

근감소성 삼킴장애 진단과 재활치료 : 증례토의

Korea University Anam Hospital Department of Physical Medicine and Rehabilitation Bo Ryun Kim



- F/92
- 2016.9.7 Lt. femur neck fracture로 Lt. bipolar hemiarthroplasty 시행 받은 이후 점진적인 보행능력 저하와 함께 최근 3개월간 식이 섭취 감소가 있었던 환자임
- 2021.4.19 호흡곤란 및 발열 발생함
- 2021.4.20 증상 호전되지 않아 본원 응급실 내원하여 시행한 균배양검사상 메티실린내성균 패혈증 진단되어 감염내과 입원하여 vancomycin 투여 시작함
- 2021.4.26 입원당시에 비해 발열 및 전신 위약감 악화되는 추세로 bedside PT 의뢰됨
- 2021.4.30 발열 및 lab 수치들은 호전 추세이나 전신 위약감은 여전히 심한 상태로 식이 섭취 감소 및 부동과 연관 있을 것으로 판단함
- 2021.5.20 내과적 상태 안정화되어 오랜 침상생활로 인한 탈조건화에 대한 포괄적인 재활치료 위하여 재활의학과 전과됨



- Past medical history>
 - Hypertension
 - Atrial fibrillation
 - Dilated cardiomyopathy
 - Osteoporosis
 - S/P Lt. bipolar hemiarthroplasty due to Lt. femur neck fracture (2016.9)
 - H/O L1 compression fracture (2008.12)
 - H/O Rt ACA & MCA borderzone infarction (2007.3)
- Social history>
 - 거주자: 서울시 성북구 아파트, 엘리베이터(+)
 - 동거: 딸
 - Good familial support



- P/Ex>
 - Height: 158 cm weight: 42 kg BMI: 16.8 kg/m²
 - MMSE: 21
 - MMT: upper & lower extremities generally F grade on both sides
 - Sensory: symmetrically intact on both sides
 - Tone: normotonous on all extremities
 - Lt. hip LROM due to Lt. hip pain
 - Sitting balance: static fair, dynamic poor
 - Standing balance: static & dynamic poor
 - Functional status : Koval 7 (nonfunctional ambulator)

<Prior functional status: Koval 6 (household ambulator with walker)>



- P/Ex>
 - Physical performance
 - BBS 2
 - 6MWT NT
 - 10MWT NT
 - TUG NT
 - 5STS NT
 - Grip strength 0.2/0kg
 - Feeding : 연하보조식 1단계
 - Bedside swallowing exam>
 - Lip sealing/mastication/mouth opening: decreased
 - Tongue movement/strength :decreased
 - Gag reflex: decreased
 - HL excursion/promptness : decreased

Lab>

WBC 5,680 /µL

Hb 9.8 g/dL

ESR 49 mm/hr

CRP 11.12 mg/L

BUN/Cr 12.5/0.50 m/dL

P 2.04 mg/dL

Total Ca 7.5 mg/dL

Mg 0.7 mmol/L

Total protein 6.4 g/dL

Albumin 2.5 g/dL

Na 137 mmol/L

K 3.3 mmol/L

Cl 105 mmol/L

00932899

F/92

노경애

290204 - 2(뒤 첫째자리까지)

【등 록 번 호】

【성별 / 연령】

【주민등록번호】

명]

【성



• VFSS (2021.5.24)

Videofluoroscopic Swallowing Study (VFSS)

검사항목 검사식이	Oral transit time (<1-1.25sec)	Pharyngeal delay time (<0.4sec)	Pharyngeal transit time (<1sec)	Penetration	Aspiration	PAS
요플레 2cc	>2.0*	0.3	0.3	+	-	4
요플레 5cc	>2.0*	0.3	0.3	+	-	4
오렌지 쥬스 2cc	>2.0*	0.3	0.3	+	-	3
오렌지 쥬스 5cc	>2.0*	0.3	0.3	+	-	3
된죽 1/2스푼						Not testable
Cup drinking	>2.0*	0.2	0.3	+	-	3
*PAS(Penetration-Aspiration Scale) 5: enters airway/contacts true vocal cord/not ejected 1: doesn't enter airway 5: enters airway/contacts true vocal cord/not ejected 2: enters airway/above true vocal cord/ejected 6: enters airway/below true vocal cord/ejected 3: enters airway/above true vocal cord/not ejected 7: enters airway/below true vocal cord/not ejected 4: enters airway/contacts true vocal cord/ejected 8: enters airway/below true vocal cord/not ejected						

Summary and interpretation

상기 환자 Stroke(2007), femur neck fx 병력으로 Bed ridden 중이시던 분으로, 2021년 04월 19일부터 발열 증 상 발생하여서 응급실 내원함. MRSA bacteremia 진단받고 본원 감염내과 입원하여 항생제 치료 진행함. 금일 정 확한 식이 가능성 평가 위하여 비디오 투시 연하 검사(Videofluoroscopic swallowing study, VFSS) 시행함. 의식 명료하였으나 지시 사항에 대하여 협응도 양호하여 머리 가누기, 앉은 자세 유지하는 데에 어려움 없었음.

이학적 검사 상 혀의 힘과 움직임은 저하되었으며 인두상승과 구역반사 모두 저하되었음.

