Complications From Planned, Posttreatment Neck Dissections

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Objective: To report the complication rate from planned, posttreatment neck dissections in patients who show control of primary squamous cell carcinoma by chemotherapy and radiotherapy or radiotherapy alone.

Design: Retrospective review of case series.

Setting: Georgetown University Medical Center, Washington, DC.

Patients: Thirty-four patients with clinically positive neck disease treated with organ preservation therapy for squamous cell carcinoma of the head and neck.

Interventions: Planned neck dissection after treatment with chemotherapy and radiotherapy or radiotherapy alone.

Main Outcome Measure: Perioperative complications.

Results: Forty-one neck dissections were performed on 34 patients. Complications were seen in 13 (38%) of 34 patients and 15 (37%) of 41 neck dissections. Wound complications occurred in 9 (22%) of 41 dissections. Neck dissection complication rate did not correlate with previous use of chemotherapy or with the use of brachytherapy at the primary site at the time of the neck dissection. Preoperative radiotherapy dose greater than 70 Gy was associated with complications in 58% vs 29% when preoperative dose was less than 70 Gy (P = .09). This trend was reflected primarily in wound complications (42% vs 14%; P = .10) and reached significance for skin flap necrosis (33% vs 0%; P = .005). Other factors that were associated with increased complications were preoperative albumin level less than 38 g/L and early neck drain removal.

Conclusions: The complication rate associated with planned posttreatment neck dissection is similar to that previously reported for neck dissection. Wound complications are more common when higher preoperative radiotherapy doses are used.


The treatment of advanced head and neck squamous cell carcinoma involves combined modality therapy to maximize locoregional control. The morbidity of surgical resection for primary cancers of the tongue base, larynx, and hypopharynx has led many institutions to explore organ preservation treatment. This may include combinations of chemotherapy and radiotherapy or high-dose radiotherapy with the use of altered fractionation schemes, brachytherapy, or other boost techniques to improve control of the primary tumor. The utility of chemotherapy and radiotherapy in avoiding surgical resection of the larynx and hypopharynx has been shown through multi-institutional, randomized studies in the United States and Europe. While these studies support organ preservation for management of the primary site, management of neck metastases in this setting remains controversial. Clinical failure in the neck after previous radiotherapy portends a grave prognosis, with most patients dying of uncontrolled cancer in the neck or distant sites. This poor outcome after treatment failure in the neck emphasizes the need to maximize neck control in organ preservation modalities.

The nonsurgical component of neck treatment varies depending on the organ preservation approach used. When tumors of the larynx and hypopharynx are treated by chemotherapy followed by radiotherapy, radiotherapy doses to the primary site and neck are usually in excess of 60 Gy. On the other hand, tumors of the tongue base may be treated initially with external beam radiotherapy followed by brachytherapy, and radiotherapy doses to the primary site and neck are usually in excess of 60 Gy. On the other hand, tumors of the tongue base may be treated initially with external beam radiotherapy to the primary tumor and neck with a subsequent implant dose to the primary site alone. In these patients, the neck usually receives 50 to 55 Gy by external beam radiotherapy.
PATIENTS AND METHODS

All patients undergoing a planned neck dissection between January 1, 1989, and December 31, 1997, after definitive nonsurgical management of their primary disease were assessed retrospectively through a review of inpatient and outpatient records. Variables assessed included tumor site and initial TNM stage, chemotherapy (yes or no), radiotherapy dose (maximal neck dose), preoperative laboratory studies (hemoglobin level, hematocrit, white blood cell count, platelet count, and albumin level), type of neck dissection, incision used (1- vs 3-limb incision), adjuvant procedures included (such as tracheostomy or afterloading catheter placement), drains (number, type, and day removed), drain output (volume per day and total volume), and pathological assessment (positive neck specimen, extracapsular spread, number of positive nodes, total nodes). Radiotherapy dose was recorded as the maximal dose delivered to any portion of the operated-on neck as determined by a review of the treatment portals and summary.

