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ORIGINAL ARTICLE

Patterns of lymph node metastasis and the management of neck dissection for parotid carcinomas: a single-institute experience

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Abstract

Background There is no consensus about the indications and range of neck dissection in patients who have parotid carcinoma, with elective neck dissection for cN0 disease being particularly controversial.

Methods This study retrospectively reviewed 185 patients with newly diagnosed parotid carcinoma who were treated at our department between September 1999 and August 2018.

Results 50 of the 185 patients had lymph node metastasis, including 7.7%, 12.2%, 36.0%, and 55.8% of patients with T1, T2, T3, and T4 disease, respectively. When classified by histological grade, 5.7% of patients with low/intermediate-grade disease had lymph node metastasis versus 55.0% of patients with high-grade disease. Multivariate analysis revealed that the histological grade and T classification were independent predictors of lymph node metastasis. Occult metastasis was found in 8 out of 73 clinically node negative patients undergoing neck dissection. The most common site of cervical metastasis was level 2, followed by the periparotid nodes, level 3, and level 4.

Conclusion Elective neck dissection may be most appropriate for parotid carcinoma patients with high grade disease and/or an advanced T classification. Because preoperative evaluation of the histological grade of parotid carcinoma has limited reliability, it is important to decide the indications and range of neck dissection from the results of frozen section biopsy.

Keywords Parotid carcinoma · Lymph node metastasis · Elective neck dissection · Occult metastasis · Histological grade

Introduction

It is known that the detection of lymph node metastasis (N+) predicts a poor outcome in patients with parotid carcinoma [1, 2]. However, there is no consensus about the indications or range of dissection in clinically lymph node positive (cN+) patients and clinically lymph node negative (cN0) patients. In particular, the performance and extent of elective neck dissection (END) are controversial for cN0 patients [3, 4]. Some authors have suggested that all patients with parotid carcinoma should undergo END, except those with low-grade mucoepidermoid carcinoma [5], while others maintain that END is unnecessary for cN0 patients [6]. Armstrong et al. proposed that END should be performed in cN0 patients with T3/4 tumors or histologically high-grade disease [7]. Medina reviewed the literature and concluded that END should be done in patients with histologically high-grade disease, T3 or T4 tumors, facial palsy, age ≥ 54 years, extraparotid spread, and lymphovascular invasion [8].

Because histologically high-grade parotid carcinoma is generally associated with a high incidence of metastasis [4, 7, 8], it seems reasonable for patients with such tumors to receive END. However, if the indications for END are to be decided from the histological grade, it must be recognized that preoperative grading of parotid carcinoma is inherently difficult [9]. The reasons for a lack of well-defined indications for END include the limited number of patients with parotid carcinoma, wide variation of tumor histology and/or grade, and difficulty in grading these tumors preoperatively.

Occult metastasis was reported to exist in 5–31% of patients with parotid carcinoma [10], but its prevalence may have been reduced recently thanks to advances in imaging techniques. The frequency of lymph node metastasis is highly dependent on the criteria used to identify involved lymph nodes and the method of evaluation, but

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many reports do not include such basic information and only a limited number of studies have stratified the incidence of occult metastasis by tumor histology or grade. Many multicenter studies of parotid cancer have been performed because of the limited number of patients treated at each center, but this approach can yield misleading results if predefined diagnostic or therapeutic criteria are not used. In particular, the criteria for preoperative evaluation of lymph node metastasis should be clearly defined.

At our department, diagnosis and treatment of parotid carcinoma have been performed according to consistent criteria over a 19-year period. In the present study, we investigated the patterns of lymph node metastasis in 185 patients with parotid carcinoma who were managed during that period and focused on the indications for END.

