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研究成果の刊行に関する一覧表

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REVIEW ARTICLE

Quality of life after neck dissection: a multicenter longitudinal study by the Japanese Clinical Study Group on Standardization of Treatment for Lymph Node Metastasis of Head and Neck Cancer

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Abstract
Background We performed a multicenter longitudinal study using our neck dissection questionnaire (NDQ) and arm abduction test (AAT) to assess the impact of rehabilitation and surgical modification on postoperative quality of life (QOL).
Methods Patients who had undergone neck dissection for the treatment of head and neck cancer answered the NDQ and completed the AAT 1, 3, 6, and 12 months after surgery. All patients enrolled in this study underwent a rehabilitation program designed for neck dissection. The obtained data were statistically analyzed according to the types of neck dissection and compared with the data of patients who had undergone neck dissection but not rehabilitation.
Results A total of 224 patients were enrolled in this study. Our findings revealed that resection of the sternocleidomastoid muscle (SCM) and spinal accessory nerve (SAN) resulted in shoulder drop. Lowering the dissection level and preservation of the SAN and SCM significantly reduced various sensory symptoms of the neck, such as stiffness, pain, numbness, and constriction, and improved shoulder function. Postoperative rehabilitation had a significant effect on arm abduction ability, particularly when the SCM and SAN were resected.
Conclusions The study demonstrated that rehabilitation, in addition to modifications to radical neck dissection, contributed to the improvement of postoperative QOL after neck dissection.

Keywords Quality of life · Neck dissection · Spinal accessory nerve · Sternocleidomastoid muscle · Questionnaire · Rehabilitation

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Introduction

Radical neck dissection (RND), which requires the complete removal of lymph nodes from levels I to V, along with the sternocleidomastoid muscle (SCM), internal jugular vein (IJV), and spinal accessory nerve (SAN), has been used as a standard operative technique in the surgical management of lymph node metastases of head and neck cancers [1]. However, significant functional and cosmetic morbidities induced by this operation have not yet been clarified [2, 3]. To address these issues, various modifications to RND have been proposed to improve quality of life

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 are dropped?
right _____ left _____
6. Have you been limited in your ability to reach above for objects because of your shoulder or neck?
right _____ left _____
7. Are you bothered by the appearance of your neck?
right _____ left _____

Fig. 1 Neck dissection quality of life (QOL) questionnaire (extracted from Ref. [14])

Please raise your arm with your palm down and rate from the following scale.

right arm _____ left arm _____

I can rise my arm
5. up to 180 degree without pain or effort
4. up to 180 degree but with pain or effort
3. up to more than 150 degree but less than 180 degree
2. up to more than 90 degree but not less than 150 degree
1. up to around 90 degree
0. up to less than 90 degree

Fig. 2 Arm abduction test (extracted from Ref. [14])

(QOL) after neck dissection [4, 5]. Several studies have demonstrated that these modifications have provided better QOL following neck dissection [6–13], with oncologically acceptable outcomes.

To evaluate the functional advantages of these modifications, the Japanese Clinical Study Group on Standardization of Treatment for Lymph Node Metastasis of Head and Neck Cancer has recently developed a self-administered neck dissection questionnaire (NDQ; Fig. 1) and arm abduction test (AAT; Fig. 2) [14]. With the aim of further improving postoperative QOL, we conducted a multicenter longitudinal study to evaluate the impact of various modifications to surgical procedures and postoperative rehabilitation on QOL following neck dissection, using our NDQ and AAT.

Patients and methods

Study design

Patients who had undergone neck dissection for the treatment of head and neck cancers at the Cancer Institute Hospital, Shizuoka Cancer Center, or Kobe University Hospital were enrolled in this study. Patients were excluded if they had any history of unrelated neck or shoulder pathologic conditions, or known recurrent diseases at the time of evaluation. All patients underwent a rehabilitation program designed for neck dissection according to the respective institute's protocol. The type of neck dissection was determined by reviewing hospital charts and operative notes. Patients completed the AAT and self-administered NDQ on QOL related to neck dissection [14] 1, 3, 6, and 12 months after neck dissection on an outpatient basis during their routine follow-up care. This study was approved by the ethics committee of Kobe University Graduate School of Medicine (#209). Data of 74 patients who underwent neck dissection but who did not have rehabilitation registered in our pilot study [14] were used as the negative control.

Neck dissection questionnaire

The first 7 items of the NDQ developed by our study group (Japanese Clinical Study Group on Standardization of Treatment for Lymph Node Metastasis of Head and Neck Cancer) [14] was used for this study. These items were: (1) neck stiffness, (2) neck constriction, (3) neck pain, (4) neck numbness, (5) shoulder drop, (6) reach above, and (7) neck appearance. Scoring was achieved by rating response items from 1 to 5, with 5 representing better QOL and 1 worsening of QOL. Patients were required to answer questions pertaining to the right and left sides of the neck separately.

Arm abduction test

In this test, patients were asked to abduct their arm with their palm down. They were then instructed to rate the abduction from 0 to 5 according to the symptoms and objective measure of the active shoulder range of motion, as follows: 5 = up to 180° without pain or effort, 4 = up to 180° but with pain or effort, 3 = up to more than 150° but less than 180°, 2 = up to more than 90° but not less than 150°, 1 = up to around 90°, 0 = up to less than 90° [14].

Statistical analysis

All statistical procedures were performed with StatView (Version 5; Abacus Concepts, Berkeley, CA, USA). Questionnaire and AAT scores were analyzed using Student's *t*-test, according to the types of neck dissection and follow-up periods after neck dissection.

Results

A total of 224 patients were enrolled in this study. Their average age was 62 years (range, 31–84 years). All patients

were followed up from the time of surgery to 12 months after neck dissection. The primary tumor sites were the oral cavity ($n = 81$), hypopharynx ($n = 50$), larynx ($n = 38$), oropharynx ($n = 26$), salivary gland ($n = 8$), thyroid ($n = 8$), and other sites ($n = 13$). A total of 84 patients underwent bilateral neck dissections and 140 underwent unilateral neck dissection for the treatment of head and neck cancers.

A total of 308 neck dissections were evaluated in this study. Patients were classified into four groups according to the extent of dissection and status of nonlymphatic structures, as shown in Table 1. In general, the cervical nerve (CN), SCM, SAN, and IJV were preserved in necks where level V was not dissected. The SCM and CN were sacrificed in necks where level V was dissected. Among them, 45 necks in which the SAN was sacrificed were classified as group VI. For the control, we used the data for 140 necks that were not subjected to any type of neck dissection (group C).

Questionnaire scores

Scores on the questionnaire and AAT for each period are summarized in Table 2 and Fig. 3.

Neck and shoulder stiffness

Scores for neck or shoulder stiffness in groups III ($P < 0.0001$), IV ($P < 0.0001$), and V ($P = 0.03$) significantly improved during the 12 months after neck dissection. At 12 months, scores in groups III and IV were significantly higher than that in group V ($P < 0.0001$), and the score in group V was significantly higher than that in group VI ($P < 0.03$). No significant difference was observed among groups III and IV ($P < 0.34$).

Neck constriction

Scores for neck constriction in groups III ($P = 0.002$) and IV ($P = 0.0007$) significantly improved during the observation period. The score in group III was slightly higher than that in group IV ($P = 0.08$), and the score in group IV was significantly higher than that in group V ($P = 0.002$). There was no significant difference in the scores between groups V and VI ($P = 0.25$).

