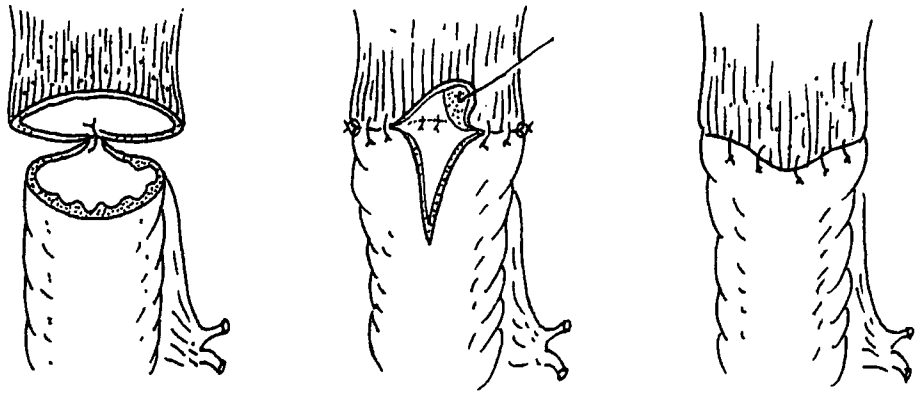


(a) 咽頭空腸縫合は後壁中央から始める。　(b) 前壁中央で空腸に縦切開を入れ口径差を調整する。　(c) 直線的な食道の再建

図 4　水平型欠損の再建

で舌骨を吊り上げる。舌骨上縁と下顎下縁との距離は 2 cm 程度とする[9]。気管切開術に関しては，舌半切では必要ないが舌全摘に近いほど必要になることが多い。

2. 咽頭喉頭頸部食道切除後の再建

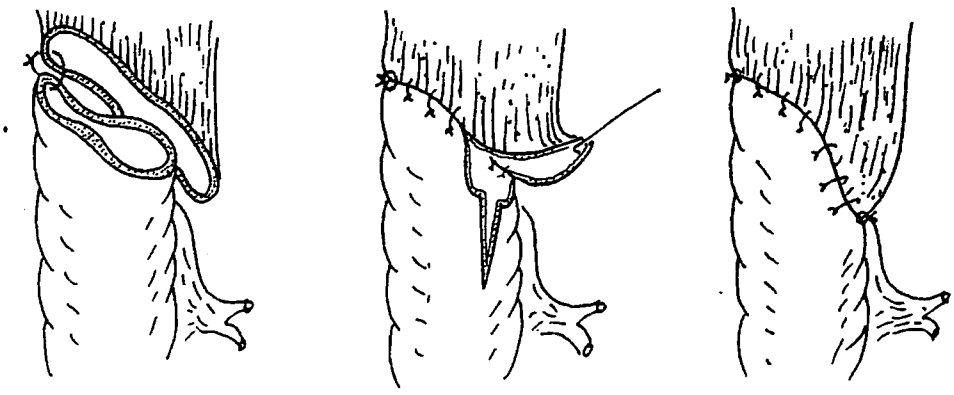
下咽頭，喉頭，頸部食道全摘術後の再建方法は，DP 皮弁を用いる方法や，筒状皮弁を用いる方法，有茎結腸や胃管挙上による再建方法などさまざまな方法が行われている。しかし現在ではその安全性，確実性からマイクロサージャリーによる遊離空腸移植が第 1 選択と考えられており，その再建方法について記述する。

空腸の採取であるが，手術時間の短縮のために腫瘍の切除完了と同時に移植腸管の採取が完了するように準備する。通常は J2～J4 の空腸動静脈いずれかを含む部分を採取する。腸間膜内の血管の走行を透過光で観察し採取部位を決定する。

咽頭側の切除後形態は 2 つに分類される。一般的な切除範囲である水平型欠損と，中咽頭側壁や後壁などに咽頭側欠損が切り上がった切上型欠損で，それぞれ再建方法も異なってくる[10]。その際重要なことは，空腸に縦切開を加えることで，空腸と咽頭側欠損との口径差を調整すること，そして術後の嚥下障害を防ぐために弛みのない直線的な空腸を移植することである。さらに，空腸の豊富な血管構造から腸間膜付着部の対側のみならず，全周のどこでも縦切開が可能であることを念頭においておく。

まず，最も一般的な水平型の再建方法に関して記述する（図 4）。頸部の血管吻合予定側に空腸の腸間膜を設置する。次に，咽頭空腸吻合を内翻一層縫合で咽頭後壁の正中部より始め左右に縫合を進めていく。続いて前壁側は Gambee 縫合で行い，前壁側の途中までを縫合し終えたところで，咽頭粘膜断端と腸管断端の口径差にあわせて腸管壁を縦切開する。空腸粘膜は伸展性がよいため，縦切開は少し短めにした方がよい。そして前壁の残りを縫合する。この際，縫合の最後の数針は結紮せずに糸をかけておき，最後に縫合糸を結紮して咽頭側断端との縫合を終了する。咽頭空腸縫合部の側面は瘻孔の好発部位である。そのため，残存軟部組織を側面の咽頭空腸縫合部に被せるように縫合する。その際，舌下神経に気をつける。

切上型の再建は，咽頭欠損が最も切り上がった位置から空腸断端と縫合を開始する（図 5）。その最初の縫合の位置を中心に左右に縫



(a) 咽頭空腸縫合は切り上がり部位から始める。　(b) 切り上がり部位から180°反対の位置に縦切開を入れ口径差を調整する。　(c) 直線的な食道の再建

図5　切上型欠損の再建

合を進めて行き，最後に生じた咽頭断端との口径差を合わせるのに必要な長さだけ空腸に縦切開を加える。結果的に，縦切開の部位は切り上がり部位とは反対側となる。縦切開部位が腸間膜付着部に相当した場合には，付着部より 5 mm ほど前方に縦切開（腸間膜付着側切開）を加える。この際，切開した断面に肉眼的に確認できる血管があれば電気メスで凝固する。

水平型欠損でも切上型欠損でも，咽頭空腸吻合が終了した後に移植空腸を尾側に強く牽引し食道断端と吻合する。先に食道空腸縫合をしてもよいが，咽頭側で空腸の長さを調節するより，食道側で空腸の長さを調節する方が簡単である。最後に顕微鏡下に血管吻合を行う。もちろん，血管吻合を終えた後に，空腸と咽頭食道断端とを吻合しても構わない。

この再建手技の大きな特徴は，頸部の左右どちらの血管を選択しても，またどのような咽頭側の欠損形態でも，比較的直線に近い咽頭頸部食道が再建できることである。

IV. 合併症と対策

高齢者が多く，手術時間も長いので，入念な術後の全身管理が必要である。術後は中心静脈栄養または経鼻経管栄養とする。移植組織の血行の監視は，肉眼でその色調を観察するか針で刺し出血の有無と色を観察する。空腸の場合は，腸管の一部を頸部の創外に露出しておき，移植腸管の血流モニタリングを行う。モニタリング用の腸管は術後 1 週程度で，腸間膜根部を結紮切離する。

以前は数日間の頸部の安静を基本としていた。しかし現在は，術後せん妄の予防のため安静は手術当日のみとし，翌日からは安静を解除し積極的に離床を勧めている。

頭頸部再建における術後管理で最も重要なことは，創部の治癒を遷延させる瘻孔や皮下膿瘍の早期発見である。これらの合併症のほとんどは，術後 4～5 日に発症することが多く，この時期に熱が 38 ℃以上，血糖が 300 以上，創部の腫脹，発赤，疼痛があるようなら疑うべきである。この場合には，積極的に創部を開け，膿瘍などの有無を確かめた方がよい。

V. 予後とインフォームドコンセント

頭頸部癌切除後に再建を要する患者の 5 年生存率は，非常に厳しいのが現状で，複雑な再建手技を選択して合併症を引き起こすこと

は，患者の余生を短くしていることになる。頭頸部再建の重要点を述べると，①術後の合併症を抑えた再建，②機能・形態を維持した再建，③総合的に安全・確実かつ低侵襲な再建，④皮弁採取部の犠牲を考慮した再建などが挙げられるが，その順番を間違えてはいけない。

一方，インフォームドコンセントとして形成再建外科医が患者に述べることは，手術手技はもちろんのことそれ以外に 4 つある。術後の合併症，術後の機能，術後のリハビリテーション，そして二次再建の可能性である。切除側はもちろんのこと，再建側も積極的に患者に対して詳細な説明をすることは非常に大事である。

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Surgical Management of Carcinoma of the Cervical Esophagus

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Objectives: The aim of the present study was to clarify the clinicopathological characteristics, reconstruction methods after resection, and prognosis of cervical esophageal squamous cell carcinoma.