검사 상 구강기에서 저작기능과 인두기에서 인두 상승 저하되었음. 모든 식이에서 구강기 지연 관찰되었음. 모 든 식이에서 인두기로의 조기 넘김(premature loss) 소견은 없었음. 주스 2cc, 5cc 와 컵 식이에서 PAS 3, 요거트 2cc, 5cc 식이에서 PAS 4의 기도 내 투과(penetration) 소견이 관찰됨. 죽 식이에서 환자 고형물의 저작 및 연하 거부하여 평가할 수 없었음. 검사한 모든 식이에서 삼킴 후 vallecular space와 pyriformis sinus에 중등도의 잔여 물이 관찰됨.

Opinion and Recommendation

 현재 식이 (연하보조식) 유지 하시기 바랍니다. 다만, 구강기 지연으로 인하여 불충분한 영양 공급, 전해질 불균형의 위험성 있어 식사량 불충분할 시 비경구 식이 병행하십시오.
 추후 임상적 필요에 따라 f/u VFSS 시행하십시오.



- Problem list>
 - Gait disturbance
 - Malnutrition
 - MRSA sepsis
 - Multiple comorbidities
 - Dysphagia
 - r/o Sarcopenia





- The concept of sarcopenia
 - In 1989, first introduced as an age-dependent decline in muscle mass (Greek word sarx; muscle, penia; lose)
 - In 2010, European Working Group on Sarcopenia in Older People (EWGSOP)
 - "Sarcopenia is a syndrome characterized by a progressive and generalized loss of skeletal muscle mass and strength"
 - With a risk of adverse outcomes, such as physical disability, poor quality of life and death
 - In 2014. Asian Working Group on Sarcopenia (AWGS)
 - In the AWGS proposal, racial, environmental and cultural differences were taken into consideration
 - In 2016, sarcopenia was included in the ICD-10 (M62.84)

Sarcopenic dysphagia



• The concept of sarcopenic dysphagia

- In 1992, the relationship between malnutrition and dysphagia became a topic of discussion
- In 2000, a causal relationship between aging/malnutrition and dysphagia was suggested
- In 2005, "Dysphagia due to sarcopenia" was first introduced
- In 2012, the term "sarcopenic dysphagia" was first used in the paper published by Kuroda et al
 - Reported a correlation between arm circumference and swallowing function, implying the presence

Variable	MUAC	Albumin	Physical Activity	Communication Ability	Age
Graded water-swallowing test	0.48 ^a	0.10	0.18	0.12	0.17
MUAC	-0.02	0.43 ^a	0.38 ^a	-0.06	
Albumin	0.15	0.15	-0.04		
Physical activity	0.48 ^a	-0.10			
Communication ability	-0.16				



Sarcopenic dysphagia



• The concept of sarcopenic dysphagia

- In 2014, the diagnostic criteria for sarcopenic dysphagia was proposed by the 19th annual meeting of the Japanese Association of Dysphagia Rehabilitation
- In 2017, A diagnostic algorithm for sarcopenic dysphagia was published by the Working Group on Sarcopenic Dysphagia

Table 1 Consensus diagnostic criteria for sarcopenic dysphagia

1) Presence of dysphagia.

- Presence of generalized sarcopenia (generalized loss of skeletal muscle mass and strength).
- The results of imaging tests (computed tomography, magnetic resonance imaging, ultrasonography) are consistent with a loss of swallowing muscle mass.
- The causes of dysphagia are excluded except for sarcopenia.
- 5) The main cause of dysphagia is considered to be sarcopenia (if other causes of dysphagia such as stroke, brain injury, neuromuscular diseases, head and neck cancer, and connective tissue diseases exist).

Definite diagnosis: 1, 2, 3, 4

Probable diagnosis: 1, 2, 4

Possible diagnosis: 1, 2, 5



Figure 1 Diagnostic algorithm for sarcopenic dysphagia. CC, calf circumference; DXA, dual-energy X-ray absorptiometry; BIA, bioimpedance analysis.



Wakabayashi H et al 2014, Mori T et al 2017 et al



Mori T et al 2017 et al, Fujishima I et al 201

- Definition
 - A swallowing disorder due to sarcopenia involving the whole-body skeletal muscles and swallowing muscles
 - Dysphagia w/o sarcopenia of the whole-body skeletal muscles : not considered sarcopenic dysphagia
 - Primary and secondary sarcopenia after inactivity, malnutrition, disease including invasion (acute inflammation), cachexia (chronic inflammation) : included in sarcopenic dysphagia
 - Dysphagia associated with sarcopenia due to neuromuscular disease only not considered





• Specificity of the swallowing muscles

- Pharyngeal and intrinsic laryngeal muscles are striated muscles originated from the fourth brachial arch, which is different from those of somatic muscles composing the skeletal muscles of the extremities
- These muscles are regulated by the respiratory center in the brainstem & show activities that are mainly synchronized with expiration

\rightarrow These muscles are more resistant to disuse-related atrophy than general somatic muscles

- The muscle mass of the geniohyoid muscle, which does not receive cyclic respiratory input, has been reported to decrease with aging
- Little is known about the influence of aging on the thyrohyoid muscle, which does receive respiratory input

→ These differences should be taken into consideration when the pathophysiology of sarcopenia is Mori T et al 2017 et al, Fujishima I et al 2019



