Objective: To compare health-related quality of life in patients having no neck dissection and those having a selective dissection, with particular reference to shoulder dysfunction.

Design: Prospective study.

Setting: Regional Maxillofacial Unit, University Hospital Aintree, Liverpool, England.


Main Outcome Measure: The University of Washington Quality of Life questionnaire, administered on the day before surgery and at 6 months, at 12 months, and more than 18 months after surgery.

Results: No neck dissection was performed in 58 patients (21%), a unilateral dissection in 181 (65%), and a bilateral dissection in 39 (14%). Patients with no neck dissection and those with unilateral level III or IV dissections had similar mean scores for shoulder dysfunction, whereas patients with unilateral level V and bilateral level III and IV dissections recorded much worse scores on average.

Conclusions: There is little subjective morbidity associated with shoulder dysfunction after a unilateral level III or IV neck dissection compared with patients undergoing primary surgery without a neck dissection. More extensive surgery in the neck, whether bilaterally removing levels I to III or IV or extending posteriorly to include level V, is associated with statistically significantly worse shoulder dysfunction.

Arch Otolaryngol Head Neck Surg. 2004;130:149-154
extended to include level V, or bilateral level III or IV neck dissection. There is also an absence of published data comparing subjective morbidity associated with a selective supraomohyoid neck dissection and that in patients having no neck dissection.

The aim of this article is to compare health-related quality of life, particularly shoulder function, by using the University of Washington Quality of Life questionnaire (UW-QOL) in patients having no neck dissection and those having a selective dissection. We additionally attempted to distinguish the effect of radiotherapy on subjective shoulder function.

The study sample consisted of all consecutive patients undergoing primary surgery for previously untreated oral and oropharyngeal squamous cell carcinoma presenting to the Regional Maxillofacial Unit, University Hospital Aintree, Liverpool, England, between January 1, 1995, and December 31, 1999. Patients were invited to complete a validated head and neck health-related quality of life questionnaire, the UW-QOL, on the day before surgery and at 6 months, at 12 months, and at a time greater than 18 months after surgery. Patients who developed recurrent disease during this postoperative period were excluded from data collection from that point onward.

The UW-QOL shoulder domain contains 4 items and allows patients to choose from the following options: no problem with their shoulder (100 points), shoulder stiffness with no effect on activity or strength (70 points), pain or weakness in the shoulder that has caused a change in work or hobbies (30 points), and an inability to work or do hobbies because of problems with the shoulder (0 points). A score of 0 represents the worst condition, while a score of 100 represents the best. The UW-QOL has been modified since it was first introduced. In the current study, version 1 was used up to 1997, version 2 from 1998 to 1999, and version 4 in follow-up questionnaires in 2000 and later. The shoulder dysfunction domain is standard to all versions, and composite scores were calculated with only the 8 domains common to all versions. The common domains were pain, appearance, activity, recreation, swallowing, chewing, speech, and shoulder disability.

Patients were grouped into those having primary surgery but no neck dissection and those having neck dissection. In our unit, the selective supraomohyoid is often extended down to include level IV nodes; therefore, dissections were categorized as unilateral level III to IV dissection, unilateral level V dissection, and bilateral level III to IV dissection. We believed that the numbers of patients undergoing a radical neck dissection (3 patients) or modified radical neck dissection (3 patients) were too few to provide statistically significant findings. Patients undergoing a bilateral level III to IV dissection were analyzed as a separate subgroup, as no attempt was made to ask the patients to report shoulder problems from each side separately. Patients having bilateral dissections that were not level III to IV on both sides were also excluded from analysis because of small numbers (6 patients).

The presentation of results is primarily descriptive, involving percentages, means and SEs, and medians and interquartile ranges. The Kruskal-Wallis test was used to compare the ordinal UW-QOL scores at presentation between the groups with no neck dissection, unilateral level III to IV, unilateral level V, and bilateral level III to IV, while the Mann-Whitney test was used to compare the unilateral level III to IV and bilateral level III to IV groups. These tests were also used to compare patient groups for the composite UW-QOL score at various stages of follow-up. Associations between clinical and demographic characteristics and UW-QOL scores were tested by means of the Kruskal-Wallis test, Mann-Whitney test, or Spearman rank correlation as appropriate. We regard statistical significance as P<.05.

RESULTS

Two hundred seventy-eight patients underwent primary surgery for oral cancer from January 1, 1995, through December 31, 1999. Of the 278 patients, 180 (65%) were men and 98 (35%) were women; overall mean (SD) age was 62 (12) years. Thirty-six percent (65/180) of men and 56% (55/98) of women were 65 years and older. There was no neck dissection in 58 patients (21%), a unilateral dissection in 181 (65%), and a bilateral dissection for 39 (14%) (Table 1).