Methods: Seventy-four with squamous cell carcinomas of the cervical esophagus not previously treated who underwent cervical esophagectomy or total esophagectomy with or without laryngectomy were retrospectively analyzed.

Results: The operative morbidity and in-hospital mortality rates were 34% (25 patients) and 4% (3 patients), respectively. Alimentary continuity was achieved with free jejunal transfer (50 patients), gastric pull-up (19 patients), and other procedures (5 patients). The frequencies of postoperative complications and death did not differ between free jejunal transfer and gastric pull-up. The overall 3- and 5-year survival rates were 42% and 33%, respectively. The significant clinicopathological factors affecting survival were patient gender, high T factor, lymph node involvement, palpable cervical lymph nodes, vocal cord paralysis, lymphatic invasion, and extracapsular invasion. The pattern of first failure was most often locoregional (82%, 36 patients).

Conclusion: The choice of free jejunal transfer or gastric pull-up for reconstruction after surgical resection of cervical esophageal carcinoma depends on the degree of tumor extension. Adverse factors affecting survival should be considered when candidates for the surgery are selected.

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KEY WORDS: **cervical esophageal squamous cell carcinoma; free jejunal transfer; gastric pull-up**

INTRODUCTION

Because the cervical esophagus is located between the lower border of the cricoid cartilage and the thoracic esophagus inlet, carcinomas arising there easily and frequently extend upward to the hypopharynx and downward to the thoracic esophagus. Carcinoma of the cervical esophagus is rare, accounting for only 2% to 10% of carcinomas of the esophagus [1]. For these reasons, carcinoma of the cervical esophagus has been classified, treated, and reported with carcinoma of the hypopharynx. However, the characteristics and prognosis of carcinoma of the cervical esophagus differ from those of carcinoma of the hypopharynx and thoracic esophagus. Moreover, the lengths of the esophagus resected because of carcinoma of the cervical esophagus vary from cervical to total esophagectomy. Furthermore, various methods of reconstruction have been reported. In particular, free jejunal transfer and gastric pull-up have become well accepted. However, surgical procedures and reconstruction methods after surgical resection of the

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tumor are controversial. Therefore, management of cervical esophageal carcinoma is reviewed in this paper. We have reviewed the results of surgical resection of cervical esophageal carcinoma to identify the clinicopathological characteristics, methods of reconstruction after resection, and prognostic factors affecting survival rates.

MATERIALS AND METHODS

Patient Population

From January 1982 through December 2002, 81 patients with cervical esophageal carcinoma underwent surgical resection at the National Cancer Center East Hospital and Central Hospital. Seventy-four patients (53 men and 21 women) had squamous cell carcinoma and had received no treatment before surgery. The records of these 74 patients were analyzed. The mean age of these patients was 60.7 years (range, 35–86 years). Preoperative evaluation in all patients included barium-swallow examination, endoscopy with biopsy, and computed tomography and ultrasonography of the neck. All 74 patients were considered candidates for radical surgery with routine functional assessment of the vital organs. Preoperative and postoperative staging was based on the 1997 International Union Against Cancer TNM classification. Metastasis to the mediastinal lymph nodes was classified as M1-Lym disease according to the TNM classification.

Eleven patients received postoperative adjuvant radiotherapy, and postoperative chemotherapy was performed for five patients.

Surgery

The extent of the curative resection was dependent on the location and extent of the tumor. Cervical or total esophagectomy was performed with or without en bloc laryngopharyngectomy. Cervical esophagectomy and total esophagectomy were performed in 55 and 19 patients, respectively. Larynx-preserving surgery was possible in 24 patients, whereas 50 patients underwent laryngopharyngectomy with cervical or total esophagectomy. All 74 patients underwent elective unilateral or bilateral dissection of cervical lymph nodes if the tumor had metastasized to either or both sides of the neck.

The reconstructive procedure was dependent on the length of esophagus resected. In 19 patients who had undergone total esophagectomy, reconstruction was performed using the stomach. In 55 patients who underwent cervical esophagectomy, reconstruction was performed using a free jejunum graft (n = 50), a free colon graft (n = 1), a free forearm flap (n = 3), or primary closure (n = 1).

Follow-Up

After discharge, all 74 patients were regularly followed up with routine physical and laboratory examinations at our hospital. Chest radiography, endoscopy, external ultrasonography of the neck, and computed tomography of the neck, chest, and abdomen were performed annually to detect possible recurrent disease. The median follow-up period for all patients was 21 months (range, 0.3–184 months) and that for the 25 survivors was 78 months (range, 23–184 months).

Statistical Analysis

Survival time was measured from the date of surgery until death or the most recent follow-up investigation. Length of survival was determined with the Kaplan-Meier method, and the log-rank test was used for comparisons. The X^2 test and Fisher's exact probability test were used for comparing proportions. A P-value of less than 0.05 was considered to indicate significance. All analyses were performed with the SPSS statistical software package (version 10.0; SPSS, Inc., Chicago, IL).

RESULTS

Clinical Characteristics and Survival Rates According to Factors

The overall survival rates of 74 patients with cervical esophageal squamous cell carcinoma based on clinical factors are shown in Table I. Fifty-nine tumors (80%) had extended to the hypopharynx or thoracic esophagus, and only 15 tumors (20%) were limited to the cervical esophagus. Tumors in 59 patients (80%) were of grade T3 or higher, and 19 of these tumors had invaded adjacent organs.

The overall 1-, 3-, and 5-year survival rates of all 74 patients were 75%, 42%, and 33%, respectively (Fig. 1). Survival rates differed significantly between patients with clinical stage I/II disease and those with stage III disease ($P = 0.00001$; Fig. 2).

The factors affecting survival rates were gender, N status, disease stage, palpable cervical lymph nodes, and vocal cord paralysis.

Mortality and Morbidity According to Surgical Procedures and Reconstruction Methods

The operative morbidity and in-hospital mortality rates were 34% (25 patients) and 4% (3 patients), respectively. In patients with tumor extension to the thoracic esophagus, total esophagectomy was performed more often than was cervical esophagectomy ($P = 0.0001$). However, the rates of postoperative complications and death and the completeness of resection did not differ

TABLE I. Clinical Characteristics and Overall Survival: Prognostic Factors Identified With Univariable Analysis

Variable	No. of patients	1-Year survival (%)	3-Year survival (%)	5-Year survival (%)	*P*-value
Sex					
Male	53	69.3	30.0	19.1	0.00003
Female	21	90.5	71.4	65.5	
Tumor location					
Ce	15	78.6	63.5	63.5	0.2432
Ce-Ph	37	75.7	40.5	29.3	
Ce-Ut	17	70.6	29.4	14.7	
Ce-Ut-Ph	5	80.0	40.0	40.0	
T status					
T1	6	100	80.0	53.3	0.0559
T2	9	88.9	53.3	53.3	
T3	40	72.5	44.7	35.8	
T4	19	68.4	21.1	14.0	
N status					
N0	42	92.7	68.2	57.7	0.00001
N1	32	53.1	9.4	3.1	
Stage					
I	6	100	80.0	53.3	0.00001
II	30	93.3	66.4	61.9	
III	38	57.9	18.1	9.0	
Palpable CLN					
Absent	52	88.3	58.4	47.7	0.00001
Present	22	45.5	4.6	0	
Vocal cord paralysis					
Absent	53	82.7	53.3	42.5	0.00001
Present	21	57.1	14.3	9.5	

CLN: cervical lymph node.

between patients undergoing total esophagectomy and those undergoing cervical esophagectomy (Table II).

