Radical Lymph Node Dissection for Melanoma

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Background: Therapeutic lymph node dissection for melanoma aims to achieve regional disease control. Radical lymphadenectomy (RLND) can be a difficult procedure associated with significant postoperative morbidity.

The aims of the present study were to review regional disease control and morbidity in a series of lymphadenectomies performed within a specialist unit.

Methods: The present study involved the analysis of 73 lymphadenectomies in 64 patients, from 1995 to 2001.

Results: The overall wound complication rate after inguinal lymphadenectomy (71%) was higher than after axillary lymphadenectomy (47%; P = 0.05). After inguinal lymphadenectomy, the wound infection rate was higher (25.0% vs 5.9%; P = 0.03), delayed wound healing was more frequent (25.0% vs 5.9%; P = 0.03), and the mean time that drain tubes remained in situ was longer (12.5 vs 8.2 days; P = 0.05). There were no significant differences in seroma (46% vs 32%) rates. Lymphoedema was more common after inguinal lymphadenectomy (P < 0.02). Multivariate analysis identified inguinal RLND (P = 0.002) and increasing tumour size (P = 0.045) as predictors of wound morbidity. More patients received postoperative radiotherapy after neck RLND compared to inguinal or axilla RLND (P = 0.03). Six (8%) patients developed local recurrence after lymphadenectomy. At a median follow up of 22 months, 34 (53%) patients have died, from disseminated disease.

Conclusions: Radical lymphadenectomy for melanoma is associated with significant morbidity. Inguinal node dissection has a higher rate of complications than axillary dissection. Low local recurrence rates can be achieved, limiting the potential morbidity of uncontrolled regional metastatic disease.

Key words: cancer, lymphadenectomy, melanoma, regional nodal recurrence, surgery, therapeutic node dissection.

Abbreviations: CT, computed tomography; FNAC, fine needle aspiration cytology; LR, local recurrence; RLND, radical lymphadenectomy; VMS, Victorian Melanoma Service.

Introduction

Malignant melanoma is common and Australia has one of the highest incidences in the world.1 With the increasing thickness of melanomas there is an increased likelihood of regional lymph node and distant metastases, and a corresponding reduction in survival.2

Uncontrolled regional metastatic lymph node disease can result in major morbidity and distress for the patient. One of the main aims of radical lymph node dissection (RLND) or lymphadenectomy, therefore, is to achieve regional control of the disease.3 Radical lymph node dissection itself has a high morbidity, particularly wound complications including wound infection, wound breakdown, delayed wound healing, seroma formation and lymphoedema.4–10

The aims of the present study were, therefore, to: (i) document a consecutive series of patients undergoing RLND following the commencement of a dedicated melanoma service; (ii) to establish the regional control rate and morbidity of the RLND within a specialist centre for melanoma using standard treatment policies; and (iii) to identify risk factors for wound morbidity and local recurrence following RLND.

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Methods

Subsequent to the establishment of the Victorian Melanoma Services (VMS) at The Alfred Hospital, from 1995 until 2001, 64 patients have undergone 73 RLND for metastatic regional melanoma (neck 10, axilla 34, groin 28, popliteal one). Of these, 57 patients underwent one RLND, six patients two RLND and one patient four RLND. Data on these patients were prospectively collected and entered into a database detailing clinical features, pathology, treatment and outcomes.

The median age of patients was 52 years (interquartile range 44–67 years): 36 were men and 28 were women. The majority, 52 (84%) patients were clinically reviewed by the VMS. Of these 52 patients, the primary histopathology was formally reviewed when available.

Three patients were referred with local recurrence or persistent disease (one patient with inguinal local recurrence; and two with persistent axillary disease). All three had bulky disease involving significant areas of skin and subcutaneous tissue. The two patients with axillary disease had previously undergone inadequate resections prior to referral. Both patients had known macroscopic disease remaining after operation and underwent radiotherapy prior to referral. Both were referred with fungating, infected disease, one of whom was infested with lice.

