

Abstracts from the 5th International Lymphoedema Framework Conference

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The theme of the 5th International Lymphoedema Framework Conference was: “Reduced Incidence, Prevalence and Impact: Making these Realistic Goals.” Collaboration, communication and holistic awareness and management based on sound evidence are the keystones of good outcomes. Patient education, involvement and self-management are critical if we are to reduce the numbers of those developing lymphoedema, the severity of their condition and the impact on their lives. This conference brought together key speakers from developed and developing nations to share their knowledge, experiences, and vision for the future. Here we present abstracts from the conference.

Prediction of a threshold for intervention in breast cancer-related lymphoedema: A multi-centre prospective study

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Introduction: Early detection of lymphoedema in women undergoing axillary clearance (ANC) enables early intervention. Arm volume measurements that compare pre-surgical baseline with repeated measurements after surgery were evaluated to define an optimal threshold for intervention to prevent lymphoedema.

Methods: Participants ($n=556$) undergoing ANC at nine centres in England underwent pre-surgical and subsequent arm measurements post-surgery (1, 3, 6, 9, 12 months, then 6 monthly). Change in arm volume was calculated using relative arm volume change (RAVC). The threshold for intervention in

lymphoedema was assessed. Ethics approval was given by the South Birmingham Research Ethics Committee (19 March 2010).

Investigations: Pre-operative assessments included bioimpedance spectroscopy (L-Dex[®]; ImpediMed), arm volume differences using circumferential measurements, magnetic resonance imaging, and functional assessments.

Results: Median age of participants was 55 years (range, 24–90 years). Median post-operative follow-up was 12.8 months (range, 3.0–37.8 months). Median time to developing lymphoedema was 6.3 months. Eighty two percent of patients received adjuvant radiotherapy, 69% had adjuvant chemotherapy, and 85% received hormone therapy.

Lymphoedema incidence (RAVC >10%) is shown in Table 1. Using time to diagnosis of lymphoedema and Kaplan–Meier estimates of those developing lymphoedema by each time point, 13.7% were diagnosed by 12 months and 25.0% by 24 months.

Multivariate analysis indicated that oestrogen receptor (ER)-negative breast cancer, number of positive nodes, and a measurement of $\geq 5\%$ – $<10\%$ at 6 months after surgery predicted lymphoedema development.

Conclusions: Measurement increase of $\geq 5\%$ – $<10\%$ in arm volume is proposed as the threshold for early intervention to prevent progression to lymphoedema. Investigation of why ER-negative patients appear to be at increased risk of developing lymphoedema is required.

Table 1. Lymphoedema rates during follow-up.

Follow-up to date (months)	At risk (n)	Lymphoedema (n)		Probability of event (%) [*]
		During interval	Cumulative incidence	
>3 ≤6	556	36	36	7.1
>6 ≤9	434	21	57	11.8
>9 ≤12	366	7	64	13.7
>12 ≤18	292	15	79	19.0
>18 ≤24	175	9	88	25.0
>24	46	4	92	–

*1-Kaplan–Meier estimates

Use of mobile technology to support self-management of long-term conditions

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Background: The number of people with long-term conditions is rising, as are the associated healthcare costs. Self-management is fundamental to improving outcomes and quality of life for people with long-term conditions. Increasingly people of all ages are using the internet and mobile devices to access health information (m-health). Such devices are now almost ubiquitous and may provide a cost-effective way to deliver long-term rehabilitation and management for people with long-term conditions including lymphoedema.

M-health can provide a platform to assess patients, provide education, deliver interventions, and review and reassess patient progress. It is also useful for people who have difficulty attending conventional health services, such as those who work, live in rural locations, have transport problems, or have a significant disability. While there are clear advantages to using mobile technologies, there are also challenges including cost, skills (both patients and staff), infrastructure, data security, and staff attitudes.

Methods: Two m-health initiatives were developed and piloted. Web-based Physio (www.webbasedphysio.com) involves exercise delivered and monitored through the internet (Paul et al, 2014). STARFISH is a mobile phone application designed to encourage groups of people to be more physically active.