Complications according to reconstruction method are listed in Table III. Significant complications occurred in 25 patients (34%). Anastomotic leakage was observed in four patients, however these leakages were healed conservatively. Graft necrosis occurred in five patients (20%). Of these patients, three underwent free jejunal transfer, two underwent gastric pull-up, and two underwent free colon transfer, and all underwent further jejunal reconstruction. Three patients (4%) died within 30 days of surgery: one patient died of pneumonia and one died of necrosis of the stomach after undergoing gastric pull-up, and one patient died of necrosis of the trachea after

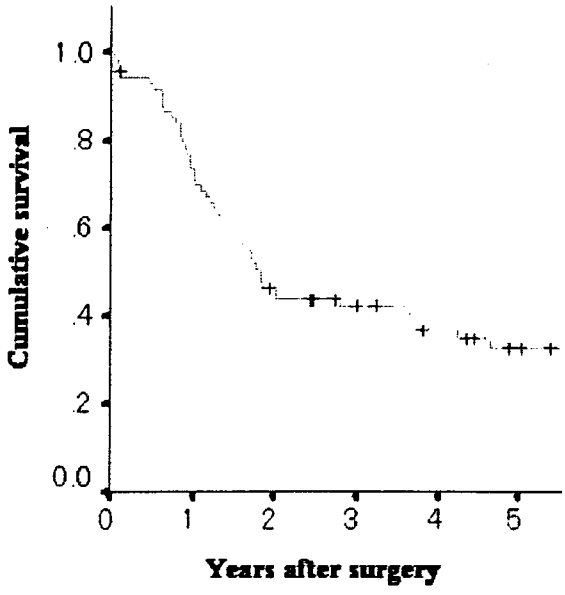

Fig. 1. Overall survival curve.

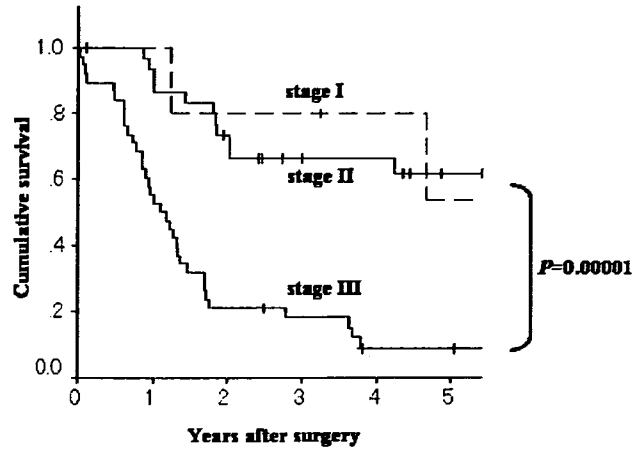

Fig. 2. Survival curves in patients with clinical stage I/II or stage III disease.

TABLE II. Comparison of Cervical Esophagectomy (CE) and Total Esophagectomy (TE)

Variables	Cervical esophagectomy	Total esophagectomy	*P*-value (X^2 test)
Number of patients	55	19	
Tumor extends to thoracic inlet			
Absent	45	7	0.0001
Present	10	12	
Postoperative complications			
Absent	38	11	0.872
Present	17	8	
Postoperative death			
Absent	54	17	0.097
Present	1	2	
Completeness of resection			
R0	48	18	0.366
R1	7	1	

undergoing free colon transfer. Morbidity rates did not differ significantly according to reconstruction method ($P = 0.238$).

Pathological Characteristics and Survival Rates According to Factors

The overall survival rates of 74 patients with cervical esophageal squamous cell carcinoma based on pathological factors are shown in Table IV. More than 70% of tumors were T3 and T4. Five of patients with metastasis to cervical lymph node had metastasis to mediastinal lymph nodes (M1 lymph). Resection was complete in 89 patients (89%) but was microscopically incomplete in 8 patients (11%).

Survival rates differed significantly between patients with pathological stage II and III ($P = 0.00001$), stage III, and IV ($P = 0.0276$) (Fig. 3). The pathological factors affecting survival rates were pT status, pN status, pM1 distant lymph node metastasis, p stage, lymphatic invasion, and extracapsular invasion.

Patterns of First Failure

Tumor recurrence was detected in 44 (59%) patients after surgical resection. The pattern of recurrence after operation is more often locoreginal (82%) than distant metastasis (Table V). Patient with locoreginal recurrence received radiotherapy with or without chemotherapy, and chemotherapy was performed for distant metastasis.

TABLE III. Complications and Death After Free Jejunal Transfer and Gastric Pull-Up

Complication	Free jejunum	Gastric pull-up	*P*-value
Absent	36	11	0.755*
Present	14	8	
Anastomosis leakage	2	2	
Necrosis of graft	3	2	
Wound infection	5	1	
Pneumonia	0	2	
Others	4	1	
Death	0	2	0.073**

*X^2 test.
**Fisher's exact tast.

DISCUSSION

Malignant tumors of the cervical esophagus are uncommon and account for only 2% to 10% of all carcinomas of the esophagus [1]. However, carcinoma of the cervical esophagus extends easily and frequently upward to the hypopharynx or downward to the thoracic esophagus, and almost all tumors are located at the pharyngocervical or cervicothoracic junctions [2]. For these reasons, carcinomas of the cervical esophagus are classified and reported with carcinomas of the hypopharynx or upper thoracic esophagus [3–8,15–18]. In this study, we attempted to identify the clinicopathological characteristics, methods of reconstruction after resection, and the prognosis of carcinoma of the cervical esophagus. We studied 74 patients with squamous cell carcinoma of the cervical esophagus. The present study included more surgically managed cases than have other recent studies [2,9–12,18]. In our series, 59 tumors (80%) extended to the hypopharynx or thoracic esophagus and only 15 tumors (21%) were limited to the cervical esophagus. Half of the patients had clinical stage III disease. More than two-thirds of patients (50 of 74 patients, 68%) had metastasis to lymph nodes. Five of these patients had metastasis to mediastinal lymph nodes (M1-Lym) and 10 patients had extracapsular invasion, both of which decreased the possibility of long-term survival. Our results are consistent with those of previous studies that found that the pattern of recurrence after surgical resection is more often locoregional than distant metastasis [16,17].

Methods of reconstruction for the resulting defects varied. Thus, great efforts have been made to establish

TABLE IV. Pathological Characteristics and Overall Survival: Prognostic Factors Identified by Univariable Analysis

Variable	No. of patients	1-Year survival (%)	3-Year survival (%)	5-Year survival (%)	*P*-value
T status					
T1	5	100	100	66.7	0.0066
T2	17	82.4	40.3	40.3	
T3	30	76.7	53.1	41.7	
T4	22	63.4	18.2	9.1	
N status					
N0	24	95.7	82.6	70.3	0.00001
N1	50	66.0	23.8	16.7	
M status					
M0	69	78.0	45.3	35.4	0.0004
M1	5	40.0	0	0	
Stage					
I	3	100	50.0	50.0	0.00001
II	29	93.1	68.8	58.1	
III	37	64.9	23.7	13.5	
IV	5	40.0	0	0	
Differentiation					
Well	21	70.4	50.3	28.3	0.6195
Moderate	48	81.3	41.1	35.7	
Poorly	5	40.0	20.0	20.0	
Lymphatic invasion					
Negative	37	94.6	67.6	63.6	0.00001
Positive	37	55.6	16.7	5.6	
Vascular invasion					
Negative	36	83.0	54.4	40.5	0.1128
Positive	38	68.4	30.2	25.9	
Extracapsular invasion					
Negative	40	72.5	29.8	20.9	0.002
Positive	10	40.0	0	0	
Completeness of resection					
Complete (R0)	66	75.4	41.1	34.8	0.6491
Incomplete (R1)	8	75.0	50.0	18.8	

more reliable reconstructive procedures following tumor resection. Although free jejunal transfer with microvascular anastomosis is now a standard reconstructive procedure, gastric pull-up has also proven to be a reliable procedure for the treatment of cervical esophageal carcinoma. However, the choice of organ for reconstruction is controversial. Total esophagectomy with gastric pull-up has been advocated to ensure adequate distal esophageal margins and to treat possible multicentric disease and requires only a single anastomosis [5,6,10]. However, the disadvantages of this procedure are its invasiveness and the high rate of cardiopulmonary complications [3,5,9,10,18]. In contrast, patients who undergo cervical esophagectomy with free jejunal transfer are able to swallow sooner and have a shorter hospital stay and lower rate of minor postoperative complications than patients who undergo gastric pull-up [12,13]. However, cervical esophagectomy with free jejunal transfer requires microvascular anastomosis and

