The influence of American Society of Anesthesiologists Physical Status on patient morbidity and survival after total thyroidectomy

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Abstract. In cases of thyroid papillary carcinoma, a less aggressive cancer, surgeons may hesitate to perform total thyroidectomy on patients with poor general condition because these may experience longer survival without undergoing surgery. To investigate the influence of general patient condition on the patients’ survival who received total thyroidectomy, we utilized the American Society of Anesthesiologists Physical Status (ASA-PS). We retrospectively reviewed all patients undergoing total thyroidectomy under general anesthesia and graded by ASA-PS between 2004 and 2014. Patients with anaplastic carcinoma and metastatic thyroid renal cell carcinoma were excluded. There were 77 (30%), 149 (58%), and 30 (12%) ASA-PS 1, 2, and 3 cases, respectively. Patient age increased significantly with increasing ASA-PS score (median age of 53, 64, and 71 years for ASA-PS 1, 2, and 3). Hospitalization periods extended significantly for patients with ASA-PS 3. Twenty patients died during the study (3.89 median years). Five-year overall survival rates were 100%, 93%, and 79% for ASA-PS 1, 2 and 3, respectively. Patients in the ASA-PS 1 group had significantly better prognosis by log-rank test. Univariate analysis showed an increased risk of death as ASA-PS score increased (hazard ratio: 3.03, 95% confidence interval: 1.55–5.92, p=0.00). In multivariate analysis, including patient age and presence of malignancy, patient age was the only significant predictor of overall survival (hazard ratio: 1.09 by year, 95% confidence interval: 1.03–1.14, p=0.00). We concluded that a high ASA-PS score should not inhibit performance of total thyroidectomy if a patient’s age is suitable for the surgery.

Key words: Total thyroidectomy, ASA-PS, General condition, Morbidity, Overall survival

THYROID operation is considered to be safer than other head and neck procedures, even in the 1970s; the mortality after a thyroid operation for non-toxic thyroid goiter was 0.02% for patients aged less than 50 years [1]. However, postoperative side effects such as hypothyroidism, hypoparathyroidism, or occasional vocal cord paralysis may worsen the patients’ prognoses, especially for elderly patients or those with poor general conditions. In a report published in 1978, the postoperative mortality increased by age to 0.66% for patients who were 70 years and older [1]. After 2000, several papers have reported thyroid operation outcomes in elderly patients. Nevertheless, few papers have reported thyroid operation outcomes for patients with severe systemic disease [2-4]. The American Society of Anesthesiologists Physical Status (ASA-PS) classification system is a method of characterizing patient operative risk, and it is performed by anesthesiologists before every procedure in which a patient will undergo anesthesia. It has been reported that this scoring system is useful for predicting medical complications and mortality following surgery [5-7]. We investigated the influence of ASA-PS before general anesthesia on postoperative morbidity, mortality, and survival after total thyroidectomy.

Methods

Between January 2004 and December 2014, a total of 261 patients underwent total thyroidectomy as their

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5 is “a moribund patient who is not expected to survive without the operation”. The last modification was approved by the ASA House of Delegates on October 15, 2014 [8].

To compare the patients’ characteristic and perioperative values among ASA scores, we collected data on the distribution of age, sex, presence of malignancy, duration of hospitalization, duration of postoperative stay, rate of preoperative heparinization or anticoagulant administration, and postoperative mortality. We also examined the distribution of postoperative morbidities by ASA classification. Finally, we estimated the influence of ASA classification on patient overall survival.

For the purpose of comparing the distribution between groups, the Chi-squared test was used to estimate differences. The Mann–Whitney U test was used to compare variables, such as age, days of postoperative stay, and days of hospitalization. The Kaplan–Meier method and log-rank test were adopted to analyze the differences in overall survival among the ASA-PS groups. The Cox regression model was adopted for univariate and multivariate analyses. These analyses were performed with Excel Tokiei 2010 (SAS institute Inc. Cary North Carolina), and P-values < 0.05 were regarded as significant.

