Presentation Number: P16-037-20

Comparison of feeding efficacy and hospital mortality between small bowel and nasogastric tube enteral nutrition in critical illness at high nutritional risk

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OBJECTIVE：

The current guidelines recommend that early enteral nutrition (EN) support by nasogastric tube enteral nutrition (NGEN) should be initiated within 48 h in the critically ill patients at high nutritional risk. Small bowel EN (SBEN) was suggested for those who are NGEN intolerance. Our previous study showed adjuvant feeding with SBEN on the 7th ICU day may improve feeding efficacy and have survival benefit for those energy achievement rate more than 65% at the 3rd day after SBEN. However, the comparison of feeding efficacy and hospital mortality between SBEN and NGEN remains unclear.

METHODS：

A retrospective cohort study enrolled 113 critically ill patients at high nutrition risk (modified NUTRIC score ≧5) and at inadequate feeding volume (<750ml/day) in the first week of ICU stay. Patients were classified into SBEN (N=48) and NGEN (N=65) group on the 7th ICU day (enrolled day). Daily actual energy intake was recorded after enrolled day in each group and feeding efficacy was compared between two groups. Cox regression analysis was used to assess factors associated with hospital mortality.

RESULTS：

The feeding volume, energy and protein intake, and achievement rate (%) of energy and protein intake increased significantly in the SBEN group (Tab 1, Fig 1). Hospital mortality in this cohort was 43.3% (Tab 2). By univariate analysis, SBEN group (HR: 0.56, 95% CI: 0.31-1.00,p=0.049), SOFA score on the 7th ICU day (HR:1.12, 95% CI: 1.03-1.22, p=0.009) and energy intake achievement rate < 65% at the 3rd followed-up day (HR: 2.53, 95% CI: 1.25-5.11, p=0.010) were associated with hospital mortality (Tab 3). By multivariate analysis, the only factor associated hospital mortality in this cohort was energy intake achievement rate < 65% at the 3rd followed-up day (HR: 2.29, 95% CI: 1.12-4.69, p=0.023) (Tab 3, Fig 2).

CONCLUSIONS：

Replace NGEN with SBEN on the 7th ICU day significantly improve energy delivery and may reduce hospital mortality risk in patients at high nutritional risk. The key factor determining survival in this population is an energy intake requirement rate > 65% within 3 days of SBEN initiation.

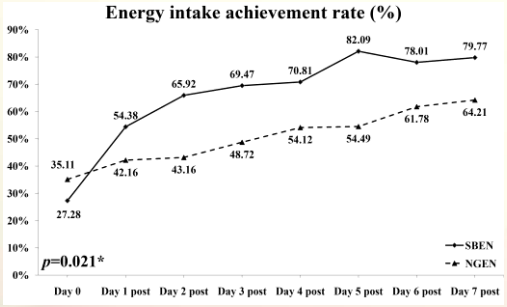

Figure 1. Achievement rate of energy intake between SBEN and NGEN group.

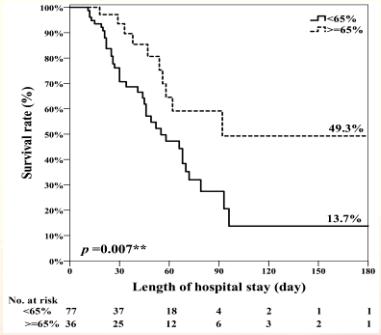

Figure 2. Energy achievement rate > 65% at the 10th ICU day was significantly associated with lower hospital mortality in patients with high nutrition risk. ** *p* =0.007

Table 1. Comparison feeding efficiency between SBEN and NGEN group at 3rd post-enrolled day in malnourished critically ill ICU patients

	SBEN group (n=48)		NGEN group (n=65)		*p* value
	Median	IQR	Median	IQR	
Energy intake achievement rate (%)	60.29	(41.29-75.11)	49.02	(32.36-66.74)	0.026*
Protein intake achievement rate (%)	49.63	(34.16-62.01)	40.85	(25.78-57.18)	0.029*
Actual feeding volume (ml/day)	992.88	(706.44-1191.38)	824.50	(541.38-1054.88)	0.025*
Actual energy intakes (kcal/day)	921.15	(635.79-1172.81)	707.40	(487.24-949.39)	0.004**
Actual protein intakes (g/day)	36.37	(25.43-46.91)	28.30	(19.49-37.98)	0.005**
Actual protein intakes (g/kgBW)	0.60	(0.41-0.74)	0.49	(0.31-0.69)	0.029*

Mann-Whitney U test. *p<0.05, **p<0.01.

Table 2. Demographic characteristics, severity scores and clinical outcomes of all malnourished patients in the intensive care unit.

	SBEN group (n=48)		NGEN group (n=65)		*p* value
Age (year)	70.45	(59.75-79.94)	74.17	(54.63-85.12)	0.423
Gender-Male (n,%)[c]	31	(64.58%)	48	(73.85%)	0.393
Body mass index (kg/m^2)	23.62	(21.29-27.32)	22.77	(21.1-25.05)	0.238
mNUTRI Score	7.00	(5.25-8)	7.00	(5.5-8)	0.491
APACHE II score	27.00	(24-32.75)	30.00	(27-33)	0.156
SOFA-day 1	10.00	(8-12.75)	10.00	(6.5-13)	0.875
Average intake achievement rate (%) ≧65% (at the 3rd day) (n,%)[c]	22	(45.83%)	17	(26.15%)	0.048*
In-hospital mortality (n,%)[c]	21	(43.75%)	28	(43.08%)	1.000

[c]Chi-square test. Mann-Whitney U test. *p<0.05. mNUTRIC: Modified Nutrition Risk in Critically Ill. SOFA: Simplified Organ Failure Assessment. APACH II: Acute Physiology and Chronic Health Evaluation II.

Table 3. Univariate and multivariate analysis of factors associated with hospital mortality

	Univariate analysis			Multivariate analysis		
	HR	(95% CI)	*p* value	HR	(95% CI)	*p* value
Age (year)	0.99	(0.98- 1.01)	0.515			
Group (SBEN vs NGEN)	0.56	(0.31- 1.00)	0.049*	0.65	(0.36- 1.18)	0.160
Gender (Female vs Male)	0.62	(0.32- 1.20)	0.155			
Body mass index (kg/m^2)	0.97	(0.91- 1.04)	0.356			
mNUTRIC score	0.91	(0.72- 1.14)	0.403			
APACHE II score	1.01	(0.96- 1.06)	0.742			
SOFA-day 1	0.99	(0.92- 1.07)	0.811			
SOFA-day 3	1.05	(0.97- 1.13)	0.223			
SOFA-day 7	1.12	(1.03- 1.22)	0.009**			
Energy intake achievement rate (%) at the 3rd day (<65% vs >=65%)	2.53	(1.25- 5.11)	0.010*	2.29	(1.12- 4.69)	0.023*

Cox regression. *p<0.05, **p<0.01.