- Age-related sarcopenia combined with dysphagia
 - Sarcopenia and dysphagia are common in older people (1-33% with sarcopenia, 11-68% with dysphagia in older people)
 - Age-related loss of the muscle mass involved in swallowing, such as a decease in tongue thickness & the geniohyoid muscle, a increase in the pharyngeal lumen size
 - Problem of decreased tongue pressure, chewing, and swallowing function
 - Poor physical activity \rightarrow less swallowing opportunities & difficulty maintaining a high QoL
 - Loss of teeth, poor oral hygiene, decrease the efficiency of chewing, poor bolus formation, decreased saliva production → contribute to development of dysphagia
 - Other risk factors : poly pharmacy, psychiatric disorders, social isolation, alcohol abuse



Aging	Age-associated muscle loss
Disease	 Inflammatory conditions (e.g., organ failure, malignancy) Osteoarthritis Neurological disorders
Inactivity	 Sedentary behavior (e.g., limited mobility or bedrest) Physical inactivity
Malnutrition	 Under-nutrition or malabsorption Medication-related anorexia Over-nutrition/obesity

The mechanisms of dysphagia caused by sarcopenia are similar for secondary sarcopenia in the generalized skeletal muscles and muscles related to swallowing after inactivity, malnutrition,

Supplementary Table 2

Risk Factors of Sarcopenia in Studies From East and Southeast Asia Since 2014

Categories	Risk Factors
Demographic characteristics	Age, sex
Household status	Living alone or living with children and/or grandchildren; Person's satisfaction with their perceived level of family function (family APGAR score)
Lifestyle habits	Binge drinkers with weekly or daily alcohol consumption (women); short sleep duration or having long sleep duration (women); water intake from food (g/d and cup/d) and dietary water adequacy ratio (mL)
Physical activity	Locomotive syndrome (one study for women)
Dietary pattern, dental	Lower frequency of nut consumption per week; impaired dentition status; higher dietary variety score
condition and nutritional status	(one study for women); lower body mass index (<18.5); risk of malnutrition (MNA score)
Comorbidities	Osteoporosis; cardiovascular risk factors (including type 2 diabetes mellitus, hypertension, dyslipidemia)

APGAR, adaptability, partnership, growth, affection, and resolve; MNA, Mini Nutritional Assessment.



• Association between sarcopenia and inflammation





Pro-inflammatory mediators Calpain Ubiquitin ligases Muscle atrophy

Figure 1 A schema of molecular mechanisms of muscle atrophy by inflammation. Inflammation induces the production of pro-inflammatory cytokines, and activates calpains and caspase-3. Activated calpains and/or caspase-3 cleave myofibrillar proteins. The ubiquitin-proteasome system degrades cleaved proteins. Autophagy is another pathway of muscle atrophy by inflammation.



Figure 4 The vicious cycle of aspiration pneumonia. Onset of aspiration pneumonia induces sarcopenia and makes patients susceptible to the recurrence of aspiration pneumonia; or, sarcopenia induces aspiration pneumonia in older people and causes further muscle atrophy and malnutrition.

Figure 3 Aspiration pneumonia induces muscle atrophy in older patients. (a) Cross-sectional areas of the dorsal muscle group at T12 vertebral level (surrounded by yellow lines) were measured. (b) The crosssectional area in (a) before the treatment was set as 100% and relative change is shown after the treatment. *P < 0.05 versus before the treatment, n = 8 in each group. Modified from Figure 6 in Komatsu *et al.*1 with permission.







• The causal relationship between sarcopenia and dysphagia



• Hospitalization may accelerate the development of sarcopenic dysphagia!





nutrients

MDPI

Article

Development and Predictors of Sarcopenic Dysphagia during Hospitalization of Older Adults

Keisuke Maeda ^{1,2,*}^(D), Yuria Ishida ³, Tomoyuki Nonogaki ⁴, Akio Shimizu ^{1,5}^(D), Yosuke Yamanaka ⁶, Remi Matsuyama ⁶, Ryoko Kato ⁴ and Naoharu Mori ^{1,2}

Table 2. Multivariate	e logistic 1	regression a	malysis fo	or swallowing problems.
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Variables	Adjusted OR	95% CI	p
Age	0.994	0.978-1.010	0.461
Male sex	1.148	0.921-1.429	0.219
CCI score	1.017	0.983-1.053	0.329
PS score	1.278	1.119-1.459	< 0.001
Gait (reference: goes out)			
Out of bed/chair	1.249	0.879-1.775	0.215
Bed/chair	1.716	1.088-2.707	0.020
MNA-SF score	0.919	0.871-0.970	0.002
Food intake (reference: sufficient)			
Insufficient	1.586	1.205-2.088	0.001
None	2.333	1.602-3.397	< 0.001
Length of hospital stay	1.008	1.003-1.013	0.001
Primary disease for admission	abbreviated		

Abbreviations: OR, odds ratio; CI, confidence interval; CCI, Charlson Comorbidity Index; PS, Eastern Cooperative Oncology Group-defined Performance Status; MNA-SF, Mini Nutritional Assessment Short Form.



Figure 1. Prevalence of swallowing disorders at discharge. Percentages and 95% confidence interval of patients with swallowing disorders at the time of discharge from hospital in the groups stratified by age (**A**), Performance Status (**B**), mobility status (**C**), body mass index (**D**), nutritional status assessed by MNA-SF (**E**), and food intake at admission (**F**). The worse the condition observed at admission deteriorates, the more patients suffer from swallowing disorders during hospitalization. Abbreviations: MNA-SF, Mini Nutritional Assessment Short Form.