Associations between neck dissection and relevant clinical and demographic variables are summarized in Table 2. Patients with neck dissections were more likely to have had larger tumors, more advanced tumors, clinically positive nodes, pathologically positive nodes, flap surgery, and radiotherapy than those without neck dissection. Those having unilateral level V dissections were more likely to have been younger and male and to have had oropharyngeal tumors, clinically positive nodes, pathologically positive nodes, and radiotherapy than those with unilateral level III to IV tumors. Patients having bilateral level III to IV dissections were younger, more likely male, and more likely to have had more advanced tumors, larger tumors, clinically positive nodes, pathologically positive nodes, and bone flap surgery than patients with unilateral level III to IV dissections.

UW-QOL AT PRESENTATION

Composite scores at baseline were available for 196 (71%) of the patients. Availability was associated with year of operation, with a decline during the cohort period: 1995, 88% (45/51); 1996, 92% (55/60); 1997, 63% (32/51); 1998, 68% (34/50); and 1999, 45% (30/66). The reason for this decline in patient inclusion at baseline is most likely that, in the first 3 years of this project, data collection was performed by one individual, while in the final 2 years data collection was incorporated into routine medical clerking procedure. Mean (SD) composite scores were similar over time: 1995, 83 (12); 1996, 85 (12); 1997, 84 (11); 1998, 85 (14); and 1999, 82 (13).

Table 1. Classification of Neck Dissection for the 278 Patients

<table>
<thead>
<tr>
<th>Type of Neck Dissection</th>
<th>No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>58 (20.9)</td>
</tr>
<tr>
<td>Unilateral</td>
<td></td>
</tr>
<tr>
<td>Level III-IV</td>
<td>153 (55.0)</td>
</tr>
<tr>
<td>Level V</td>
<td>22 (7.9)</td>
</tr>
<tr>
<td>Modified radical</td>
<td>3 (1.1)</td>
</tr>
<tr>
<td>Radical</td>
<td>3 (1.1)</td>
</tr>
<tr>
<td>Bilateral</td>
<td></td>
</tr>
<tr>
<td>Both level III-IV</td>
<td>33 (11.9)</td>
</tr>
<tr>
<td>Level III-V/level V</td>
<td>4 (1.4)</td>
</tr>
<tr>
<td>Level III-V/radical</td>
<td>1 (0.4)</td>
</tr>
<tr>
<td>Level V/radical</td>
<td>1 (0.4)</td>
</tr>
</tbody>
</table>
Overall, at presentation patients had the most problems with pain, with only 29% reporting that they had no pain (Table 3). Appearance, swallowing, speech, and shoulder disability were the least problematic domains. Patients having bilateral level III to IV dissections tended to present with the worst scores for chewing, swallowing, and speech and had significantly lower scores in these domains than patients having unilateral level III to IV dissections. There were no significant differences between the groups with no neck dissection, unilateral level III to IV dissection, and unilateral level V dissection, at the 5% level of significance.

**UW-QOL AT FOLLOW-UP**

There was a minimum of 16 months of follow-up from operation for the whole cohort. By 12 months, 17% (47/278) had died. The estimated (life-table) mortality rates at 2, 3, and 4 years from operation were 26%, 30%, and 35%, respectively. At around 6 and 12 months and beyond 18 months, about two thirds of patients completed the UW-QOL (Table 4). There was a differential loss of patients over time according to neck dissection status, with 81% of patients not having neck dissection surviving to 3 years compared with 71% of patients with unilateral level III to IV dissection, 64% of those with unilateral level V dissection, and 57% of those with bilateral level III to IV dissection. There was a tendency over time to lose more patients from follow-up if they had received radiotherapy (Table 4).

**Figure 1** shows mean UW-QOL domain scores over time. Pain tended to improve with time, while for all other domains the trend was for worse scores at 6 months compared with baseline and for similar or slightly improving scores thereafter. Composite scores were associated with tumor size and T staging, in which, broadly speaking, the differential established at presentation was maintained over time (results not shown). Patients receiving radiotherapy had worse composite scores on average from 6 months onward than patients not receiving radiotherapy (results also not shown). Patients not requiring flap surgery maintained a good UW-QOL composite pro-
file (mean values: preoperative, 88; 6 months, 83; 12 months, 85; last assessment, 83), while the profile for patients with flap surgery was considerably worse (88, 66, 69, and 69, respectively).

Patients with bilateral level III to IV dissections had the worst composite UW-QOL profile over time, while those with no neck dissection (most of whom had no flap surgery) had the best profile. Patients with unilateral level III to IV dissections had slightly better scores longitudinally than those with level V dissections. These trends were influenced by similar trends seen for the chewing and swallowing domains in particular.