Table 1 Classification of neck dissection

Group	Extent of dissection	SCM/CN	SAN	No. of patients
C	–	Preserved	Preserved	140
III	I–III	Preserved	Preserved	64
IV	II–IV	Preserved	Preserved	124
V	I–V or II–V	Resected	Preserved	75
VI	I–V or II–V	Resected	Resected	45

SCM/CN sternocleidomastoid muscle/cervical nerve, *SAN* spinal accessory nerve, *C* control group

Neck and shoulder pain

The score for neck and shoulder pain in group III significantly improved during the observation period ($P = 0.03$). There was also a trend for improvement in group IV ($P = 0.1$); however, the scores in the other groups showed no improvement. A marginally significant difference in the scores for neck pain between groups IV and V was found ($P = 0.06$). There was a significant difference in the scores between groups III/IV and groups V/VI.

Neck numbness

The score for neck numbness showed no improvement during the observation period. There was a significant difference between groups III/IV and groups V/VI, but not between groups III and IV, or groups V and IV.

Shoulder drop

Scores for shoulder drop in groups III ($P = 0.001$) and IV ($P = 0.005$) significantly improved during the observation period. On the other hand, statistical analysis revealed a trend for a decrease in the score in group VI ($P = 0.06$). Scores in groups III/IV were significantly higher than that in group V ($P = 0.005$). The score in group V was significantly higher than that in group VI ($P = 0.003$).

Reach above

Scores for reach above in groups III, IV, and V significantly improved during the observation period ($P < 0.0001$, $P < 0.0001$, and $P < 0.01$, respectively). The score in group V was significantly higher than that in group VI ($P = 0.0001$). Scores in groups III/IV were slightly higher than that in group IV ($P = 0.1$). The score in group V was also significantly higher than that in group VI ($P = 0.0001$). There was no significant difference in the scores among groups III and IV.

Appearance

Scores for neck appearance in groups III ($P = 0.04$) and IV ($P < 0.0001$) improved during the observation period. However, there was no significant increase in the scores in groups V and IV. The score in group III was significantly higher than those in groups IV/V ($P = 0.03$). The score in group V was marginally higher than that in group IV ($P = 0.07$).

Table 2 Results of questionnaire and arm abduction test

Item	C		III		IV		V		VI	
	Score	*P*	Score	*P*	Score	*P*	Score	*P*	Score	*P*
Stiffness										
1 M	4.3	0.7	2.0	<0.0001	2.1	<0.0001	2.0	0.30	1.8	0.27
3 M	4.3		2.5		2.5		2.1		1.8	
6 M	4.2		3.0		2.6		2.2		2.1	
12 M	4.1		3.2		3.0		2.5		2.1	
Constriction										
1 M	4.3	0.84	2.5	0.003	2.4	0.001	2.1	0.12	2.2	0.85
3 M	4.2		2.9		2.6		2.2		2.4	
6 M	4.2		3.4		2.8		2.4		2.2	
12 M	4.3		3.4		3.0		2.6		2.3	
Pain										
1 M	4.4	0.49	3.2	0.03	3.3	0.1	3.0	0.44	3.1	0.83
3 M	4.4		3.4		3.4		3.2		3.1	
6 M	4.3		3.7		3.5		3.2		2.9	
12 M	4.5		3.9		3.7		3.4		3.2	
Numbness										
1 M	4.5	0.95	3.3	0.54	3.2	0.15	3.2	0.50	3.5	0.70
3 M	4.5		3.6		3.2		3.3		3.5	
6 M	4.5		3.6		3.5		3.5		3.2	
12 M	4.4		3.7		3.5		3.2		3.3	
Shoulder drop										
1 M	4.6	0.30	3.3	0.001	3.6	0.05	3.5	0.60	3.5	0.06
3 M	4.5		3.0		3.6		3.3		3.1	
6 M	4.4		3.4		3.6		3.4		2.8	
12 M	4.4		3.9		3.9		3.5		2.9	
Reach above										
1 M	4.6	0.29	2.4	<0.0001	2.8	<0.0001	2.7	0.01	2.6	0.65
3 M	4.3		2.6		2.8		2.6		2.4	
6 M	4.3		3.3		3.2		3.2		2.3	
12 M	4.4		3.7		3.5		3.2		2.3	
Neck appearance										
1 M	4.5	0.44	3.4	0.04	3.2	<0.0001	3.2	0.40	3.0	0.99
3 M	4.4		3.2		3.4		3.3		3.2	
6 M	4.5		3.6		3.5		3.5		3.1	
12 M	4.6		3.9		3.6		2.8		3.1	
AAT										
1 M	4.4	0.07	2.9	<0.0001	2.9	<0.0001	2.8	<0.0001	2.3	0.61
3 M	4.5		3.1		3.2		3.3		2.6	
6 M	4.6		4.0		3.6		3.6		2.3	
12 M	4.8		4.4		3.8		4.1		2.7	

AAT arm abduction test, *M* months, *P*: *P* value

P indicates the level of significance between the scores for each question at 1 month and 12 months in the statistical analysis

Arm abduction test

Scores for the AAT in groups III ($P < 0.0001$), IV ($P = 0.001$), and V ($P = 0.0002$) significantly improved during the observation period, but not that of group VI. The score in group III was significantly higher than that in group IV ($P = 0.01$), and the score in group V was significantly higher than those in groups V/VI ($P < 0.001$).

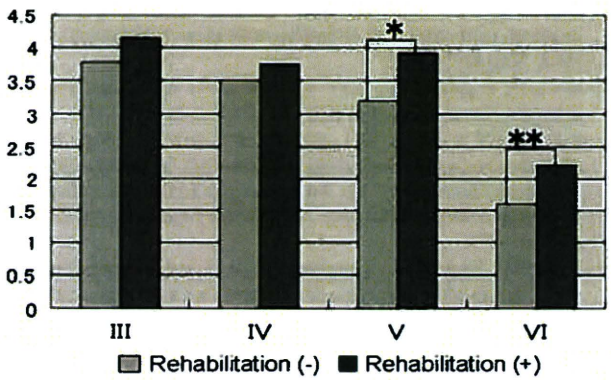

Fig. 3 Impact of rehabilitation on arm abduction test (AAT). The AAT scores of the patients who underwent rehabilitation were higher than those of the patients who did not undergo rehabilitation, particularly when level V was dissected. $*P = 0.06$, $**P = 0.03$

The average score in group V was higher than that in group IV, although not significantly so, and was similar to that in group III.

Finally, we compared the scores for the AAT, obtained 12 months after neck dissection, in each group in this multicenter study with the AAT scores in the patients in our pilot study in whom postoperative rehabilitation was not performed [14]. As shown in Fig. 2, the AAT scores in the present multicenter study were higher than those in our pilot study. In particular, the scores in group V ($P = 0.06$) and group VI ($P = 0.03$) in the present study were significantly higher than those in these groups in the pilot study.

Discussion

Since the introduction of "functional neck dissection" [4], various modifications have been made to reduce its adverse effects [15]. However, uncertainty remains regarding prediction of the superiority of organ preservation, and/or the reduction in the level of dissection, in avoiding these adverse affects.

To further improve QOL after neck dissection, we performed a multicenter longitudinal study and examined the impacts of rehabilitation and surgical modification on postoperative QOL.