Figure 3. Prevalence of swallowing disorders regarding possible sarcopenia indicators in a subgroup analysis. Percentages and 95% confidence interval of patients with swallowing disorders at the time of discharge from hospital with comparisons between groups in terms of calf circumference (**A**), hand grip strength (**B**), and possible sarcopenia (**C**). Patients presenting with decreased muscle mass and strength and possible sarcopenia at admission are likely to develop swallowing disorders during hospitalization.



- Diagnosis is quite difficult
- The condition, which is recognized as **sarcopenic dysphagia**, is **underestimated and underdiagnosed** as a cause of symptoms in the older people
- The prevalence of dysphagia in the sarcopenic population was reported to be 32%
- The main clinical presentation is possible through the recording of complications
 - <u>Choking and tracheobronchial aspiration due to loss of deglutition safety</u> → lead to aspiration pneumonia (occur in up to 50 % of the nursing home residents, approximately 45 % die)
 - <u>Dehydration and malnutrition due to loss of deglutition efficacy</u>
- The syndrome of sarcopenic dysphagia : important factor of recurrent aspiration pneumonia and the generalized loss of skeletal muscle

Diagnosis of sarcopenic dysphagia



 Consensus diagnostic criteria for sarcopenic dysphagia was proposed by the 19th annual meeting of the Japanese Association of Dysphagia Rehabilitation in 2014

Table 1 Consensus diagnostic criteria for sarcopenic dysphagia

 Presence of dysphag 	ia.
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- Presence of generalized sarcopenia (generalized loss of skeletal muscle mass and strength).
- The results of imaging tests (computed tomography, magnetic resonance imaging, ultrasonography) are consistent with a loss of swallowing muscle mass.
- The causes of dysphagia are excluded except for sarcopenia.
- 5) The main cause of dysphagia is considered to be sarcopenia (if other causes of dysphagia such as stroke, brain injury, neuromuscular diseases, head and neck cancer, and connective tissue diseases exist).
 - Definite diagnosis: 1, 2, 3, 4
 - Probable diagnosis: 1, 2, 4

Possible diagnosis: 1, 2, 5

• <u>However, imaging evaluations of the loss of mass of the swallowing muscles were difficult to</u> perform, and thus arriving at a definite diagnosis was difficult

Diagnosis of sarcopenic dysphagia

- The diagnostic algorithm for sarcopenic dysphagia was published by the Working Group on

Sarcopenic Dysphagia in 2017 is the only reliable and validated diagnostic method

The cut-off values of the European Working Group on Sarcopenia in Older People 2 (EWGSOP2)

- ✤ Handgrip strength (<27 kg in men, <16 kg in women)</p>
- Appendicular skeletal muscle (ASM)/height² (<7.0 kg/m² in men, <5.5 kg/m² in women)
- ✤ Gait speed (≤0.8 m/s)

The cut-off values of the Asian Working Group for Sarcopenia (AWGS) 2019

- ✤ Handgrip strength (<28 kg in men, <18 kg in women)</p>
- Appendicular skeletal muscle (ASM)/height² (<7.0 kg/m² in men, <5.7 kg/m² in women by bioimpedance, <5.4 kg/m² in women by dual-energy X-Ray absorptiometry)
- ✤ Calf circumference (<34 cm in men, <33 cm in women)</p>
- ✤ Gait speed (≤1.0 m/s)

The cut−off value of tongue pressure ◆ 20< kPa

> Figure 1 Diagnostic algorithm for sarcopenic dysphagia. CC, calf circumference; DXA, dual-energy X-ray absorptiometry; BIA, bioimpedance analysis.



Mori T et al 2017, Wakabayashi H et al 2021

Diagnosis of sarcopenic dysphagia (sarcopenia)

Gait speed ($\leq 1.0 \text{ m/s}$)



Fig. 1. AWGS 2019 algorithm for sarcopenia. F, female; M, male.

Diagnosis of sarcopenic dysphagia (sarcopenia)





The cut-off values of the European Working Group on Sarcopenia in Older People 2 (EWGSOP2)

- ✤ Handgrip strength (<27 kg in men, <16 kg in women)</p>
- ✤ Appendicular skeletal muscle (ASM)/height² (<7.0 kg/m² in men, <5.5 kg/m² in women)
- Gait speed ($\leq 0.8 \text{ m/s}$)



Figure 1. Sarcopenia: EWGSOP2 algorithm for case-finding, making a diagnosis and quantifying severity in practice. The steps of the pathway are represented as Find-Assess-Confirm-Severity or F-A-C-S. *Consider other reasons for low muscle strength (e.g. depression, sroke, balance disorders, peripheral vascular disorders).

Diagnosis of sarcopenic dysphagia (dysphagia)





The assessment of dysphagia

- Simple screening tests : EAT-10, FILS (Food intake level scale), FOIS (Functional oral intake scale)
- Bedside examination tests : TOR-BSST (Toronto bedside swallowing screening), GUSS (Gugging swallowing screen), V-VST (volume-viscosity swallow test), WST (water swallowing test), MWST (modified WST)
- Instrumental tools : videofluoroscopy, videoendoscopic evaluation

Diagnosis of sarcopenic dysphagia (tongue pressure)



Dysphagia (2015) 30:80-87 DOI 10.1007/s00455-014-9577-v

ORIGINAL ARTICLE

Decreased Tongue Pressure is Associated with Sarcopenia and Sarcopenic Dysphagia in the Elderly

