

Abstracts from the 10th Australasian Lymphology Association Conference

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In April, the Australasian Lymphology Association welcomed 263 delegates to their 10th annual professional conference in Auckland, New Zealand. Platinum sponsors were Haddenham Health, gold sponsors Smith & Nephew, and bronze sponsors Toomac Solutions.

Here, the *Journal of Lymphoedema*, in conjunction with the Australasian Lymphology Association and the International Lymphoedema Framework, publishes 11 abstracts presented at the conference, including the prize winners (as marked).

CLINICAL CASES

Liposuction for lymphoedema: Improving physical and functional quality of life



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Background: The Macquarie University Cancer Institute established Australia's first multidisciplinary Advanced Lymphoedema Assessment Clinic (ALAC) in May 2012 and has embedded translational clinical care and research into its liposuction programme.

Presentation: Mrs M (aged 70 from Tasmania) developed right arm lymphoedema in 1994 following a radical mastectomy and radiotherapy in 1984, complicated by neuropathic pain in 1993. In 2007, following cellulitis complicated by septicæmia, her arm became grossly swollen. She experienced recurrent episodes of cellulitis requiring hospitalisation for 41 nights

over 4 years. Her arm symptomatically and functionally worsened leading to her desperately requesting amputation. In October 2012, she attended ALAC for assessment for liposuction of her lymphoedematous arm.

Investigations: Pre-operative assessments included bioimpedance spectroscopy (L-Dex), arm volume differences using circumferential measurements, magnetic resonance imaging, and functional assessments. Initially, Mrs M presented with non-pitting, dry, scaly, flaky skin with a volume difference of 67% and an L-Dex of 52.2.

Treatment: In December 2012, liposuction removed 1400 mL of fat and fluid. Custom-made Elvarex® compression garments were fitted immediately following surgery and have been worn continuously since.

Outcome: From October 2013, arm volume difference reduced to 4%, with no episodes of cellulitis. Mrs M is functionally pain-free and has returned to most activities, reporting liposuction to be "life-changing". Mrs M will be followed up in ALAC regularly for 2 years, which has strong links to her local lymphoedema practitioner.

Conclusions: A translational, multidisciplinary clinic for managing lymphoedema with liposuction surgery has improved physical and functional symptoms, and improved quality of life, for those eligible.



Primacy of quality of life: Applying flexibility in the management of secondary lymphoedema in a palliative care context

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Background: The presentation of complex lymphoedema in the palliative care context requires an approach that is first and foremost responsive to the immediate and prioritised needs of the patient. This approach may require modifications of guidelines for lymphoedema management, as well as flexibility in the provision of treatment.

Presentation: This case describes a 55-year-old woman with advanced lung cancer who presented with a pathological fracture of the right neck of humerus, thrombi of the axillary and subclavian veins, significant pain, and extensive oedema of her right-upper limb.

Treatment: Modification of treatment was necessary in response to changing circumstances

in light of the patient's deteriorating condition. Despite some potential contraindications to treatment, lymphoedema management was successfully undertaken. Management included manual lymphatic drainage, multilayered bandaging, wrap compression garments and kinesiotaping.

Outcome: A dramatic reduction in oedema was achieved and then maintained with adjustable compression. There was a concurrent, significant reduction in the patient's reported pain levels and emotional distress associated with the oedematous limb.

Conclusions: This case outlines the challenges of supporting a patient with refractory disease. Guided by the principles of palliative care, the lymphoedema therapist can contribute to the improvement of quality of life where oedema is a significant issue. Responsiveness and sensitivity to the physical, emotional and psychosocial needs of the patient and their carers are required, in tandem with flexibility with respect to oedema management techniques.

RESEARCH PRESENTATIONS

Assessments for axillary cording and the implications for physical treatments

Winner of the Best Queensland Poster

Denise Stewart

Mater Private Breast Cancer

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Background: There is limited understanding of the formation of axillary cording, or axillary web syndrome (AWS), after breast surgery. Physical structure and pain are known to have significant impacts on shoulder and arm movement for many women following breast cancer treatment. There is wide variance in the reporting of incidence and longevity due to a lack of valid and reliable assessment protocols. Treatment options are currently descriptive and involve physical therapies, such as myofascial massage, stretching, low-level laser, and kinesiotaping. Available case studies identify that treatment can be provided at a range of locations, from the axilla to the hand. Symptom relief and improved shoulder flexion are currently used as guides to indicate the effectiveness of treatment. More clinical input is required for researchers to identify better

assessments, accurate incidence, and longevity and a rationale for treatment technique choice and location of treatment. This abstract will show how these assessments are done and the implications regarding the location for physical treatments techniques.

