from T L Landham, F Jepson, K Hurst, E Condie, E Owen, B Meadows, D Simpson, S Laird

**2 Confirmation of the Minutes of 2010 AGM**

The minutes were agreed to be an accurate record.

**3 Matters Arising**

There were no matters arising.

**4 Resolutions to amend the Constitution**

Two resolutions to amend the ISPO UK NMS Constitution were tabled:-

Resolution 1: That the terms and language of the ISPO UK NMS Constitution be changed, and references to all Article numbers be amended, to align with the ISPO International Constitution.

Resolution 2: That Article 7 – Finance – be amended to read as follows:-

“7.6 The Honorary Treasurer shall operate the UK Society bank account under the overall direction of the National Committee. All cheques shall be signed by any two of four, being the Chairman, Honorary Secretary, Honorary Treasurer and Secretarial Assistant of the National Committee.”

Adrian Stenson formally proposed the two resolutions be adopted by the membership. Saeed Zahedi seconded the motion which was approved unanimously by the membership.

**5 Chair's Report**

Laura Burgess began by thanking the members of the UK NMS committee for their support during the year, including Terry Pond and Colin Dance for editing the E-bulletin; Lal Landham who has agreed to act as Vice-Chair and Honorary Treasurer and Membership Secretary; and Jai Kulkarni and Ramesh Munjal who now had completed their first year on the committee.

Despite the global economic climate, membership numbers are only slightly down for the year to 30 June 2011. Financially, the UK NMS Society again sustained a deficit for the year, however, to a lesser extent than the previous year.

An interim meeting of ISPO International will be held in 2012 in Leipzig and the Chair will attend to represent the interests of the UK NMS Society.

2012 will be the 40<sup>th</sup> anniversary of ISPO UK NMS and it is intended to mark the occasion at the annual scientific meeting. It is hoped this will be a collaborative event with BAPO and BACPAR - discussions are already underway - and will attract a much larger multidisciplinary audience.

## **6 Honorary Treasurer and Membership Secretary's Report**

Jai Kulkarni reported in Lal Landham's absence. Financial statements for the year ended 30 June 2011 were tabled and a number of points noted.

- Given the current poor global financial situation, interest rates are low with a resultant impact on the society's ability to generate income from current savings.
- Membership has declined over the last five years.
- There has been an increase in the workload of the Secretarial Assistant resulting in an increase in fees.
- The Society incurred a deficit of just under £4,000 for the year to 30 June 2011 but it is hoped the events in 2012 (TIPS and a larger annual scientific meeting) will generate a surplus for the coming year.
- Plans to hold an additional one day educational event in early 2012 will also hopefully generate funds for the Society.
- Subscription fees have remained at £90 for two years. An increase of £5 to £95 is therefore recommended by the ISPO UK NMS committee.

Bill Spence proposed that the annual subscription rate be increased to £95 for the year 1 January 2012 to 31 December 2012. Paul Charlton seconded the motion and it was unanimously approved by members.

## **7 Honorary Secretary's Report**

Fergus Jepson's apologies having been previously noted, Laura Burgess reported.

Committee elections:- the three members due to retire – Colin Dance, Rebecca Beltran and Tom Wickerson – have all agreed to serve a further three year term. In addition, Steve Hutchins, has been nominated to serve on the committee and will provide much valued academic and orthotic expertise to the committee.

There being no objections, Colin Dance, Rebecca Beltran, Tom Wickerson and Steve Hutchins were duly elected to serve on the national committee for a term of three years.

## **8 AOB**

- Robin Luff proposed that A J Dilworth be retained as auditor of the ISPO UK NMS financial accounts for the year to 30 June 2012. Mary Jane Cole seconded the motion and it was approved unanimously by the membership.
- It was noted it was over 20 years since the last consensus conference on post polio syndrome had been undertaken and a request was made to clarify arrangements for organising an International Consensus Conference. Rajiv Hanspal undertook to make enquiries and report back to the Society.

## **9 Date of Next AGM**

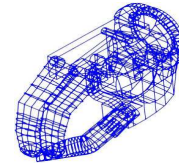
To be advised.



International Society for Prosthetics and Orthotics  
United Kingdom National Member Society

## Trent International Prosthetic Symposium

# 2012



**Burleigh Court Conference Centre, Loughborough, UK**  
**21<sup>st</sup> to 23<sup>rd</sup> May 2012**

### ***Guest Speakers:***

- *Randall Alley, CEO & Chief Prosthetist, **biodesigns**, Southern California, USA*
- *Dr Oskar Aszmann, Professor of Plastic & Reconstructive Surgery, Medical University of Vienna, Austria*
- *Diane Atkins, OTR, FISPO, Clinical Assistant Professor, Department of Physical Medicine and Rehabilitation, Baylor College of Medicine, Houston, Texas, USA*
- *Danny Crates, 2004 Paralympic Champion, European Champion & Paralympic World Cup winner, UK*
- *Professor Simon Kay, FRCS, FRCS (Plas), FRCS Ed (Hon), Consultant in Plastic & Reconstructive Surgery & Surgery of the Hand, St James University Hospital, Leeds, UK*

### ***Call for Abstracts & Short Clinical Papers***

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### ***IMPORTANT DATES:***

***Tuesday 31 January 2012*** – Closing date for receipt of free paper abstracts & short clinical papers

***Friday 20 April 2012*** – Last day for early bird registration



The ISPO UK NMS Executive Committee would like to wish all their members and their families a very Merry Christmas and a happy, healthy and prosperous new year in 2012