Keisuke Maeda · Junji Akagi

© FHUR 2017

Table 4 Univariate analyses show differences in parameters between the non-dysphagia group and dysphagia group

Variable	Dysphagia $(n = 44)$	Non-dysphagia $(n = 60)$	p value
MTP (kPa)	14.7 ± 8.0	25.3 ± 7.7	< 0.001
Age (years)	84.8 ± 4.1	84.2 ± 5.6	0.502
AC (cm)	20.8 ± 3.1	25.3 ± 3.3	< 0.001
TSF (mm)	8.3 ± 5.2	13.5 ± 7.1	< 0.001
AMA (cm ²)	26.7 ± 6.8	35.7 ± 8.0	< 0.001
BMI (kg/m ²)	18.4 ± 3.6	21.8 ± 4.0	< 0.001
Albumin (g/dL)	2.8 ± 0.6	3.4 ± 0.6	< 0.001
MNA-SF (points)	7.1 ± 2.9	9.9 ± 2.8	< 0.001
CONUT (points)	5.8 ± 2.9	3.8 ± 2.7	< 0.001
Barthel index (points)	36.8 ± 34.1	56.4 ± 38.9	0.015
Sex (men, %)	31.8	36.7	0.679
Dentures (%)	59.1	60.0	1.000
Sarcopenia (%)	1.7	31.8	< 0.001

MTP maximum voluntary tongue pressure against the palate, *AC* midupper arm circumference, *TSF* triceps skinfold thickness, *AMA* arm muscle area, *BMI* body mass index, *MNA-SF* Mini-Nutritional Assessment short form

Diagnosis of sarcopenic dysphagia (tongue pressure)



Assessment of Tongue Strength in Sarcopenia and Sarcopenic Dysphagia: A Systematic Review and Meta-Analysis





Chen KC et al 2021

Diagnosis of sarcopenic dysphagia



• Between-study heterogeneity for diagnosis of sarcopenia & sarcopenic dysphagia

Num-Year Diagnosis method of sarcopenic dysphagia Publication type First Author ber of patients 60 Sakai K 2020 Sarcopenia and dysphagia, no other causes of dysphagia Cross-sectional 2020 Diagnostic algorithm for sarcopenic dysphagia Case report Kasahara K Diagnostic algorithm for sarcopenic dysphagia 16 Kunieda K 2020 Case series Sarcopenia and dysphagia, no other causes of dysphagia 2020 Case report Nakayama E Consensus diagnostic criteria for sarcopenic dysphagia Review 0 Azzolino D 2019 0 Fujishima I 2019 Diagnostic algorithm for sarcopenic dysphagia Review 236 Sarcopenia and dysphagia Cross-sectional Cha S 2019 108 Diagnostic algorithm for sarcopenic dysphagia Cohort Wakabayashi H 2019 Sarcopenia and dysphagia Cross-sectional 245 Sakai K 2019 Diagnostic algorithm for sarcopenic dysphagia 125 Cohort Miyauchi N 2019 History recording, physical examination, laboratory Evalua-0 Dellis S 2018 Review tion and diagnostic imaging Wakabayashi H 2018 Diagnostic algorithm for sarcopenic dysphagia Randomized controlled trial 104 55 Ogawa N 2018 Diagnostic algorithm for sarcopenic dysphagia Cross-sectional 2018 Diagnostic algorithm for sarcopenic dysphagia Case report Yamada Y Uno C Diagnostic algorithm for sarcopenic dysphagia Case report 2018 Sarcopenia and dysphagia Case report Hashida N 2017 2017 Sarcopenia and dysphagia, no other causes of dysphagia Cohort 95 Maeda K 119 Mori T 2017 Diagnostic algorithm for sarcopenic dysphagia Cross-sectional Borda MG Consensus diagnostic criteria for sarcopenic dysphagia 2017 Case report Wakabayashi H Consensus diagnostic criteria for sarcopenic dysphagia Case report 2016 Sarcopenia and dysphagia, no other causes of dysphagia Maeda K 2016 Case report Consensus diagnostic criteria for sarcopenic dysphagia 0 Wakabayashi H 2014 Review

 Table 1 Characteristics of included studies on diagnosis







• Plan>

- Nutritional assessment & support
- Swallowing therapy
- Physical therapy



• Nutritional assessment & support>

기영양평가	2021-04-21 09:30 [영양사 : 허주미]
	환자구분 : 성인 1. 영양검색(Nutrition Screening) 1) 연령 : 92 2) BMI : 16.8 3) S-albumin : 3.5 4) 섭취감소 : 유 5) 체중감소 : 무 2. 영양초기평가 결과 [불량]에 해당합니다. 1) 평가점수 : 10.5 2) 평가결과 : 불량
!양경과기록	2021-04-21 10:22 [영양사 : 허주미]
	Nutrition Assessment
	1. Food and Nutrition related History 식욕상태 : 저하 식사처방 : 연하보조식(2단계) 총섭취량 : 600kcal(50% of needs) 평소식품 및 영양소 섭취 : 에너지 1145kcal, 당질 159g, 단백질 46g, 지방 37g (CPF ratio = 56%, 16%, 29%)
	2. Anthropometic Measurements 키 158cm, 체중 42kg, IBW 52.4kg 80.2% BMI 16.8
	3. Biomedical Data Alb: ▼ 2.8, Hgb: 12.9, TLC: 715.4, chol: ▼ 89,
	4. Medical History 진단명 : Fever, unspecified
	5. Nutrition Requirements 에너지(체중당) : 30kcal/kg(IBW) = 1600kcal/d 단백질 52.4 * 1.2g/kg = 63g/day
	 ■ Nutrition Intervention 목표 : 에너지,단백질 요구량의 70% 이상 영양공급 유지 영양교육 * 본 환자는 영양검색지표 평가 결과 BMI, 고령, 식욕상태로 인하여 영양불량군 입니다. * 고령 및 컨디션 저조, 평소 식사섭취 패턴 및 식사섭취량, 병원식 섭취 상태, fever, S-alb level 등의 영양과 관련된 생화학검사 결과 등을 미루어 볼 때 영양상태 Moderate PCM으로 판단됩니다. * 영양상태 개선 위해 식사섭취량 모니터링 하겠습니다. Diet intervention 필요시 영양팀 컨설트 의뢰 요망합니다. 감사합니다.