Impact of preservation of spinal accessory nerve (SAN) and rehabilitation on shoulder function

In the present study, regardless of the dissection levels, scores for reach above and AAT were significantly improved for the necks where the SAN was preserved. Differences in the scores for the questions regarding reach above and AAT were very small among groups III, IV, and V. Statistical analysis showed a significant difference in the score for AAT between groups III and IV, but no such difference was shown in the score for the question about raising the arm. Of interest, at 12 months, the average score in group V, in which the SCM was resected, was higher than that in group IV, in which the SCM was preserved, although the difference was not significant. These findings again suggest that shoulder function was satisfactorily maintained as long as the SAN was preserved [13] even if the SCM was resected.

On the other hand, scores for shoulder drop were significantly higher in the necks where the SCM was preserved, but lower in the necks where the SCM was resected. Twelve months after the surgery, a significant difference was observed between groups IV and V, as well as between groups V and VI. These results indicate that both the trapezius muscle and the SCM are involved in shoulder drop.

In all groups, the average scores for AAT in the present study were higher than those in our previous study in which patients did not undergo postoperative rehabilitation. Notably, the score for AAT in the present study was significantly higher than that in our previous study in the necks where level V was dissected. Because the SAN was resected in group VI, improvement of the ability to abduct the arm could not be expected [7], as shown in Table 2. However, as Pettern et al. postulated, the so-called "shoulder syndrome" consists of accessory nerve palsy and adhesive capsulitis of the glenohumeral joint capsule [16]. Prevention of adhesive capsulitis may be the main mechanism by which postoperative rehabilitation contributes to improvement in shoulder function [7].

Changes in subjective symptoms during the first 12 months after surgery

Stiffness and constriction abated and appearance improved in the necks where the SCM and SAN were preserved, but not in the necks where level V was dissected. Pain also abated in necks where dissection of levels IV and V was avoided. On the other hand, numbness showed no abatement in any type of neck dissection, in accordance with a previous study [10].

There is a criticism that these improvements during the follow-up period merely reflect the patients having gotten accustomed to and coping with their symptoms. Indeed, Cappiello et al. reported that subjective findings did not correlate with the function of the SAN as evidenced on an electromyogram [13]. Subjective complaints, such as appearance, also appear to be influenced by factors other than or in addition to the physical conditions of the neck [17]. However, the degree of improvement varied significantly depending on the questions, types of neck

dissection, and among patients with or without rehabilitation, suggesting that most symptoms eventually abate and shoulder function eventually improves with time in the modified types of neck dissection.

In general, in the present study, group III showed markedly superior scores for all items. Group IV also demonstrated markedly similar favorable scores for most items. The only significant difference between these two groups was observed in the AAT. Marginally significant differences were also observed in the items of pain and appearance. However, the differences in the average scores for these questions were very small. These findings must be taken into consideration when planning neck dissection procedures, particularly in the N0 or N1 neck [5].

The present study demonstrated that postoperative rehabilitation and modifications to RND resulted in better QOL after neck dissection.

We are currently conducting another multicenter study in collaboration with more than 20 institutions to obtain more detailed information. This ongoing study will, it is hoped, provide a better understanding of QOL after neck dissection.

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The Role of Pulmonary Resection in Tumors Metastatic from Head and Neck Carcinomas

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Objective: The purpose of this study was to determine the role of surgical treatment and to identify factors affecting the survival of patients undergoing pulmonary resection for tumors metastatic from head and neck carcinomas.
Methods: Thirty-three patients who had undergone resection of pulmonary tumors metastatic from head and neck carcinomas, other than thyroid cancers and sarcomas of the head and neck, were reviewed.
Results: The operative morbidity rate was only 6%, no patients died within 30 days after resection and complete resection was achieved in 94% of patients. The overall 1- and 3-year survival rates were 76% and 43%, respectively, and the median survival time was 21 months. The factors found on univariate analysis to significantly affect survival were a disease-free interval of $\leq$2 years, tongue carcinoma and squamous cell carcinoma. The factor found, on multivariate analysis, to most strongly affect survival was tongue carcinoma. The most frequent pattern of initial recurrence after pulmonary resection was distant metastasis (64%).
Conclusions: The safety and effectiveness of surgical treatment for pulmonary tumors metastatic from head and neck carcinomas in adaptive criteria for resection are well demonstrated. The poor survival after surgical resection of pulmonary tumors metastatic from cancers of the tongue should be noted.

Key words: head and neck cancer – metastasectomy – prognostic factors

INTRODUCTION

Local and regional control of head and neck cancers has improved through the use of multimodal treatment combining surgical resection, radiation and chemotherapy. However, no effective or beneficial systemic treatment has been established for head and neck cancers that have metastasized to distant sites. The anticipated incidence of clinically detected distant metastases from head and neck cancers ranges from 5.5% to 40% (1–7). The most common site of metastasis is the lung (8–10). Nevertheless, surgical resection has become the standard treatment for selected pulmonary tumors metastatic from a variety of malignancies, including sarcomas, germ cell tumors, renal cell cancers and colorectal cancers. However, for patients with head and neck cancers, few studies have examined the role of pulmonary resection, and the clinical factors that best predict outcome remain unclear. The purpose of this study was to present our experiences with pulmonary resection of epithelial head and neck cancers and to clarify factors affecting survival according to the primary site of head and neck carcinomas.

PATIENTS AND METHODS

Patient Population

From October 1992 through November 2006, 41 patients with pulmonary metastatic tumors who had been treated for head and neck malignant tumors underwent surgical resection at the National Cancer Center Hospital East. All

patients who underwent pulmonary resection for metastatic tumors met the following criteria: (i) head and neck primary cancer controlled or imminently controllable; (ii) metastatic disease limited to the lung; (iii) pre-operative assessment of complete respectability of all pulmonary lesions; and (iv) ability to tolerate the planned pulmonary resection. Excluded from the study were five patients with thyroid cancers, one patient with chondrosarcoma and two patients with incomplete clinical information. Therefore, 33 patients with complete clinical and pathological data were retrospectively analyzed.

Pre-operative clinical staging for primary carcinomas of the head and neck was based on the 1997 International Union Against Cancer TNM classification. All pathological specimens were examined by pathologists with specific experience with tumors of the head and neck and of the lung. Pulmonary lesions were diagnosed as metastatic tumors when they showed histological similarity to the primary tumor of the head and neck and when possibility of a second primary lung malignancy had been excluded. Lesions that had originated within the bronchus were diagnosed as second primary lung tumors.

Surgery

The aim of surgery for lung tumors was complete resection. The most common procedure was wedge resection, which was performed for 17 of the 33 patients. Lobectomy was performed for 12 patients, and segment resection was performed for 4 patients (Table 2). Systemic lymph node dissection was not performed.

Follow-up

After discharge, all 33 patients were regularly followed up with routine physical and laboratory examinations at our hospital. Chest radiography, external ultrasonography of the neck and computed tomography of the neck and the chest were performed annually to detect possible recurrent disease. The median follow-up period was 21 months (range, 4–128 months).

Statistical Analysis

The disease-free interval was calculated from the date of the start of definitive treatment of the head and neck cancer to the date of the diagnosis of the pulmonary metastasis with radiological examinations. Survival time was defined as the interval from the date of initial resection of lung tumors to the date of last follow-up or death. Length of survival was determined with the Kaplan–Meier method, and the log-rank test was used for comparison. Multivariate analysis was performed with the Cox proportional hazard model. A P value of <0.05 was considered to indicate significance. All analyses were performed with the SPSS statistical software package (version 11.0; SPSS, Inc., Chicago, IL, USA).