Patients and methods

Patients

We treated 185 patients with newly diagnosed parotid carcinoma during the 19-year period between September 1999 and August 2018 (Table 1). Their mean age was 55.3 years and they included 103 males and 82 females. The observation period ranged from 4 to 230 months, with a median of 73 months. There were 26 patients with T1 disease, 82 patients with T2 disease, 25 patients with T3 disease, and 52 patients with T4 disease. In addition, 137, 13, 32, and 3 patients had N0, N1, N2b and N2c disease, respectively. Regarding the clinical stage, 24, 71, 23, and 67 patients were in Stage I, II, III, and IV, respectively. With respect to the histological grade, 105 patients had low/intermediate grade tumors and 80 patients had high grade tumors. Among the 185 patients, survival was assessed in 148 patients for whom information on outcomes was available. These 148 patients comprised 20, 57, 17, and 54 patients with Stage I, II, III, and IV disease, respectively. Tumors were classified according to the WHO histological classification of parotid carcinoma [11].

Definition of lymph node metastasis

Preoperative evaluation of clinical lymph node metastasis (cN) was done by ultrasound (US). A positive lymph node was defined as a node with a short axis diameter ≥ 7 mm and a short axis diameter/long axis diameter ratio ≥ 0.5 [12]. Among the patients with positive lymph nodes, 6 did not receive neck dissection, but underwent fine needle aspiration (FNA).

Table 1 Characteristics of the patients with parotid carcinoma ($N = 185$)

Characteristic	All patients (%)
Median age (range), years	55.3 (14–85)
Gender	
Male	103 (55.7)
Female	82 (44.3)
Clinical T classification	
T1	26 (14.1)
T2	82 (44.3)
T3	25 (13.5)
T4	52 (28.1)
Clinical N classification	
N0	137 (74.1)
N1	13 (7.0)
N2b	32 (17.3)
N2c	3(1.6)
Clinical stage	
I	24 (13.0)
II	71 (38.4)
III	23 (12.4)
IV	67 (36.2)
Histological grade	
Low/intermediate	105 (56.8)
High	80 (43.2)
Histological type	
Mucoepidermoid carcinoma	48 (26.0)
Carcinoma ex pleomorphic adenoma	27 (14.6)
Adenoid cystic carcinoma	21 (11.4)
Salivary duct carcinoma	15 (8.1)
Secretory carcinoma	12 (6.5)
Aciniccell carcinoma	11 (5.9)
Basal cell adenocarcinoma	11 (5.9)
Squamous cell carcinoma	9 (4.9)
Epithelial-myoepithelial carcinoma	9 (4.9)
Adenocarcinoma, not otherwise specified	6 (3.2)
Myoepithelial carcinoma	6 (3.2)
Others	10 (5.4)

Methods

Lymph node metastasis

The relationship between neck dissection and lymph node metastasis was examined, as well as that between lymph node metastasis and the T classification, tumor histology, and grade. The frequency of occult metastasis was also evaluated, and the sites of lymph node metastasis were analyzed. The 50 patients with metastasis and 135 patients without metastasis were compared to identify possible

factors related to lymph node metastasis, including the age, gender, T classification, histological grade, preoperative facial nerve status, and pain/tenderness.

Diagnosis by frozen section biopsy

Frozen section biopsy (FSB) was performed in 132 of the 185 patients. The final histological diagnosis was low/intermediate grade parotid carcinoma in 83 of these patients and high grade parotid carcinoma in 49 patients. The results of FSB were classified into the following five diagnostic categories: correct histological type and grade, correct histological grade (regardless of histological type), malignancy only, suspected malignancy, and benign lesion or insufficient material.

Survival rate

In 148 patients with outcome information, disease-specific 5-year survival rate was calculated with stratification by stage and N classification. In the 115 patients who had neck dissection, lymph node recurrence was analyzed.

Statistical analysis

Evaluation of the risk factors for cervical metastasis was performed using the Chi-square test. Multivariate logistic regression analysis was employed to account for possible confounders and to identify independent predictors of lymph node metastasis. Odds ratios were calculated with 95% confidence intervals. All tests were 2-tailed, and differences were considered statistically significant at $P=0.05$. Disease-specific survival rates were calculated by the Kaplan–Meier method.