• Nutritional assessment & support>

2021.4.28 NST 협

[영양사] 최정현

1. Rec. diet: 경관유동식, 일반 1300kcal (300-350-300-350)

2. 환자 4/27 NG tube feeding 개시되어 금일 100+4 (400kcal) feeding 예정입니다.

3. 환자 고령으로 위잔여량, 구토여부, 배변양상 등 소화적응도 주의깊게 관찰하여 주십시오.

적응도 양호할 경우 2-3일간격으로 50cc/1회씩 feeding slowly build up 하며 주시기 바랍니다 . 초기 도달 목표는 300-350-300-350 (1300kcal) 입니다.

4. 환자 refeeding syndrome 에 주의하시고, electrolyte close monitoring 하시기 바랍니다. 5. 환자의 영양상태, 영양지원현황 모니터 시행하겠습니다.

[약사] 김민

feeding 증량 시 TPN 단계적으로 감량하는 것 고려 바랍니다. EN 200-400kcal/day feeding 시 TPN 40ml/hr,EN 600kcal/day feeding 시 TPN 30ml/hr, EN 800kcal/day feeding 시 TPN 20ml/hr, EN 1000kcal/day 도달 시 TPN cut 하여 주십시오.

[간호사] 강주연

경장영양 주입시 주입 및 배설과 관련된 모니터링 필요합니다. bowel sound 확인 및 배변양상 확인해 주십시오.

흡인을 예방하기 위해 영양제공시 제공 후 1시간동안 침상머리를 30-45도 상승시켜주십시오. [의사] 곽정면

feeding 은 적응도 주의깊게 관찰하며 천천히 증량하여 주시고 refeeding syndrome에 주의, 전 해질 close monitoring 하시기 바랍니다.

2021.5.5 NST 협

[영양사] 김주연

1. 환자 5/1 경구섭취 이행, 연하보조식 1단계 섭취 중, 금일 내시경으로 인해 NPO 중입니다.

2. 임상상태, bowel sound 등 모니터하며 diet 재개시점을 결정하며 주십시오.

3. 섭취 적응도, 섭취율 주의깊게 관찰하여 주시고, 충분량 경구섭취 도달 이전까지는 TPN 병
 행 유지하시기 바랍니다. 세부 regimen 은 약제팀 권고를 참고하여 주십시오.

4. 환자의 영양상태, 영양공급현황 모니터 시행하겠습니다.

[약사] 김형진

NPO 지속 시 TPN 50ml/hr 로 증량 공급 고려하여 주십시오. diet 재개 되어 병원식 30% 수준 섭취 시 TPN 30ml/hr, 병원식 50% 섭취 시 TPN 20ml/hr, 병원식 70% 이상 안정적으로 섭취 시 TPN cut 하여 주십시오.

[간호사] 강주연

섭취 시 sitting position 유지하며 천천히 식이 진행하시기 바랍니다. 기침, 사레와 같은 aspiration sx 발생여부 주의깊게 관찰하여 주십시오.

[의사] 곽정면

경구섭취 이행 단계에서 영양지원 감량은 섭취 적용도에 따라 점차적으로 시행될것을 권고합니 다. 섭취량이 충분량 도달시까지 PN 병행 고려하여 주십시오.



• Nutritional assessment & support>

2021.5.13 NST 협

[영양사] 김주연 1. 환자 5/6 경구섭취 이행, 사식으로 죽류 섭취 중입니다. 2. 아직 경구섭취량 충분하지 않으며, 영양불량 지속되고 있습니다. TPN support 유지하며 주 십시오. 섭취량에 따른 세부 regimen 은 약제팀 권고를 참고하시기 바랍니다. 경구섭취 적응도 양호할 경우 병원식으로 이행 고려 바랍니다. (연식(죽)) 4. NST 협진 종료하겠습니다. nutritional further management 필요 시 영양팀 컨설트 의뢰 고 려하며 주십시오. 감사합니다. [약사] 김형진 경구섭취 충분하지 않으므로 당분간 TPN support 유지하며 주십시오. 매끼니 죽 1/3공기 섭취 시 TPN 30m1/hr, 1/2 공기 섭취 시 TPN 20m1/hr, 2/3공기 이상 안정적으로 섭취 시 TPN cut 가 능합니다. TPN 에 tamipool 1vial 유지하시고, furtman 0.5vial 추가로 공급하며 주십시오. 경구섭취 충 분량 도달되어 TPN 중단 시 미량영양소 함께 cut 하시기 바랍니다. [간호사] 강주연 섭취 시 sitting position 유지하며 천천히 식이 진행하시기 바랍니다. 기침, 사례와 같은 aspiration sx 발생여부 주의깊게 관찰하며 주십시오. [의사] 곽정면 경구섭취 미행 단계에서 섭취량 충분량 도달되기 전까지는 영양지원 유지하는 것이 좋겠습니다.