For shoulder disability (Figure 3), patients with no neck dissection and patients with unilateral level III to IV dissections had reasonably similar mean scores, whereas the patients with unilateral level V and bilateral level III to IV dissections recorded much worse scores on average. When radiotherapy was used (Figure 4), both the group with no neck dissection and the group with unilateral level III to IV dissection had a similar set of shoulder scores on average, with a deterioration over time, although few patients with no neck dissection had radiotherapy. In the absence of radiotherapy, the shoulder domain profile was similar for each group and postoperative trends were slightly better.

The UW-QOL is widely used and of particular note is the shoulder dysfunction domain when compared with other questionnaires. The UW-QOL shoulder domain has been validated as a responsive instrument when the morbidity of a neck dissection in regard to shoulder function is assessed. The UW-QOL makes a relatively crude assessment of subjective shoulder function. The domain is only a 4-item question, and a shoulder-specific questionnaire could potentially be more responsive, although at the time of our study there was no specific validated head and neck shoulder questionnaire. Such a questionnaire could be used to differentiate between the symptoms of each side after a bilateral procedure.

Our longitudinal data were collected prospectively and included good baseline recruitment of a large series of patients (see Table 4). There are, however, inherent problems with research of this nature, and dropout is always a source of data bias. Although we managed to maintain good data collection at all time collection points, the

<table>
<thead>
<tr>
<th>Table 3. UW-QOL Scores at Presentation by Neck Dissection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neck Dissection</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>Pain</td>
</tr>
<tr>
<td>Appearance</td>
</tr>
<tr>
<td>Activity</td>
</tr>
<tr>
<td>Recreation</td>
</tr>
<tr>
<td>Swallowing</td>
</tr>
<tr>
<td>Chewing</td>
</tr>
<tr>
<td>Speech</td>
</tr>
<tr>
<td>Shoulder disability</td>
</tr>
</tbody>
</table>

Abbreviation: UW-QOL, University of Washington Quality of Life questionnaire.
*Percentage of patients with the best score of 100.
†Number of patients with baseline composite UW-QOL.
‡Test to compare 4 main groups: no neck dissection, unilateral level III to IV, unilateral level V, and bilateral.
§Test to compare unilateral level III to IV and bilateral level III to IV.

<table>
<thead>
<tr>
<th>Table 4. Patient Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interval Start Time, mo</td>
</tr>
<tr>
<td>--------------------------</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>12</td>
</tr>
<tr>
<td>18</td>
</tr>
<tr>
<td>24</td>
</tr>
<tr>
<td>36</td>
</tr>
<tr>
<td>48</td>
</tr>
<tr>
<td>60</td>
</tr>
</tbody>
</table>

Abbreviations: IQR, interquartile range; QOL, quality of life.
*Percentages of number of patients entering the interval.
numbers in some subsets are so small as to provide no statistically useful analysis. The numbers of radical and modified radical dissections have been excluded, and the subsets of no neck dissection and selective supraomohyoid dissection become statistically insignificant once subdivided according to radiotherapy. Although different versions of the questionnaire were used during the study, composite scores were calculated with only the domains common to all versions and for which the questionnaire wording remained the same. Where comparable, essentially the composite and domain scores at 6 and 12 months, there were no notable differences between versions of the questionnaire.

In this study, the mean UW-QOL domain scores apart from pain were notably worse at 6 months (Figure 1). The mean scores then gradually improved at subsequent questioning at 12 and then more than 18 months after operation. Interestingly, the shoulder domain is the least problematic of the QOL domains over all time periods, and its response was similar to those for most other domains, showing dramatic increase in dysfunction at 6 months and then a very slight improvement over time.

We found that at 6 months there was a drop in composite score compared with baseline for all neck subgroups. Those who received no neck dissection scored better than those who received a unilateral level III to IV dissection, who in turn scored better than the level V subgroup, with the bilateral III to IV subgroup faring worst of all. As the degree of surgery in the neck became more extensive, the UW-QOL score decreased. At 1 year and then at a time greater than 18 months after operation, there was a gradual increase in composite scores within all subgroups, with this gradation between the neck dissection groups being maintained.

