Can we prevent the development of lymphoedema?

The focus of this debate is the prevention of the development of overt, clinical lymphoedema in those at risk. Much of the literature has concentrated on reducing the risk of lymphoedema development after treatment for breast cancer. Some of this has related to refinements in surgical and radiotherapy techniques, such as sentinel node biopsy (Sener et al, 2001), which try to minimise damage to the lymphatic system. Other papers have described recommendations to reduce the likelihood of swelling after treatment. These are intended to prevent further damage to the lymphatic system, reduce the risk of infection and improve lymphatic drainage. The advice is mainly based on common sense with little research evidence to support it (Clark et al, 2005; Lymphoedema Framework, 2006). Following these recommendations may significantly alter the patient's way of life and, therefore, it is important to identify which measures are the most effective, so that informed decisions can be made.

The prevention of the development of leg oedema is not addressed extensively in the literature. A similar common-sense approach may be recommended for those at risk following cancer treatments, e.g. inguinal node dissection for vulval cancer, but other groups, such as those at risk due to immobility, are generally neglected. Even where there is evidence of effective preventive measures, such as the use of elastic compression stockings following acute deep vein thrombosis in reducing the risk of developing post-thrombotic syndrome (Brandjes et al, 1997), these may not be routinely adopted in acute clinical settings. VK

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What do you feel are the three most important recommendations for 'at risk' patients to prevent the development of lymphoedema? How effective do you think these are?

ML: Every person who is at risk of lymphoedema should be given advice on prevention. The following recommendations are the most important:

- It is important to prevent infections through daily skin care, moisturising with an emollient and avoiding any cuts or openings in the skin, including all invasive needling techniques (Soran et al, 2006)
- Exercise and general mobility are important, as skeletal muscle contractions provide the primary pumping action for lymphatic and venous drainage. Exercise also improves range of movement and achieves better functional outcomes. It also raises endorphins, helping to improve mood, and helps with weight reduction. Immobile patients should be encouraged to do simple leg exercises in the chair to get the calf muscle pump functioning
- Weight and body mass index (BMI) must be kept within normal limits. Obesity is a significant risk factor in lymphoedema and all must be done to support patients as they embark on a healthy eating lifestyle. (Johansson et al, 2002).

ND: Paced exercise and activity, good skin care and, where possible, avoidance of venopuncture and skin puncture in the at-risk limb. These recommendations do help towards reducing the risk and there are anecdotal reports of patients linking lymphoedema onset to not following this advice.

SN: The most important recommendations are:

- To keep the skin healthy by washing with soap and water and massaging with an Ayurvedic oil
- To practice pranayama and other yogic breathing
- To prevent injury or infection.

NG: Before answering these questions, the term 'at-risk' needs to be addressed. The medical profession is currently at odds as to how to accurately measure and quantify lymphoedema. The lack of standardised measurement techniques has led to disparity in diagnosis and classification. Sensitivity of the mode of measurement and accurate preoperative volumetric assessment are of the utmost importance to identify the patient who has developed stage I lymphoedema. Early identification and diagnosis of stage I lymphoedema is necessary to prevent the condition from progressing, but it is frequently unidentified by currently accepted measurement techniques. New optoelectronic and bioelectrical impedance devices have demonstrated that subclinical evidence of interstitial changes and lymphatic congestion can be detected in the absence of visual change in the limb.

Even in the presence of adequate early detection and intervention, lymphoedema is likely to develop in a certain percentage of those at risk. When preventive detection techniques and adequate early intervention strategies are employed, the progression of lymphoedema may be prevented.