. 위 권고내용을 참고하시며 PN 유지하며 주십시오.



- Swallowing therapy>
 - Oromotor stimulation (ice stick)
 - Tongue exercise
 - Laryngeal movement training
 - Direct swallowing training (요거트, 바나나, 연두부, 죽, 망고주스, 미역국 등 점진적으로 식이 시 도함)
- Physical therapy>
 - Complex PT (gait training from tilt table)
 - Cardiac rehabilitation (PRE ex using leg extension & leg curl, PBWSTT)



- Progress>
 - 5/20 RM 전과 후 VFSS 시행 → 연하보조식 평가 불가하여 현 연하보조식 1단계 유지하고 점도증진제 사용 필요성 설명함.
 - 5/25 연하보조식 1단계 거부하여 연하보조식 2단계 올리고 경과 관찰함.
 - 5/27 지속적으로 식이 거부하여 식이량 지속적으로 적은 상태로 TPN 병행 투여함.
 - 6/2 BBS 2->14점으로 호전됨. Walker로 maximal assist하에 7m 정도 보행 가능함.
 - 6/8 severe constipation으로 주말 동안 관장 3회 시행하였으나 defecation 하지 못하여 GE consult 하에 medication 다량

사용 후 defecation 함.

- 6/11 PBWSTT 0.3km/h 30min 가능함.
- 6/16 환자 집으로의 퇴원 강력히 원하여 퇴원함.
- 7/2 외래 내원함. 하루에 평균 밥 반공기, 뉴케어 하루 반 캔 정도 드신다고 함.

VFSS 시행하였고, 모든 식이에서 aspiration/penetration 관찰되지 않아 점진적으로 RD 까지 증진 가능함을





- Physical rehabilitation
 - Lack of physical activity contributes to pre-existing sarcopenia, so early mobilization and physical activity is very important for every therapeutic intervention
 - Reduction of bed rest and lying down along with increased activity should be the most important directions
 - Encouragement for starting simple tasks like sitting up in bed and walking
 - Resistance training → muscle mass and muscle strength increase is the goal of intervention



• Nutritional support

- Nutritional assessment is important because poor nutritional status is a main characteristic of sarcopenic dysphagia
- Nutritional screening tool
 - MNA-SF (mini nutritional assessmentshort form)
 - SGA (subjective global assessment)
 - GNRI (geriatric nutritional risk index)
 - MST (malnutrition screening tool)
 - MUST (malnutrition universal screening tool)

ľ	Mini Nutritional Assessment Nestlé MNA [®] NutritionInst	itute
0	름: 성별: 나이: 키: cm 체중: kg 일자:	
ж :	해당 사항에 체크하시고, 오른쪽 빈 칸에 점수를 적으십시오.	
S	sreening	
A	지난 3개월 동안 밥맛이 없거나, 소화가 잘 안되거나, 씹고 삼키는 것이 어려워서 식사량이 줄었습니까? 0= 많이 줄었다 1= 조금 줄었다 2= 변화 없다	
В	지난 3개월 동안 몸무게가 줄었습니까? 0= 3kg 이상 감소 1= 모르겠다 2= 1kg-3kg 감소 3= 변화 없다	
c	거동 능력 0= 외출 불가, 침대나 의자에서만 생활 가능 1= 외출 불가, 집에서만 활동 가능 2= 외출 가능, 활동 제약 없음	
D	지난 3개월 동안 정신적 스트레스를 경험했거나 급성 질환을 앓았던 적이 있습니까? 0= 예 2= 아니오	
E	신경 정신과적 문제 0= 중증 치매나 우울증 1= 경증 치매 2= 없음	
F1	체질량 지수 = kg 체중 / (m 높이) ² 0 = BMI < 19 1 = 19 ≤ BMI < 21 2= 21 ≤ BMI < 23 3= BMI ≥ 23	
	체질행지수를 모른 경우 F2 로 가십시오. F1 등답을 하신 분응 F2 를 하실 필요가 없습니다.	
F2	중아리둘레 (Calf circumference, cm) 0 = CC < 31 3 = CC ≥ 31	
Sc	reening score (총 14점)	
12- 8-1 0-7	14 점 정상 73 11 점 영양불량 위험 있음 54 7점 영양불량 143	

Pocket manual of dysphagia 4th edition, Baik HW et al 2019

• Nutritional support

- Aggressive nutrition therapy : management that uses the patient's daily energy expenditure and daily energy accumulation to establish a daily energy requirement that will increase body weight and muscle mass
 - Energy requirement to increase body weight by 1kg : approximately 7500kcal
 - Energy intake of ≥ 30 kcal/kg/day & protein intake of ≥ 1.2 g/kg/day based on the ideal body weight : marked impact on the increase in tongue strength in older adults with sarcopenia
 - Vitamin D supplementation
 - Pharmacological treatment



Fig. 8.1 Nutrients under consideration for the treatment of low muscle mass. *HMB* beta-hydroxy beta-methylbutyrate, *EPA* eicopentaenoic acid. (Adapted from Prado et al. J Cachexia Sarcopenia Muscle. 2020; 11: 366–380 [53] and Prado et al. Ann Med. 2018;50:675–693)





• Nutritional support



Interdisciplinary nutritional management and care for older adults, Holst M et al 2021

• Primary Care Nutrition Pathway for Hospital to Community Transitions

Primary Care Nutrition Pathway for Hospital to Community Transitions A Guide for Providing Nutrition Care to At Risk and Malnourished Patients from Hospital to Community



· Solid arrows indicate prioritized actions. Refer to the guidance document for more information the Canadian Nutrition Society.