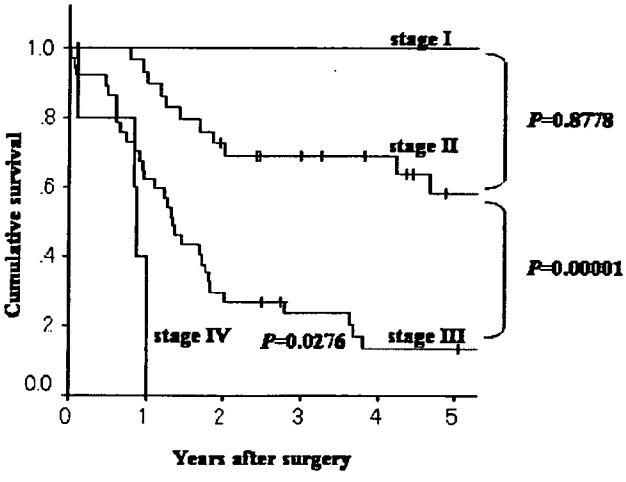

Fig. 3. Survival curves according to pathological stage.

TABLE V. Patterns of First Failure

Failure patterns	No. (%) of patients
Locoregional	36 (82)
Primary	5 (9)
Lymph node	31 (70)
Distant metastasis	6 (14)
Both	2 (5)

has an increased frequency of disease-positive surgical margins. Therefore, the two important points of contention are curative resection for the carcinoma and the safety of the operation. The reported rates of postoperative complications and mortality range from 24% to 58% and 0% to 10.8%, respectively [3,4,9–11,18]. In the present study, the overall complication and mortality rates were 34% and 4%, respectively, and were similar to those of previous studies. The morbidity rate did not differ significantly between gastric pull-up and free jejunal transfer, although no patients died after undergoing free jejunal transfer.

This study has demonstrated that the safety and effectiveness of free jejunal transfer are at least equal to, if not superior to, those of gastric pull-up. With regards to the frequency of disease-positive surgical margins, there was no significant difference in the completeness of resection between cervical esophagectomy and total esophagectomy ($P = 0.37$). The reason for this result is that the presence of disease in both the proximal and distal margins surgical margins can be detected through examination of frozen sections stained with Lugol's solution, which allows the extent of a cancerous lesion to be clearly visualized [14]. Both Schusterman et al. [12] and Vries et al. [13] have concluded that free jejunal transfer and gastric pull-up are equally successful and effective when used appropriately and have similar morbidity rates, as found in this study. For these reasons, there were differing indications for both procedures. The selection of reconstructive procedure depends on the resected length of esophagus to ensure adequate distal esophageal margins, gastric pull-up adapts to total esophagectomy, and whether free jejunal transfer accommodates the cervical esophagectomy with or without pharyngolaryngectomy.

The prognosis of patients with cervical esophageal cancer is worse than that of patients with hypopharyngeal cancer [2,5,18]. Jones et al. [2] have reported that cervical esophageal malignancy has a significantly worse prognosis (3-year survival rate, 18%) than does hypopharyngeal malignancy (3-year survival rate, 33%), and Wang et al. [18] have reported that hypopharyngeal cancer was associated with better surgical results than cervical esophageal cancer. Then Wang et al. [18] have proposed the reason for the prognostic dissimilarity is different anatomical locations. Because cervical esophageal carcinoma and carcinoma of the hypopharynx are considered distinct entities, their prognoses should also be considered to be distinct. The reported 3- and 5-year survival rates for cervical esophageal carcinoma treated with surgical resection have ranged from 18% to 35.4% and 12% to 31.4%, respectively [2,4–6,9,11,18]. The overall 3- and 5-year survival rates in our series (42% and 33%, respectively) were similar to those in previous studies. Prognostic factors reported by previous studies to influence the long-term survival of patients with hypopharyngeal and cervical esophageal carcinoma include positive surgical margins [8,15], lymph node involvement [8,16], postoperative complications [6,17], patient gender [6,17], depth of tumor invasion [2,6,16], intramural metastasis [6], and tumor size more than 5 cm [18]. However, most of these studies combined results from cases of hypopharyngeal and cervical esophageal carcinoma or from cases treated with chemotherapy or radiotherapy without surgery.

In the present study, prognostic factors affecting survival were examined in only patients undergoing surgical resection of cervical esophageal carcinoma. The following were found to be significant prognostic factors: patient gender, high T factor, lymph node involvement, palpation of cervical lymph nodes, vocal cord paralysis, lymphatic invasion, and extracapsular invasion. In particular, the likelihood of long-term survival was extremely low in patients with mediastinal lymph node metastasis (M1-Lym) or extracapsular invasion. Furthermore, palpable cervical lymph nodes and the presence of vocal cord paralysis on preoperative physical examination were identified as prognostic factors. For these reasons, the significant adverse factors affecting survival should be considered when candidate for surgery are selected. Moreover, the characteristics of cases in which long-term survival is possible after surgical resection were clarified. Survival rates differed significantly between clinical stage I/II disease and stage III disease. Patients with clinical stage I or II disease are good candidates for surgical resection; such patients had a 5-year survival rate of 58.6% in the present study.

Our present study, as well as all previous studies, has found that cervical esophageal carcinoma has an extremely poor prognosis. However, Kelley et al. [11] have demonstrated the superiority of surgical resection to chemotherapy with or without radiotherapy for cervical esophageal carcinoma. Recent studies have suggested that esophageal carcinoma and head and neck carcinoma may benefit from combined treatment [18–21]. Wang et al. [18] have reported that adjuvant radiotherapy contributed to a better outcome for squamous cell carcinoma in the pharyngoesophageal junction. Ando et al. [19] have reported that in patients with esophageal carcinoma postoperative chemotherapy with cisplatin and fluorouracil is better able to prevent relapse than is surgery alone. Cooper et al. [20] (Radiation Therapy Oncology Group 9501) and Bernier et al. [21] (European Organization for Research and Treatment of Cancer Trial 22931) have both reported that concurrent postoperative chemotherapy with cisplatin and radiotherapy for locally advanced head and neck cancer significantly improves the rates of local and regional control and disease-free

survival compared with postoperative radiotherapy alone. Bernier et al. have also demonstrated improvement in the overall survival rate. Single-modality treatment after surgical resection cannot guarantee long-term survival; therefore, multimodal therapy, such as postoperative chemotherapy and radiotherapy, is essential for the treatment of cervical esophageal carcinoma. On the basis of the results of the present study and previous studies, we now use adjuvant chemoradiotherapy (cisplatin and radiotherapy) followed by surgery to treat patients with cervical esophageal carcinoma who have one or more significant adverse factors.