Treatment Policy

Unit policy is to diagnose suspicious lymph nodes with fine needle aspiration cytology (FNAC) and wherever possible to avoid open biopsy and the need for two stage surgery. Elective prophylactic RLND is not performed by the unit.
Management policy is to undertake the following RLND: radical resection to level III is undertaken for the axilla (up to and including the lymph nodes above the pectoralis minor), including those behind (level II) and lateral (level I). The pectoralis minor muscle is retracted but not divided or resected. An en bloc resection is undertaken, and therefore includes division of the intercostobrachial nerve. A subinguinal (infrainguinal or superficial) RLND is undertaken for the groin, and when there is clinical or computed tomography (CT) evidence of suprainguinal disease, a combined supra- and subinguinal dissection is performed. The boundaries of superficial inguinal RLND are the lateral margin of sartorius, the medial margin of adductor longus and the recurred portion of the inguinal ligament. The skin and subcutaneous tissue edges are routinely excised with a 5-mm margin or occasionally more to demonstrate adequate vascularity. A standard radical neck dissection is performed if multiple nodes or levels are involved. A selective posterolateral (levels II–V) dissection is performed if the disease appears limited to this area on the basis of clinical or CT scan findings. For selective posterolateral neck dissection the sternocleidomastoid muscle, the internal jugular vein and the spinal accessory nerve are preserved.

For all dissections, subcutaneous flaps are raised using a combination of knife and diathermy dissection. Meticulous haemostasis is obtained using multiple fine absorbable ligatures. Closed suction drainage is routinely used; usually two drains for inguinal dissections and neck dissections, and one drain for axillary dissection.

The patients cease aspirin or other anti-inflammatory drugs preferably 10–14 days prior to surgery to reduce the risk of haematoma. All patients are covered with prophylactic perioperative and postoperative antibiotics for 24 h using Cephalexin. For inguinal dissections all patients rest in bed for 7 days postoperatively and wear below-knee graduated compression stockings as soon as mobility is achieved, for 6 months.

Wound infection was defined by the presence of any of the following: a purulent discharge; a positive culture of a pathogenic organism from a wound swab; or the use of antibiotics postoperatively for wound cellulitis. Wound haematoma was defined as an accumulation of blood following lymphadenectomy requiring surgical evacuation. Wound seroma was defined as a palpable collection of serum at the lymphadenectomy site whether or not aspiration was required. Delayed wound healing was diagnosed if primary healing was not achieved within 2 weeks. Delayed wound healing may be caused by wound infection, wound breakdown because of necrosis of the skin edges, or persisting discharging seroma fluid. We defined the overall wound complication rate as any one of wound infection, delayed wound healing, haematoma or seroma.

Unit policy was to discharge patients from hospital on the day their drain tubes were removed, when drainage was less than 30 mL over a 24-hour period.

Seromas were aspirated if they were large, painful, tense, associated with infection or on patient request. Small seromas were usually left to resolve spontaneously.

All patients were routinely considered for adjuvant postoperative radiotherapy, as part of their assessment by the multidisciplinary melanoma clinic. The indications for postoperative radiotherapy were: multiple node involvement, extranodal extension of disease, bulky disease (typically total node replacement larger than 4 cm), and recurrent nodal disease following previous surgery.11

Lymphoedema was defined as postoperative limb swelling persisting beyond 3 months, noted either by patient or clinician.

SURVIVAL AND STATISTICS

Local recurrence was defined as histologically proven melanoma at the site of the RLND.

The median follow up from the time of surgery for all patients was 22 (interquartile range 15–32) months, and for survivors was 23 (interquartile range 14–34) months.

Patients were seen for clinical review at 3 monthly intervals for 2 years after treatment, at 6 monthly intervals for a further 3 years and annually thereafter.

The SAS system – Version 8.0 (SAS Institute, Cary, NC, USA) was used for all statistical analyses.