Methods: Within a single breast cancer centre, the authors developed and reviewed assessment techniques, other than shoulder flexion, for the assessment of AWS.

Results: Two physical assessments, other than shoulder flexion, were identified to show if cording was present: (i) Reach out the Back Test (at three levels); and (ii) Lateral Thoracic Fascia Stretch.

Conclusions: These tests increase our knowledge of the impact of medical breast cancer interventions on shoulder girdle performance.



Reducing oedema after lower-limb cellulitis: A pilot study

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Background: Within the Australian health system, hospital admissions due to cellulitis have reached >40 000 episodes per year. Data from the UK show that hospital admissions due to cellulitis have increased by 77% in the past 7 years. One explanation for this increase of lower-leg cellulitis may be the population-level increases in associated risk factors such as obesity, diabetes, and venous insufficiency. When investigating recurrent cellulitis, chronic oedema is of particular importance. The standard protocol for managing cellulitis is oral or intravenous antibiotics, or a combination of both. Guidelines for recurrent cellulitis include long-term antibiotic therapy, compression therapy, and tinea treatment. In a climate where healthcare resources are becoming increasingly scarce, healthcare providers need to investigate not only time-effective, but also cost-effective, interventions to reduce the effect of conditions such as recurrent cellulitis.

Methods: This randomised, controlled pilot study with a total of 20 participants used three principles

of lymphoedema care (education, exercises, and skin care) as interventions to potentially decrease residual lower-limb oedema among patients who have recently been treated for lower-limb cellulitis.

Results: No statistically significant reduction between the two groups was found, but did suggest a trend toward decreasing leg circumference with a -2% decrease in the control group ($n=10$) and a -5.6% decrease in the intervention group ($n=10$).

Conclusion: This pilot study suggests further investigation may be beneficial.



Acceptability and perceived effectiveness of treatments prescribed for the management of lymphoedema

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Background: Patients' perceived acceptability and effectiveness of lymphoedema treatments, and reasons for discontinuing treatment were investigated.

Methods: A self-administered questionnaire was sent to members of the Lymphoedema Associations of Victoria and Queensland; 421 questionnaires were completed and returned by eligible participants (adults with a clinical diagnosis of lymphoedema).

Results: Mean age of participants was 66 years (range 18–91 years), and the majority were female (95%). Of those with secondary lymphoedema (78%), 83% developed lymphoedema following cancer treatment. The most common treatments for lymphoedema included compression garments (86%), self-administered massage (79%), prescribed exercises (69%), and manual lymph drainage (MLD; 67%). Financial costs associated with complex physical therapy (CPT), compression garments and bandaging, MLD, and laser therapy, as well as levels of discomfort associated with compression garments and bandages, were considered unacceptable by 28%–57% of respondents who completed each treatment type. Twenty-one percent of participants stopped using compression garments due to associated side-effects, and 36%, 27%, and 26% of participants ceased use of MLD, compression garments and CPT, respectively, as a consequence of

financial costs. Between 40% and 60% of participants who completed treatment with compression bandaging and garments, MLD, or CPT considered them to have helped reduce swelling, heaviness, and/or tightness 'quite a lot' or 'very much'.

Conclusions: Understanding patients' perceived acceptability and effectiveness of treatments is necessary to determine whether clinically effective treatment strategies are feasible in real-world settings.

Low-level laser treatment for fibrosis: Capsular contracture of post-mastectomy breast implants

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Background: Cosmetic reconstruction of the breast can involve implantation of a prosthetic device. Due to contraction of the fibrotic capsule that develops around them, implants undergo deformation in 10%–50% of cases; grade III or IV contracture requires implant removal. Based on its efficacy in treating lymphoedema and fibrosis, recent work in the USA has shown improvements in capsular contracture in humans following low-level laser treatment (LLLT). The authors evaluated the effect of LLLT on fibrosis associated with implant capsules in an animal model.

Methods: Two silicone implants (provided by MENTOR*) were placed subcutaneously on the dorsum of mice and the implant site was irradiated (X-rays; 10 gray) to induce fibrosis. The animals then received either LLLT ($n=5$) or placebo ($n=5$) three times per week for 3 weeks. Implants were imaged by microCT and histological assessment performed.

