Retrospective audit of a prevention clinic for BCRL

Eilish Lund, Jim Turner

Abstract

Background: There was an awareness by lymphoedema practitioners that patients with breast cancer-related lymphoedema (BCRL) did not assimilate written information at the time of surgery and were poorly managing their 'at-risk' arm. *Aims:* To evaluate the effect of a prevention scheme on the development of arm oedema. *Methods:* The lymphoedema database was searched for all patients who had undergone surgery in the two years before 1st July 2006. Data from the two years following the introduction of the prevention clinic up to 30 June 2008 were searched for the comparison group. *Results:* Patients who had axillary surgery (253) were invited to the lymphoedema prevention clinic and there was a 91% (228) attendance rate. Ninety-nine patients who had surgery in the four years were used for the analysis. A reduction in referrals to the lymphoedema service from 28% to 17% of all patients undergoing surgery was recorded. No significant effect from radiotherapy was found, however, the type of axillary intervention influenced the results. *Conclusions:* No extra funding was sought and the service was initiated out of existing staff. Patients were educated to become expert in managing their compromised lymphatic system, thereby reducing the incidence of BCRL. *Declaration of interest:* None.

Key words

Breast cancer-related lymphoedema (BCRL)
Arm oedema
Surgery
Lymphatic system

Historically within the Wrexham and Flintshire area, patients with arm swelling as a result of breast cancer surgery or radiotherapy (RT) were treated reactively and referred to the lymphoedema service when they presented with arm, breast or truncal swelling. Following surgery, all patients were given written information on prevention of lymphoedema, including advice on cellulitis, skin care and exercises and were seen postoperatively by the physiotherapist. However, with the consultant's drive to have patients discharged as soon as possible following surgery, patients are now frequently discharged before seeing the physiotherapist, especially those who have their surgery at weekends. As a result, reduced range of movement, cording and scar complications were not being identified and treated appropriately.

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When referred to the authors' lymphoedema service, anecdotal evidence from some patients confirmed the onset of arm swelling following poor management of the at-risk limb through lack of knowledge. The written instructions had not been taken on board and some presented following an episode of cellulitis that might have been prevented by adherence to the skin care programme. Patients also reported having immunisations, blood sampling and blood pressure monitoring on the affected arm (Smith, 1998; Greene et al, 2005).

Following positive outcomes from a prevention service at Swansea NHS trust, it was decided at the authors' trust to see patients for a follow-up appointment at the lymphoedema prevention clinic six weeks after surgery. Patients would have their arm function assessed by a physiotherapist and be given appropriate exercises and advice on general activities for their health and wellbeing. They would have their limb volumes measured in both arms and have a 20–30-minute education session on the prevention of lymphoedema. This would include education around the possibility of developing cellulitis and how to prevent this. Patients would also be given an alert card with advice on avoiding injections, blood pressure monitoring and blood sampling, and to get appropriate antibiotic therapy for the management of cellulitis. Appointments would be sent out by the

breast care nurses who would also attend the clinic and provide an advice and prosthesis-fitting service.

The incidence of breast cancer-related lymphoedema (BCRL) has been the topic of a number of reviews (Petrek and Heelan, 1998; Williams et al, 2005; Meneses and McNees, 2007). The development of lymphoedema as a consequence of breast cancer, or its treatment has long been recognised. The incidence ranges from 6–83% in patients who are treated with a combination of surgery and radiation for breast cancer (Clark et al, 2005). The majority of opinion puts the incidence somewhere in the region of 12–25%, (Pain and Purushotham, 2000; Campisi et al, 2002; Querci della Rovere and Ahmad, 2003; Armer et al, 2004; Clark et al, 2005; Sakorafas et al, 2006). However, a number of papers suggest that evolving surgical techniques such as sentinel lymph node biopsy (SLNB) will ultimately reduce the incidence of lymphoedema in patients not requiring a full axillary clearance (Goffman et al, 2004; Armer, 2005). In a randomised controlled trial of 298 patients, Golshan et al (2003) found that two patients of 77 years of age who had SLNB had developed arm swelling, an incidence of 2.6%. McLaughlin et al (2008) in a five-year study of 936 women who had SNLB alone, or followed by axillary lymph node dissection, found that 5% developed arm swelling in the SNLB group alone.