Complications were categorized as wound complications and systemic complications. A low threshold was kept for describing complications. Systemic complications were defined as any item noted in the perioperative record that required additional testing or intervention (eg, urinary obstruction, postoperative fever evaluation, or evaluation or treatment for possible postoperative aspiration). Data were recorded in Microsoft Access (Microsoft Corporation, Redmond, Wash) and analyzed by means of SPSS for Windows (SPSS Inc, Chicago, Ill). The relationship between complications (and type of complications) and preoperative treatment used, radiotherapy dose, type of neck dissection, and other variables listed above was evaluated by means of χ² testing (or Fisher exact testing where appropriate). Continuous independent variables (such as radiotherapy dose and preoperative platelet count) were transformed to ordinal values and evaluated by χ²t tests of trends. A secondary analysis of the likelihood of a pathologically positive specimen was compared with preoperative neck stage, treatment, and radiotherapy dose by similar statistical methods.

Alternatively, organ preservation modalities may include external beam radiotherapy alone or with concomitant chemotherapy. The various methods applied to the treatment of aerodigestive primary cancers may influence the amount of radiotherapy directed to the neck.

Unfortunately, successful nonsurgical treatment of the primary site does not ensure response and control of neck disease. In the Veterans Affairs Cooperative Study on organ preservation in advanced laryngeal cancer, the response rate of advanced neck disease (N2-N3) differed from that at the primary site in more than 50% of patients. Patients with complete response in the neck after chemotherapy required a salvage dissection in almost 28% of cases, while those with less than a complete response required a salvage neck dissection in 68%. Survival was correlated with neck response after induction chemotherapy. More than 50% of patients who showed less than a complete response after chemotherapy died of uncontrolled neck disease. For this reason, planned neck dissection has been recommended before or immediately after completion of definitive radiotherapy in patients with N2 or N3 neck disease who undergo laryngeal preservation with chemotherapy and radiotherapy.

For patients treated for cancer of the tongue base by means of brachytherapy, it is generally accepted that the preimplant radiotherapy dose to the neck of 50 to 55 Gy is not adequate to control clinically positive nodal disease. In this group of patients, those with clinically positive disease at initial examination merit neck dissection at the time of afterloading catheter placement.

At Georgetown University Medical Center, Washington, DC, patients with clinically positive neck disease who are successfully treated with intent of organ preservation at the primary site underwent a planned neck dissection after the completion of radiation therapy. The purpose of this article was to describe the prevalence and spectrum of complications associated with these neck dissections and to identify factors that might relate to these complications. In addition, we will report our rate of histologically positive neck dissection specimens and attempt to define predictive factors for residual disease after organ preservation treatment.

RESULTS

Forty-one neck dissections were performed on 34 patients. Seven patients underwent bilateral neck dissections, 6 simultaneously. Table 1 summarizes stage, previous therapy, and intraoperative therapy. Preoperative radiotherapy dose directed to the neck ranged from 50 to 80 Gy (mean, 58.25 Gy). In 1 case, the radiotherapy dose could not be determined from the record available. The mean (±SD) radiotherapy dose for the group of neck dissections treated preoperatively with chemotherapy and radiotherapy was 66.47 ± 10.08 Gy, while the dose in the group receiving radiotherapy alone was 53.31 ± 7.68 Gy (P < .001, by t test).

The type of neck dissection performed included suprathyroid neck dissections, modified neck dissections, radical neck dissections, and 1 extended radical neck dissection. The type of neck dissection performed was decided by the operating surgeon. More than half of the patients underwent radical neck dissection, including 3 with N1 disease during the early portion of this case series. Increased use of modified neck dissection was seen during the latter part of this series for N1 and N2 disease. The precise breakdown is shown in Table 1.