Results

Treatment of the neck

Six of the 185 patients received radiotherapy instead of surgery because their tumors were inoperable, while the remaining 179 patients underwent surgery as the initial treatment. Neck dissection was performed in 115 of these 179 patients and the range of dissection was determined by preoperative evaluation. As a principle, total neck dissection (TND: levels I to V) was selected for all cN+ patients and for cN0 patients with an advanced T classification or high-grade malignancy, while selective neck dissection (SND: levels I to III and upper V) was done for the other cN0 patients. Among the 115 patients undergoing neck dissection, 47 received TND and 68 had SND (Fig. 1). As to high-grade carcinoma, we did not perform neck dissection in 15 among 80 cases; 10 in inoperable/refusal, three in T1N0, one in T2N0, and one in T3N0 cases. Most of their cases were confirmed to have high-grade carcinoma in the final pathology. Postoperative radiation therapy were performed in all cases except T1N0. As a principle, postoperative radiation therapy was administrated for high grade tumors, positive lymph node metastasis, T4 disease, and a positive resection margin.

Lymph node metastasis

Among the 185 patients with parotid carcinoma, 48 patients were positive for metastasis by US examination and 137 patients were negative (Fig. 1). Neck dissection was performed in 42 of the 48 patients with metastasis (TND in 33 and SND in 9). Among the 33 patients who received TND, 29 patients were pathologically node

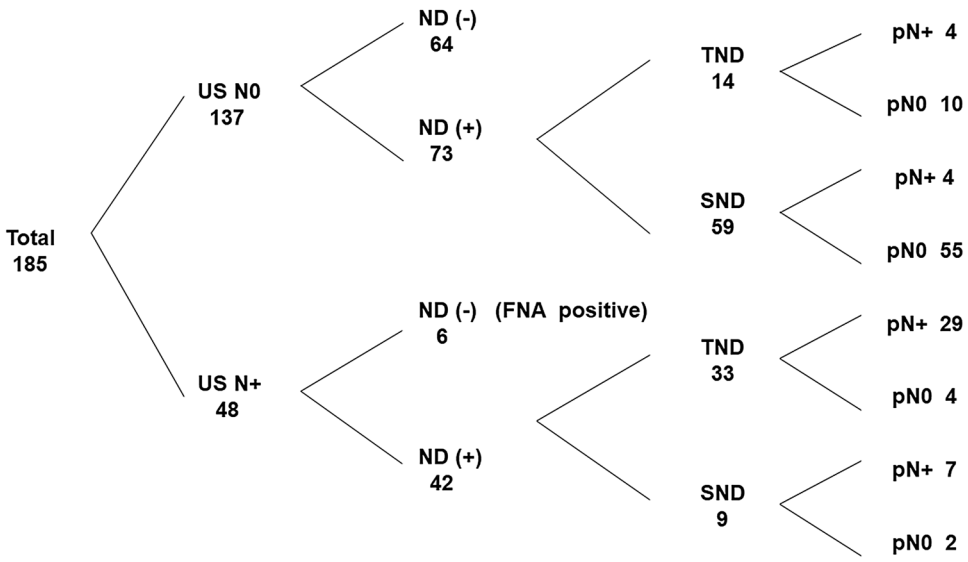

Fig. 1 Management of the neck in all patients ($N=185$). US N0; node-negative on ultrasound, US N+, node-positive on ultrasound; ND (−), neck dissection not performed; ND (+), neck dissection performed; TND, total neck dissection (levels I–V); SND, selective neck dissection (levels I–III and upper level V); pN+, pathologically lymph node positive; pN0, pathologically lymph node negative

positive (pN+) and 4 patients were pathologically node negative (pN0). Among the 9 patients treated by SND, 7 and 2 patients were pN + and pN0, respectively. All 6 patients who did not receive neck dissection were confirmed to have lymph node metastasis by US criteria and malignant cytology of FNA. Out of 137 patients diagnosed as cN0, 73 patients underwent neck dissection (TND in 14 and SND in 59). Among the 14 patients who underwent TND, 4 patients were pN + and 10 patients were pN0. Among the 59 patients receiving SND, 4 patients and 55 patients were pN + and pN0, respectively.