Study purpose

The effect of the prevention scheme on the development of arm oedema in the breast cancer patient was evaluated to inform future practice, especially the inclusion of a structured prevention clinic as part of the patient journey through breast cancer treatment.

Sample

The lymphoedema database at the authors' clinic was searched for patients who had undergone breast surgery, including surgery to the axilla, in the two years before 1 July 2006. All patients referred to the service are entered onto the system where all dates and types of surgery are recorded. Data from the two years following the introduction of the prevention clinic until 30 June 2008 was searched for the comparison group.

One hundred and three patients were referred to the lymphoedema service over this four-year period. However, four of them had undergone bilateral surgery and were excluded from analysis. Exclusion was due to the main outcome measure being the percentage difference in size between affected limbs and non-affected limbs. These exclusions resulted in 99 patients being used in the analysis. Patients with advanced cancer who died before the conclusion of the audit were included in the data collection.

Coincidentally, SLNB was started at the same time as the prevention clinic, and both initiatives rolled out in July 2006. However, a full change over to SLNB from axillary sampling did not come into place until January 2007. Out of a total of 253 patients, 228 attended the prevention clinic (91%).

In variance to the British Lymphology Society (BLS, Clinical Definitions, January 2001), the authors' lymphoedema service chose to categorise the levels of severity differently. The majority of measurements were less than 20% excess, and considering current research on the early recognition of pre-clinical oedema (Cornish et al, 2005; Stout Gergich et al, 2008), the authors decided to categorise by severity (*Table 1*).

The percentage difference was studied in three distinct ways: total, distal and proximal volume. Using these distinctions and an understanding of the anatomy and physiology of the lymphatic system when evaluating the patients seen at the prevention clinic, the authors felt that proximal swelling (the upper part of the arm down to the elbow) was more likely to be a residual post-operative swelling. If the arm proved to have swelling in the distal segment (from the elbow to the wrist), it was more likely to be lymphoedema. Patients from the prevention clinic were not referred to the lymphoedema service if they had mild proximal swelling. However, a further appointment for measurement to rule out any postoperative effect was given. Full arm swelling or distal swellings were automatically referred to the lymphoedema service.

Method of measurement

Limb volume was determined by using the Kuhnke formula for calculating the volume of a cylinder (Kuhnke, 1976). Measurements are calculated by taking circumferential measurements of the arm starting two centimetres above the lateral epicondyle, then continuing at four centimetre intervals proximally, stopping at two centimetres below the axillary fold. The cylindrical sections are then calculated with the formulae: volume = circumference$^2/\pi$. The percentage volume excess (PCVE) is calculated by comparing the measurements taken from both limbs, using formulae: PCVE = 100 x excess limb volume/normal limb volume.

The software, LymCalc, gives the total volume of the arm and the volume of the distal segment from the wrist to the elbow, and for the proximal segment from the elbow to two centimetres below the axillary fold.

Results

Ideally, the authors would have liked to have measured limbs pre-surgery. However, due to the location of

Table 1

Levels of severity as defined by BLS and North Wales NHS Trust (East)

Categories (%)	Mild	Moderate	Severe
BLS	0–20	21–40	>40.0
North Wales Trust (East)	0–10	10.5–20.5	>20.5

Table 2

Number of referrals and surgical procedures between 2004 and 2008

Date of surgery	Referrals to clinic	Surgical procedures	Proportion %: referrals/procedures
1 July 2004–30 June 2006	59	213	28
1 July 2006–30 June 2008	43	253	17

Table 3

Number of clearances and completions between 2004 and 2008

Date	ANC+completion clearance	Surgical procedures to axilla	Proportion %
1 July 2004–30 June 2006	143	213	68
1 July 2006–30 June 2008	112	253	44

the lymphoedema clinic off-site it was impractical. There are plans to incorporate this into the service in the future. Differences in limb volume due to dominance and other factors were not excluded.