Overview: Both initiatives incorporate behaviour change techniques and demonstrate that mobile technologies are acceptable to and effective for people with long-term conditions. Self-management is more effective if effective behaviour change techniques (e.g. self-monitoring, goal setting, feedback) are incorporated.

Conclusions: Both Web-based Physio and STARFISH are appropriate for enabling self-management in people with long-term conditions, including lymphoedema, to prescribe exercise, assist with weight management, and may also allow physiological monitoring of limb volumes using sensors and Bluetooth technology.

Reference

Paul L, Coulter EH, Miller L et al (2014) Web-based physiotherapy for people moderately affected with multiple sclerosis; quantitative and qualitative data from a randomized, controlled pilot study. *Clin Rehabil* 28(9): 924–35

Compression treatment of early diagnosed breast oedema

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Background: Breast oedema is an often overlooked side-effect of breast conserving surgery and radiotherapy (RT). The incidence measured by tissue dielectric constant (TDC) has been determined to be 69% at 3 months after completion of RT. Early diagnosis and compression treatment of breast cancer-related arm lymphoedema has a good and long-lasting effect. We hypothesised that early treatment for breast oedema could have a similar effect. The aim of the present study was to examine the impact of compression treatment on changes in early diagnosed breast oedema following breast cancer treatment.

Methods: Fifty-eight women diagnosed with breast cancer-related oedema 3–6 months post-RT were included. They were randomly assigned to either a control group (CG; no intervention) or an intervention group (IG) with daily compression treatment with compression-type sport bras that provided a firm pressure, flattening the breasts. There was no significant difference between the groups with regards to age (62/61 years), BMI (28.8/28.5 kg/m²) or grey (Gy; the absorption of one joule of radiation energy by one kilogram of matter) received. Measurements of local tissue water were performed using an ultra-high frequency electromagnetic wave transmitted by a probe in contact with the skin. An electrical parameter, TDC, directly proportional to tissue water content, was calculated. Both breasts were measured and the probe was placed in the middle of each breast quadrant with the edge of the probe 10 mm from the areola. A mean of the quadrant values of each breast was calculated, however, the quadrant/s with scar tissue was excluded. Participants estimated the feeling of heaviness, tension, and pain in the breasts using a visual analogue scale (VAS). Measurements were performed at baseline and study end (9 months).

Results: Both groups showed a significant reduction in TDC value from baseline to study end (CG, 1.89±0.34 to 1.6±0.37; IG, 1.84±0.26 to 1.56±0.36; $P<0.001$) but no difference between the groups. Both groups also showed significant/close to significant reductions in tension, heaviness and pain on VAS, but with no difference between the groups.

Conclusions: Compression with a compression-type sport bra did not influence the degree of oedema in the breast, or patient estimated feelings of heaviness, tension, and pain, after RT following breast conserving surgery, indicating that early treatment of breast oedema with this modality is of no advantage.

Development of a self-report tool: The Lymphoedema Genitourinary Cancer Questionnaire

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Background: Self-report tools have been developed previously for women treated for breast and gynaecological cancers; however no such tool exists for men following genitourinary cancer treatment. The aim of this study was to develop a patient self-report tool that could be used to detect symptoms of genital and lower-limb lymphoedema in male survivors of genito-urinary cancer. Approval was given by the local ethics committee.

Methods: This qualitative study incorporated the views of patients and subject specialists (lymphoedema and urology) in the design of a prototype patient questionnaire based on the literature. A series of individual semi-structured interviews were conducted to obtain their views on the prototype Lymphoedema Genitourinary Cancer Questionnaire (LGUCQ) in relation to comprehensiveness, relevance of content, ease of understanding, and perceived acceptability to patients. The result of the analysis was then used to inform the iteration of the LGUCQ.

Nineteen participants were interviewed from three groups: (i) lymphoedema specialists, (ii) urology consultants, and (iii) male patients who had received treatment for genito-urinary cancer, with and without identified lymphoedema.

Results: A tool for men to self-report lymphoedema following genito-urinary treatment cancer was successfully developed.