CONCLUSION

We advocate reconstruction with free jejunal transfer or gastric pull-up after surgical resection for cervical esophageal carcinoma. Both were equally successful and effective in this series. The choice of reconstruction method depends on the degree of tumor extension. Patient gender, high T factor, lymph node involvement, palpation of cervical lymph nodes, vocal cord paralysis, lymphatic invasion, and extracapsular invasion are factors influencing survival in patients undergoing surgical resection. Significant adverse factors affecting survival should be considered when candidates for surgery are selected.

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Immediate maxillary reconstruction after malignant tumor extirpation☆

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Abstract

Aims: Immediate maxillary reconstruction after malignant tumor extirpation differs from other types of maxillary reconstruction. Our reconstruction algorithm is described in this article.
Methods: One hundred ninety-four patients who had undergone maxillectomy for malignant tumors were reviewed, and maxillectomy defects were classified with the method of Cordeiro and Santamaria.
Results: Mean total blood loss was 848 ml, and 71 patients died within 2 years after surgery. For type IIIa defects of the orbital floor, titanium mesh or vascularized bone or cartilage was used for reconstruction, but the rate of postoperative complications did not differ between titanium and autografts. Therefore, to reconstruct orbital floor defects we have recently used only titanium mesh. For type I or II defects, we use autografts for only selected cases.
Conclusions: We strive to perform less-invasive reconstructive surgery after resection for maxillary malignancy.
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Keywords: Maxilla; Head and neck neoplasm; Reconstructive surgical procedure

Introduction

The aim of the maxillary reconstruction varies with the extent of maxillectomy. Many types of tissue flaps have been used for maxillary reconstruction: fibular osteocutaneous flap,[1] radial forearm osteocutaneous flap,[2] rectus abdominis flap with costal cartilage,[3] rectus abdominis flap with non-vascularized bone,[4] and vascularized iliac crest with internal oblique muscular flap.[5] In addition, several classifications of maxillectomy defects and algorithms for reconstructive procedures have been published, including those of Wells and Luce in 1995,[6] Spiro et al. in 1997,[7] Davison et al. in 1998,[8] Brown et al. in 2000,[9] Cordeiro and Santamaria in 2000,[10] and Yamamoto et al. in 2004.[11] These classifications suggest that most maxillary defects should be reconstructed with free osteocutaneous flaps. Indications for maxillary reconstructions are varied and include immediate reconstruction after cancer extirpation or removal of benign tumors, secondary reconstruction, and trauma. Immediate reconstruction after malignant tumor extirpation differs from other types of reconstruction because the primary goal is curing the malignancy rather than reconstruction.

In this study, we evaluated all maxillectomies for malignancy that were performed at our institution to formulate indications and methods for immediate maxillary reconstruction.

Patients and methods

We reviewed all maxillectomies for complete resection of tumors performed from 1992 through 2003 at the National Cancer Hospital East, Chiba, Japan. Clinical data and medical histories were obtained from the patients' charts. For each maxillectomy, we recorded the presurgical condition (comorbid conditions, alcohol or tobacco use, previous surgery or chemotherapy/radiotherapy, and clinical stage), surgical details (resected sites, reconstructive

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procedure, blood loss, and surgical time), and postoperative course (complications, adjuvant therapy, tumor recurrences, and state of peroral intake and speech).

The treatment protocol for maxillary malignancy at our institution is the following: against T1 or T2, we administer multimodality therapy, which is consisted of limited maxillectomy, radiotherapy, and intra-arterial chemotherapy: against T3, multimodality therapy or total maxillectomy and postoperative (chemo-) radiotherapy is performed: against T4 is total maxillectomy and postoperative systemic chemo and radiotherapy. About the limited maxillectomy as a part of multimodality therapy, the aim of this surgery is tumor reduction not but complete resection. Therefore, we never plan immediate reconstructions, so these patients were excluded from this study.

To evaluate the type of defect resulting from maxillectomy, the classification of Cordeiro and Santamaria[10] was used. In this classification, defects are classified into five types: type I (limited maxillectomy): defects from resection of the anterior and medial walls of the maxilla; type II (subtotal maxillectomy): defects from resection of the lower five walls of the maxilla, including the palate, but sparing the orbital floor; type IIIa (total maxillectomy [TM]): defects from resection of all six walls of the maxilla, but preserving the orbital contents; type IIIb (total maxillectomy): defects from resection of all six walls of the maxilla, including the orbital contents; and type IV (orbitomaxillectomy) defects from resection of the upper five walls of the maxilla, including the orbital contents.

Results

The subjects of this study were 194 patients (117 men and 77 women) with a mean age of 62.5 ± 14.2 (SD) years. The primary sites, T stages are shown in Table 1. The pathological diagnoses were the following: 137 squamous cell carcinomas, 11 adenoid cystic carcinomas, 10 sarcomas, 6 malignant melanomas, 6 mucoepidermoid carcinomas, 4 adenocarcinomas, and 20 other cancers. Reconstruction with autografts was performed in 61 of 194 cases. The maxillectomy defect classifications of all cases are shown in Table 2.

Mean total blood loss during surgery and the number of patients who were died within 2 years after surgery are shown in Table 2. Some patients could not be followed up for 2 years after surgery; therefore, the actual 2-year survival rate might be lower.

Type I maxillary defect

All patients with type I defects were not fitted with a prosthetic obturator and did not undergo reconstruction.

Type II maxillary defect

Most of the 110 patients with type II defects were only fitted with a prosthetic obturator and did not undergo reconstruction. However, 15 patients underwent free flap reconstruction for various reasons, including wide defects of the skin or mucosa and patient request due to, for example, the fear the obturator would become displaced at the workplace. Only one patient with a type II defect underwent reconstruction with a free osteocutaneous flap, because the alveolus had been resected beyond the midline and the support of the nasal columellar and alar bases was required. This patient underwent reconstruction with a rectus abdominis musculocutaneous flap with a vascularized rib flap.

Free flaps that were used to reconstruction type II defects included 7 rectus abdominis musculocutaneous flaps, 6 anterolateral thigh flaps, 1 deep inferior epigastric perforator flap, and 1 radial forearm flap. Most of these flaps were divided into two skin paddles for closure of the palate and the lateral nasal wall. If a skin defect was present, the free flap was divided into three skin paddles. Some patients who had undergone reconstruction with free flaps required a prosthetic obturator, and if the maxillectomy defect included all the upper teeth, the palate was reconstructed with a slit-shaped fenestration utilizing a free flap with a single skin paddle through the palate and the nasal lateral wall.[12]

Type IIIa maxillary defect

The reconstructive procedures for type IIIa defects were the most complex in this series (Table 3). Various reconstructive materials were used for these defects, because

Table 1
Patient details

Mean age in years (range)	62.5 (21–89)
Male: Female	117: 77
Primary site and clinical stage	
Maxillary sinus	78 (40.2%)
T2	1
T3	11
T4	24
Recurrence	42
Upper alveolus	78 (40.2%)
T1	7
T2	18
T3	9
T4	18
Recurrence	26
Palate	25 (12.9%)
T2	9
T3	3
T4	5
Recurrence	8
Nasal cavity	12 (6.2%)
T2	2
T3	3
T4	2
Recurrence	5
Ethmoid sinus	1 (0.5%)
Recurrence	1

Table 2
Cordeiro and Santamaria's classification among the patients who underwent curative surgery

Defect type	Total	Surgical reconstructions*				Prosthesis*	Mean total blood loss (ml)	Patient's number who was died within 2 years after surgery
		Free flap (soft tissue only)	Free osteocutaneous flap	Local flap	Skin graft			
I	20	0	0	0	0	0	523	6
II	110	15	1	4	3	92	788	38
IIIa	28	13	6	0	3	16	1408	12
IIIb	18	11	0	0	0	8	1058	8
IV	2	2	0	0	0	0	2199	2
Unclassified	16	1	0	2	0	5	200	5
Total	194	42	7	6	6	121	848	71

*Some patients both underwent surgical reconstruction and received a prosthesis.

reconstruction can involve the palate, the orbital floor, the alveolar bone, and bulky soft tissue. In particular, reconstruction of the orbital floor is important for good quality of life.