Differences between groups were analysed statistically using the $\chi^2$ test, Fisher’s exact test, Student’s $t$-test and the Wilcoxon rank sum test where appropriate for univariate analysis. Multivariate analyses of risk factors using logistic regression for overall wound complications and seroma formation were performed. The following categorical and continuous variables were evaluated for these multivariate analyses: age, sex, type of primary tumour, tumour thickness, location of disease, method of diagnosis (excisional biopsy and cytology), number of involved lymph nodes, extra-capsular nodal spread, median size of largest involved lymph node, and length of time drain tubes remained in situ.

RESULTS

Clinical and pathological features

The macroscopic types of primary tumours of 60 of the 64 tumours where information was available were: superficial spreading: 25; nodular: 19; unknown primary: 10; acral lentiginous: 3; dermally derived: 1; amelanotic: 1; lentigo maligna melanoma: 1.

The median thickness of the primary melanoma was 1.7 mm (interquartile range 0.83–3.40 mm).

The median time to diagnosis of regional lymph node disease was 11.2 (interquartile range 2–48) months.

The methods used to diagnose melanoma in regional nodes were: FNAC in 44 patients (60%); excisional biopsy in 17 (23%); sentinel node biopsy (SNB) in six (8%) – four inguinal, two axilla; core biopsy in two (3%) (where FNAC was inconclusive); three patients (4%) were diagnosed clinically on the basis of multiple known previous recurrences; and one (1%) patient was diagnosed by positron emission tomography scan.

In this series four patients had lower limb in-transit disease preceding their inguinal RLND. Distant metastatic disease was present in four patients undergoing axillary RLND, but not for neck or inguinal RLND.

Treatment including surgery and radiotherapy

There were 73 lymphadenectomies in 64 patients. Of these, six had two RLND (two axilla/inguinal and one each of axilla/neck, neck/inguinal, inguinal/inguinal and axilla/axilla). One patient had four lymphadenectomies; three selective neck dissections and one axillary dissection. There were 34 axillary dissections in 33 patients. There were 28 inguinal dissections in 27 patients. Of these, 25 were subinguinal and two were combined supra- and infra-inguinal dissections. One patient underwent a suprainguinal dissection after a previous subinguinal dissection. One patient underwent a popliteal RLND. There were 10 neck dissections in eight patients. Of these there were three radical neck dissections; three radical neck dissections with superficial parotidectomies; and four selective (three posterolateral, level II–V and one supra-omohyoid) neck dissections.
All patients referred for surgery were considered operable and subsequently all were resectable. The surgery was undertaken by four surgeons; however, the senior author (JWS) performed 70 of the procedures and the other three surgeons performed one RLND each.

The three patients referred with recurrent or persistent nodal disease required major and wide excisions of overlying skin and subcutaneous tissue in addition to re-exploratory RLND. All three required reconstructions with myocutaneous flaps to repair the resulting major tissue deficits. For the inguinal RLND, a free latissimus dorsi flap was used, and for the two axillary RLND, pedicled pectoralis major flaps were used. None of these patients had a wound complication and regional control was achieved in all three cases.

The median time to drainage tube removal (and therefore inpatient stay postoperatively) was significantly greater comparing inguinal to axillary to neck RLND: medians of 10, 7 and 4 days, respectively (P = 0.005). The proportion of patients receiving postoperative radiotherapy was significantly greater after neck RLND: eight (80%) of 10, compared to axillary or inguinal RLND, 15 (44%) of 34 and nine (32%) of 28, respectively (P = 0.03).

The details of the pathology results are shown in Table 1 including the median number of nodes in the resected RLND specimen, the median number of positive nodes, and the median of the size of the largest involved node in each lymphadenectomy specimen. The results were similar in each pathology parameter across the axilla, inguinal region and neck.