Conclusions: The development and application of the LGUCQ was of value for identifying previously undetected or “neglected” lymphoedema. The tool was seen as particularly helpful in enabling men to voice concern over swelling in the genitals. Identification of previously undetected lymphoedema has the

potential to give more accurate figures on incidence. This would enable advice, education, and surveillance to be targeted more accurately and efficiently. The recommendation of this study is for further evaluation of the LGUCQ in the clinical setting.

Integrated protective footwear units at the district level in India: A new initiative



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Introduction: Footwear refers to garments worn on the feet, for fashion, protection against the environment, and adornment. Being barefoot is commonly associated with poverty, but some cultures chose not to wear footwear, at least in some situations. A fundamental feature of footwear is to offer the foot protection from the environment. In its more contemporary role the shoe has undergone technological advances over the past 30 years, with claims from major sporting footwear companies that certain designs improve performance and offer protection from injury.

Early protective footwear used in leprosy programmes was made from tyre sole and tubes, latter on developed and modified by using tyre sole and leather. These shoes were not aesthetically acceptable to patients but, because it was essential to wear foot protection, they had little choice.

Methods: In 1997 the LEPRA Society India began working with two podiatrists, Dr Hugh Cross and Ms Justine Bulton, to improve the quality of life of people with leprosy and went on to study more than 2000 affected people from tribal, urban, and village populations and introduce new footwear models. Now LEPRA has started many footwear units lead by physiotherapists and shoes technician that produce quality protective footwear that are acceptable to the community and the person with foot disability. Each unit has produced between 750 and 1000 pairs of protective footwear to date.

Results: The volume of protective micro-cellular rubber footwear prepared and distributed by four footwear units in Bihar and Jharkhand between 2010 and 2013 is shown in *Table 1*.

Conclusion: Despite high demand for these protective footwear, modification as per clients' needs is commonly needed. If clients are not satisfied, it will lead to noncompliance and that in turn will result in ulceration and further disability. The main purpose of advocating at the district level is to reach more disabled people who, due to poverty or geographical isolation, cannot otherwise access footwear services.

Table 1. Pairs of protective micro-cellular rubber footwear prepared and distributed in Bihar and Jharkhand between 2010 and 2013.

	Year		
	2010-11	2011-12	2012-13
Group for whom the footwear was prepared			
Unit's own patients	1258	1781	1966
Government	6313	2761	1603
ILEP agencies	588	923	0
Other states	763	499	21
Total	8921	5964	3590

Impact of severe lower-leg trauma with extensive soft tissue loss on the lymphatic system



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Introduction: High-energy trauma often results in a combination of bony injury and the loss or damage of soft tissue. Such injuries require reconstruction with local, regional, or free tissue transfer in addition to the fixation of bone. The normal post-operative oedema, both within and surrounding the site of reconstruction, presents acutely but usually resolves. However, in some patients, debilitating oedema persists which suggests a failing lymphatic system. This failure could be due to the lymphatic vessels' inability to regenerate within or across the wounded area, or the system's inability

to handle the increased load imposed on it during the post-traumatic period. Lymphatic involvement in the healing, or knowledge of the failure of the lymphatic system, in this specific trauma population has not been researched extensively. A method is proposed to measure the impact of extensive lower-limb soft tissue trauma on the lymphatic system.

Measurements: To detect the presence of local oedema and lymphoedema, circumferential measurements (truncated cone formula), bio-impedance spectroscopy, and local epi-facial fluid measurement with di-electric constants were performed. Combining an intradermal injection of a fluorescence contrast agent indocyanine green (ICG; 0.1 mL dorsal side of both feet) and a near-infrared camera allowed real-time visualisation of the superficial lymphatic vessels.

Results: Twenty patients, treated between 2009 and 2013, were assessed. Preliminary findings of the ICG imaging showed no superficial lymphatic vessels in free muscle flaps, often with dermal backflow patterns near the scar tissue surrounding the flap. This suggests failure of the superficial lymphatic system.

Conclusions: Oedema is a significant factor in the morbidity of patients who have undergone lower-limb reconstruction. This study enhances our understanding of lymphatic repair after severe soft tissue trauma and improves awareness of the risk of lymphoedema in this population, leading to earlier detection and improved treatment outcomes.