Although TMs are placed into a single group in many classifications, they can be divided into two subtypes on the basis of whether the zygomatic prominence is preserved: Le Fort II TM (preservation of the zygomatic prominence) and Le Fort III TM (resection of the zygomatic prominence) (Fig. 1). The orbital floor was reconstructed in more than half (9/17) of patients who underwent Le Fort III TM but in only 2 of 11 patients who underwent Le Fort II TM. Patients who did not undergo reconstruction of the orbital floor after Le Fort III TM had rapid growth tumor; therefore, complex reconstructions were avoided, and simple reconstructions, such as skin grafting, were performed. Conversely, in patients who did not undergo reconstruction of the orbital floor after Le Fort II TM, defects of the orbital floor were so small that reconstruction was not required. Examples of such defects were defects of the orbital floor that did not involve the inferior orbital rim and defects preserving the orbital periosteum, which prevents dystopia.

Table 3
Reconstruction of type IIIa maxillectomy defects

Autograft	Attachment	Patients
Free MC flap*	None	5
	Prosthesis	3
	Titanium mesh	2
	Prosthesis and titanium mesh	3
Free OC flap**	None	2
	Prosthesis	1
	Titanium mesh	3
Skin graft	Prosthesis	3
None	Prosthesis	5
None	None	1
Total		28

*Free MC flap: Free musculocutaneous flap: all rectus abdominis musculocutaneous flaps. **Free OC flap; free osteocutaneous flap: 4 rectus abdominis musculocutaneous with vascularized rib flaps and 2 double flaps combined with fibular osteocutaneous flap and anterolateral thigh flap.

The materials used for reconstruction of the orbital floor in patients with type IIIa defects included artificial materials (titanium mesh) and autografts (vascularized bone or cartilage) (Table 4). The major complication after reconstruction of the orbital floor with a titanium mesh was exposure of the implant, which necessitated its removal. In some patients the orbital floor, the inferior orbital rim, and the zygomatic prominence were reconstructed with an alloplastic implant, although in other patients only the orbital floor was reconstructed. The major complication after reconstruction with a vascularized rib graft was severe graft infection requiring debridement. All minor complications were local infections, which were successfully treated with open drainage and irrigation. The rates of minor and major complications did not differ significantly between patients receiving titanium mesh and those receiving vascularized bone or cartilage (Table 4).

The free flaps for reconstruction of type IIIa maxillary defects required 1, 2, or 3 skin paddles, as did the free flaps used to reconstruct type II maxillary defects.

Type IIIb maxillary defect

Sixteen of 18 IIIb defects resulted from Le Fort III TM, and 11 of these defects were reconstructed with rectus abdominis musculocutaneous flaps. For these cases, at least a bulbar conjunctival defect was present; therefore, a skin paddle was needed for the superficial defect; the free flap was designed as two or three skin paddles according to whether the palate was reconstructed with a slit-shaped fenestration.

Type IV maxillary defect

Both patients with type IV defects underwent reconstruction with free rectus abdominis flaps.

Unclassified type maxillary defect

Sixteen maxillectomies were unclassified. These included 6 limited maxillectomies combined with resection of the orbital floor (upper subtotal maxillectomy) and 10

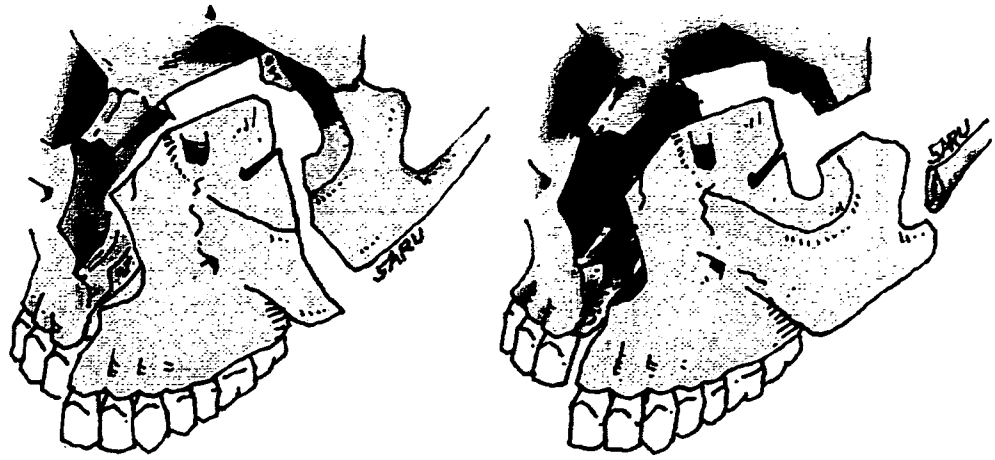

Figure 1. Subtypes of TM. Le Fort II TM preserves the zygomatic prominence (left). Le Fort III TM involves resection of the zygomatic prominence and produces a wide defect of the orbital floor (right).

alveolar resections without an oronasal or oroantral fistula. In one patient who underwent upper subtotal maxillectomy, reconstruction was performed with a free rectus abdominis flap, which had one skin paddle for the lateral nasal wall, and titanium mesh for the orbital floor. Two patients had skin defects requiring superficial reconstruction with a local flap.

Discussion

Maxillectomy is associated with surgical invasiveness and a poor prognosis of the primary malignancy. In our series, the mean total blood loss during surgery resulting in type IIIa, IIIb, and IV defects, most of which required reconstruction, was 1315 ml, while that during recent free jejunum transfers after total pharyngolaryngoesophagectomy at our institution was 399 ml.[13] The main causes of large-volume blood loss during maxillectomy are bleeding from the stump of the nasal or paranasal mucosa and persistent oozing from the pterygomaxillary fossa, where a venous plexus surrounds the maxillary artery. Therefore, reconstructive surgeons must attempt to quickly cover the oozing area with an autograft to minimize blood loss. Although maxillary malignancies have a poor prognosis, we must attempt to perform reconstructive surgery that is less invasive and more reliable because a short hospital stay and fewer sequelae may improve the quality of the patients' remaining life. These problems may mostly be the concern of head and neck surgeons but should also be the concern of reconstructive surgeons.

Table 4
Material used to reconstruct for orbital floor and postoperative complications

Reconstruction material	Patients	Postoperative complication*	
		Minor**	Major**
Titanium mesh	8	5	1
Vascularized bone or cartilage	3	1	1

*Minor complications: treated conservatively; major complications: required additional surgery. **No statistical differences with chi-square test.

Our algorithm for maxillary reconstruction

Our algorithm for immediate maxillary reconstruction after malignant tumor resection is shown in Fig. 2. The first decision is whether maxillary reconstruction should be performed. As microsurgical techniques have become less invasive and more reliable, most patients can be considered candidates for reconstruction. Head and neck surgeons deal with oncological problems; however, reconstructive surgeons can offer reliable reconstructive techniques for high-risk cases.

In addition to the classification of Cordeiro and Santamaria,[10] superficial defects and the extent of palatectomy are also taken into account by our algorithm. In our algorithm, a free osteocutaneous flap is indicated for only subtotal or total palatal defects, which are horizontal component b or c defects in the classification of Brown et al.[9] Such defects include those of the nasal columellar and alar base, which result in an extremely flat nose. To reconstruct these defects we have recently used fibular osteocutaneous flaps, which are long enough for the entire alveolus and thick enough for placement of osseointegrated implants.[14] If bulkier soft tissue is required, an additional cutaneous or musculocutaneous flap should be used.