### Results

There were 77 ASA-PS 1 cases (30%), 149 ASA-PS 2 cases (58%) and 30 ASA-PS 3 cases (12%). The incidence of comorbidities and specific medications in ASA-PS2 and ASA-PS3 was shown in Table 2 and Table 3. The circulatory comorbidities were the most common in both ASA-PS 2 and ASA-PS 3 groups. There were some patients who received administration of antiplatelet or anticoagulant in ASA-PS2 and 3 groups.

Distributions of patient characteristics by ASA classification are shown in Table 4. Patient age increased significantly with increasing ASA-PS score (median age of 53, 64, and 71 years for respective ASA-PS 1, 2, and 3). Duration of the hospitalization and duration of postoperative hospitalization were significantly longer in the ASA-PS 3 group. The proportion of patients needing preoperative heparinization was also significantly higher in the ASA-PS 3 group. Compared with the other two groups, the proportion of malignant disease was the highest in the ASA-PS 1 group.
The distribution of the postoperative complications is shown in Table 5. Among 30 patients with postoperative recurrent nerve palsy (RNP), seven patients had RNP secondary to cancer invasion prior to surgery, and seven newly emergent RNPs were caused by resecting or shaving the nerve during the operation because of cancer invasion. The RNP was unrelated to cancer invasion in 16 patients (6.3%); it was transient in 14 and permanent 2 (0.8%) patients. No RNP was seen in patients with benign tumors. There was no relationship between morbidity of RNP and ASA-classification (Table 3).

ASA-PS, American Society of Anesthesiologists Physical Status. 

\*1 \(P<0.05 \) (vs ASA 1), \*2 \(P<0.05 \) (vs ASA 2), ** \(P<0.05 \) (vs ASA 1 and vs ASA 2).

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<td>Disease status</td>
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</tr>
<tr>
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<td>Specific medication</td>
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<td>Anticoagulant</td>
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the oral anticoagulant with intravenous heparin during the perioperative period; however, he presented a pulmonary embolism. Including these two deaths, there were 20 deaths during the observation period (3.89 median years): seven deaths were attributed to thyroid cancer and 13 deaths to other causes. Overall survival curves of each ASA-PS group are shown in Fig. 1. Five-year overall survival rates were 100%, 93%, and 79% for ASA-PS 1, 2 and 3 groups, respectively. Patients with ASA-PS 1 showed significantly better prognosis by log-rank test compared with those in the ASA-PS categories. The Cox proportional hazard model test was performed to investigate which factors among age, malignancy, and ASA-PS score, exerted a greater influence on patient overall survival (Table 6). Univariate analysis demonstrated increased risk of death with increasing ASA-PS score (hazard ratio: 3.03, 95% confidence interval: 1.55–5.92, \( p = 0.00 \)). However, multivariate analysis indicated that patient age was the only factor associated with overall survival (hazard ratio: 1.09 by year, 95% confidence interval: 1.03–1.14, \( p = 0.00 \)).

### Discussion

The ASA-classification was introduced in 1941 by Saklad in an attempt to provide a basis for comparison of statistical data in anesthesia [9]. This classification was revised in 1963 with the number of classes being reduced from seven to five [10]. Several retrospective studies have demonstrated a correlation between ASA classification and postoperative mortality, and the