The three main recommendations that I would give those considered at risk would be: skin and nail care, observance of sensory changes in the at-risk limb and early intervention and management

ML: *As a possible risk factor, tests of blood pressure should be avoided in the affected limb.*

ND: *In women who have had bilateral breast disease, blood pressure would ideally be measured in the leg or using a finger cuff.*

SN: *Even with bilateral disease 'judicious' measure of blood pressure may not damage the lymphatics.*

NG: *Blood pressures which are appropriately taken according to clinical guidelines should pose little threat to the at-risk limb.*

for a new onset of swelling. Meticulous skin care will minimise the impact of an inflammatory phase taking place in the at-risk limb and may reduce the potential onset of stage I lymphoedema. Sensory changes in the limb have been shown to correlate with subclinical signs of interstitial lymphatic congestion (Armer et al, 2003). Patients and healthcare providers should be taught to recognise and manage these sensory changes, as well as detecting early signs of swelling in an at-risk limb in order that the progression of lymphoedema may be prevented.

Exercise is generally recommended for the improvement of lymphatic drainage. However, women treated for breast cancer sometimes report that their swelling developed after exercise, such as decorating or carrying a heavy bag. What should we advise the 'at-risk' patient about exercise?

ML: Exercise is vitally important and should be encouraged although common sense must prevail. There is a difference in recommending general aerobic exercise, such as flexing and extending the elbow or cycling, which contracts and relaxes muscles, to recommending a sustained muscle contraction such as carrying a static load for a long period of time which does not allow the muscle to rest. We suggest that all women can do decorating and go shopping but they must be realistic and know their limits. They should take regular rests and not repetitively overuse the limb. A randomised controlled trial by Ahmed et al (2006) stated that weight training did not increase the risk of lymphoedema in women with breast cancer.

ND: I think this depends upon the individual, their response to exercise, their personal needs and previous levels of activity. My advice is to pace the introduction or return to exercise gently and gradually. This, combined with educating about the possible signs of an 'overwhelmed' lymphatic system, and action to take should this happen, should empower people to exercise independently and monitor their 'at-risk' limb.

SN: In our patients with upper and lower limb lymphatic filariasis we observed that oedema increases after prolonged yoga exercises (more than 40 minutes). Therefore, we advise that patients should rest for 5–10 minutes every 30 minutes if they want to exercise for an extended period. We have also treated a few sportswomen with lower-limb lymphoedema whose symptoms became worse after they stopped participating in sport.

NG: Exercise is beneficial and recommended for patients who have been well-educated about their risks of developing lymphoedema. A graded exercise programme that encourages proper protection and observation of limb changes over time can be successfully and safely implemented. Patients should be advised about how to protect their limb against an undue inflammatory process incited by an exercise programme or activity. This involves initiating an exercise programme with the input and supervision of a knowledgeable therapist, teaching patients about safely advancing their exercise programme and monitoring the limb for changes with an advanced programme. Limb changes that commonly occur with the onset of lymphoedema can include sensory changes and/or visible swelling. The presence of these symptoms should encourage the patient to reduce the exercise or activity to a range where symptoms are not experienced.

Should we recommend that women treated for breast cancer should not have their blood pressure measured in the at-risk arm? What about those women who have had bilateral breast disease?

ML: As a possible risk factor, tests of blood pressure should be avoided in the affected limb. Although there is no evidence to prove that this is the case, clinical experience has often shown that a sudden onset of lymphoedema can be caused by an episode of blood pressure monitoring. If patients have had bilateral surgery, blood pressure testing could be taken on the limb which has had the least invasive axillary surgery or on the lower limb.

ND: Yes, wherever possible. Although I have not come across any evidence to substantiate this I am aware of anecdotal reports of lymphoedema developing soon after a blood pressure test. In women who have had bilateral breast disease, blood pressure would ideally be measured in the leg or using a finger cuff. If these methods were contraindicated I would advise, although this does pose a potential risk (Ozalan and Kuru, 2004), using the side that has had least axillary nodes removed. If that is not appropriate or relevant, use the side that has not had axillary radiotherapy and, if this was performed bilaterally, use the non-dominant arm.

