Quality of Life After Neck Dissection

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Objective: To assess the impact of modifications to radical neck dissection on postoperative quality of life.

Design: Cross-sectional study using a self-administered neck dissection questionnaire and an arm abduction test.

Setting: Department of Otolaryngology–Head and Neck Surgery, Kobe University Hospital.

Patients: Seventy-four patients who had undergone neck dissection for the treatment of head and neck cancer.

Main Outcome Measures: Arm abduction test results and responses to questions on quality of life related to neck dissection.

Results: Forty-one patients underwent bilateral neck dissections, and 33 patients underwent unilateral neck dissection. Level V nodes were dissected in 74 necks. Among them, the spinal accessory nerve (SAN) was resected in 29 necks. Patients who had neck dissections that spared the SAN had better shoulder function. When the SAN was preserved, patients without dissection of level IV and V nodes had better scores on measures of pain and constriction of the neck. Sacrifice of the sternocleidomastoid muscle and/or the SAN had a significant effect on daily activities, work, and leisure. The arm abduction test scores and answers to questions regarding shoulder function were significantly correlated.

Conclusions: Modifications to radical neck dissection contribute to improvements in the postoperative quality of life after neck dissection. A multicenter study using the arm abduction test and questionnaire used in this study is currently in progress to further evaluate the impact of modifications to radical neck dissection on quality of life after surgery.


RADICAL NECK DISSECTION requires complete removal of nodes from levels I to V along with the sternocleidomastoid muscle (SCM), internal jugular vein (IJV), and spinal accessory nerve (SAN). Since its first description by Crile,1 radical neck dissection has been and remains a cornerstone of surgical management of lymph node metastases of head and neck cancers. Although there is little doubt that radical neck dissection is oncologically effective, significant functional and cosmetic morbidities induced by this operation are problematic. Pain and shoulder dysfunction associated with loss of the SCM and/or innervation by the SAN have been documented by many authors.2,3 To address these issues, Bocca and Pignataro4 popularized the so-called functional neck dissection in 1967. Since then, various modifications to radical neck dissection have been proposed to improve the quality of treatment results without jeopardizing oncologic outcome.5 However, these modifications were essentially developed from the oncologic point of view, with only a few studies specifically focusing on the quality of life (QOL) after neck dissection.6-13

To evaluate the impact of modifications to radical neck dissection on postoperative QOL, we developed a self-administered neck dissection questionnaire and an arm abduction test (AAT). With these measures, we evaluated the QOL of the patients who had undergone neck dissection with various modifications. The results were statistically analyzed according to levels dissected as well as the status of the SCM, IJV, and SAN.

METHODS

STUDY DESIGN

We conducted a cross-sectional study to evaluate the factors that affect patients after neck dissection procedures. Seventy-four patients completed the AAT and a self-administered questionnaire on QOL related to neck dissection. All the patients had undergone neck dis-
As a result of the cancer treatment, how much have you been bothered by the following?

1. Are you bothered by neck or shoulder stiffness?
   right left

2. Are you bothered by constriction of your neck?
   right left

3. Are you bothered by neck or shoulder pain?
   right left

4. Are you bothered by numbness of your neck?
   right left

5. Do you think your shoulders have dropped?
   right left

6. Have you been limited in your ability to reach above your head for objects because of your shoulder or neck?
   right left

7. Are you bothered by the appearance of your neck?
   right left

8. Are you bothered by facial swelling?

9. Are you bothered by difficulty with dressing because of your neck or shoulder?

10. Are you bothered by difficulty with combing hair?

11. Have you been limited in your ability to do work (including work at home) because of your neck or shoulder?

12. Have you been limited in your ability to do leisure or recreational activities because of your neck or shoulder?

**Figure 1.** Neck dissection quality-of-life questionnaire. Right and left refer to the right and left sides of the neck.

A simple assessment method, the AAT, was developed to evaluate shoulder function related to neck dissection. Briefly, patients were asked to abduct their arm with their palm down and to rate the abduction from 0 to 5 according to the symptoms and an objective measure of active shoulder range of motion. A higher score indicates a better QOL (Figure 2).

**Figure 2.** Arm abduction test.

**ARM ABDUCTION TEST**

A simple assessment method, the AAT, was developed to evaluate shoulder function related to neck dissection. Briefly, patients were asked to abduct their arm with their palm down and to rate the abduction from 0 to 5 according to the symptoms and an objective measure of active shoulder range of motion. A higher score indicates a better QOL (Figure 2).