### Complications

Wound complications are detailed in Table 2. There were significantly more procedures followed by wound infection and delayed wound healing in the inguinal compared to axillary RLND groups, and comparing both to neck RLND. The seroma rate was not significantly different following inguinal (46%) and axillary (32%) RLND. There were no complications following the popliteal RLND.

The overall wound complication rate following axillary RLND of 16 (47%) complications was significantly less than that following inguinal RLND, 20 (71%) complications (P = 0.05). The complication rates for axillary and inguinal RLND were both significantly greater than that following neck RLND – one (10%) complications (P = 0.003).

After inguinal RLND, seven patients had delayed healing: five associated with seromas and two with wound infection (both of whom had skin edge necrosis). After axillary RLND, delayed wound healing was associated with infection in one patient and a chronically discharging seroma in another, but no patient had skin edge necrosis. The wound infection rate compared to duration of drain-tube time was not significantly different (no infection, 8 days; infection, 10 days; Student’s t-test, P = 0.18).

The median duration for seroma resolution was not significantly different for inguinal RLND (36 days) compared to axillary RLND (31 days; P = 0.44).

Multivariate analysis identified location (axilla vs groin vs neck; P = 0.04), and median size of the largest involved lymph nodes (P = 0.045) as significant, independent, risk factors predicting overall wound morbidity (Table 3).

Univariate and multivariate analyses for seroma formation did not identify any significant predictive risk factors, although location (inguinal, axilla, neck) (P = 0.07) and drain-tube time (P = 0.07), approached statistical significance.

There was a significantly greater incidence of lymphoedema following inguinal RLND, eight (29%) of 28 procedures compared to axillary RLND, two (6%) of 34 procedures (P = 0.01). Of the eight patients developing lymphoedema after inguinal RLND four had wound infections, three had seromas but only one patient had neither wound infection nor seroma.

### Local recurrence

In this series, regional control following RLND was achieved in 67 (92%) of 73 procedures. There were six (8%) local recurrences (LR), over a total follow up of 1522 patient months. Of the local recurrences, two followed axillary RLND, three followed inguinal RLND, and one followed radical neck dissection. The LR all occurred within 12 months of lymphadenectomy and all but one patient with local recurrence have died within 12 months, with distant metastatic disease. The rate of local recurrence was similar with (four (12.5%) of 32) or without (two (5%) of (40) postoperative radiotherapy (P = 0.3). Multivariate analysis was not performed for risk factors for local recurrence because of the small number of fails (local recurrence).

### Table 1. Pathology of RLND specimens

<table>
<thead>
<tr>
<th>Location</th>
<th>Median no. nodes</th>
<th>Median no. positive nodes</th>
<th>Median size of largest node (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axilla (n = 34)</td>
<td>16 (interquartile range: 10–23)</td>
<td>1 (interquartile range: 1–3)</td>
<td>35 (interquartile range: 10–70)</td>
</tr>
<tr>
<td>Inguinal (n = 28)</td>
<td>10 (interquartile range: 7–13)</td>
<td>1 (interquartile range: 1–2)</td>
<td>41 (interquartile range: 9–60)</td>
</tr>
<tr>
<td>Neck (n = 10)</td>
<td>22 (interquartile range: 12–30)</td>
<td>1 (interquartile range: 1–10)</td>
<td>15 (interquartile range: 7–28)</td>
</tr>
</tbody>
</table>

### Table 2. Wound complications following RLND

<table>
<thead>
<tr>
<th>Wound complication</th>
<th>Axilla (n = 34)</th>
<th>Inguinal (n = 28)</th>
<th>Neck (n = 10)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wound infection</td>
<td>2 (6%)</td>
<td>7 (25%)</td>
<td>0</td>
<td>0.03</td>
</tr>
<tr>
<td>Delayed healing</td>
<td>2 (6%)</td>
<td>7 (25%)</td>
<td>0</td>
<td>0.03</td>
</tr>
<tr>
<td>Haematoma</td>
<td>1 (3%)</td>
<td>0</td>
<td>0</td>
<td>Not significant</td>
</tr>
<tr>
<td>Seroma</td>
<td>12 (32%)</td>
<td>13 (46%)</td>
<td>1 (10%)</td>
<td>Not significant</td>
</tr>
</tbody>
</table>
Table 3. Risk factors for overall wound complications