COMPICATIONS

Complications were recorded in 13 (38%) of 34 patients and 15 (37%) of 41 neck dissections. Wound complications were seen in 8 (24%) of 34 patients and 9 (22%) of 41 neck dissections. Systemic complications were seen in 7 (21%) of 34 patients and 8 (20%) of 41 neck dissections. Two patients (6%) and 2 (5%) of 41 neck dissections had both wound and systemic complications. Table 2 details the types of complications seen.
Complications were seen in 2 (20%) of 10 necks staged N1, 10 (40%) of 25 necks staged N2, and 3 (50%) of 6 necks staged N3 (P = .20). Although not statistically different, the prevalence of complications in necks treated with chemotherapy and radiotherapy was lower than that in necks treated with radiotherapy alone despite the higher doses of radiotherapy given in the group undergoing chemotherapy and radiotherapy. Table 3 shows the relationship between complications and previous therapy. A trend toward increased complications (38% vs 29%; P = .09) and wound complications (42% vs 14%; P = .10) was shown in those patients who received more than 70 Gy of radiotherapy when compared with those treated with lower doses of radiotherapy. In the subgroup of patients receiving chemotherapy and radiotherapy, radiotherapy doses in excess of 70 Gy were associated with a significant increase in complications (56% vs 0%; P = .04).

There was no significant difference in the complication rate in those treated with radical or extended radical neck dissection (42%) vs those treated with modified or supraomohyoid neck dissections (29%). There were no wound complications in 6 patients treated with supraomohyoid neck dissection. The overall complication rate (and the wound complication rate) was equivalent whether a single transverse incision (n = 13) or a 3-limb incision (n = 26) was used. For 2 neck dissections, the type of incision could not be determined from the records.

The performance of tracheostomy or the placement of brachytherapy catheters was evaluated with respect to complication rate. The overall complication rate and the wound complication rate was similar whether or not any adjuvant procedures were performed (10 of 26 vs 5 of 15 [P > .95] and 5 of 26 vs 4 of 15 [P = .71], respectively). Systemic complications were seen in 7 (27%) of 26 patients undergoing tracheostomy or tracheostomy and brachytherapy catheter placement as compared with 1 (7%) of 15 patients undergoing neck dissection alone (P = .22).

Higher doses of radiotherapy were associated with a trend toward increased likelihood of overall and wound complications. When the type of complication was considered, skin necrosis was seen in 4 (33%) of 12 patients who received more than 70 Gy of radiotherapy before neck dissection compared with 0 of 28 who received less radiotherapy before surgery (P = .005). The type of skin incision did not correlate with the likelihood of skin necrosis.

Preoperative laboratory results were available for a subset of patients. The rate of overall, wound, or systemic complications did not correlate with preoperative hemoglobin level, hematocrit, white blood cell count, or platelet count. A trend was seen when the overall complication rate and the wound complication rate were compared with preoperative albumin level. Complications were seen in 6 (50%) of 12 patients with albumin level less than 38 g/L vs 0 of 10 with albumin level of 38 g/L or more (P = .06). These complications consisted of wound complications in all cases. The length of time that drains remained in the operated-on neck could be determined from the available records in 33 neck dissections. This was compared with the rate of complications. When all drains were removed less than 3 days postoperatively, complications were seen in 7 (64%) of 11 dissections, with wound complications in 6 (55%) of 11. When drains were left for 3 days or longer, complications were seen in 6 (27%) of 22 dissections, with wound complications in 2 (9%) of 22 (P = .06 overall and P = .008 for wound). Overall volume of wound drainage could be determined in 28 patients. The mean volume was 306 mL in patients with complications and 275 mL in patients without complications (P = .54).
Radiotherapy alone was used (8 (50%) of 16 neck dissections vs 8 (32%) of 25 when neck specimens (30%) of 10 N1, 9 (36%) of 25 N2, and 4 (67%) of 6 N3 cancer in 16 (39%) of 41 dissections. This was seen in 3.

Neck dissection specimens were positive for metastatic findings from neck dissection. The prevalence of overall, wound, and systemic complications was 25%, 13%, and 19%, respectively, for those with positive neck dissections vs 44%, 28%, and 20%, respectively, for those with negative neck specimens (P = .32, P = .44, and P > .95 for each respective pair).