When the shoulder domain is examined in isolation, it can be seen that shoulder morbidity at baseline was very similar between all neck subgroups (Figure 3). At 6 months after surgery, there was very little subjective difference between patients who underwent a unilateral level III to IV neck dissection and those having surgery but no neck dissection. This minimal difference in morbidity was maintained over time for these 2 subgroups. Extending the dissection into level V had a detrimental effect on shoulder dysfunction. A bilateral level III to IV neck dissection also had a profound effect on shoulder morbidity at 6 months, but some improvement occurred with time.
6 months if they received a neck dissection, and, al-
derwent a unilateral level III to IV neck dissection. Pa-
radiotherapy scored similarly regardless of whether they

dysfunction is interesting (Figure 4). Those receiving no
who had no dissection, and postoperative adjuvant ra-

derman LV, is associated with statistically signifi-
cantly worse shoulder dysfunction. Adjuvant radio-
therapy appears to have a detrimental effect on shoul-
der, whether or not the patient has a unilateral
level III to IV neck dissection; this finding was not sta-

tistically significant but is an interesting observation and

deserves further research.

Submitted for publication November 12, 2002; final rev-
er May 9, 2003; accepted May 20, 2003.

Corresponding author and reprints: Sean Laverick, FDS,
FRCs, Regional Maxillofacial Unit, University Hospital
Aintree, Lower Lane, Liverpool L9 7AL, England.

When tumors that may have bilateral drainage into the
cervical nodes are treated, the need to perform bilateral
neck dissections could be reduced if sentinel node biopsy

If data are subdivided according to patients who un-
derwent a unilateral level III to IV dissection and those
who had no dissection, and postoperative adjuvant radi-
otherapy is taken into account, the effect on shoulder
dysfunction is interesting (Figure 4). Those receiving no
radiotherapy scored similarly regardless of whether they
underwent a unilateral level III to IV neck dissection. Pa-

tients receiving adjuvant radiotherapy scored poorly at
6 months if they received a neck dissection, and, al-

Figure 4. Shoulder disability score on the University of Washington Quality
of Life questionnaire by whether the patient had adjuvant radiotherapy for the

When tumors that may have bilateral drainage into the
cervical nodes are treated, the need to perform bilateral
neck dissections could be reduced if sentinel node biopsy

If data are subdivided according to patients who un-
derwent a unilateral level III to IV dissection and those
who had no dissection, and postoperative adjuvant radi-
otherapy is taken into account, the effect on shoulder
dysfunction is interesting (Figure 4). Those receiving no
radiotherapy scored similarly regardless of whether they
underwent a unilateral level III to IV neck dissection. Pa-

tients receiving adjuvant radiotherapy scored poorly at
6 months if they received a neck dissection, and, al-

though some improvement over time occurred in the dis-
section group, those having no neck dissection fared
poorly over time. Although the latter group has very few
patients and the confidence intervals are wide, this is an
interesting trend.

In conclusion, there is little subjective morbidity as-
associated with shoulder dysfunction after a unilateral level
III to IV neck dissection compared with patients under-
going primary surgery without a neck dissection. More

extensive surgery in the neck, whether bilaterally remov-
ing levels I to level III to IV or extending posteriorly to
include level V, is associated with statistically signifi-
cantly worse shoulder dysfunction. Adjuvant radio-
therapy appears to have a detrimental effect on shoul-
der, whether or not the patient has a unilateral
level III to IV neck dissection; this finding was not sta-

tistically significant but is an interesting observation and

deserves further research.

1. Shah S, Har-El G, Rosenfeld RM. Short-term and long-term quality of life after

2. Kuntz AL, Weymuller EA Jr. Impact of neck dissection on quality of life. Laryn-

3. Saunders JR, Hirata RM, Jaques DA. Considering the spinal accessory nerve in

4. Nahum AM. A syndrome resulting from radical neck dissection. Arch Otolaryn-
gol. 1961;74:82-86.

5. Shone GR, Yardley MP. An audit into the incidence of handicap after unilateral

6. Short SO, Kaplan JN, Laramore GE, Cummings DW. Shoulder pain and function
after neck dissection with or without preservation of the spinal accessory nerve.

209.

8. Robbins KT, Medina JE, Wolfe GT, Levine PA, Sessions RB, Pruett CW. Stan-
dardizing neck dissection terminology: official report of the Academy’s Commit-

9. Medina JE, Byers RM. Supraomohyoid neck dissection: rationale, indications and

the treatment of head and neck tumors: survival results in 212 cases. Arch Oto-


tion of mood and anxiety domains to the University of Washington quality of

of life and clinical function after primary surgery for oral cancer. Br J Oral Max-

15. Rogers SN, Hannah L, Lowe D, Magennis P. Quality of life 5-10 years after pri-

16. Weymuller EA, Yueh B, Delejannais FW, Kuntz AL, Alsarrar R, Cotterra MD. Qual-
ity of life in patients with head and neck cancer: lessons learned from 549 pro-
spectively evaluated patients. Arch Otolaryngol Head Neck Surg. 2000;126:329-
336.