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Univariate analysis</th>
<th>Multivariate analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Odds ratio</td>
<td>P-value</td>
</tr>
<tr>
<td>Location (axilla vs neck)</td>
<td>2.947</td>
<td>0.05</td>
</tr>
<tr>
<td>Location (inguinal vs neck)</td>
<td>9.714</td>
<td>0.05</td>
</tr>
<tr>
<td>Location (inguinal vs axilla)</td>
<td>3.296</td>
<td>0.05</td>
</tr>
<tr>
<td>Median size largest involved node</td>
<td>1.147</td>
<td>0.06</td>
</tr>
<tr>
<td>Age</td>
<td>0.999</td>
<td>0.94</td>
</tr>
<tr>
<td>Time to diagnosis</td>
<td>0.999</td>
<td>0.87</td>
</tr>
<tr>
<td>Drain time</td>
<td>1.023</td>
<td>0.59</td>
</tr>
<tr>
<td>Tumour thickness</td>
<td>0.923</td>
<td>0.39</td>
</tr>
<tr>
<td>Number involved nodes</td>
<td>0.884</td>
<td>0.16</td>
</tr>
<tr>
<td>Extracapsular nodal spread</td>
<td>0.788</td>
<td>0.70</td>
</tr>
<tr>
<td>Excision biopsy</td>
<td>0.913</td>
<td>0.88</td>
</tr>
<tr>
<td>Diagnosis by cytology</td>
<td>1.026</td>
<td>0.96</td>
</tr>
<tr>
<td>Sex</td>
<td>1.524</td>
<td>0.42</td>
</tr>
<tr>
<td>Nodular type</td>
<td>0.485</td>
<td>0.54</td>
</tr>
<tr>
<td>Superficial spreading type</td>
<td>0.727</td>
<td>0.54</td>
</tr>
</tbody>
</table>

**Survival**

The median follow up for all patients of the series was 22 months (interquartile range 15–32 months). Of the 64 patients undergoing RLND, 34 (53%) have died, with a median time to death of 12 months (range 2–35 months). Of the 34 deaths, 15 followed axillary RLND, 15 after inguinal RLND, three after neck RLND and the patient undergoing popliteal RLND. These differences were not significant ($P = 0.09$). Of the 10 patients with an unknown primary site, five have died with a mean follow up of 10 months.

**DISCUSSION**

The morbidity of uncontrolled regional metastatic disease to lymph nodes can be incapacitating as occurred in the three patients referred with infected and uncontrolled disease in this series. Difficulties with pain, infection, discharge and dressing requirements contribute to this unpleasant morbidity. This series has confirmed, however, that with appropriate surgery involving RLND, satisfactory regional control is achievable with a low local recurrence rate (8%).

As tumour thickness increases, the likelihood of lymph node metastases and reduced survival also increase. However, some patients with tumours of good prognosis as thin as 0.4 mm, developed lymph node metastases emphasizing that any melanoma may metastasize.

Because of the morbidity of uncontrolled regional disease, distant metastases or in-transit disease are not contraindications to surgery to achieve regional control. Four patients in this series had in-transit metastases in the lower limbs prior to their lymph node dissection and indeed have had subsequent in-transit disease in their lower limbs, but this has been controllable and none of these patients has relapsed regionally. Others have shown it is appropriate to undertake combined RLND of the inguinal region simultaneously with isolated limb infusion. Surgical excision is often the preferred treatment option for isolated metastatic melanoma at any site, and this series confirms that this is the case for regional lymph node metastatic disease.