**Table 3. Complications From Neck Dissection According to Type of Previous Therapy**

<table>
<thead>
<tr>
<th>Previous Treatment</th>
<th>No.</th>
<th>Overall</th>
<th>P</th>
<th>Wound</th>
<th>P</th>
<th>Systemic</th>
<th>P</th>
</tr>
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<tr>
<td>All necks</td>
<td>41</td>
<td>15 (37)</td>
<td>. .</td>
<td>9 (22)</td>
<td>. .</td>
<td>8 (20)</td>
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<td>Chemotherapy</td>
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<tr>
<td>Yes</td>
<td>16</td>
<td>5 (31)</td>
<td>.81</td>
<td>3 (19)</td>
<td>&gt;.95</td>
<td>2 (13)</td>
<td>.45</td>
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<tr>
<td>No</td>
<td>25</td>
<td>10 (40)</td>
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<td>6 (24)</td>
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<td>6 (24)</td>
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<tr>
<td>Radiotherapy</td>
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<td>.9</td>
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<td></td>
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<tr>
<td>≥70 Gy</td>
<td>12</td>
<td>7 (58)</td>
<td>.09</td>
<td>5 (42)</td>
<td>.10</td>
<td>2 (17)</td>
<td>&gt;.95</td>
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<tr>
<td>&lt;70 Gy</td>
<td>28</td>
<td>8 (29)</td>
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<td>4 (14)</td>
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<td>6 (21)</td>
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<td>Chemotherapy and</td>
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<tr>
<td>≥70 Gy</td>
<td>9</td>
<td>5 (56)</td>
<td>.04</td>
<td>3 (33)</td>
<td>.23</td>
<td>2 (22)</td>
<td>.49</td>
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<td>0</td>
<td></td>
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<tr>
<td>Radiation alone</td>
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</tr>
<tr>
<td>≥70 Gy</td>
<td>3</td>
<td>2 (67)</td>
<td>.54</td>
<td>2 (67)</td>
<td>.13</td>
<td>0</td>
<td>.55</td>
</tr>
<tr>
<td>&lt;70 Gy</td>
<td>22</td>
<td>8 (36)</td>
<td></td>
<td>4 (18)</td>
<td></td>
<td>6 (27)</td>
<td></td>
</tr>
</tbody>
</table>

* Ellipses indicate not applicable.

**PATHOLOGICAL FINDINGS**

Neck dissection specimens were positive for metastatic cancer in 16 (39%) of 41 dissections. This was seen in 3 (30%) of 10 N1, 9 (36%) of 25 N2, and 4 (67%) of 6 N3 neck specimens (P = .19). When previous therapy included chemotherapy, positive specimens were found in 8 (50%) of 16 neck dissections vs 8 (32%) of 25 when radiotherapy alone was used (P = .41). Previous radiotherapy dose greater than 70 Gy was associated with positive neck specimens in 4 (33%) of 12, while 11 (39%) of 28 neck specimens were positive when lower doses were used. Complications were compared with pathological findings from neck dissection. The prevalence of overall, wound, and systemic complications was 25%, 13%, and 19%, respectively, for those with positive neck dissections vs 44%, 28%, and 20%, respectively, for those with negative neck specimens (P = .32, P = .44, and P > .95 for each respective pair).

This retrospective review of a case series of neck dissections performed after organ preservation therapy shows complications in more than one third of patients. The use of chemotherapy as part of the organ preservation strategy does not appear to increase the likelihood of complications. Necks treated with higher preoperative radiotherapy doses, however, do show a trend toward increased wound complications.

Although Conley cited a complication rate for neck dissection of 5%, there are few studies reporting the complication rate from neck dissection alone (ie, without simultaneous resection of the primary tumor) to provide accurate data. Bland et al reported complications in 50 (38%) of 132 “isolated” neck dissections, similar to our study. No patient in that series had received previous cytototoxic therapy, including radiotherapy. Forty-seven of these were complications confined to the neck, with the majority consisting of seromas, wound infections, and skin necrosis. Maran et al described a series of 394 neck dissections, most of which involved simultaneous resection of the primary tumor, that included 54 (14%) with wound breakdown and 17 (4%) with carotid rupture. Patients without previous radiotherapy had wound breakdown in 12 (5%) of 227 cases, whereas those with previous radiotherapy had breakdown in 42 (25%) of 167 cases.