The most notable result was that referrals to the lymphoedema clinic dropped substantially relative to the number of surgical procedures (proportion difference = 0.11, 95% CI: 0.03, 0.18, z=2.8, p< 0.01) (*Table 2*).

There was a significant difference between surgical procedures to the axilla in the two groups of patients (proportion difference = 0.23, 95% CI: 0.14, 0.32, z=5.0, p< 0.001) (*Table 3*).

Chi-square trend analysis showed that for distal excess volume there was a significant decrease in the numbers of patients in the more than 20% volume category (Xtrend 3.99, p<0.05) (*Figure 2*). No significant differences were found in total excess volume category (*Figure 1*), or proximal excess volume category (*Figure 3*).

There was no significant difference in total excess volume between axillary node sampling (ANS) with clearance and SLNB with clearance. However, there was a statistically significant difference between axillary node clearance (ANC) and ANS with clearance (mean difference=-6.3, p=0.01, 95% CI: -10.6, -1.8); and between ANC and SLNB with clearance (mean difference=-6.4, p=0.01, 95%CI: -11.2, -1.7).

The number of days from surgery to lymphoedema assessment was significantly different between pre and post-intervention periods (mean difference=-97, p=0.03, 95% CI: -185, -8).

Taking the four-year period as a whole, the effect of RT on total excess volume was not significant. However, the group receiving RT waited significantly longer for the first assessment than those not receiving RT (mean difference=-265, p<0.001, 95% CI: -371, -158). There was no correlation between number of days waiting and volume excess.

Once SLNB was introduced, 106 patients had this intervention in the axilla only, of that, three developed arm swelling, an incidence of 2.8%. This is similar to the figures in the Golshan et al (2003) study.

For those who were treated with the standard lymphoedema management programme, a comparison between first and third measurements of total excess volume showed a statistically significant difference in the pre-intervention period (mean difference=1.81, p=0.05, 95% CI: 0, 3.6), but no significant difference in the post-intervention period. The excess volume was less than 10% in 30 of the 41 post-intervention patients, making any small reduction statistically insignificant.

Discussion

Earlier assessment following surgery has a marked effect on the swelling in the distal segment, which is traditionally the 'problem area' in managing arm oedema (*Figure 2*). The subcutaneous lymph collectors of the arm originate in the fingers and terminate in the axillary nodes. The lymph vessels of the forearm and hand form into bundles and unite in the region of the elbow. The lymph collector system forms branches, which in turn form new collectors resulting in a reservoir-like enlargement of the lymph system in the cubital fossa (Kubik, 2003). This complicated arrangement seems to become engorged if the lymph system has not formed collateral drainage following surgery.

This study found that patients who were selected to have ANC alone had a statistically significant limb volume difference to those who had clearance of the axilla later following ANS or SNLB. It could be surmised that these patients were assessed pre-operatively to have a higher grade tumour, or more advanced disease, and this had an adverse effect on their lymphatic function.

As lymphoedema therapists, the authors would have had a conception that two surgical procedures in the axilla would have been more detrimental to lymphatic drainage, resulting in greater scarring and reduced range of movement. The findings of this audit challenge this common belief. It is also notable that the surgical procedure changed significantly over the four-year period, in