RESULTS

Clinical Characteristics for Head and Neck Carcinomas

The characteristics of the primary head and neck carcinomas are shown in Table 1. Twenty-five patients were men and eight were women. The median patient age was 59 years, and the age range was 22–83 years. The primary sites of the head and neck carcinomas were as follows: hypopharynx in eight cases, the larynx in six cases, the oropharynx in three

Table 1. Clinical characteristics for head and neck carcinoma

Variable	Number of patients (%)
Sex	
Male	25
Female	8
Age	
Median (range)	59 (22–83)
Location of primary tumor	
Hypopharynx	8
Larynx	6
Oropharynx	3
Tongue	7
Nasopharynx	4
Salivary gland	5
T status	
T1/2	2/8 (6/24)
T3/4	13/10 (40/30)
N status	
N0	12 (36)
N1/2/3	6/14/1 (18/42/3)
M status	
M0	30 (90)
M1	3 (9)
Stage	
Stage I/II/III	2/3/6 (6/9/18)
Stage IV	22 (67)
Treatment for HN carcinomas	
Surgical resection	26 (79)
Nonsurgical	7 (21)
Histological type of HN carcinomas	
Squamous cell carcinoma	27 (82)
Other	6 (18)

HN, head and neck.

cases, the tongue in seven cases, the nasopharynx in four cases and major or minor salivary glands in five cases. Most patients presented with T3 or T4 and Stage IV disease. Three patients with M1 disease had a synchronous pulmonary metastasis. The initial treatment for the primary tumors was surgical resection for 26 patients and radiation or chemoradiation for seven patients. The histological type of the primary tumor was squamous cell carcinoma (SCC) in 27 patients and other in 6 patients. The other histological types were as follows: adenocarcinoma in two patients, adenoid cystic carcinoma in two patients, undifferentiated carcinoma in one patient and salivary gland carcinoma in one patient.

Pulmonary Clinical Features and Resection

Clinical features of lung tumor and results of pulmonary resection are shown in Table 2. Three of the 33 patients with synchronous pulmonary tumors underwent resection after surgical resection of the primary tumor. Thirty-one (94%) patients had a solitary lung tumor, but two patients had two lung tumors. One of these two patients underwent bilateral thoracotomy at the same time, and the other patient twice underwent wedge resection by unilateral thoracotomy. All lung tumors in the 33 patients were pathologically diagnosed and confirmed to be metastases from head and neck carcinomas. Complete resection of metastatic tumors in the lung was achieved in 94% of the patients. The overall rate of postoperative complications was 6%; two patients had pneumonia but did not require mechanical ventilation. No patients died in the 30 days after surgery.

Table 2. Pulmonary clinical features and pulmonary resection

Variables	Number of patients (%)
Presentation of metastasis	
Synchronous	3 (9)
Metachronous	30 (91)
Number of metastases	
Single	31 (94)
Multiple	2 (6)
Extent of resection	
Wedge resection	17 (52)
Segmental resection	4 (12)
Lobectomy	12 (36)
Completeness of resection	
Complete	31 (94)
Incomplete	2 (6)
Complications after resection	
Absent	31 (94)
Present	2 (6)

Patterns of First Failure

Disease recurred after pulmonary resection in 21 patients (64%). Distant metastasis, especially to the lung, was the most common pattern of recurrence after resection (Table 3).

Survival and Factors Affecting Survival in Univariate and Multivariate Analyses

The overall 1- and 3-year survival rates of the 33 patients were 76% and 43%, respectively, and the median survival time was 21 months. The overall survival curves according to the sites of primary head and neck tumors are shown in Fig. 1. The overall 1- and 3-year survival rates of patients with salivary gland tumors were each 80%. The overall 1- and 3-year survival rates of patients with nasopharynx and oropharynx were each 86%. The overall 1- and 3-year survival rates of patients with tumors of the larynx and hypopharynx were 79% and 25%, respectively. In patients with tumors of the tongue, the overall 1-year survival rate after resection was 57% and the median survival time was 13 months; no patient survived for >2 years. Significant prognostic factors identified with univariate analysis were a disease-free interval of ≤2 years, a primary tumor of the

Table 3. Sites of first recurrence after pulmonary resection

Variable	Number of patients (%)
Absent	12 (36)
Present	21 (64)
Locoregional	3 (14)
Distant	14 (67)
Lung	10
Bone	4
Mediastinal lymph node	5
Both local and distant	4 (19)

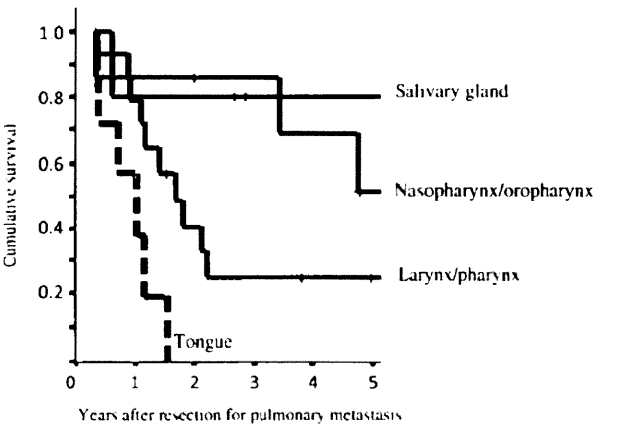

Figure 1. Overall survival curves according to location of primary tumors.

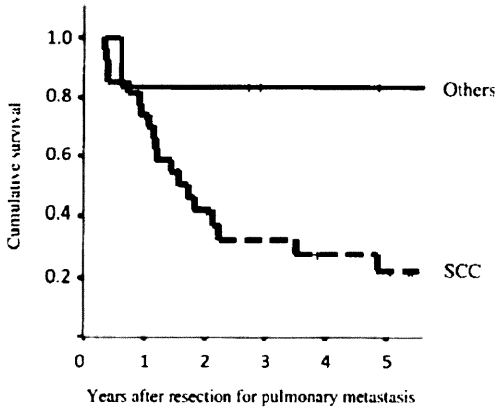

Figure 2. Overall survival curves according to histological types. SCC, squamous cell carcinoma.

tongue and SCC (Fig. 2 and Table 4). The most significant prognostic factor identified with multivariate analysis was carcinoma of the tongue (Table 5).

DISCUSSION

The most common site of distant metastasis in patients with head and neck carcinomas is the lung (8–10). Furthermore, patients with head and neck cancers are at high risk for metachronous primary lung cancers (11,12). The relative risk of a lung carcinoma developing in patients who have been treated for an SCC of the head and neck is three to six times higher than in a healthy population (13,14). Therefore, pulmonary malignances are a major problem after definitive treatment of head and neck malignancies. Distinguishing a pulmonary metastasis from a primary lung cancer in patients with head and neck SCC has been difficult because of the similarities in histopathological and radiographic appearance. However, the molecular genetic approach has helped clarify the fundamental distinction between pulmonary metastases and primary lung cancers (15,16). By comparing loss of loci on chromosome arms 3p and 9p between paired SCCs of the head and neck and of the lung, Leong et al. (16) have found that the pulmonary SCCs were metastases rather than independent lung carcinomas in 12 (75%) of 16 patients. Geurts et al. (15) have reported that loss of heterozygosity analysis suggested that tumors of the lung diagnosed as metastatic SCCs in 19 (50%) of 38 patients were in fact second primary lung carcinomas.