- Dysphagia rehabilitation
 - Prompt initiation of oral intake is important !
 - Compensative strategy
 - Immediate benefit to patient
 - Postural adjustments (90' seated position & keeping for at least 30 min after the meal)
 - Swallowing maneuvers (e.g., Mendelsohn's maneuver, supra-and super-supraglottic swallow, effortful swallow)
 - Diet texture modifications (changes in the consistency of solid and/or liquid foods))
 - Rehabilitative strategy
 - Wide spectrum of resistance training exercises (e.g., head raising exercises, tongue strengthening exercises) to train the swallowing muscles

Treatment of sarcopenic dysphagia (case reports)



Table 2Case reports of sarcopenic dysphagia

	Maeda <i>et al.</i> ⁶⁹	Wakabayashi <i>et al.</i> ⁷⁰	Hashida <i>et al.</i> ⁷¹
Disease	Aspiration pneumonia	Lung cancer surgery	Tongue cancer surgery
Age (years) and sex	80-year-old woman	71-year-old man	75-year-old woman
Height	153 cm	174.5 cm	158 cm
Bodyweight	22.0 kg	46.6 kg	32 kg
Body mass index	9.4 kg/m ²	15.3 kg/m ²	12.8 kg/m ²
Weight loss rate	27.3%/5 months	18%/80 days	10.5%/6 months
MNA-SF	2 points	2 points	8 points
Barthel Index at the time of intervention	0 points	27 points	75 points
FOIS at the time of intervention	1	1	1
Nutritional care management	1830 kcal/day	2200 kcal/day	1900 kcal/day
	83.2 kcal/kg current bodyweight 35.3 kcal/kg ideal bodyweight	47.2 kcal/kg current bodyweight 32.8 kcal/kg ideal bodyweight	59.3 kcal/kg current bodyweight 34.6 kcal/kg ideal bodyweight
Bodyweight after intervention	33 kg	55.5 kg	45 kg
Body mass index after intervention	14.1 kg/m ²	18.2 kg/m ²	18.0 kg/m ²
FOIS after intervention	5	7	3
Barthel Index after intervention	50 points	100 points	100 points

FOIS, Functional Oral Intake Scale; MNA-SF, Mini Nutritional Assessment-Short Form.

- Common history : elderly status, malnutrition, low independence in ADL, presence of disease (aspiration pneumonia or cancer)
- Common risk factors : obvious whole-body sarcopenia, aging, inactivity, malnutrition, diseases
- Common rehabilitation strategies : dysphagia rehabilitation, nutritional support consisting of 30~35kcal/kg IBW/day

Treatment of sarcopenic dysphagia (case reports)

- An 80-year-old woman with a history of severe dysphagia and no oral intake
- Comprehensive care intervention
 - Nutritional intake : 23.2kcal/kg IBW/day → 35.3kcal/kg IBW/day
 - Protein intake : 0.84g/kg IBW/day → 1.42g/kg IBW/day

&

- Active nursing care
- Physical
- dysphagia



Figure 2. Changes in body weight in an 80-year-old woman with a history of severe dysphagia and no oral intake. The body weight increased gradually after the comprehensive care intervention initiated; it could be 33 kg after 7 months of intervention. The patient's body weight returned to the same level as before the onset of dysphagia.

Table. Outcomes of physical and dysphagia rehabilitation in an 80-year-old woman with a history of severe dysphagia and no oral intake^a

	Premorbid status (September 2012)	Pre-intervention (April 2013)	Post-intervention (September 2013)
Barthel index (points)	80	0	40
Functional oral intake scale	Level 6	Level 1	Level 5
Mid-upper arm circumference (cm)	_	11.7	17.5
Triceps skinfold thickness (mm)	_	0.5	6
Mid-arm muscle area (cm ²)	_	8.2	19.4
Hand-grip strength (kg)	_	2	6.5

^aAfter intervention by multi-disciplinary comprehensive care, the nutritional parameters including mid-upper arm circumference, triceps skinfold thickness, mid-arm muscle area, and handgrip strength could be better, as well as the activities of daily living and swallowing function.



Summary



• The concept and definition

• A swallowing disorder due to sarcopenia involving the whole-body skeletal muscles and swallowing muscles

• Mechanism and risk factors

- The mechanisms of sarcopenic dysphagia are similar for those of secondary sarcopenia (inactivity, malnutrition, disease)
- Sarcopenia and dysphagia have a causal relationship
- Hospitalization may accelerate the development of sarcopenic dysphagia

• The evaluation and diagnosis

- Diagnosis is quite difficult, and underestimated and underdiagnosed
- A diagnostic algorithm for sarcopenic dysphagia in 2017 is the most widely used diagnostic method

• Treatment and rehabilitation

- Interdisciplinary rehabilitation nutrition consisting of nutritional support, physical and dysphagia rehabilitation might be useful
- Additional interventional studies are imperative to develop definite diagnostic criteria and clinical practice