SN: We may measure the blood pressure in the at-risk arm. Even with bilateral disease, 'judicious' measure of blood pressure may not damage the lymphatics.

NG: Blood pressures which are appropriately taken according to clinical

ML: *Regardless of the 2002 paper that showed that air travel is a low risk and compression devices are possibly counterproductive, all our breast cancer patients are supplied with a class one compression sleeve if they have had axillary surgery.*

ND: *Although there are also studies supporting the use of compression garments (Casley-Smith, 1996), I would not advocate their use while there is the possibility of detrimental effect.*

guidelines (Kracher, 2005) should pose little threat to the at-risk limb when taken during regular medical visits and screening examinations. Repeated blood pressure measurements on a limb over a short period of time may pose a risk for developing lymphoedema, however, there are no studies that currently exist that fully support this anecdotal evidence.

Patients with, or those at risk of, developing chronic oedema often ask about the effect of flying on their condition. One paper has suggested that wearing compression garments may in fact increase the risk of flight-associated lymphoedema after breast cancer treatment (Graham, 2002). What advice should we give to those at risk of developing lymphoedema when they are planning to fly?

ML: Regardless of the 2002 paper that showed that air travel is a low risk and compression devices are possibly counterproductive, all our breast cancer patients are supplied with a class one compression sleeve if they have had axillary surgery. Due to the alteration in air cabin pressures by about 30% during take off and landing, it is usually suggested that they wear a compression sleeve prophylactically just for the flight. Patients are also encouraged to regularly do specific relax/contract exercises. People who have had a previous cellulitic episode are advised to get a precautionary prescription of antibiotics that can be taken if an infection were to occur. For long-haul flights, lower-limb anti-embolism travel stockings are also recommended.

ND: Although there are also studies supporting the use of compression garments (Casley-Smith, 1996), I would not advocate their use while there is the possibility of detrimental effect. My advice would be similar to the recommendations I would give anyone planning to fly: they should promote healthy lymphatic and venous drainage through regular changes in position and walks; perform circulatory, stretching and breathing exercises during the flight; wear loose, comfortable clothes and remove tight jewellery; and they should avoid becoming dehydrated.

SN: Movement is an important factor and walking inside the aircraft is a good idea. I would not advise wearing compression garments during the flight, but to use overnight limb elevation following air travel. However, this is not relevant to the patients at my clinic.

NG: Currently, there is no evidence to convincingly guide us to issue compression recommendations preventively for air travel. However, the anecdotal reports are convincing enough for us to consider this as a potential trigger for lymphoedema. Lymphoedema initiated during an air flight may be attributed to a multitude of factors associated with a travel day. A typical travel day may involve lifting and carrying baggage heavier than what the patient is accustomed to in a normal day. This may put undue strain on the limb and perpetuate an inflammatory response. Additionally, there may be heightened physical strain with travel, including walking long distances at an increased pace which may further fatigue and dehydrate the body. A long flight may also perpetuate dehydration, as the cabin air tends to be dry. All of these factors, along with the consideration of the changing air pressures in the plane, must be considered in the prevention of lymphoedema. Issuing a compression garment that is ill-fitting or of an inappropriate compression grade can perpetuate the onset of lymphoedema. Therefore, recommendations to those at risk should focus on minimising all of the factors faced during a travel day that may heighten their risk. Encourage packing bags lighter so as not to unduly strain the limb, allow adequate time to navigate airports, with time for rest and drinking plenty of fluids to maintain hydration. If a recommendation is made for a compression garment, the patient must be adequately sized to ensure correct fit of the garment. Education must take place for proper donning and doffing of the garment, as well as an appropriate wear schedule during the travel day. The compression garment may be packed in a carry-on bag and only utilised if needed.

Following treatment for breast cancer, a number of women develop symptoms in their at-risk arm, such as a feeling of swelling/heaviness without any clinical evidence of lymphoedema (sometimes called stage 0 lymphoedema). How should we manage this problem? Can we prevent the development of overt oedema?