Treatment strategies for primary lung cancers differ from those for metastases to the lung from head and neck carcinomas. For resectable second primary lung cancers, surgical intervention with curative intent should be considered (17), but for lung metastases, systemic therapy or limited surgical resection should be considered. The survival benefit from surgical resection after the treatment of SCCs of the head and neck might be expected to be greater for patients with primary lung cancers than for patients with metastasis to the lung. However, no significant difference in survival has been found between these groups of patients (14). Distant metastasis is considered to be a systemic disease and is generally treated with chemotherapy. However, the results of chemotherapy for pulmonary metastases have been

Table 4. Results of univariate analysis

Variable	Number of patients (*n*)	1-year survival rate (%)	3-year survival rate (%)	*P* value
Sex				
Male	25	83	41	0.843
Female	8	56	56	
Disease-free interval				
≤2 years	19	68	25	0.027
>2 years	14	86	70	
Location of primary tumor				
Tongue	7	57	0	0.0014
Other	26	81	52	
T status of primary tumor				
T1/2	10	90	54	0.215
T3/4	23	70	38	
N status of primary tumor				
Absent	12	75	47	0.621
Present	21	76	41	
Clinical stage				
Stage I/II/III	11	75	66	0.263
Stage IV	22	76	31	
Presentation of pulmonary metastasis				
Synchronous	3	100	0	0.14
Metachronous	30	77	48	
Number of metastases				
Single	31	97	58	0.54
Multiple	2	50	50	
Histological type of primary tumor				
Squamous cell carcinoma	27	78	33	0.038
Other	6	83	83	
Completeness of resection				
Complete	31	77	42	0.864
Incomplete	2	50	50	

Table 5. Results of multivariate analysis for prognostic factors

Variables	*P* value	Hazard ratio	95% confidence interval
Disease-free interval <2 years	0.074	2.61	0.91–7.45
Location of primary: tongue vs. other	0.018	3.72	1.25–11.06
Histological type of primary tumor: squamous cell carcinoma vs. other	0.13	4.83	0.64–37.30

extremely poor, with few complete responses and short survival (7). In contrast, surgical resection has become the standard therapy for selected cases of a variety of malignancies metastatic to the lung, including sarcomas, germ cell tumors, renal cell cancers and colorectal cancers. However, there have been few reports of surgical resection of pulmonary metastases from head and neck carcinomas. Although previous reports have demonstrated the safety of surgical resection and its effect on survival, independent prognostic factors remain unclear. Therefore, the aim of the present study was to confirm the role of surgical resection for pulmonary metastases from such tumors and to identify factors affecting survival according to the site of the primary tumor of the head and neck.

The safety and curativity of resection for malignant tumors of the lung are well established (7,18,19); in the present study, no patients died within 30 days after resection, and complete resection was achieved in 94% of the patients. In addition, the 5-year survival rates of previous reports have been excellent, ranging from 29% to 59% (6,7,19,20). The overall 3-year survival rate in our series (43%) was similar to rates in previous studies. Surgical treatment for pulmonary metastases from head and neck carcinomas in selected patient is a safe and therapeutically beneficial procedure. There is little doubt that such favorable outcomes depend on good locoregional control of primary tumors and careful selection of candidates. Several factors affecting survival have been reported. Factors reported to be associated with poor survival include the histological diagnosis of SCC, site of oral cavity, disease-free interval of $\leq$2 years, incomplete resection, older patients, male sex, mediastinal lymph node involvement and multiple metastases (6,7,18–22). In our study, the significant factors affecting survival identified with univariate analysis were a disease-free interval of $\leq$2 years, tongue carcinoma and SCC. On multivariate analysis, tongue carcinoma was the most significant factor affecting survival. In general, the disease-free interval and the histological diagnosis of SCC are considered the most reliable prognostic factors. In our study and that of Liu et al. (18), a disease-free interval of $\leq$2 years was associated with a poor prognosis, and Finley et al. (7), Chen et al. (21), Nibu et al. (22) and Wedman et al. (6) have found that a disease-free interval of $\leq$1 year is a poor prognostic factor. After all, a short disease-free interval is predictive of a negative outcome. There is little doubt that SCC is associated with poor survival (6,18,21,22). However, few studies have examined prognostic factors according to the site of head and neck primary tumors. Mazer et al. (19) and Nibu et al. (22) have found that a primary tumor of the oral cavity has a significantly poorer than do tumors of other sites. Although the oral cavity includes numerous subsites, such as the buccal mucosa, upper gums, lower gums, hard palate, floor of the mouth and tongue, these studies did not describe these subsites in detail. Our present study found that primary tumors of the tongue had a significantly poorer prognosis than did tumors of other sites. However, we could not elucidate causal relationship between primary tumors of the tongue and poor prognosis. To our knowledge, our study is the first to report factors significantly associated with a poor prognosis according to subsites of the primary tumor. The notion that multiple metastases and mediastinal lymph node involvement affect survival is controversial because contradictory results have been obtained from studies with small numbers of patients (7,19,20,22,23). At our institution, systemic mediastinal and hilar lymph node dissection is performed only when enlarged lymph nodes are observed on radiological examination. There was no statistically significant difference in survival between the number of metastases ($P = 0.54$). We would consider performing resection of bilateral pulmonary lesions, multiple tumors or both if the patients met the criteria for pulmonary resection for metastatic tumors. We could not detect a statistically significant difference in survival between patients with different T factors, N factors or stage of the primary tumor. Nibu et al. (22) and Wedman et al. (6) have also found that the TNM stage of the primary tumor was not correlated with survival after pulmonary resection for metastatic tumors. In the present study, disease recurred after pulmonary resection in 64% of the patients (21 of 33 patients). Distant metastasis, especially to the lung, was the most frequent pattern of recurrence after pulmonary resection.

CONCLUSIONS

We believe that pulmonary resection should be attempted in patients with pulmonary tumors, regardless of whether the tumors are single or multiple, if the patients meet the criteria for pulmonary resection of metastatic tumors. We have confirmed that pulmonary resection after the treatment of head and neck carcinomas is safe and increases the likelihood of long-term survival. We found that the factors of a disease-free interval $<$2 years, a histological diagnosis of SCC and a primary site of the tongue are negatively correlated with survival. However, the lack of long-surviving patients who have undergone surgical resection for pulmonary tumors metastatic from primary tumors of the tongue should be taken into account. The pattern of initial recurrence after pulmonary resection was most often distant metastasis (64%). Therefore, adjuvant systemic chemotherapy after pulmonary resection might help prolong survival.

Conflict of interest statement

None declared.