Most regional metastatic disease was diagnosed by FNAC in this series. FNAC of clinically malignant lymph nodes is an important diagnostic measure. In a patient with a previously excised malignant melanoma, a cytological aspirate obtained by fine needle from a clinically enlarged node, showing melanoma is adequate diagnostically to undertake a RLND. This enables one-stage surgery and avoids the second stage necessitated by an open excisional lymph node biopsy. Excisional lymph node biopsy has other disadvantages. Often the incision is placed inappropriately for a subsequent RLND, with the potential to compromise subsequent wound healing. Further, excisional biopsy of a node may be incomplete or tumour spillage may occur, resulting in a higher rate of local recurrence after diagnostic excisional biopsy. If uncertainty remains after fine needle aspiration cytology, a core biopsy can be performed. In this series there were no false positives with fine needle aspiration cytology, and FNAC remains the preferred diagnostic technique. In this series excisional biopsy was not a significant factor predisposing to wound morbidity. Others have reported higher wound complication rates following excisional biopsy and we therefore continue to recommend FNAC as the preferred method of diagnosis, and caution against open excisional biopsy.

In this series, subinguinal RLND achieved adequate regional control in all but one case. In this case where suprainguinal relapse occurred, a second-stage dissection was undertaken and achieved appropriate control. Others have advocated a combined supra- and subinguinal RLND. There is the potential for a higher morbidity rate, especially lymphoedema, after the combined approach, which makes it less attractive. Further, given that the aim is regional control, it would seem reasonable to adopt the more conservative approach in the first instance, reserving a second stage suprainguinal dissection for cases of suprainguinal relapse.

There is an increasing role for selective RLND in the neck. In this series several patients underwent selective dissections of the posterolateral regions of the neck including levels II, III, IV and V. There is evidence that a selective and function preserving approach is appropriate and in the present series we found we were able to achieve adequate regional control using this selective approach in the neck.
Incomplete surgical clearance leaving residual macroscopic disease is a certain recipe for persistent regional lymph node disease and regional failure. This occurred in two patients with persistent axillary disease in this series. Radiotherapy alone did not salvage either of these patients and both presented with incapacitating discharging, infected regional disease. A further patient with recurrent groin disease presented. These patients all had extensive involvement of the skin and subcutaneous tissues and therefore as part of the re-excision required major excision of skin and subcutaneous tissue. This resulted in a significant soft tissue and skin defect and in these cases necessitated a plastic surgery repair. Radical excisional surgery remains the best option for dealing with recurrent or persistent regional nodal disease and it is usually possible to resect the recurrence en bloc. A possible explanation is that melanoma appears to grow with a pushing, rather than an infiltrating edge. As a result, melanoma rarely invades major structures such as nerves and vessels, and these structures therefore rarely require resection. No patient in this series required sacrifice of a major structure to achieve radical excisional surgery.

In this series most patients undergoing neck RLND received radiation whereas fewer with axillary dissection received radiation and inguinal RLND received radiation least often. This is in line with other series and reflects the corresponding likelihood of regional failure. The incidence of recurrence in the neck without radiotherapy is of the order of 28%. However the overall local recurrence rate in this series is low (8%), and may reflect in part the use of postoperative radiotherapy. Burmeister et al. have demonstrated an acceptable rate of toxicity related to radiotherapy after lymphadenectomy. Therefore the next study by the Trans-Tasman Radiation Oncology Group is a randomized study comparing surgery alone with surgery plus postoperative radiotherapy.

Melanoma patients with metastatic disease to regional lymph nodes have a high incidence of up to 70% of distant metastatic disease and subsequent death. These patients may therefore benefit from a multidisciplinary approach. In the present series, the patients received this through the Victorian Melanoma Service where surgical oncology, dermatology, radiation oncology, medical oncology, pathology and palliative care expertise are available. It is possible that such a multidisciplinary approach, and centralization of treatment to a specialist centre will result in better outcomes for these patients, as it does in other cancers.