ML: Upper limb circumference measurements must be taken before surgery to establish a baseline. During the past three years we have taken preoperative upper-limb measurements in over 600 breast cancer patients. Surprisingly, a significant number have a smaller circumference on their affected limb before surgery. Arguably, if these patients then go on to develop oedema there may not be a large difference between the limbs and lymphoedema may not be diagnosed. For example, if a patient's affected limb was 16% smaller preoperatively and then she experiences heaviness and is referred for lymphoedema management, it may appear that the arm is only 4% bigger, putting her into the at-risk category when in fact the limb is 20% larger. Therefore, comparing with the preoperative measurements will enable therapists to have a much clearer picture on lymphoedema severity.

SN: *Movement is an important factor and walking inside the aircraft is a good idea. I would not advise wearing compression garments during the flight...*

NG: *Currently, there is no evidence to convincingly guide us to issue compression recommendations preventively for air travel.*

If preoperative measurements are unavailable, patients should be treated as if they have mild lymphoedema. The four cornerstones of care include wearing a compression sleeve for 4–6 hours a day, skin care, exercise and simple lymphatic drainage. The symptoms should improve if the patient complies. Patients should also be taught stretching techniques to prevent any soft tissue and fascia tightness which prevents full movement and causes feelings of heaviness.

ND: I have only had experience in managing patients with breast cancer, so my answer relates to this group. Initially I would check that symptoms were not musculoskeletal or neurological in origin, and compare present measurements (e.g. movement and limb volume) to those taken preoperatively. If symptoms seem lymphatic I follow the four cornerstones of treatment. I have found that using a sleeve for about 4–6 months usually helps symptoms resolve. Any less and I have noticed that there are frequent recurrences — often with oedema.

A study by Box et al (2002) showed apparent reduction in the development of secondary lymphoedema and alteration of its progression in patients with breast cancer. We have attempted to address this issue by trying to reduce some of the risk factors thought to be associated with lymphoedema, along with patient education, within our service provision: such as postoperative wound complications, restricted shoulder movement and cording (Sitza and Harlow, 2002). For example, venous/lymphatic exercises and one-shoulder exercise (with limited fixed repetitions) are advised, as is a general reduction of activity in both arms. Outpatient review is given with the aim of providing early assessment and treatment of lymphatic and musculoskeletal problems, such as movement and cording and to ensure that radiotherapy position can be achieved. This is important as there is an increased risk of radiation dosage error associated with the inability to maintain planning position (Johnson and Musa, 2004). Initial results are promising, suggesting a reduction in wound healing problems, improvement in the range of movement of the shoulder, posture, pattern, resumption of activities and less than half the average lymphoedema incidence (National Institute for Health and Clinical Excellence [NICE], 2002). Lymphoedema symptoms in more than 50% of the patients resolved and they have been discharged, although long-term monitoring and further evaluation is needed.

SN: There are several Ayurvedic formulations made up of herbs available in India. Lymphoedema is classified under the heading 'shleepada' in Ayurveda. Many Ayurvedic practitioners say that medicines like *nityananda ras*, or *shakotak*, available in the form of liquid preparations, could be used for the prevention of the development of oedema. Although the concept of being 'at risk' is explained in Ayurveda and assessed on the basis of clinical history and presentation, there are no clear guidelines on its management in the traditional books. The appearance of skin, classified under *shtanaeeya vikruthi* (local disease) could also be treated using Ayurvedic formulations and *phanta* soaking solutions. Our experience with lower limb oedema due to lymphatic filariasis shows that the skin of the oedematous limb gradually reverts to clinical normality as the oedema reduces. The Indian Council for Medical Research, New Delhi, is planning studies to investigate whether Ayurvedic medicines could be used to prevent lymphoedema.