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Window resection of the trachea and secondary reconstruction for invasion by differentiated thyroid carcinoma

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Abstract

Objective: In cases of differentiated thyroid carcinoma, the presence or absence of invasion into the circumferential organs is an important prognostic factor. Surgical procedures include circular resection of the trachea with end-to-end anastomosis and window resection with secondary closure. We have used window resection with secondary closure since 1993, and herein retrospectively analyze the treatment outcomes for this surgical procedure in order to determine the indications for procedure selection.
Methods: Subjects comprised 41 cases of invasion by differentiated thyroid carcinoma into the trachea, for which surgery was performed at the Department of Head and Neck Surgery of the National Cancer Center Hospital East from 1993 to 2007. The mean age was 65.7 ± 7.9 years, and the median length of the observation period was 43 months. There were 17 cases (41.4%) cases of secondary relapse.
Results: The 5-year and 10-year overall survival rates for this surgical procedure were 78.9% and 74.5%, respectively, while the 5-year and 10-year local control rates were 92.4% and 73.4%, respectively. The pathological resection stump was positive in 27 cases (65.8%), but no significant differences in treatment outcome were observed between the stump-positive group and the stump-negative group. There were 26 cases in which closure of the tracheal fistula was performed by the time of observation. When the tracheal defect had a diameter equivalent to 7 rings of the trachea or less and a circumference half that of the tracheal cartilage or smaller, including partial cricoid cartilage, it was possible to perform closure with only a local flap. For larger defects, reconstruction was performed using hard tissues or materials, such as hydroxyapatite, titanium mesh, and costal cartilage. There were 2 cases that required re-window because of dyspnea after closure.
Conclusion: The treatment outcomes for this surgical procedure for invasive cases of differentiated thyroid carcinoma into the trachea resulted in a low rate of local recurrence and similar survival rates as described in other reports. Even for cases of resection exceeding half the circumference of the trachea, closure of the tracheal fistula can be performed using hard tissues or materials; however, in such cases, we believe that closure should be attempted progressively in a two-stage reconstruction.

Keywords: Differentiated thyroid carcinoma; Tracheal invasion; Secondary reconstruction

1. Introduction

The prognostic factors for differentiated thyroid carcinoma include age, histopathological type, size of primary lesion, presence or absence of invasion into organs around the thyroid, and presence or absence of distant metastasis [1]. Treatment outcomes for differentiated thyroid carcinoma are generally good, but when invasion into the circumferential organs (trachea, larynx and cervical esophagus) occurs, it is necessary to resect those organs, thereby making treatment more difficult in many cases. The trachea and larynx are particularly susceptible to invasion,

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and this often causes problems for treatment. For cases of invasion into the trachea, circular resection, end-to-end anastomosis or window resection are mainly performed. We use a surgical procedure comprising resection of part of the trachea at the site of tumor invasion, temporary formation of a tracheal fistula, and secondary closure of the fistula. The advantage of this surgical procedure is that postoperative rest and fixation of the neck region are not necessary, and the airway can be secured with certainty. However, the resection margins are often close together or adjacent. Here, we examined the long-term treatment outcome of this surgical procedure and studied its validity and usefulness.

2. Patients and methods

Subjects comprised 41 cases diagnosed with invasion into the trachea before surgery and in which window resection of the trachea was performed, and these cases were selected from 338 cases of differentiated thyroid cancer for which surgery was performed at the Department of Head and Neck Surgery at the National Cancer Center Hospital East from 1993 to 2007, and we examined these cases retrospectively. On preoperative evaluation, subject cases included those in which invasion into the trachea was suspected based on CT and echo images and in which endoscopy detected redness or irregularity in the membrane of the tracheal lumen. The cases included 18 males and 23 females with a mean age of 65.7 ± 7.9 years, and the median observation period was 43 months (4–167 months). There were 24 cases undergoing initial treatment, including Stage IVA (22 cases) and Stage IV C (2 cases) cases, and there were 17 cases of secondary relapse, which comprised 41.4% of the total. And there were 22 cases with recurrent nerve paralysis before surgery.

3. Statistical analysis

Treatment outcomes were evaluated using the Kaplan–Meier method, and significant differences between the two groups were examined with the log-rank test.

4. Results

For all of the cases showing invasion into the trachea, window resection of the trachea (including cases of partial resection of the thyroid and cricoid cartilage) was performed, and there were no cases in which circular resection or end-to-end anastomosis were performed. In addition, there were 2 cases that required a free jejunal graft due to invasion into the esophagus. Although all cases were histopathologically diagnosed as papillary carcinoma, 4 of the cases presented with papillary carcinoma involving poorly differentiated components, and 1 case was papillary carcinoma involving anaplastic components. Histopathological evaluation of the resection stumps revealed that 27 of the 41 cases were stump positive (65.8%). In addition, no pathological findings of invasion into the trachea were observed in 2 cases. There were no cases in which radiation therapy was performed as an additional postoperative treatment.

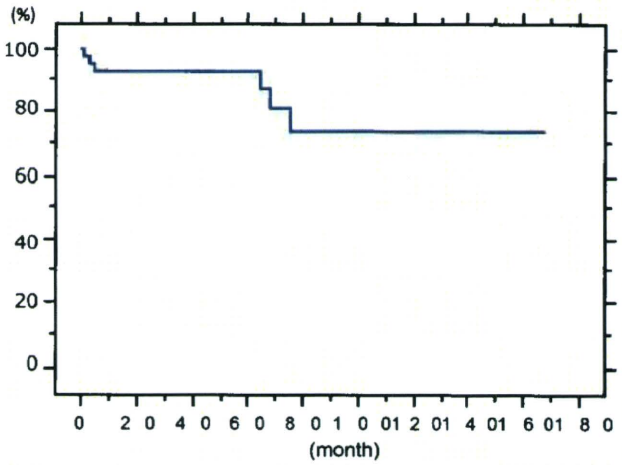

Fig. 1. Postoperative local control.

The 5-year and 10-year local control rates were 92.4% and 73.4%, respectively (Fig. 1), and the 5-year and 10-year overall survival rates were 78.9% and 74.5%, respectively (Fig. 2). For the pathological resection stumps, no significant differences were observed in the 5-year survival rates between the stump-positive and stump-negative groups (Fig. 3). Examination of the histopathological type in the 36 cases of papillary carcinoma and the 5 cases of papillary carcinoma involving poorly differentiated components and anaplastic components revealed that survival rates was significantly lower in the latter group ($p < 0.0001$). We included a case with poorly differentiated components on pathological findings, and death at 4 months after surgery was due to original disease by rapid regrowth in the neck and mediastinal lymph nodes. In addition, with regard to sex, age (older or younger than 65 years), the presence or absence of preoperative recurrent nerve paralysis, history of initial treatment or recurrence, and the presence or absence of

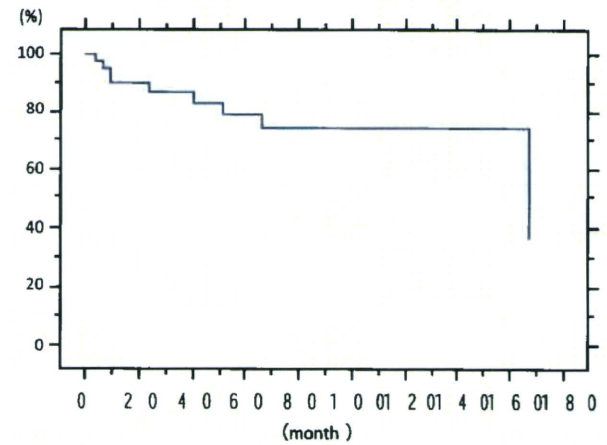

Fig. 2. Postoperative overall survival.