In summary, pN + disease was found in 50 patients (27.0%), comprising 14 patients with pN1, 33 patients with pN2b, and 3 patients with pN2c. Regarding the diagnostic yield of US, a false-negative result was obtained in 8/137 patients (5.8%) and a false-positive result was obtained in 6/48 patients (12.5%), while the correct diagnosis was obtained in 171/185 patients (92.4%).

When pN + patients were stratified by T classification, lymph node metastasis was positive in 2/26 T1 cases (7.7%), 10/82 T2 cases (12.2%), 9/25 T3 cases (36.0%), and 29/52 T4 cases (55.8%). Thus, larger tumor size was associated with a higher frequency of lymph node metastasis (Table 2). When pN + patients were analyzed by histological grade, 6 out of 105 patients (5.7%) with low/intermediate-grade malignancy and 44 out of 80 patients (55.0%) with high-grade malignancy were pN+. The frequency lymph node metastasis was significantly higher in high-grade patients compared with low/intermediate-grade patients.

Risk factors for metastasis were evaluated by univariate analysis comparing the 50 pN + patients and 135 pN0 patients. This analysis revealed that advanced age, male sex, advanced T classification, high-grade malignancy, and preoperative facial palsy were significant risk factors. Subsequent multivariate analysis indicated that high-grade malignancy was the most important risk factor (Tables 3, 4).

Table 2 Patients with neck dissection and positive nodes stratified by T classification

T	No. of patients	ND		pN+	pN + patients
T1	26	No	17	0	2/26 (7.7%)
		Yes	9	2	
T2	82	No	32	0	10/82 (12.2%)
		Yes	50	10	
T3	25	No	4	1[a]	9/25 (36.0%)
		Yes	21	8	
T4	52	No	17	5[a]	29/52 (55.8%)
		Yes	35	24	

[a]Diagnosed by fine-needle aspiration cytology

ND, neck dissection; pN+, pathologically lymph node positive

Table 3 Univariate analysis for factors associated with lymph node metastasis

Risk factor	pN+ ($N=50$)	pN0 ($N=135$)	P value
Age (mean)	62.5	56.0	< 0.01
Gender (male)	40 (80%)	63 (47%)	< 0.001
T classification (T3, T4)	38 (76%)	39 (29%)	< 0.001
Grade (high)	44 (88%)	36 (27%)	< 0.001
Facial palsy	17 (34%)	17 (13%)	< 0.01
Pain/tenderness	30 (60%)	67 (50%)	0.28

Tumor histology and lymph node metastasis

Histological types associated with a high rate of lymph node metastasis were salivary duct carcinoma (10/15, 66.7%), squamous cell carcinoma (4/9, 44.4%), mucoepidermoid carcinoma (18/48, 37.5%), and carcinoma ex pleomorphic adenoma (8/27, 29.6%).

On the other hand, histological types associated with low rate of lymph node metastasis were adenoid cystic carcinoma (1/21) and secretory carcinoma (1/12), as well as acinic cell carcinoma, basal cell carcinoma, and epithelial-myoepithelial carcinoma (no lymph node metastasis).

Lymph node metastasis was also analyzed by histological type and grade. Among 48 patients with mucoepideomoid carcinoma, 24 patients each had low/intermediate-grade and high-grade tumors, with the frequency of metastasis being 16.7% and 58.3%, respectively. Among 27 patients with carcinoma ex pleomorphic adenoma, 11 and 16 patients had low/intermediate-grade and high-grade tumors, respectively. The frequency of metastasis was 0% in patients with low/intermediate-grade tumors versus 50% in those with high-grade tumors. Among 21 patients with adenoid cystic carcinoma, 16 patients had low/intermediate-grade tumors and 5 patients had high-grade tumors, with the frequency of metastasis being 0% and 20.0%, respectively.