The complication rate for neck dissections performed after radiotherapy was evaluated previously at the University of Florida and comparison was made between standard fractionation radiotherapy and twice-a-day radiotherapy. Reports on this trial have focused on “2+ and 3+” complications, consisting of neck dissections with significant wound breakdown that did (3+) and did not (2+) require operative intervention. Wound infections, seromas, and other complications were not described. There were 24 reported complications (13%) in 192 radical or modified neck dissections. The complications were comparable between the 2 radiotherapy treatment protocols. A higher complication rate was seen with higher total radiotherapy dose (from 6% in those receiving <60 Gy to 17% in those receiving >75 Gy), but this did not reach statistical significance.

A recent study by Boyd et al reported the complication rate from postradiotherapy neck dissections for a group of patients with predominantly oropharyngeal primary tumors and N2 to N3 neck disease. Radiotherapy dose was not reported. Four (14%) of 28 patients had delayed healing and/or wound dehiscence. Unfortunately, systemic complications were not included in this report. We reported all wound and systemic complications in our series, and our wound complication rate of 22% is in line with these previous reports.

A previous randomized study on resectable head and neck squamous cancer demonstrated no increase in surgical complications from resection of the primary and neck disease in patients treated with preoperative radiotherapy. The preoperative radiotherapy arm of this trial involved a dose of 50 Gy. Organ preservation therapy, especially when high-dose radiotherapy is delivered to the primary site via the neck (ie, larynx and hypopharynx), may include neck doses far in excess of this level of radiation.
Our data show a trend toward an increase in overall complications and wound complications when levels of radiotherapy in excess of 70 Gy precede neck dissection. Our data also show a trend between albumin level less than 38 g/L and an increase in wound complications. A similar correlation between albumin level and wound complications has been shown for other head and neck oncological procedures and for reconstruction by means of pectoralis myocutaneous flaps. Orthopedic and gastrointestinal tract surgery have shown this association as well.

The use of oral nutritional supplementation during definitive radiotherapy for head and neck cancer has been supported by data from a randomized controlled trial. Serum albumin levels were maintained during and after treatment in the group receiving oral nutritional supplementation. Our results suggest a need for greater attention to nutritional management during organ preservation treatment to reduce surgical complications. This is a strong argument for multidisciplinary management in head and neck cancer treatment and for continued surgical involvement during the chemotherapeutic and radiotherapeutic phases of treatment.

With respect to perioperative management, most surgeons will manage neck drains based on the volume collected over 24 hours. Often, patient discharge will be delayed awaiting drain removal. Our data suggest increased wound complications when all drains are removed less than 3 days after surgery. When patients are stable enough to be discharged less than 3 days after neck dissection, we would support discharge with drains in place.

Our rate of pathologically positive neck dissections (39%) was similar to that reported by Boyd et al (32%). Goodwin and Chandler showed that a clinical complete trial. Serum albumin levels were maintained during and after treatment in the group receiving oral nutritional supplementation. Our results suggest a need for greater attention to nutritional management during organ preservation treatment to reduce surgical complications. This is a strong argument for multidisciplinary management in head and neck cancer treatment and for continued surgical involvement during the chemotherapeutic and radiotherapeutic phases of treatment.

This series of neck dissections following organ preservation therapy via combinations of chemotherapy and radiotherapy suggests several areas for further study. The increasing use of organ preservation modalities of treatment throughout the United States may allow further exploration of these issues through cooperative trials. The following questions merit investigation: Can we reduce the number of neck dissections required by defining which patients have residual positive neck disease? Can we limit complications through modifications of radiotherapy portals and dosimetry to the neck or through the use of selective neck dissection? Would our findings suggesting that an albumin level less than 38 g/L may predict increased wound complications be supported in a larger series of neck dissections? If so, would improved nutrition management during the nonsurgical phases of organ preservation treatment reduce this complication rate?

Organ preservation therapy is gaining acceptance, but management of the neck continues to require surgical intervention. While neck dissection is usually considered less debilitating than resection of the primary disease, our data show that this intervention is associated with complications in about one third of patients. Given that the radiotherapeutic management of the primary disease often determines the radiotherapy dose to the neck, substantial adjustments in neck dose may not be possible. Attention to issues such as nutritional support during chemotherapeutic and radiotherapy and perioperative drain management may improve the rate of complications without compromising oncologic control of neck disease.

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REFERENCES