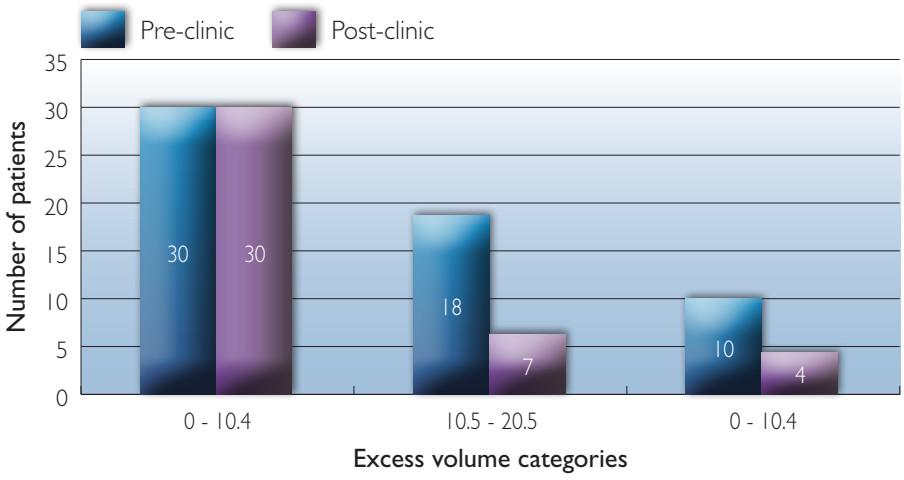

Figure 1. Pre- and post-intervention clinic total excess volume by category.

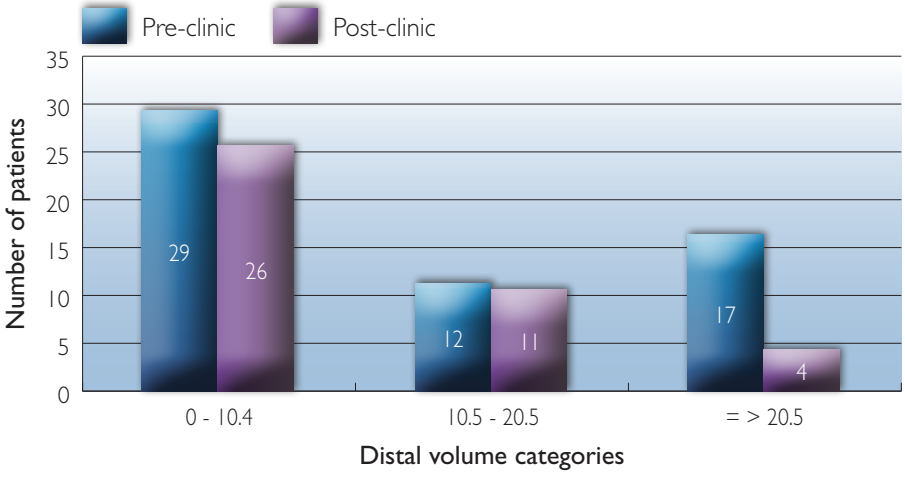

Figure 2. Pre- and post-intervention distal excess volume by category.

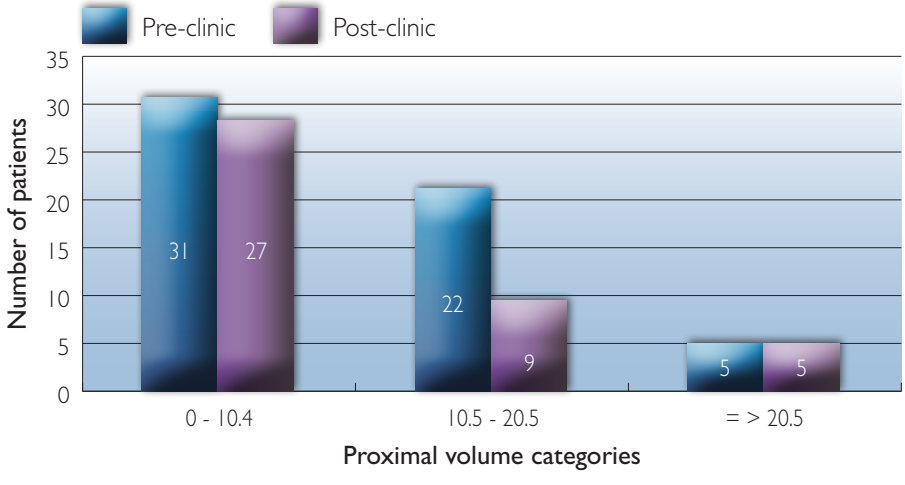

Figure 3. Pre- and post-intervention proximal excess volume by category.

that the percentage of clearances and completion clearances decreased from 68–44% with the introduction of SLNB. There was no significant effect from RT.