We believe that the type of free soft tissue flap selected for each type of maxillary defect is relatively unimportant. In general, a free radial forearm flap, latissimus dorsi musculocutaneous flap, rectus abdominis musculocutaneous

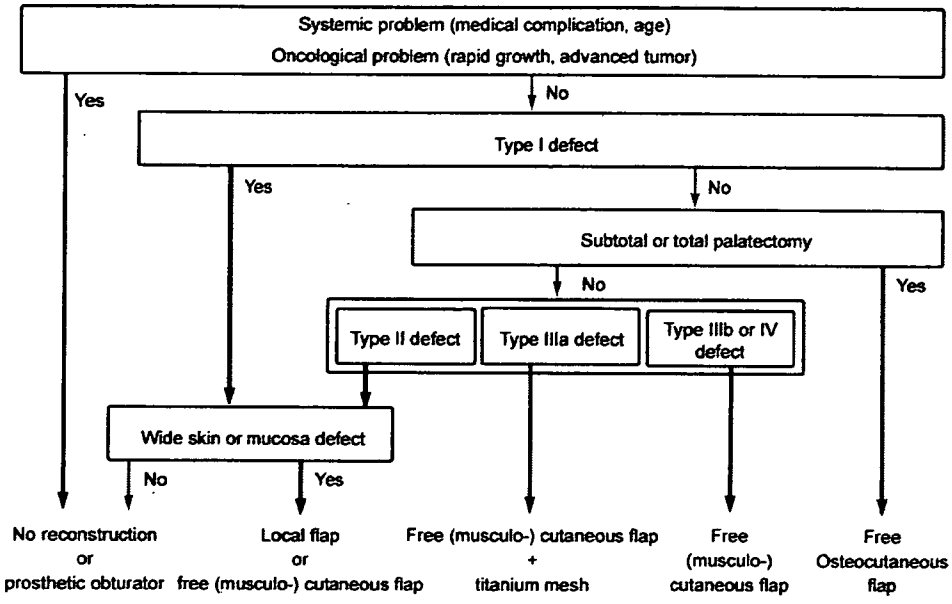

Figure 2. Algorithm of immediate maxillary reconstruction after malignant tumor extirpation at the National Cancer Center Hospital East.

(deep inferior epigastric perforator) flap, or anterolateral thigh flap with or without a vastus lateral muscular flap can be used. We prefer a rectus abdominis or anterolateral thigh flap because they are large enough to provide skin paddles, have perforators that allow the skin paddle to be divided, have enough muscle volume to cover alloplastic implants (titanium mesh), and can be harvested while the tumor is being resected. Our selection of flap depends on the required thickness of the subcutaneous adipose tissue. Because a large volume of adipose tissue is required for most maxillary reconstructions, we usually select a rectus abdominis musculocutaneous flap.

Our algorithm does not indicate the number of skin paddles required for each type of maxillary defect. In most cases, separate skin paddles are required for the palate, the nasal wall, and the skin; therefore, we harvest a free flap as one, two, or three skin island flaps according to the defects. However, patients who have lost all their upper teeth after maxillectomy are exceptional, because a maxillary denture is required if edentulous patient are to eat normally. If the palate is completely obturated with a skin flap in these patients, a tissue-borne denture would not fit the reconstructed palate. For these patients, we reconstruct the palate with slit-shaped fenestration to stabilize the prosthesis and harvest a single skin-island flap connecting the nasal wall and the palatal surfaces.[12]

The selection of materials for reconstruction of the orbital floor is controversial. Some articles have reported vascularized bone or cartilage[3] or non-vascularized bone.[4] We believe titanium mesh is good material for immediate maxillary reconstruction because the procedure used is fast, simple, and non-invasive. However, an alloplastic implant may become exposed or cause infection. To avoid these complications, we reconstruct only the orbital floor, but not the inferior orbital rim, and cover the implant tightly with a muscular flap (Fig. 1). Even with these precautions, minor complications occurred in our patients, but all impaired quality of life only slightly and were treated conservatively.

Classification of maxillectomy

When we attempted to use some classifications of maxillectomy to evaluate our series, we encountered two problems. First, upper subtotal maxillectomy, which produces a type I defect as well as the orbital floor in the Cordeiro and Santamaria classification, does not fit in any classification. In our series 6 of 194 patients had this type of defect, and 1 of them underwent reconstruction with a free flap. Harii's classification, which is often used in Japan, includes upper subtotal maxillectomy. Because cancer surgeons now favor functional preservation, this type of maxillary defect will become more common.

Another problem is the subtype of TM (types III a and IIIb in the classification of Cordeiro and Santamaria). We compared the rate of orbital floor reconstruction between Le Fort II TM and Le Fort III TM. Because Le Fort III TM produces a more extensive defect of the orbital floor, almost all patients with this type of maxillary defect required reconstruction of the orbital floor. However, Le Fort II TM may also produce small defects of the orbital floor not requiring reconstruction. Patients with such small defects might require only a prosthetic obturator or free (musculo-) cutaneous flap transfer. In addition to orbital floor defects, facial deformities of varying type and severity

can be produced by Le Fort TM; however, we did not evaluate facial appearance in this study.

Finally, we have presented our reconstruction algorithm for maxillary cancer resection in this article, but several problems remain. One problem is facial deformity, despite the degree of deformity being acceptable for most patients in our series. We must perform aesthetic reconstructions because the maxilla is important for facial aesthetics. However, for immediate maxillary reconstruction, less invasive surgery is required. Therefore, we consider aesthetic reconstruction to be that meeting the minimal requirements of patients, i.e., the coverage of surface defects and augmentation of the cheek with soft tissue alone. When patients are not satisfied with reconstruction, we perform additional corrections. To do so, we must assess the patients' facial complications. We believe additional corrections, i.e., secondary maxillary reconstructions, should be performed if requested by the patient.

For plastic and reconstructive surgeons, reconstruction of the maxilla, which is a foundation of facial appearance, is challenging and worthwhile, and various complex reconstructive procedures have been reported. However, for immediate maxillary reconstruction after malignant tumor extirpation, safe and simple methods should be selected.

Conclusion

Immediate maxillary reconstruction after cancer resection is exceptional because of poor prognosis of the primary disease and much invasion of tumor extirpation. Therefore, we insist that we should perform less invasive and reliable reconstruction. Our reconstructive algorithm for maxillectomy is as follows: For maxillectomy defects of type I or II in the classification of Cordeiro and Santamaria without wide skin or mucosal defects, we do not perform reconstruction with autografts except for special cases. To reconstruct type IIIa maxillectomy defects of the orbital floor, we employ titanium mesh and free soft tissue flap to cover the implant. For type IIIb and IV defects, free soft tissue flaps are used. Vascularized bone flap is used only to reconstruct defects of the nasal columellar and alar base (subtotal or total palatectomy).

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チタンメッシュと遊離皮弁による眼窩底一次再建

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特集　上顎癌切除後の再建と形態の回復

チタンメッシュと遊離皮弁による眼窩底一次再建

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Key words：上顎癌　眼窩底再建　チタンメッシュ　上顎再建

はじめに

上顎癌切除後の再建においては遊離肩甲骨皮弁などの硬性再建が，機能的にも整容的にも理想的である。一方，再建術を必要とする頭頸部癌は，病期が進行している場合が多く，生命予後が期待できない場合も少なくない。このような症例に対して，複雑な術式を駆使した高侵襲で長時間の手術を行うことは好ましくないと考えられる。このことから，上顎癌切除後の一次（即時）再建においては，可能な限り低侵襲・簡便で，かつ必要な機能の保持ができる手術が求められる。チタンメッシュと遊離皮弁を用いた眼窩底再建は，簡便かつ低侵襲な方法で眼球機能の保持が可能な方法の一つである。当院におけるチタンメッシュと遊離皮弁による眼窩底一次再建について，その方法と問題点について報告する。

I 対　象

1992年から2005年の間に当院において上顎全摘術後に遊離皮弁による再建術を行った症例は60症例である。このうち，眼窩底骨欠損に対してチタンメッシュによる眼窩底再建を行った14症例を対象とした。症例の内訳は，男性10例，女性4例，平均年齢は60.4歳（34～79歳）であった。原疾患は上顎洞癌11例，上歯肉癌3例であった。初回治療例は6例で，いずれもStage IVの進行癌であった。再発例8例の治療歴は，手術のみ4例，手術と放射線治療3例，手術と動注照射1例であった（表1）。