**STATISTICAL ANALYSIS**

In the pilot study, the reliability of the questionnaire was assessed by single-item test-retest correlation using Spearman log-rank correlation. Twenty-six patients (52 necks) were asked to complete the questionnaire 2 months after initial entry. Items with less than a 0.5 retest correlation were not considered reliable and were not included in this study (Table 1). Content and face validity were confirmed by patient interview. Questionnaire responses or AAT scores were statistically analyzed with the t test according to the type of neck dissection and status of the SCM, SAN, or IJV. To evaluate the convergent validity and discriminant validity, correlations between the questionnaire responses and AAT scores were statistically analyzed using the Pearson correlation coefficient. All statistical procedures were performed with StatView statistical software (version 5; SAS Institute Inc, Cary, NC).
The AAT and questionnaire were completed by 74 patients who had undergone neck dissection for the treatment of head and neck cancer at the Department of Otolaryngology–Head and Neck Surgery, Kobe University Hospital. The mean age of the patients was 61 years, ranging from 39 to 84 years. The mean time from the neck dissection to this study was 36 months, ranging from 12 months to 23 years. The primary sites of the tumor were the oral cavity in 24 patients, oropharynx in 16 patients, larynx in 8 patients, hypopharynx in 20 patients, and other sites in 6 patients. Squamous cell carcinoma was the most common tumor type.

Forty-one patients underwent bilateral neck dissections and 33 patients underwent unilateral neck dissections. In total, 115 neck dissections were included in this study and were classified into 4 groups according to the extent of dissection (Table 2). In general, the cervical nerve, SCM, SAN, and IJV were preserved in necks in which level V nodes were not dissected. Level V nodes were dissected in 74 necks. Both the SCM and cervical nerve were resected in all necks in which level V nodes were dissected. Among them, necks in which the SAN was sacrificed were classified as group Vx. The SAN was sacrificed in 49 necks and the IJV was sacrificed in 21 necks. Thirty-three necks that had not undergone any type of dissection served as controls.

The mean AAT scores for all 4 groups were significantly lower than for the control group. Among the 4 groups, the score for group Vx was significantly lower than for the other 3 groups (P<.001).

IMPACT OF TYPE OF NECK DISSECTION

The first 7 questions were analyzed according to the type of neck dissection (Table 3). The scores of the 4 groups for neck stiffness, constriction, and appearance were significantly lower than those of controls (P<.001), whereas no statistically significant differences were observed among

**ARM ABDUCTION TEST**

The AAT scores decreased as the extent of dissection increased. The AAT scores for all 4 groups were significantly lower than for the control group. Among the 4 groups, the score for group Vx was significantly lower than for the other 3 groups (P<.001).
the 4 groups. Scores for pain and numbness in the controls and group III were significantly better than those in groups IV, V, and Vx (P = .001 for pain and P < .001 for numbness). The score in group Vx for shoulder drop was significantly lower than that in the other 3 groups. The score for reach hand for above object showed a statistically significant difference between controls and group III (P = .05) and between groups V and Vx (P = .02).

**IMPACT OF PRESERVATION OF THE SCM, SAN, AND IJV**

The scores for the last 5 questions of the questionnaire were analyzed according to the status of the SCM, SAN, and IJV. Sacrifice of the SAN was related to restrictions in dressing (P = .08), work (P = .02), and leisure activities (P = .04). Resection of the SCM was related to lower scores for dressing (P = .46) and combing (P = .06), as well as for work (P = .006) and leisure activities (P = .02). Preservation of the IJV did not affect the scores for any of the questions (data not shown).

**IMPACT OF POSTOPERATIVE IRRADIATION**

Postoperative radiotherapy was performed in 29 necks (5 necks in group IV, 9 necks in group V, and 15 necks in group Vx). The impact of radiotherapy on the first 7 questions and the AAT scores was analyzed according to the type of neck dissection using the t test. Although no statistically significant differences were observed in any item, marginally statistically significant differences between the irradiated necks and the necks that did not undergo irradiation were observed in the scores for shoulder drop in group IV (3.6 vs 4.4; P = .07), pain in group V (3.0 vs 4.1; P = .06), and constriction in group Vx (2.6 vs 3.3; P = .09).

**CORRELATIONS BETWEEN QUESTIONNAIRE RESPONSES AND AAT SCORES**

To determine the convergent validity, statistical evaluation of correlations between the scores for the first 7 questions and the AAT scores was performed using the Pearson correlation coefficient. As we expected, strong correlations were observed between the AAT scores and those for shoulder drop and reach hand for above object. The correlation index for shoulder drop and AAT score was 0.46, and that for AAT score and reach hand for above object was 0.64 (Table 6).