Table 4 Multivariate analysis for factors associated with lymph node metastasis

Risk factor	Odds ratio	95% confidence interval	P value
Grade (high)	17.70	5.01–62.49	< 0.001
T classification (T3, T4)	4.06	1.63–10.12	0.0026
Gender (male)	1.79	0.68–4.71	0.24
Age (1-y increment)	0.98	0.95–1.01	0.29
Facial palsy	0.96	0.36–2.56	0.94
Pain/tenderness	0.61	0.24–1.56	0.30

Table 5 Occult metastasis stratified by T classification and histological grade

	T1N0	T2N0	T3N0	T4N0	Occult
Low/intermediate (45)	6(0)	26(1)	9(0)	4(0)	1/45 (2.2%)
High (28)	1(0)	13(1)	5(2)	9(4)	7/28 25.0%
Total (73)	7(0) (0%)	39(2) (5.1%)	14(2) (14.2%)	13(4) (30.8%)	8/73 (11.0%)

Numbers in the parentheses indicate patients with pathologically positive nodes

Table 6 Distribution of positive lymph nodes (levels I–V and periparotid nodes) ($N=44$)

Neck level	No. of patients (%)
Periparotid	27 (61%)
Level I	5 (11%)
Level II	33 (75%)
Level III	22 (50%)
Level IV	15 (34%)
Level V	9 (20%)

Occult metastasis

Occult metastasis was analyzed in the 73 patients with cN0 disease who underwent neck dissection. Overall, 8 out of 73 patients (11.0%) had occult metastasis (Table 5). When analyzed by the T classification, occult metastasis was present in 0/7 patients with T1 disease (0%), 2/39 patients with T2 disease (5.1%), 2/14 patients with T3 disease (14.2%), and 4/13 patients with T4 disease (30.8%). The frequency of occult metastasis was higher in patients with more advanced tumors. When analyzed by histological grade, lymph node metastasis was positive in 1/45 patients with low/intermediate-grade tumors (2.2%) and in 7/28 patients with high-grade tumors (25.0%). The occult metastasis rate was significantly higher in patients with high-grade tumors.

Localization of cervical metastasis

The site of metastasis was examined in 44 pN + patients treated by neck dissection (Table 6). The most common site was level II (33 patients, 75%), followed by the periparotid nodes (27 patients, 61%), level III (22 patients, 50%), level IV (15 patients, 34%), level V (9 patients, 20%), and level I (5 patients, 11%). The mean number of nodal metastases was 2.5. Among these 44 patients, only 3 had metastasis to sites other than the periparotid nodes and/or level II. All 3 of them had metastasis to level III. Among 9 patients with metastasis to level V, the metastasis was located at upper level V in 7 patients, while the other 2 had multiple widely scattered metastases. In the 8 patients with occult metastasis, the sites were level II (6 patients), periparotid nodes (5 patients), and level III (1 patient).

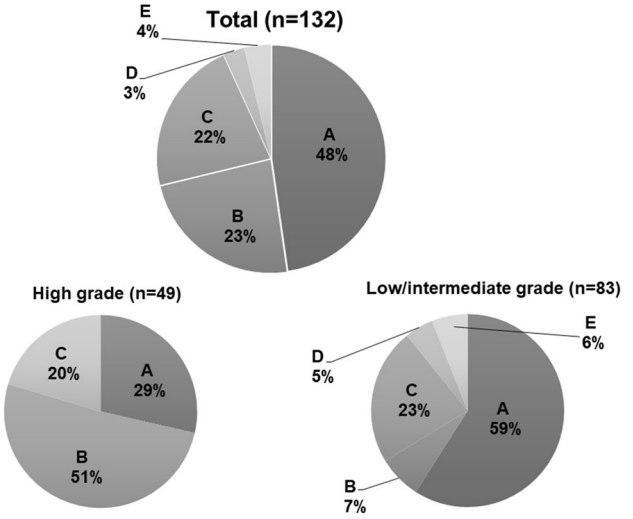

Fig. 2 Results of frozen section biopsy ($n=132$, 49 high grade tumors and 83 low/intermediate grade tumors). A, correct histology and grade; B, correct grade; C, malignancy only; D, suspected malignancy; E, benign or insufficient materials