Sixty-three of the 99 patients had RT. Of those, 35 were from the pre-intervention group and 28 from those who attended the scheme. Only one patient had both the breast and the supra clavicular fossa (SCF) treated. None of the 63 had RT to the axilla, which is a positive change of practice from the 1980s.

Kissin et al (1986) found that 81 patients had RT to the axilla from a total of 200. Of that number, 47 also had a clearance, and 38% of that group developed lymphoedema. This type of treatment is no longer practiced.

Patients who did not have the advantage of the prevention service were referred later to the service. However, they responded well to management, which consisted of a compression sleeve, advice on skin care, exercise and how to do self-administered lymphatic drainage. At the six-month period (usually at third limb volume measure), they had achieved a significant reduction in percentage difference; 63% had achieved an improvement of 4.9% on average. Of those who had attended the prevention clinic, 37% achieved an improvement of 4.5% on average. Some patients (13) had died, moved away or been discharged and did not have a third measurement recorded. Patients who were assessed earlier following the prevention clinic, did not achieve the same volume reduction at the six-month period. It could be argued that as 70% had an excess difference of less than 10%, finding a significant reduction in volume would be less likely.

The database was searched in August 2010 and only one patient who had surgery in the two-year audit (and was seen at the prevention clinic) has been referred since the initial audit.

This is encouraging and the authors would like to think that they have educated them to become expert patients in the management of their compromised arm, thereby enabling them to avoid circumstances which may cause them to develop lymphoedema.

The information session is interactive, in a relaxed setting with no more than six people. There is a large lymphatic system chart, education material on the anatomy and physiology (A&P) of the lymphatic system, numerous photographs of cellulitis of the arm and a folder of pictures to remind patients of the 'dos and don'ts'. They are encouraged to look through this

folder when waiting for their individual sessions with the staff. They are issued with a laminated alert card, with advice on management of cellulitis, explaining that they have a compromised lymphatic system in the arm, which is identified in a tick box.

This audit does not give us a definite incidence figure for breast cancer-related lymphoedema in this cohort of patients. However, the lymphoedema service has been established for 15 years and is part of the breast multidisciplinary team (which includes surgeons, oncologists, radiologists, breast care nurses, physiotherapists, lymphoedema specialist nurses, research nurses). The service is also well known to the general practitioners, specialist nurses and district nurses. Referrals are made swiftly and seen by the service within two weeks of referral. The authors are confident that patients presenting with arm swelling in the catchment area are being referred appropriately.

Conclusions

Considering the reduction in referrals from 59 (28%) before the introduction of the prevention clinic and new surgical diagnostics to 43 (17%), and the reduction in severity of lymphoedema that occurred, this intervention has proven successful. Although the time for the physiotherapist, breast care nurse and lymphoedema specialist to provide the weekly service was initially challenging, no extra hours were funded. For the lymphoedema team, the 20-minute joint education session proved to be a time-saver at the clinic. This cut down the initial assessment time of the 43 patients referred and saved roughly 14 hours, two full working days.

The authors have noticed a reduction in hosiery spend on arm-sleeves and therapist time spent on care for this group of patients, due to a lesser severity of the arm swelling at the time of referral. For the first time in 15 years, the percentage of breast cancer patients has dropped and is now 39% of the caseload. This can be attributed to less referrals and earlier discharge of patients who have mild symptoms and are self-managing. Although not audited for this study, the physiotherapy intervention stopped the necessity for referral for intensive physiotherapy or hydrotherapy for patients awaiting RT who had developed a reduced range of movement following surgery. Recording of physio assessment, and exercises and advice given has been changed so that this intervention can be more easily audited in the future.

The introduction of SLNB six months into the two-year period changed the surgery to the axilla, as instead of having sampling (averaging removal of 3–7 nodes), only one or two sentinel nodes were removed. This has had a positive effect in the reduction of instances of lymphoedema. Unfortunately, it also influences the results of this audit in that the authors cannot say for certain the total effect that the prevention clinic has had. However, it is a good result for the breast patients and the authors are encouraged in the knowledge that they have the best system to enable them to reduce the chance of developing lymphoedema in the future. JL

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