NG: Evidence exists to correlate these sensory changes with the onset of lymphoedema. Subclinical lymphoedema is purported to be the genesis of sensory changes in the limb, including heaviness and aching. The presence of these symptoms in an at-risk patient requires vigilant observation and assessment to detect subclinical lymphoedema. Optoelectronic devices and bioelectrical impedance may be useful in the early detection of subclinical lymphoedema when used preoperatively to assess limb volume. Volumetric changes in the at-risk limb may benefit from light grade compression garments, elevation and self-lymphatic massage. Although subclinical changes in limb volume may not be prevented, prevention of the progression of lymphoedema is possible with early detection and management.

Lymphoedema services report that they are seeing more women with breast oedema following the wide local excision for breast cancer and postoperative radiotherapy to the breast. Are there any ways of reducing the risk of this?

ML: First patients undergoing these treatments must be made aware of the possibility that the breast can swell. Breast care nurses must encourage women to wear a soft bra or supportive vest as soon as possible after surgery. Some women with breast oedema have not worn a bra for months afterwards and then wonder why their breast was swelling. Ideally all patients should also be taught simple lymph drainage as this would not only encourage collateral lymph drainage but could improve the psychological fear of touching the scar post treatment.

ND: I have found little guidance on this, but advise patients on skin protection, to moisturise the breast once the wound

ML: *In the current health climate, funding is extremely tight and, as the patients who have lymphoedema are not being adequately treated, there is not much hope for those who are merely at risk.*

ND: *[Lymphoedema services] should raise awareness of lymphoedema among patients and healthcare professionals and encourage evidence-based research to achieve standardised identification, assessment and treatment.*

has healed and to wear wireless, seamless bras. I have noticed that seams and wires can encourage areas of fibrosis and fluid accumulation, especially in larger breasts. If patients feel heaviness or fullness in their breasts without visible signs of oedema than I will often try a Tubigrip 'vest'. I am unsure whether this reduces the risk, but patients normally report that it helps alleviate symptoms and feel that it works better than compression bras.

SN: Studies are under way in India to reduce the adverse effects of cancer therapy by combined use of Ayurvedic medicines with chemotherapy. Beneficial effects have been seen with the administration of Kanchanara Guggulu and Punarnavamandoora (personal communication).

NG: The current surgical techniques for breast conservation including lumpectomy and sentinel lymph node dissection may contribute to breast oedema. Breast oedema may exist in the absence of upper extremity lymphoedema (Ronka et al, 2004). Removal of the sentinel node(s) may impede lymphatic drainage from the breast tissue as these nodes are the primary pathway for lymphatic fluid to be evacuated from the breast. Radiation therapy further compounds this drainage deficit by impeding the remaining healthy lymphatics. Assuring good mobility of scar tissue and preventing tissue adherence after surgery and radiation therapy may be meaningful techniques to reduce the risk of breast oedema.

Many people, particularly the elderly, develop chronic leg oedema as a result of immobility due to a variety of conditions. The oedema itself tends to reduce mobility further. What can we do to prevent this?

ML: Patients have to be made aware of the potential damage that could occur if they sit all day and night in a chair and never elevate their legs. Many community patients access services daily for leaking legs which will not improve if they never go to bed. The onus must be placed with the patient and carers to wash and moisturise their limbs every day. Self-care strategies, including gentle exercises to do while sitting, with simple realistic goals will encourage and motivate patients. Further educational support for the community nurses and staff is also imperative.

ND: There needs to be improved identification and monitoring of this at-risk group, alongside increased education both of prospective patients and healthcare professionals. Although this is not my speciality, addressing issues such as provision of exercise programmes, compression garments and postural positioning may help work towards prevention, as could optimising patient function and mobility through aids/adaptations and support from healthcare staff.

SN: In our setting we recommend practising regular yoga and yogic breathing. Since yoga is culturally accepted in our society we have less difficulty persuading patients to accept the regimen.