<table>
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<td>ASA-PS score (by one)</td>
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HR, hazard ratio; CI, confidence interval; ASA-PS, American Society of Anesthesiologists Physical Status. Significant \( P \) values are indicated by bold and italics.
proportion of patients corresponding to each class has been changing by the decade [5-7]. Vacanti examined 68,388 cases between 1964 and 1966 in 11 U.S. Naval Hospitals, and the proportion of patients in each class was 74%, 18%, and 5% for ASA-PS 1 to 3, respectively [6]. According to the report by Wolters in 1996, the proportion of patients in ASA-PS 1 decreased to 18% and those of ASA-PS 2 and 3 increased to 43% and 35% [7]. In 2015, Hackett et al. analyzed the data of a cohort of 2,297,629 patients from the 2012 ACS NSQIP database in order to evaluate patients across distinct surgical specialties [5]. Though they excluded patients with cardiac surgery, the proportion of patients in ASA-PS 1, 2, and 3 were 10%, 46%, and 38%, respectively. They also reported the postoperative morbidity and mortality increased with increasing ASA-PS. By ASA-PS 1, 2, and 3 categories, the morbidities were 2%, 5% and 14%, and the mortality was 0.02%, 0.14% and 1.41%, respectively. In the present study, the distribution of the ASA-classification was 30%, 58% and 12% for ASA-PS 1, ASA-PS 2, and ASA-PS 3, and the proportion of the patients with low risk seemed higher than that reported by Hackett et al. This is mainly because thyroid disease requiring total thyroidectomy occurred in comparatively younger and healthy individuals.

In the group of ASA-PS 3 patients, we had two cases of treatment-related death and one was considered as a postoperative death because this patient died within 30 postoperative days. Thus, the postoperative mortality in all patients was 0.4% and 3.3% in ASA-PS 3 patients. In past reports, the most frequent cause of postoperative death after thyroidectomy was hematoma [11, 12]. Especially among patients undergoing antiplatelet or anticoagulation therapy, the odds ratio of presenting postoperative hematoma was 2.12 [12]. In the present study, 12 patients were preoperatively treated with antiplatelets and 21 patients with antiplatelet therapy. Eight patients needed a high preoperative dose of heparinization, and three patients underwent total thyroidectomy while receiving antiplatelet therapy. Two patients in the ASA-PS 2 and ASA-PS 3 groups each presented postoperative cervical hematoma and required re-operation. One patient did not require anticoagulant or antiplatelet therapy and the other required perioperative intravenous heparinization instead of anticoagulant therapy. The morbidity of cervical hematoma was 0.8%, which was almost identical to that in past reports [12-14]. Fortunately, both hematomas were promptly controlled after the revision surgery.

Permanent RNP is the most common complication specific to thyroidectomy, with the morbidity in the past report ranging from 1% to 3% [14-18]. In the present case series, two cases of permanent RNP were unrelated to cancer invasion in the ASA-PS 1 and ASA-PS 2 groups. The morbidity of permanent RNP was 0.8%, which was not higher than the past report. Neither poorer general condition nor age was shown to be a risk factor of permanent RNP in this study. Further, of the 30 patients with postoperative RNP, seven patients already had palsy secondary to cancer invasion prior to the operation and seven newly emergent palsies were caused by resecting or shaving the nerve trans-operatively because of cancer invasion into the nerve. In the ASA-PS 3 group, one patient had preoperative palsy in both vocal cords and two patients presented postoperative RNP because of the intraoperative resection of the recurrent nerve owing to cancer invasion. Among these three patients, two died during postoperative hospitalization because of circulation–respiratory complications. Maximum care should be taken for patients in poorer general condition having RNP, because these patients present dysphagia that is caused by RNP, which can easily lead to serious consequences such as aspiration pneumonia.

Concerning the overall survival, univariate analysis revealed that the hazard ratio of death became more than three as ASA-PS increased by one category in this study. This result, added to the higher postoperative mortality rate up to 3.3% in the ASA-PS 3 group, may be an excuse to avoid total thyroidectomy in patients in poorer general conditions with thyroid cancer, which is comparatively less aggressive than cancers affecting other organs. Surgeons sometimes think that patients in poorer condition may benefit from a longer survival period without undergoing the indicated operation. However, multivariate analysis revealed that patient age was the only factor associated with overall survival and that higher ASA score was not a significant risk factor for poor overall survival. Moreover the incidences of permanent RNP or hematoma were not significantly difference between hemi-thyroidectomy and total thyroidectomy in a large number of the report [14]. Based on these findings, we consider that a high ASA-PS score should not inhibit performance of total thyroidectomy if a patient’s age is suitable for the surgery.
Acknowledgments

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Conflict of Interest Disclosure

None of the authors have any potential conflicts of interest associated with this research.

References