**COMMENT**

Since functional neck dissection was introduced, various modifications have been developed to reduce the adverse effects of this surgical procedure. However, uncertainty remains regarding the superiority of organ preservation and/or shrinking of levels of dissection to predictably avoid these disabilities. If there is no functional advantage, all other arguments for modified neck dissection carry little weight.

**IMPACT OF PRESERVATION OF THE SAN ON SHOULDER FUNCTION**

Classic shoulder syndrome consists of accessory nerve palsy complicated by adhesive capsulitis of the glenohumeral joint capsule. The Manual Test, a common clinical test used for evaluating SAN function, can produce varying results depending on the examiner. To overcome this drawback, we developed the AAT for evaluating SAN function in this study. The results presented in this article demonstrate that the AAT scores and those for shoulder drop and reach hand for above object were closely correlated, which suggests that the AAT may be a useful alternative test for SAN function after neck dissection. The AAT scores and the responses to questions related to SAN function decreased as the dissected portion of the SAN increased. These results support the idea that dissecting or skeletonizing the SAN, even though it is performed to preserve the nerve, is traumatic. On the other hand, it is also important to remember that the shoulder function of the SAN-preserved neck was significantly better than that of the SAN-resected...
neck. In terms of shoulder drop, the score in group IV was the same as that in group III and better than that in group V. Although not statistically significant, these findings indicate that preservation of the SCM in addition to that of the SAN may contribute to the prevention of shoulder drop.

IMPACT OF TYPE OF NECK DISSECTION ON SUBJECTIVE ITEMS

All groups marked significant low scores for neck stiffness and constriction, as well as neck appearance. Of interest, no significant differences occurred among the 4 groups. These results seem to reflect the fact that any type of neck dissection produces fibrosis in the neck, which leads to a feeling of stiffness and constriction. Cappiello et al reported that subjective findings did not correlate with the function of the SAN, as evidenced on an electromyogram. Subjective complaints, such as appearance, also appear to be influenced by factors other than or in addition to the physical condition of the neck.

Group III, the so-called supraomohyoid neck dissection group, marked significantly superior scores for pain and numbness. Patients in group IV, whose SCM and SAN were preserved and whose level V node was not dissected, marked similarly favorable scores for shoulder functions but poorer scores for pain and numbness. The only difference between group III and group IV was the dissection of the level IV node. The possible reason why dissection of the level IV node made such a difference in scores for pain and numbness may be manipulation of the cervical nerve, such as traction, skeletonization, and devascularization during level IV node dissection.

IMPACT OF NECK DISSECTION ON DAILY LIFE, WORK, AND LEISURE

Schuller et al reported that modified radical neck dissection had no advantage compared with radical neck dissection in terms of patients being able to return to their pretreatment employment status. Our results showed that sacrifice of the SCM and/or SAN resulted in difficulties in leisure-related, work-related, and daily activities, such as dressing and combing. In other words, the patients whose SCM and SAN were preserved marked significantly better scores for such activities. Since our study population included a variety of primary sites, it is difficult to reach a definitive conclusion on this topic. However, these findings deserve to be taken into consideration when planning a neck dissection procedure.

IMPACT OF IRRADIATION ON QOL AFTER NECK DISSECTION

Irradiation has been reported as an independent predictor of unfavorable shoulder-related QOL. Although we did not find any significant difference in the present study, the marginally significant difference in the scores for shoulder drop between the irradiated necks and necks that did not receive irradiation in which the SCM and SAN were preserved suggests a possible adverse effect of postoperative radiotherapy on the SCM and SAN. Currently, we are conducting a multicenter study on QOL after neck dissection using the measure presented in this article. This multicenter study will provide us with a further understanding of the effects of irradiation as well as other possible factors, including type of neck dissection, treatment modalities for primary sites, chemotherapy, and rehabilitation, on QOL after neck dissection.

In conclusion, neck dissections that spare the SAN are associated with better shoulder function, whereas dissections of level IV and/or V nodes are more associated with pain and numbness. Patients who undergo any type of neck dissection experience stiffness and constriction of the neck and are bothered by appearance. Preservation of the SCM may help prevent shoulder drop.

Submitted for Publication: April 23, 2005; final revision received November 3, 2005; accepted January 24, 2006.

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Financial Disclosure: None.

Funding/Support: This study was supported in part by a Grant-in-Aid for Research (14370543; Dr Nibu) and a Health and Labour Sciences Research Grant for Clinical Cancer Research (H16-Gannrinshou-001) from the Ministry of Health, Labour and Welfare, Tokyo, Japan.

Previous Presentation: This study was presented at the Sixth International Conference on Head and Neck Cancer; August 9, 2004; Washington, DC.

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