Results: There was no evidence of capsular contracture in either group. Capsules surrounding implants receiving LLLT were better organised histologically, with tight connective tissue layers parallel to the capsule surface, well aligned fibroblasts, and moderate inflammatory cell infiltration. Capsules receiving placebo treatment were less well organised, with more random connective tissue and fibroblast cell orientation, a greater degree of interstitial space and more inflammatory cell infiltration.

Conclusions: Capsular contracture was not induced in this model. LLLT resulted in a more

organised capsular structure and a more moderate inflammatory reaction to the implant. These observations may be relevant to the efficacy of LLLT in lymphoedema.

Segmental impedance thresholds for early detection and monitoring of upper-limb lymphoedema

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Background: Early detection of lymphoedema is important for effective treatment and reduction of disease burden. However, diagnosis can be difficult due to the localisation of early lymphoedema and the sensitivity of whole-arm measures to detect early changes. Therefore, the authors aimed to determine normal inter-limb impedance ratios in smaller portions of the upper limb, specifically the hand and four 10-cm segments of the arm, using bioimpedance spectroscopy (BIS) to provide diagnostic thresholds for detection of early lymphoedema.

Methods: One-hundred women, aged 49.1 (± 13.8) years, with no history of breast cancer or lymphoedema participated. Impedance measures for the hand and four arm segments were used to determine inter-limb segment BIS ratios. A subgroup of women were measured on two occasions, 1 week apart to determine normal impedance fluctuations over time.

Results: Thresholds were determined for the dominant and non-dominant limb, based on two and three standard deviations (SD) above the mean. The 2SD and 3SD thresholds for the dominant arm ranged from 1.121–1.150 and 1.172–1.209, respectively, and for the non-dominant limb ranged from 1.057–1.107 and 1.103–1.169, respectively. Intra-rater reliability was high (intra-class correlation coefficient, 0.945–0.983) and minimal detectable change in the hand and arm segments ranged from 0.06–0.09.

Conclusions: BIS diagnostic thresholds for the hand and four segments of the arm, based on normative data, taking into consideration arm dominance, have been developed. Segmental BIS has been shown to be highly reliable.

Prevalence and cumulative burden of lymphoedema following gynaecological cancer: Results from a longitudinal cohort study

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Background: Secondary lymphoedema following gynaecological cancer is associated with adverse physical and psycho-social consequences, yet its prevalence is poorly understood. The purpose of the Lymphoedema Evaluation in Gynaecological cancer Study (LEGS) was to determine the prevalence and cumulative burden of lower-limb lymphoedema (LLL) at regular intervals from before to 24 months following treatment for gynaecological cancer.

Methods: LEGS is a prospective, longitudinal cohort study of 460 women treated for endometrial, ovarian, cervical, vulval, or vaginal cancer, in Queensland, Australia between 2008 and 2011. Lymphoedema status was measured using the sum of leg circumferences (SOLC) and self-reported swelling (SRS) and diagnosed when an increase of >5% in SOLC was observed from baseline in any leg and SRS of the leg, pelvis and/or abdomen was reported.

Results: Point prevalence ranged between 12% and 44%, depending on time of measurement and type of assessment used. SRS produced consistently higher point prevalence when compared with SOLC. By 24-months post-treatment, 36% and 70% of patients were classified as having lymphoedema/swelling during at least one measurement period using SOLC and SRS, respectively. These are preliminary results, unadjusted for weight gain, with subsequent analysis to be undertaken to confirm findings and explore lymphoedema incidence.

Conclusions: This prospective cohort study of gynaecological cancer patients was designed to increase evidence for the onset, persistence, and severity of LLL. Secondary LLL following gynaecological cancer presents a significant public

health problem, with lymphoedema presenting as a disease- and/or treatment-sequelae for many women.

Focal upper limb and generalised oedema following taxane-based chemotherapy in women with early breast cancer

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Background: Taxane-based chemotherapy regimens are a standard element of care for early breast cancer. They commonly cause generalised oedema by an increase in extracellular fluid (ECF), but it is unknown whether the risk of lymphoedema in the arm on the side of surgery is increased. The authors sought to describe the incidence of lymphoedema and generalised limb oedema in women receiving taxane-based chemotherapy.