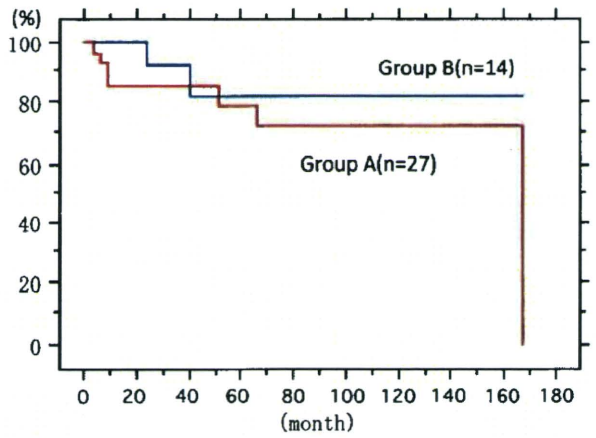

Fig. 3. Postoperative overall survival of group A (positive surgical stump) and group B (negative). No statistically significant differences were noted between the two groups ($p = 0.3359$).

lymph node relapse, no significant differences were observed in the treatment outcomes.

Prognoses were disease-free survival in 13 cases (31.7%), survival with cancer in 18 cases (43.9%), death due to the original disease in 9 cases (21.9%), and death due to other cancer in 1 case.

In the present study of local control, we observed 7 cases (17.1%) that appeared to recurrence from the resection stump. Among these 7 cases, 1 case was salvaged through total laryngectomy, while 4 cases resulted in death due to the original disease caused by rapid enlargement of the tumor, in which anaplastic conversion was suspected. There was only one case that required surgical management because of postoperative infection around the tracheal fistula. And there were 17 cases developed recurrent nerve paralysis after surgery.

Regarding the closure of the tracheal window area, complete closure was possible in 26 cases (63.4%) at the time of final observation. In 15 cases, we were unable to close the tracheal fistula, and there were 13 cases in which we did not attempt closure because of bilateral recurrent nerve paralysis or locoregional recurrence, and 2 cases that required re-windowing after closure.

The surgical procedure for closure involved the use of a local flap, such as a hinge flap, in 24 cases, and the range of the tracheal defects in these cases was, at maximum, equivalent to 7 rings of the trachea with a circumference of one-third to half. In cases for which complete closure was attempted using hard materials for defects with a wider range, complete closure was possible in 2 cases, while re-windowing was performed in 2 cases due to dyspnea after surgery. In the other cases, 2 cases ended in partial closure due to bilateral recurrent nerve paralysis. To determine the criteria for selection of the tracheal reconstruction operative method, the ranges for tracheal defect and reconstruction procedure, as well as the success and failure rates, are presented in Table 1. However, we excluded 13 patients who

Table 1
Range of resected areas for closure of tracheal fistula ($n = 28$).

Tracheal rings	1–4	5–7	8–
Circumference			
1/3–1/2	18	6	1[a]
1/2–	2 (1[a])	1	

[a] Re-window for dyspnea after closure.

were not able to undergo closure of tracheal fistula as described earlier. In these cases, we attempted closure using a rotation flap or Deltopectoralis flap with hard tissues and materials such as thyroid cartilage, costal cartilage, titanium mesh and hydroxyapatite for defects more than half circumference or up to 10 rings of trachea. The 2 cases in which we used hydroxyapatite for such defects were closed progressively and perfect closure was possible.

5. Discussion

Organs that are susceptible to invasion in advanced cases of differentiated thyroid carcinoma include the trachea, the larynx and the esophagus. McCaffrey et al. noted that invasion into the trachea was observed in 37% of cases of local advanced papillary thyroid carcinoma, while invasion into the esophagus was observed in 21% of cases [2]. Typically, esophageal invasion remains limited to the muscle layer, and it is extremely rare for resection of all layers to be necessary. In fact, in the present study, all layers of the esophagus were resected and a free jejunal graft was required in only 2 cases.

For cases of invasion into the trachea, many reports have stated that if the invasion remains limited to the surface layer of the tracheal wall, it can be treated through a procedure known as shaving [3–5]. If the tumor can be completely resected through a macroscopic procedure, even if the tumor cells remain at the microscopic level, there is thought to be no effect on treatment outcome. However, when there is invasion reaching the lumen of the trachea, resection of all layers of the trachea is required. As the mode of invasion into the trachea, the Stage classifications proposed by Shin et al. have been widely used, and the cases in this study were mainly classified as Stage III or IV [6]. When a wide resection of the trachea is required in these cases, circular resection of the trachea and end-to-end anastomosis are often performed. The maximum range of tracheal resection that allows for simple end-to-end anastomosis is generally determined to be equivalent to 7 rings of the trachea or a major axis of 5–6 cm [3].

In addition, Shiba et al. reported that end-to-end anastomosis was possible for defects up to 7 cm. Furthermore, they needed to release the surrounding tissue for defects of 5 cm or more, and fixation of the neck region about 2 weeks after surgery [7]. Therefore, indications for surgery are limited in elderly patients if the range of tracheal resection becomes extensive. In circular resection, it is also

necessary to be aware of possible bilateral recurrent nerve paralysis, as in such cases, a postoperative tracheal fistula may be required. In particular, in some cases of recurrence, unilateral recurrent nerve paralysis has already been expressed, and it is necessary to be careful of bilateral recurrent nerve paralysis. Tracheostomy after end-to-end anastomosis should be avoided in most cases because of wound infection [8], while Shiba et al. suggested that it should be avoided in order to make a tracheal fistula around the anastomotic region.

We have avoided performing circular resection whenever possible for cases of invasion of differentiated thyroid carcinoma into the trachea that are Stage III or IV cases, in accordance with Shin et al., and we have instead employed a surgical procedure involving closure in two stages after window resection. In many cases of invasion of thyroid carcinoma into the trachea, lesions are unevenly distributed on either the left or right side, and it is believed that there are few cases that require circumferential resection. In addition, the greatest advantage of this surgical procedure is that the level of surgical invasiveness is lower than in cases of circular resection and the airway can be secured with certainty. The mean age of the cases in this study was relatively high, and there were many cases in which prognoses were not favorable. We believe that it is desirable to select a surgical procedure with as low a level of invasiveness as possible. In cases of window resection of the trachea, fixation of the neck region after surgery is not necessary. Regarding postoperative swallowing function, in a previously reported study of 30 cases, oral ingestion became possible after a mean period of 6 hospital days (1–55 hospital days) [9].

On the contrary, this procedure requires secondary closure of the tracheal fistula, and when the resection range is wide, hard tissues or materials are required to secure the lumen of the trachea during closure. According to a previous report, if the resection range of the trachea is small (i.e., in cases of resection with a range equivalent to 4 rings or less, and a circumference of half or less), closure can be performed using a local flap without any problems [9]. In addition, Suginoya et al. reported a case in which window resection of the trachea was performed because of invasion of thyroid carcinoma into the trachea [10]. In that case, auricular cartilage was used for secondary closure, but we have found no reports on limiting the surgical procedure and treatment outcomes for window resection over a wide range, or for closure of the fistula using hard tissues or materials.