Frozen section biopsy

FSB achieved accurate diagnosis of the histological grade in 94 out of 132 patients (71.2%). Comparison between the FSB diagnosis and the final diagnosis revealed that the accuracy rate of FSB was 66.3% in 83 patients with a final diagnosis of low/intermediate-grade disease, while it was 80.0% in 49 patients with a final diagnosis of high-grade disease (Fig. 2).

As to the detection of node metastasis by FSB, lymph nodes in level II and periparotid regions were usually proposed to FSB to detect node metastasis during END. 4 among 8 cases which were confirmed to node positive in the final pathology were detected positive node by FSB.

Survival

The disease-specific 5-year survival rate was calculated for 148 patients with outcome data. As a result, disease-specific 5-year survival rate was 100%, 97.7%, 71.6%, and 51.6% in stage I, stage II, stage III, and stage IV, respectively. When analyzed by the N classification, disease-specific 5-year

survival rate was 87.2%, 71.1%, and 31.6% in patients with N0, N1, and N2 disease, respectively.

Pattern of node recurrence

We studied about the relationship between lymph node recurrence and neck dissection. 8 among 73 cases in which END was performed for US N0 were confirmed to have lymph node metastasis in the final pathology (Fig. 1). Only two cases were subsequently detected as lymph node recurrence in these 73 cases where END was performed. Among the 64 cases where END was not performed and who were also node negative by US, none of them had any subsequent recurrence confined to the lymph nodes. While, 36 among 42 cases where performed therapeutic neck dissection for US N + were confirmed to have lymph node metastasis in the final pathology (Fig. 1). Only three among these 42 cases were detected as lymph node recurrence, and two cases of these three were node recurrent in the field of neck dissection.

Discussion

There is no consensus regarding the indications for END in patients with cN0 parotid carcinoma [3, 4]. In these patients, the frequency of occult metastasis is reported to range widely from 5 to 31% [10]. Armstrong et al. studied 474 patients with major salivary gland carcinoma and found that 111 patients (23.4%) were pN+, while among 90 cN0 patients treated by END, 34 patients (38%) had occult metastasis [7]. In recent reports, the rate of occult metastasis was from 20 to 37% [3, 10, 13, 14]. In our series, END was performed in 73 patients who were cN0 and occult metastasis was found in 8 patients (11.0%). Recent advances in imaging may have improved the detection of metastatic nodes and decreased the frequency of occult metastasis. It is known that the detection of cervical lymph node metastasis is better with US than CT or MRI [15]. However, in our previous studies for US diagnosis of lymph node metastasis by the same criteria in papillary thyroid carcinoma [12] and in oral carcinoma [16], the sensitivity, specificity, and accuracy of the US diagnosis were 65–78%, 97–99%, and 83%, respectively, and in oral cancer, the rate of occult metastasis was 18% [16], suggesting that a certain frequency of occult metastasis (e.g., 10–20%) may be inevitably even with advanced imaging methods. Not only due to this rate of occult metastasis, the low node recurrent rate after neck dissection, as well, suggested that neck dissection was an effective therapy in the management of node metastasis.

