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Risk of Aspiration Pneumonia Relation to Swallowing Function

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Objective

This study aimed to evaluate risk of aspiration pneumonia relation to swallowing function. Swallowing process is divided to 3 phases by anatomical location of bolus; 1) oral phase, 2) pharyngeal phase, 3) esophageal phase. Videofluoroscopic study (VFSS) is a diagnostic tool to evaluate swallowing process from oral phase to pharyngeal phase. Considering above, we planned to study what kind of Functional Dysphagia Scoring (FDS) items increase prevalence of aspiration pneumonia.

Methods

Between January 2015 and June 2019, 1245 patients who examined VFSS were collected through reptrospecive chart review. We classified total patiento into two groups which are aspiration pneumonia and non-aspiration pneumonia. (Tab-1) We defined aspiration pneumonia group as those who had pneumonia before and after 1month from VFSS study date. VFSS report consists of 11 items that assess the dysfunction to swallowing by anatomical site. (Tab-3) And then we categorized 11 items to 5 top items. (Tab-2) Oral function includes Lip closure, Bolus formation, Residue in oral cavity, Oral transit tiem. Pharyngeal response includes Pharyngeal delayed time, Laryngeal elevation and epiglottic closure, Pharyngeal transit time. Pharyngeal Residue include Residue in valleculae, Residue in pyriform sinuses. Nasal penetration and Coating of pharyngeal wall after swallow was used according to its original contents.

Result

1,033 patients are non-aspiration pneumonia group and 241 patients are aspiration pneumonia group. The most common disease was cerebral infarction followed by dysphagia, cerebral hemorrhage. (Tab-1) In this study, we defined dysphagia as there was no abnormality of cognitive, anatomy, neuromuscular system and so on. Logistic regression anlysis is detailed in Tab-2 which shows various factor for aspiration pneumonia. Univariable binary logistic regression showed that all of the top items are significantly associated with aspiration pneumonia. Multivariable analysis of significant risk factors revealed that Pharygenal residue were independent risk factor for aspiration pneumonia. (Tab-2) The association between various FDS items and aspiration pneumonia is shown in

Table-3. All those items except Lip closure, Residue in oral cavity, Nasal penetration were significantly higer in the Aspriation pneumonia group.

Conclusion

In this study, All 5 top items were significantly associateed with aspiration pneumoni in univariable binary login regression. On the other hand, Pharyngeal residue were only significant risk factor. All detailed factor in FDS except Lip closure, Residue in oral cavity, Oral transit time, Nasal penetration has a significant difference between twon groups. So, if the dysphagia items listed above is positive, the patients is needed more frequent work-up including VFSS, blood test, vital sign check and we try to offer compensatory feeding method, dysphagia rehabilitation.

	Non aspiration pneumonia (n=1,033)	Aspiration pneumonia (n=241)
Sex		
Female	454 (45.26)	73 (30.29)
Male	549 (54.74)	168 (69.71)
Age	69.73 ± 13.54	73.49 ± 11.38
Disease		
Cerebral Infarction	497 (49.55)	98 (40.66)
Cranial Hemorrhage	193 (19.24)	37 (15.35)
Dysphagia	179 (17.84)	66 (27.38)
Parkinsonism	35 (3.49)	11 (4.56)
CNS lesion	30 (3.10)	9 (3.73)
Traumatic brain injury	27 (3.09)	6 (2.90)
Dementia	12 (1.20)	8 (3.32)
Spinal cord injury	13 (1.30)	3 (1.24)
Amyotrophic lateral sclerosis	7 (0.70)	1 (0.41)
Esophageal cancer	5 (0.50)	1 (0.41)

Tab-1

Cranial hemorrhage : Spontaneous hemorrhage, subarachonid hemorrhage, Moyamoya

CNS lesion : Brain tumor, hydrocephalus, brain abscess, encephalitis, epilepsy

	Uni-variable		Multi-variable	
5 Top items	**OR (95% CI)**	**P-value**	**OR (95% CI)**	**P-value**
Oral Function	1.58 (1.01-2.47)	0.046	1.44 (0.70-2.95)	0.319
Pharyngeal Response	3.43 (1.37-8.61)	0.009	2.27 (0.37-13.89)	0.376
Pharyngeal Residue	1.81 (1.29-2.55)	0.001	2.45 (0.99-6.04)	0.050
Nasal penetration	1.77 (1.05-2.96)	0.031	0.77 (0.06-9.38)	0.841
Coating of pharyngeal wall	2.14 (1.52-3.00)	<0.001	1.59 (0.79-3.21)	0.192

Tab-2

11 items in FDS	Non aspiration pneumonia (n=1,033)	Aspiration pneumonia (n=241)	P-value
Lip closure			0.319
Intact	939 (93.62)	221 (91.70)	
Abnormal	64 (6.38)	20 (8.30)	
Bolus formation			0.043
Intact	266 (26.52)	47 (19.50)	
Abnormal	737 (73.48)	194 (80.50)	
Residue in oral cavity			0.166
Intact	423 (42.17)	89 (36.93)	
Abnormal	580 (57.83)	152 (63.07)	
Oral transit time			0.325
Intact	753 (75.07)	170 (70.54)	
Abnormal	250 (24.93)	71 (29.46)	
Pharyngeal delayed time			0.022
Intact	550 (54.84)	108 (44.81)	
Abnormal	453 (45.16)	133 (55.19)	
Laryngeal elevation and epiglottic closure			0.004
Intact	79 (7.88)	7 (2.90)	
Abnormal	924 (92.12)	234 (97.10)	
Nasal penetration			0.074
Intact	949 (94.62)	219 (90.87)	
Abnormal	54 (5.38)	22 (9.13)	
Residue in valleculae			<0.001
Intact	347 (34.60)	61 (25.31)	
Abnormal	656 (65.40)	180 (74.69)	
Residue in pyriform sinuses			<0.001
Intact	520 (51.84)	87 (36.10)	
Abnormal	483 (48.16)	154 (63.90)	
Coating of pharyngeal wall after swallow			<0.001
Intact	863 (86.04)	179 (74.27)	
Abnormal	140 (13.96)	62 (25.73)	
Pharyngeal transit time			0.010
Intact	558 (55.63)	110 (45.64)	
Abnormal	445 (44.37)	131 (54.36)	

Tab-3