Predictors of pneumonia complication in patients with acute stroke requiring assistance for mobility

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Introduction & Purpose

Pneumonia complication in patients with acute stroke

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 - The incidence of overall infection in acute stroke is 30%.
 - Pneumonia is associated with higher mortality.
 - To prevent pneumonia in patients with stroke is important.
- Westendorp et al. *BMC Neurology*, 2011

 - A^2DS^2 is a clinical score to predict pneumonia after ischemic stroke.

Hoffmann S et al, *Stroke*, 2012

A^2DS^2

- age ≥ 75 y = 1
 - Atrial fibrillation = 1
 - Dysphagia = 2
 - Man = 1
 - NIH stroke scale (NIHSS)
0-4 = 0; 5-15 = 3; ≥ 16 = 5

➤ Hoffmann's study was enrolled mild stroke patients including NIHSS median 4.0 or 5.0.
- Over all, 0-10点
Higher scores is defined as higher risk of pneumonia complication

Cut-off, ≥ 4 (sensitivity, 0.91; specificity, 0.57)
 ≥ 5 (sensitivity, 0.83; specificity, 0.72)

To identify early predictors of pneumonia complications in patients after stroke **requiring assistance for mobility**.

Methods Retrospective cohort study

Subjects

281 stroke patients who admitted our hospital within 3 days after onset (without subarachnoid hemorrhage)

- The rate of pneumonia complication; 15.3%
- Definition of pneumonia complication
 - ① Description of clinical indications
 - ② Positive chest radiograph or CT scan

Data extraction

Characteristics at admission

- Age
 - Gender
 - Body Mass Index
 - Modified Rankin Scale (mRS) before onset
 - Type of stroke
 - Operation or intravascular treatment after onset
 - Serum albumin
 - Total serum protein
 - Dysphagia
- Lesion side
 - NIHSS
 - A^2DS^2 scores

Comorbidities

- Hypertension
- Dyslipidemia
- Diabetes mellitus
- Atrial fibrillation
- Previous stroke and nervous disease
- Heart disease
- Respiratory disease
- Orthopedic disease
- Dementia

Physical therapy (PT) interventions^{*}

- The day of PT started
- The day of initial ambulation
- PT credits among hospitalization (1 credit = 20 minutes)

Outcomes at discharge^{*}

- Days of hospitalization
- Discharge destination

^{*}These factors were excluded as independent variables in multivariate analysis.

Statistic analysis (SPSS ver.24, $P < 0.05$)

- ① Comparison between 2 groups (P group and NP group)
Students T-Tests, Mann-Whitney U Test, Chi-square test
- ② Logistic regression analysis (factors with a significance level of < 0.2 as independent variables for ①)
- ③ Cut-off value, Using receiver operating characteristic (ROC) curves

Results & Discussion

Table 1. Demographic, baseline disease, and clinical characteristics (Present only items with $P < 0.2$)

	Overall (N = 111)	P group (N = 17)	NP group (N = 94)	P
Age, years	72.7 $\pm$ 15.2	80.9 $\pm$ 13.7	71.2 $\pm$ 15.0	0.015
Males gender, n(%)	74 (66.7)	14 (82.4)	60 (63.8)	0.136
mRS before onset, $\geq$ III, n(%)	19 (17.1)	5 (29.4)	14 (14.9)	0.165
Lesion side, Rt, n(%)	51 (45.9)	10 (58.8)	41 (43.6)	0.171
Serum albumin, g/dl	4.0 $\pm$ 0.6	3.8 $\pm$ 0.4	4.0 $\pm$ 0.6	0.115
Total serum protein, g/dl	7.0 $\pm$ 0.7	6.8 $\pm$ 0.4	7.0 $\pm$ 0.8	0.034
NIHSS, points	9.0 (4.0-18.0)	17.0 (6.5-24.0)	9.0 (4.0-17.0)	0.024
Dysphagia, n(%)	75 (67.6)	17 (100.0)	58 (61.7)	0.002
A^2DS^2 scores, points	6.0 (4.0-8.0)	8.0 (7.5-8.5)	5.0 (3.0-8.0)	<0.001
The number of comorbidities, n	4.0 (2.0-5.0)	4.0 (3.0-6.0)	3.5 (1.8-5.0)	0.089
Atrial fibrillation, n(%)	26 (23.4)	7 (41.2)	19 (20.2)	0.115
Orthopedic disease, n(%)	23 (20.7)	7 (41.2)	16 (17.0)	0.045
Dementia, n(%)	8 (7.2)	4 (23.5)	4 (4.3)	0.018
Duration until initial ambulation, days	3.0 (2.0-5.0)	4.0 (3.0-7.0)	3.0 (2.0-5.0)	0.063
Days of hospitalization, days	33.0 (18.0-50.0)	53.0 (39.5-66.5)	30.0 (17.0-47.0)	<0.001
Ratio of home discharge, n(%)	27 (24.3)	0 (0.0)	27 (28.7)	0.011

mean $\pm$ SD or median (IQR; interquartile range)

Table 2. Factors related to incidence of pneumonia in patients with acute stroke (Logistic regression analysis)

	OR(95% CI)	P
The NIHSS at admission	1.07(1.01-1.13)	0.024
A history of orthopedic disease	4.21(1.20-14.82)	0.025
The presence of dementia	6.70(1.26-35.57)	0.026

Stepwise procedure (forward selection (likelihood ratio)) with age, gender, mRS before onset, lesion side, serum albumin, the NIHSS at admission, the number of comorbidities, atrial fibrillation, orthopedic disease, and dementia

NIHSS The cut-off value, 12.5
Sensitivity, 0.58
Specificity, 0.66
AUC, 0.67(0.54-0.80)

Figure. Sensitivity and specificity to predict the pneumonia complication in patients with acute stroke

Limitation

- We did not analyze prevalence of dysphagia in multivariate analysis.
- We had not investigated the onset date of pneumonia.

Conclusion

Concomitant diseases, such as **a history of orthopedic diseases** and **dementia**, are important factors in addition to **the severity of stroke** and may predict pneumonia complications in patients requiring assistance with basic mobility immediately after admission.