There are various opinions about the indications for END in cN0 parotid carcinoma, with some authors arguing that END is not needed and others maintaining that it is indicated for all patients [5, 6]. Many authors have suggested that the indications for END can be determined from the T classification and histological grade [7, 8]. In our study, the frequency of lymph node metastasis was 7.7%, 12.2%, 36.0%, and 55.8% in patients with T1, T2, T3, and T4 disease, respectively, being higher in T3 and T4 cases. Among 8 patients with occult metastasis, 2 were T2, 2 were T3, and 4 were T4 cases. In addition, the rate of lymph node metastasis was only 5.7% in patients with low/intermediate-grade, while it was as high as 55.0% among patients with high-grade disease. Lau et al. analyzed metastasis by tumor grade and reported that the rate was 0%, 10%, and 35% for low, intermediate, and high grade tumors, respectively [14]. Among our 8 patients with occult metastasis, the histological grade was low/intermediate in only 1 and was high grade in 7. Multivariate analysis revealed that histological grade was the most significant determinant of lymph node metastasis. Santos et al. analyzed risk factors for lymph node metastasis in patients with parotid carcinoma and reported that histological grade and advanced T classification were the most significant factors [13]. Their multivariate analysis also revealed that histological grade was more important, consistent with our results. Based on these findings, we consider that END may be appropriate for T3 or T4 patients and those with high-grade tumors.

When the T classification and histological grade are used to decide the indications for END, accurate preoperative evaluation becomes very important [4]. Thanks to advances in imaging methods, the T classification is relatively easy to evaluate, while the histological grade is usually evaluated by FNA preoperatively and by FSB intraoperatively. Because FNA shows insufficient performance for grading parotid carcinoma, we have to rely on FSB [9]. In our study, an accurate diagnosis of tumor grade was made by FSB in 80% and 66% of patients with high-grade and low/intermediate-grade disease, respectively, so the results were better for high-grade patients.

Based on these findings, we have developed an algorithm for determining the indications for and the extent of neck dissection utilizing FSB (Fig. 3). When END is used for treatment of cN0 parotid carcinoma, SND can be selected for patients with T3 or T4 tumors of any histological grade and patients with high-grade T1 or T2 tumors. In general, high-grade cases are easily diagnosed compared with low/intermediate grade cases preoperatively since high-grade malignancy is often strongly suspected from FNA, imaging findings, and symptoms such as facial palsy. Some lymph nodes should be examined by FSB while SND is being performed, with the procedure being switched to TND if FSB detects node metastasis, or SND being continued if FSB of lymph nodes is negative. Level II and periparotid lymph nodes were selected for the target of FSB because some previous studies have demonstrated that node metastases were