Radical lymph node dissection whether of the neck, inguinal region or axilla carries a high morbidity and are technically demanding procedures. Even in centres of excellence, reported rates of wound complications are high. This has been reflected in our series. The overall wound morbidity in the axilla following RLND, in this series was 44% compared to reported rates of between 35% and 51%. Similarly in the inguinal region our overall wound complication rate was 71% compared to reported rates of 25% to 90%. This series reflects the experience of others where the complications following inguinal RLND tend to be higher than that following axillary RLND. This series has confirmed that the overall wound infection rate and delayed wound healing rate are significantly higher in the inguinal than in the axillary region. Even with prophylactic antibiotics, wound infection rates of over 10% occurred in this series. Multivariate analysis confirmed site as the major predictor of wound morbidity. Greater median size of largest involved node also predicted wound failure. The mechanism for this is unclear, although clinically this type of bulky disease, especially in the groin, appears to stretch and perhaps compromise the viability of the overlying tissues.

In the present series, postoperative seroma occurred in 44% of patients following inguinal RLND, and therefore perhaps should be regarded as an almost inevitable consequence of the operation rather than a true complication. It would seem likely that minor degrees of seroma always occur. Our definition of seroma was a palpable, fluctuant swelling whether or not aspiration was required. This definition would therefore tend to exclude more minor degrees of seroma formation. There was only one case of seroma following neck dissection. Inguinal dissection and greater drain tube duration both approached significance as predictors of seroma formation, and it is likely with greater overall numbers they would be significant. The reason for the different rates of seroma following inguinal, axillary and neck dissection are not clear; however, we suggest that they are related to the overall surface area which has been dissected. This being the case, one would expect that the inguinal rate would be higher than the axillary rate. This is reflected in the present series, although the difference was not significant but is consistent with drain tubes being required following inguinal RLND significantly longer than axillary or neck RLND. The volume of lymph draining into the inguinal region is higher compared to the axilla or neck, and this may also contribute to the higher seroma rate in the inguinal region. Gravity may play a role and may explain why the rates for neck dissection are significantly lower than axillary or inguinal.

It would seem that the problem of seroma is largely unpreventable but in view of the long duration of resolution (on average at least 6 weeks) it is certainly an important complication for the patient. The origin of the seroma fluid is unclear. It may originate from the overall dissected surface area or it may be related to specific sites and in fact therefore represent a lymphatic fistula. After inguinal RLND, fewer lymph nodes on average were removed compared to the axillary or neck regions and therefore one would expect that the likelihood of lymphatic fistula would be lower. This is at variance with the observed incidence of seroma suggesting that lymphatic fistula is not the underlying aetiology.

The suction drains are left in situ for a considerable length of time particularly after inguinal dissection (median 10 days). These patients are otherwise well and could be managed by district nurses at home or using facilities such as ‘hospital in the home’. Such an approach could theoretically achieve considerable cost savings.

Eight (29%) of 28 patients post inguinal RLND developed lymphoedema. This is a major problem following inguinal RLND and reflects the experience of others. It seems likely that local recurrence rates are related to the adequacy of surgery and radiotherapy, and hence the effectiveness of the local treatment. If this is inadequate, recurrence rates are likely to be higher. Limited dissections will not guarantee adequate excision of positive nodes and node picking operations for such lymph nodes are inappropriate. Thorough formal dissections will substantially lower the risk of recurrence in a
dissected node field. Others have questioned this, and concluded local recurrence depends on regional tumour burden rather than the extent of surgery.36

Patients with regional lymph node metastases from melanoma are at a significant risk of distant metastases and death.3,34 This is reflected in the current series where 34 (53% of patients) have died at a relatively short follow up of a median of 22 months.

Patients presenting with regional lymph node metastases of melanoma with no known primary still benefit from regional RLND and in this series there were 10 such patients, half of whom are still alive.37

In conclusion, radical RLND is a major, technically demanding operative procedure with a significant complication rate, especially related to the wound. However, when undertaken adequately it is likely to achieve regional control of the disease.

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REFERENCES