Methods: In this longitudinal study, 63 women recruited after surgery for early breast cancer were assessed prior to anthracycline-based, prior to taxane-based therapy, and 3 weeks and 6 months after taxane-based chemotherapy. At each assessment, the inter-limb ECF ratios and intra-limb intracellular (ICF) to ECF ratios were determined using bioimpedance spectroscopy.

Results: Taxane-based chemotherapy increased the ICF:ECF ratio in both upper and lower limbs, which was not observed after anthracycline-based chemotherapy. Taxane-related generalised oedema resolved 6 months following its completion, except in the arm on the side of surgery. Women with an elevated ECF ratio following taxane-based chemotherapy showed an increased ICF:ECF ratio. The inter-limb ECF ratio was increased in two women prior to all chemotherapy, five following anthracycline therapy, and 17 and 12 women at 3 weeks and 6 months, respectively, following taxane-based chemotherapy.

Conclusions: While generalised swelling in the legs and opposite arm diminished 6 months after chemotherapy, the incidence of lymphoedema in the arm on the side of surgery following taxane-based chemotherapy was still increased 6 months after the completion of that therapy.

Do women with breast cancer-related lymphoedema need to wear compression garments during resistance-exercise?

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Background: Regular exercise while wearing compression garments is recommended for women with breast cancer-related lymphoedema (BCRL). Unfortunately, compression garments may impede mobility, cause discomfort, or interfere with heat transfer. The authors compared the acute effects of wearing versus not wearing compression garments during a moderate intensity, resistance-based exercise (RE) session on arm swelling in women with BCRL.

Methods: Twenty-four women with clinically diagnosed ($\geq 5\%$ inter-limb circumference difference and/or bioimpedance spectroscopy [BIS] L-Dex score ≥ 10), stable, unilateral BCRL participated by completing two RE sessions, one with compression and one without, in a randomised order, separated by a 7–10 day wash-out period. Each RE session consisted of five upper-body exercises, with each exercise performed for two sets at a moderate intensity (8–12 repetitions maximum). Lymphoedema was measured using BIS (L-Dex score) and limb circumferences (% inter-limb difference). Measurements were taken pre-exercise, immediately post-exercise, and 24 hours post-exercise.

Results: No change in L-Dex scores were observed pre-exercise, immediately post-exercise, or 24 hours post-exercise in either the compression or non-compression garment-wearing groups (mean \pm standard deviation for compression: 17.7 \pm 21.5, 12.8 \pm 12.8, 15.3 \pm 18.8, respectively; non-compression: 14.7 \pm 18.5, 15.7 \pm 18.0, 13.4 \pm 16.1, respectively). Inter-limb circumference differences were also stable across time and treatment groups.

Conclusions: These findings suggest that, at least in the short term, moderate intensity upper-body RE performed in the absence of compression garments does not exacerbate lymphoedema in women with BCRL.

Liposuction in the management of persistent arm swelling following conservative management of lymphoedema

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Background: A significant number of women who undergo axillary surgery for breast cancer will develop lymphoedema, which can stimulate adipose stem cells and result in fat hypertrophy. Conservative therapies can effectively reduce fluid accumulation, but have no effect on the residual fat and may result in a persistent excess limb volume. The authors sought to review the outcome of patients with arm lymphoedema who have undergone liposuction to remove associated hypertrophied fat.

Methods: A prospective database of all lymphoedema patients undergoing liposuction has been maintained since 2005. Liposuction was performed in the manner described by Brorson (2003) and all patients received postoperative compression garments. Limb volumes were recorded preoperatively and at each postoperative visit. Volume of fat removed, and demographic data, were documented. Patients completed the Hospital Anxiety and Depression Scale (HADS). These data were analysed and compared to previously published outcomes.

Results: Of 37 referrals, 24 patients were offered liposuction and it was undertaken in 19. Mean duration of lymphoedema was 7 years, and the mean volume excess was 1350 mL. A mean of 1295 mL of fat and 120 mL of fluid were aspirated. At 3 months, mean volume reduction was 86.58% ($n=19$), 6 months 88.56% ($n=18$), 1 year 95% ($n=17$), 2 years 106% ($n=13$), 4 years 119% ($n=11$), 6 years 129% ($n=7$). HADS scores improved from 13.92 to 5.57 over 3–6 months. These results compare favourably with the published literature.

Conclusions: Liposuction and continuous postoperative compression are effective treatments for advanced arm lymphoedema.