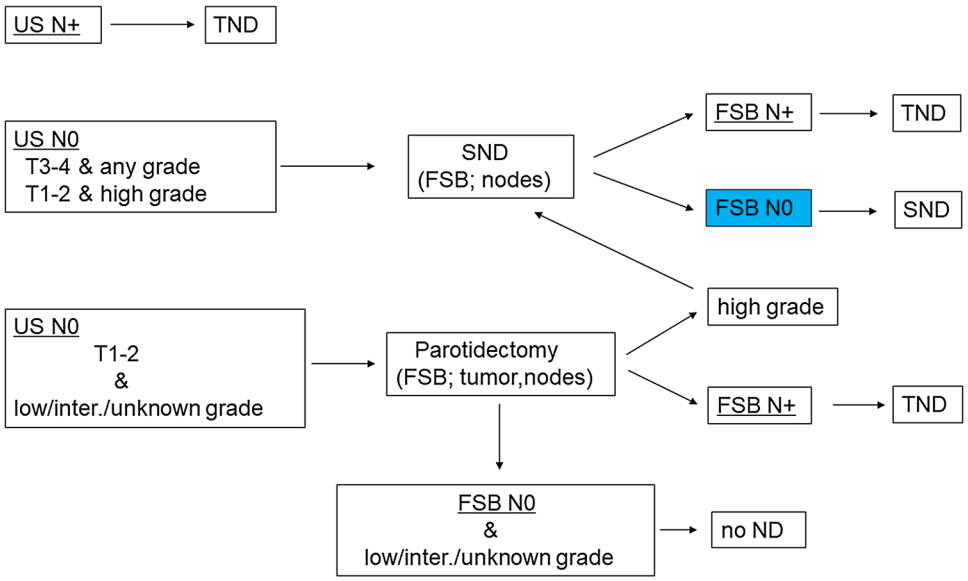

Fig. 3 Flow chart for planning neck dissection. Elective neck dissection should be performed in patients with T3/T4 or high-grade disease. The range of neck dissection is decided according to the results of ultrasonography (US) and frozen section biopsy (FSB). US N+, lymph node positive diagnosed by US; US N0, lymph node negative diagnosed by US; FNB N+, lymph node positive diagnosed by FSB; FSB N0, lymph node negative diagnosed by FSB; ND, neck dissection; TND, total neck dissection (levels I–V); SND, selective neck dissection (levels I–III and upper level V)

dominant in these areas in parotid cancer [10], and also in consequence with our results: 41 patients (93%) had periparotid or level II metastasis among 44 pN + patients. Several selecting nodes were proposed to FSB according to their size. On the other hand, in T1 and T2 patients with tumors of low/intermediate/unknown grade, an S-shaped incision can be used for resection of the primary parotid tumor to allow examination by FSB, with SND being performed if FSB of the parotid tumor shows high-grade malignancy. In addition, the periparotid and level II lymph nodes available in this operative field by common parotidectomy utilizing an S-shaped incision can be examined by FSB, with TND being selected if node metastasis is detected. In patients with low/intermediate/unknown grade disease, END is not done when FSB shows no metastatic nodes and low/intermediate grade of the primary tumor.

Regarding the range of neck dissection in cN + patients, many authors have suggested that TND should be performed [3, 17, 18]. In our patients, lymph node metastases were scattered over a wide range from level I to V, suggesting that TND is appropriate for N + cases. Klussmann et al. reported that dissection should cover levels I to V because metastasis at level IV predicts a poor outcome [2]. On the other hand, there is no consensus as to the range of END for N0 disease [10]. In our series, the most common site of metastasis was level II (75%), followed by the periparotid nodes (61%), and then level III (50%). Among 44 pN + patients, 41 patients had periparotid or level II metastasis, and the other three had level 3 metastasis. Klussmann et al. analyzed the distribution of occult metastasis and found that metastasis was most common at level II, while there was no metastasis at levels III or IV [2]. Armstrong et al. pointed out that the frequency of metastasis was similar between levels II and III [7]. Lim et al. found metastasis at level V in 10.6% of patients with cN0 disease and 28.2% of patients with cN + disease. They concluded that it is not necessary to include level V in cN0 patients [19]. Stodulski et al. reviewed the literature and concluded that metastasis was most common at level 2, followed by levels III and 5 [10]. In our patients, 20% had metastasis at level V; 7 out of 9 patients with level V metastasis had involvement of upper level V, and the other two had widely scattered multiple metastases. Based on these findings, the appropriate range of END may be at the periparotid nodes, level II, level III, and upper level V. An adequate operative field for this range of dissection can be obtained by extending the S-shaped incision (commonly used for parotid tumor resection) anteriorly for several centimeters. This procedure is unlikely to cause functional impairment. In these cases, the procedure should be changed to TND if any positive nodes in the field of END are confirmed by FSB.

Conclusion

In patients with parotid carcinoma, the two most significant risk factors for lymph node metastasis were high-grade malignancy and an advanced T classification. The frequency of lymph node metastasis exceeded 50% in patients with high-grade tumors or T4 disease, and occult metastasis was found in 11% of patients even after careful preoperative evaluation. END may be appropriate for patients with an advanced T classification or high-grade tumors in cN0 patients. Based on the frequency of metastasis in our series, the range for END should include the periparotid nodes, level II, level III, and upper level V. It is important to determine the range of dissection from the results of FSB using tumor/lymph node samples obtained during primary tumor resection or END.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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