II 切除範囲と眼窩底再建の方法

上顎骨の切除範囲は，平成17年厚生労働省波利井班の分類で，IV-A-upper（口蓋の切除なし）が1例，IV-Bが12例，Vが1例であった。頬骨は14例中7例で切除されていた。口蓋は切除なしの1例を除いて，硬口蓋の1/2が切除されていた。

再建に用いた皮弁は14例中13例が遊離腹直筋皮弁で，残る1例では遊離前外側大腿皮弁と腓骨弁を併用した。移植皮弁の皮島の数は1皮島が3例，2皮島が8例，3皮島が3例であった。頬骨切除を伴った7例のうち，1例では腓骨弁による頬骨部の硬性再建を行い，1例でチタンメッシュを眼窩底に連続させて頬骨部を再建した。ほかの5例では頬骨部分には軟部組織再建を行うのみに留めた。口蓋部分は2例で義歯装着のため，Sakurabaら[1]の方法に従いスリット型の再建を行い，11例で皮弁による閉鎖を行った，また1例

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表1　症例一覧

症例	年齢/性別	原発巣	TN分類	前治療
1	34/男	上顎洞	再発	口蓋部分切除
2	56/男	上顎洞	T4N0	なし
3	57/男	上顎洞	T4N0	なし
4	66/女	上顎洞	T4N2c	なし
5	77/女	上顎洞	再発	上顎亜全摘
6	53/男	上顎洞	再発	上顎部分切除＋動注照射
7	37/男	上歯肉	再発	上顎部分切除
8	60/男	上顎洞	再発	上顎部分切除＋陽子線
9	55/男	上歯肉	T4N2c	なし
10	67/女	上歯肉	再発	上顎部分切除＋放射線治療
11	75/男	上顎洞	再発	上顎亜全摘＋放射線治療
12	64/男	上顎洞	T4N0	なし
13	79/女	上顎洞	再発	上顎部分切除，頸部郭清
14	66/男	上顎洞	T4N0	なし

は口蓋が温存されていた。術後，放射線治療は10例で行われ，線量は30～66 Gyで平均55.7 Gyであった。

眼窩底の欠損部は全例でチタンメッシュを用いて再建を行った。骨欠損の大きさは，約3×3 cmから3×5 cm程度で，眼窩底に限局するものが5例，眼窩外側壁の一部合併切除が4例，内側壁の一部合併切除が4例，内側壁・外側壁ともに一部合併切除されたものが1例であった。眼窩底再建は眼窩底骨欠損がある場合，眼窩骨膜の切除の有無にかかわらず全例で行った。チタンメッシュは，できるだけ薄いものを選択することが望ましく，当院では現在，厚さ0.3 mmのものを使用している。チタンメッシュは眼窩の形状に合わせて緩やかに弯曲させ，欠損の大きさに合わせて大きさを調整した。具体的には骨欠損の大きさと同等からわずかに大きめとした。固定にはワイヤーまたはモノフィラメントのナイロン糸を使用し，欠損部周囲の骨に孔をあけて緩く固定した。固定は厳密である必要はなく，多少の遊びがあっても問題ないと考えている。チタンメッシュの表面は皮弁で被覆したが，その際，血流のよい筋体部分でチタンメッシュを被覆するよう皮弁の配置を行った。その際，筋体の容量が多過ぎると顔面皮膚の縫合閉鎖に難渋するので，過剰な筋体は薄く切除するとよい。上顎再建においては三次元的な骨の形態のため，複雑に入り組んだ死腔を形成しやすいので，吸引ドレーンよりは複数のペンローズドレーンをこまめに挿入してドレナージを図るようにした。

III 結　果

皮弁は全例生着した。術後感染を4例で認めたがいずれも保存的治療で軽快した（表2）。眼球機能評価では，3例で眼球運動障害を認め，うち2例で複視を認めた。このうち1例は，腫瘍の再発によるものであった。眼球突出または眼球陥凹は認められなかった。術後，失明および指数弁程度までの視力低下を3例で認めたが，うち2例は視神経近くに及んだ腫瘍の摘出，もう1例は腫瘍の再発による圧迫が原因であった（表3）。

その後の経過は健存4例，原病死6例，担癌生存4例で平均観察期間は24.6カ月であった。健存例のうち頬骨弓部までチタンメッシュで再建した症例5において，術後4年にチタンメッシュの露出を認めた。これに対して，チタンメッシュを全摘し遊離広背筋皮弁による再建を行った。

表2　再建方法

症例	上顎欠損 type	TM適用部位	移植皮弁	皮島数	術後照射線量 (Gy)	周術期合併症	備考
1	IV-B	眼窩底/下縁	ALT, 腓骨弁	2	40	感染	頬部再建（腓骨）
2	IV-B	眼窩底のみ	RAMC	2	60	感染	
3	IV-B	眼窩底のみ	RAMC	3	60	なし	
4	IV-B	眼窩底のみ	RAMC	1	60	感染	口蓋スリット型再建
5	IV-B	眼窩底/下縁/頬骨	RAMC	2	60	感染	頬部再建（TM）
6	IV-B	眼窩底/下縁	RAMC	2	なし	なし	
7	IV-B	眼窩底/下縁	RAMC	2	60	なし	
8	IV-A-Upper	眼窩底のみ	RAMC	1	なし	なし	口蓋切除なし
9	IV-B	眼窩底のみ	RAMC	2	66	なし	
10	V	眼窩底のみ	RAMC	3	なし	なし	
11	IV-B	眼窩底のみ	RAMC	2	なし	なし	
12	IV-B	眼窩底のみ	RAMC	1	60	なし	口蓋スリット型再建
13	IV-B	眼窩底のみ	RAMC	2	30	なし	
14	IV-B	眼窩底のみ	RAMC	3	61	なし	

TM；チタンメッシュ，RAMC：腹直筋皮弁

表3　術後眼球機能と予後

症例	複視	眼球偏位	視力	眼球運動障害	下眼瞼外反	TM露出	予後	観察期間	備考
1	+	−	正常	下方視で癒着	−	−	原病死	7カ月	術直後より癒着
2	−	−	正常	なし	+	−	担癌	11カ月	
3	−	−	正常	なし	+	−	担癌	1年11カ月	
4	−	−	正常	なし	+	−	原病死	8カ月	
5	−	−	正常	なし	+	+	健存	5年8カ月	術後4年TM摘出
6	−	−	正常	なし	+	−	健存	5年	
7	−	−	正常	なし	+	−	健存	4年9カ月	
8	−	−	正常	なし	−	−	原病死	1年11カ月	
9	−	−	指数弁	なし	+	−	担癌	1年	腫瘍浸潤による
10	−	−	正常	なし	−	−	原病死	1年5カ月	
11	−	−	失明	上方視で軽度	+	−	原病死	11カ月	腫瘍浸潤による
12	−	−	正常	なし	−	−	担癌	2年	
13	+	−	低下	外転神経麻痺	−	−	原病死	7カ月	再発による
14	−	−	正常	なし	+	−	健存	1年4カ月	

IV 代表症例

【症例12】 64歳，男

上顎洞癌T4N0M0で，眼窩底骨を含む上顎全摘術を施行され，欠損範囲は波利井分類のIV-Bで硬口蓋の1/2，鼻側壁および頬骨は温存されていた。腫瘍の切除と同時進行で遊離腹直筋皮弁を挙上した。眼窩底骨欠損に合わせて，厚さ0.2 mmのチタンメッシュを適宜トリミングし，約3.0×3.0 cmを使用して眼窩底部分のみを再建した。骨の断端にドリルで小孔をあけ，4-0黒ナイロンで縫合固定した。皮弁は1皮島として断端の粘膜に縫着，硬口蓋断端部で折り曲げスリット状の隙間を残して頬粘膜断端と縫合した。移植床血管には顔面動静脈を利用し，それぞれ端端吻合を行った。術後経過は良好で，術後6日よ