NG: Early identification and management of swelling conditions may prevent the progression to lymphoedema. Long-standing oedema in the lower extremity may contribute to phlebolymphostatic conditions over time. This condition may perpetuate diminished mobility if the progression to lymphoedema is not controlled. Early stage management of venous oedema or other dependent oedemas with elevation and light grade compression may prevent long-term insufficiencies of the lymphatic system from developing. Encouraging mobility along with compression in the early stages will further enhance the muscle pump of the lower extremities and allow for maximal fluid decongestion along with continued ambulation.

With increasing knowledge of the aetiology and genetics of primary lymphoedema, what can be done to prevent oedema developing in those believed to be at risk?

ML: This is probably the most difficult to prevent but similar principles can be applied to all patients:

- Prevent infections by washing and moisturise limbs daily
- Exercise regularly, particularly swimming and aqua-aerobics, as not only does the water have hydrostatic pressure but the buoyancy reduces body mass
- Keep BMI and weight to normal limits
- The use of lightweight compression garments could be used for a few hours daily or if the at-risk patient is standing all day
- Last, but not least, know the signs and symptoms of lymphoedema and where to access clinical support if needed.

ND: Hopefully with these advances at-risk patients and families can be identified earlier, advised more accurately and further effective preventive measures and treatments will evolve. However, in order to benefit from these developments and reduce the risk, it is important to ensure effective and timely services are in place.

SN: Although supported by experience rather than studies, we would recommend having Ayurvedic oil massages and practising yoga.

NG: If we are able to prenatally determine the presence of a genetic predisposition to lymphoedema then steps can be taken to manage the condition

SN: *Patients at risk would benefit from counselling and education given by trained counsellors or nurses.*

NG: *Lymphoedema services should focus on incorporating assessment and education interventions before the patient undergoes surgical procedures that are known to compromise the lymphatic system.*

from an early stage and potentially stop its progression. With adequate identification and management techniques, stage I lymphoedema can be maintained and progression of the condition prevented. Early identification of genetic risk and early management of swelling are necessary to accomplish this.

What role should lymphoedema services have in the management of the at-risk patient?

ML: As there is no medical or surgical cure for lymphoedema, prevention and risk stratification are extremely important. However, in the current health climate funding is extremely tight and, as the patients who have lymphoedema are not being adequately treated, there is not much hope for those who are merely at risk.

If awareness was improved among healthcare professionals then advice could be provided in primary care. It is important that patients are aware of risk factors and how they can help themselves. We have provided a prevention scheme for breast cancer patients for the past three years and have seen a reduction in the incidence of lymphoedema to one in 10, instead of one in three. Ideally, group sessions targeting those most at risk could be arranged jointly with other healthcare professionals with the involvement of the lymphoedema services.

ND: They should provide systems that identify patients as early as possible to enable timely access to information, education, support and any necessary treatment (Lymphoedema Framework, 2006). They should raise awareness of lymphoedema among patients and healthcare professionals and encourage evidence-based research to achieve standardised identification, assessment and treatment.

SN: Patients at risk would benefit from counselling and education given by trained counsellors or nurses. This counselling must be a full-time programme. In our set-up we have a counsellor called the 'patients' relations officer'. Every day patients call the centre and preliminary data shows that bacterial acute dermatolymphangioadenitis (ADLA) attacks are reduced through better management of their entry points. Patient compliance has also improved following this programme.

NG: The key to detecting and managing lymphoedema in the early stages is to identify it at, or before, the clinical onset of the condition. Measurement devices exist that have a high sensitivity for detecting volume changes in the limb, however, these devices are only useful in the context of preventive assessment. Without pre-morbid and pre-surgical 'normal' measurements of a limb, early detection becomes difficult. Lymphoedema services should focus on incorporating assessment and education interventions before the patient undergoes surgical procedures that are known to compromise the lymphatic system. A preventive model of lymphoedema service delivery may help stop the progression of the condition through early detection and management.

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