In the present study, it was possible to perform closure using a local flap with a diameter equivalent to 7 rings of the trachea when the circumference of the defects ranged from one-third to half of that of the cartilage wall of the trachea, even in cases that included partial resection of the cricoid cartilage. Therefore, it is thought that partial resection of the cricoid cartilage unrelated to the success of closure. However, for defects with a circumference of over half, or with tracheal defects equivalent in diameter to up to 10

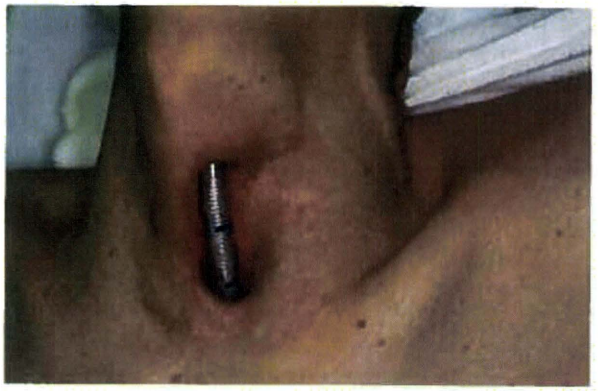

Fig. 4. Tracheal defects (3 rings including partial cricoid resection, and more than half of tracheal circumference).

rings of the trachea, thyroidal cartilage, costal cartilage, titanium mesh or hydroxyapatite are used, and a rotation flap or Deltopectoralis flap is used to perform closure. In 2 cases in which hydroxyapatite was used for defects with a circumference of over half, complete closure was possible using a 2-stage gradual procedure. In addition, in both of the cases in which dyspnea occurred after closure and re-windowing was performed, closure was attempted in a single procedure after the initial surgery (Figs. 4–6). Based on these findings, in cases of defects with a wide range requiring the use of hard tissues or materials, we suggest partial closure after waiting for scar formation around the fistula, after which gradual closure is safer. Moreover, in cases of wide invasion in the direction of the major axis (10 rings of the trachea was the longest in the present study), end-to-end anastomosis should be selected based on tumor invasion, but this surgical procedure can be applied due to its low invasiveness. About hard materials, we found that hydroxyapatite is useful, but we cannot use it for surgery because this material is unauthorized by Pharmaceutical Affairs Act in Japan at present. So we prefer to use costal cartilage because of moderate rigidity or titanium mesh for wide defect.

Fig. 5. Secondary closure using titanium mesh.

Fig. 6. Closure with rotation flap. However, re-windowing was required because of dyspnea.

With regard to treatment outcomes, there have been many reports that the 5-year survival rate in cases of thyroid carcinoma with invasion into the aerodigestive system is approximately 60–80%. Nishida et al. reported that the 5-year survival and local recurrence rates of circular resection in cases of invasion into the deep layers of the trachea were 67% and 7.5%, respectively [11]. McCaffrey et al. reported that the 5-year and 10-year survival rates were 79% and 63%, respectively [2], and Andersen et al. reported that the 5-year and 10-year survival rates were 60% and 50%, respectively [12]. The present study found similar outcomes as these other reports using circular resection, and in cases of differentiated thyroid carcinoma in which the treatment outcome is believed to be relatively favorable, the long-term prognosis for surgery in cases of invasion into the circumferential organs, particularly the trachea, is not always favorable. We need longer follow-up periods in future studies because of the slowly growing tumor. However, in the present study, local recurrence was often rapid, usually due to anaplastic transformation with regional metastasis or distant metastasis during the postoperative follow-up period. With regard to the reasons for complete closure of the fistula in approximately 60% of cases, this was largely due to bilateral recurrent nerve paralysis and the disease course.

In this histopathological comparative study of resection stumps, no significant differences were observed between the survival rates for cases in which the resection stump was positive and cases in which the resection stump was negative. In addition, the local stump recurrence rate was relatively low, and it is therefore believed that even in cases of invasion of differentiated thyroid carcinoma into all layers of the trachea, if complete resection can be performed through a macroscopic procedure, the necessity of complete pathological resection is reduced.

Considering the prognosis of tracheal invasion cases, we believe that the present surgical procedure is valid and appropriate due to its low invasiveness. For extensive tracheal defects, it is hoped that tracheal regenerative therapy will be possible in the future [13].

6. Conclusions

There were no significant differences between the treatment outcomes for cases of complete pathological resection and cases of incomplete resection, and local control was highly favorable, indicating that the implementation of window resection of the trachea and secondary closure is an appropriate surgical procedure for cases of invasion of differentiated thyroid carcinoma into the trachea. In addition, due to its low invasiveness, this procedure can be used safely in elderly patients. This surgical procedure is particularly useful for cases in which the range of invasion is limited to half the circumference of the tracheal wall or less, and for cases with wider defects, it is also possible to safely perform closure of the tracheal fistula by conducting reconstructive procedures in two stages using hard tissues or materials.

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ORIGINAL ARTICLE

Free Jejunal Patch Graft for Reconstruction After Partial Hypopharyngectomy With Laryngeal Preservation

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Objectives: To examine postoperative complications and swallowing function associated with free jejunal patch graft transfer after partial hypopharyngectomy with laryngeal preservation.

Design: Retrospective medical record review.

Setting: Academic research.

Patients: A consecutive series of 43 patients who underwent free jejunal patch graft transfer after partial hypopharyngectomy with laryngeal preservation composed the study sample. They represented the following 3 groups based on the type of hypopharyngeal defect: 13 patients with defects of the posterior wall (PW group), 28 patients with defects extending to the unilateral piriform sinus (PS-PW group), and 2 patients with defects extending to the bilateral piriform sinuses (PS-PS group).

Main Outcome Measures: Postoperative complications and oral intake ability were compared among the groups.

Results: Except for 1 patient, all the patients in the PW and PS-PS groups resumed oral intake within 2 weeks after surgery. Four patients in the PS-PW group had severe dysphagia, 2 of whom could not discontinue tube feeding.

Conclusions: Free jejunal patch graft transfer after partial hypopharyngectomy allows satisfactory swallowing function, with a low complication rate. Postoperative dysphagia was slightly more common in the PS-PW group than in the PW group.

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ALTHOUGH TOTAL PHARYNgolaryngectomy has long been the standard treatment for locally advanced hypopharyngeal cancer, partial hypopharyngectomy with laryngeal preservation has recently become possible, and its indications have steadily been expanding for selected patients.[1-6] Reconstruction after partial hypopharyngectomy with laryngeal preservation is a challenging problem because of the risk of postoperative aspiration. Free jejunal patch graft (FJPG) transfer is widely accepted as the method of first choice for reconstruction[6-8]; however, few investigations have examined postoperative complications and swallowing function. Furthermore, the relationship between postoperative functional results and defect type remains unclear. In the present retrospective study, we examined clinical results (including postoperative complications and swallowing function by defect type) of FJPG transfer after partial hypopharyngectomy with laryngeal preservation.

METHODS

Forty-three patients with hypopharyngeal cancer underwent FJPG transfer immediately after partial hypopharyngectomy with laryngeal preservation at the National Cancer Center Hospital East, Kashiwa, Japan, from December 9, 1992, through June 20, 2008, and were included in the study. The patients were 37 men and 6 women who had a mean (SD) age of 62.3 (8.2) years. Thirty-nine patients had primary cancer and 4 had recurrent cancer after initial treatment. Among those with primary cancer, 7 patients were classified as having stage I; 24, as having stage II; 6, as having stage III; and 2, as having stage IV according to the *TNM Classification of Malignant Tumours*[9] (**Table 1**).

SURGICAL TECHNIQUES

A segment of jejunum approximately 15-cm long was harvested in the usual manner. After a small segment of jejunum to be exteriorized for postoperative monitoring had been prefabricated, the remaining segment of jejunum was trimmed on the oral and anal sides by referring to the longitudinal length of the resected