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The Validity of a Modified Swallowing Screening Tool for Critically Ill Trauma Patients

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Introduction

ICU-acquired swallowing dysfunction, particularly post-extubation dysphagia, is a common complication in critically ill patients and is associated with aspiration pneumonia, prolonged hospitalization, as well as increased morbidity and mortality. Early identification of dysphagia is therefore essential in the ICU setting. Although fiberoptic endoscopic evaluation of swallowing (FEES) is the gold standard for diagnosis, its routine use in trauma ICUs is often limited, and no validated bedside screening tool exists for this population. Therefore, we aimed to evaluate the validity and inter-rater reliability of a modified dysphagia screening tool for critically ill trauma patients in the ICU.

Methods

This prospective study included critically ill trauma patients admitted to the ICU who required dysphagia screening based on established risk factors. Patients with tracheostomy, direct neck injury, altered mental status, or pre-existing dysphagia were excluded.

The modified screening tool consisted of a preliminary assessment of alertness, voluntary cough, saliva swallowing, and vocal cord mobility using vocal cord US, followed by a stepwise direct swallowing test progressing from semi-solid to solid consistencies. Swallowing safety, including cough, drooling, and voice change, was evaluated, and results were compared with flexible endoscopic evaluation of swallowing.

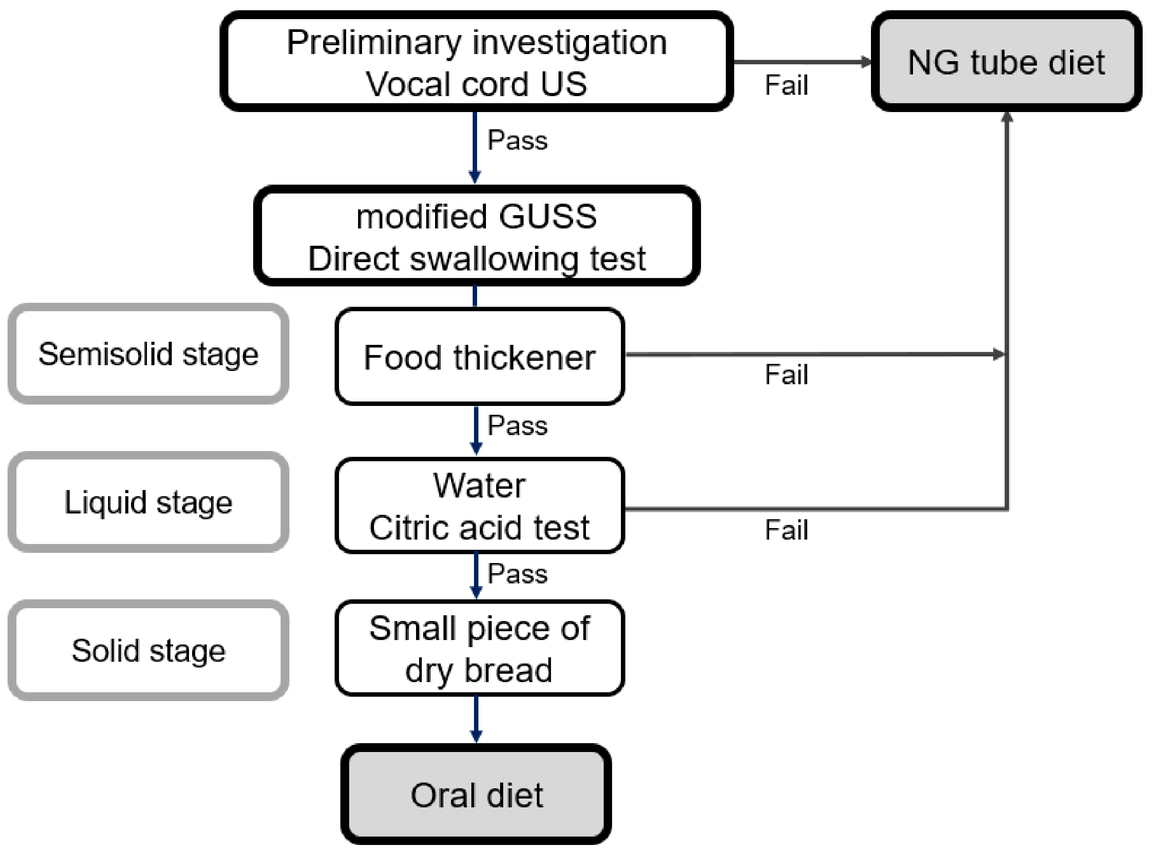

Fig 1. Flowchart of the modified dysphagia screening tool for critically ill trauma patients (Abbreviations : US, ultrasound; GUSS, Gugging Swallowing Screening; NG, nasogastric)

Results

Among 55 potentially eligible patients, 48 were included in the final analysis. The mean age was 59.0 ± 19.9 years, and 79.2% were male. Major trauma (ISS >15) was present in 85.4% of patients and the mean duration of intubation was 5.21 ± 7.8 days.

US assessment of vocal cord mobility was feasible in 97.9% of cases. Compared with FEES, US demonstrated a sensitivity of 60.0% and specificity of 97.6% for detecting vocal cord palsy, with a positive predictive value of 75.0% and negative predictive value of 95.4%. For detection of dysphagia using FEES as the reference standard, the modified GUSS showed a sensitivity of 78.6% and specificity of 97.1% for rater 1, and 71.4% and 97.1% for rater 2, respectively. The positive predictive values were 91.7% and 90.9%, and the negative predictive values were 91.7% and 89.2%, respectively. The area under the ROC curve was 0.872 for rater 1 and 0.923 for rater 2.

Table 1. Diagnostic accuracy of ultrasound for vocal cord palsy compared to FEES (N=47)

	FEES vocal cord palsy	FEES normal	
Assessable (visualization rate)			97.9% (47/48)*
US vocal cord palsy	3	1	PPV=75.0% (95%CI 27.6-95.9%)
US normal	2	41	NPV=95.4% (95%CI 87.5-98.4%) Prevalence = 10.6% PLR=25.2 (3.20-198.62) NLR=0.41 (0.14-1.20)
	Sensitivity = 60.0% (95%CI 14.7-94.7%)	Specificity = 97.6% (95%CI 87.4-99.9%)	

Table 2. Sensitivity, specificity, and predictive values of the modified gugging swallowing screen in trauma ICU compared to flexible endoscopic evaluation of swallowing

	FEES Dysphagia positive FEDDS (3-6)	FEES Dysphagia negative FEDDS (1,2)	
Modified GUSS, rater 1			
Dysphagia positive (GUSS 0-14)	11	1	PPV=91.7% (95%CI 84.7-99.9%)
Dysphagia negative(GUSS 15-20)	3	33	NPV=91.7% (95%CI 80.1-96.8%) Prevalence=31.1% PLR=26.71 (3.80-187.81) NLR=0.22 (0.08-0.60)
	Sensitivity = 78.6% (95%CI 49.2-95.3%)	Sensitivity = 97.1% (95%CI 84.7-99.9%)	
Modified GUSS, rater 2			
Dysphagia positive (GUSS 0-14)	10	1	PPV=90.9% (95%CI 58.5-98.6%)
Dysphagia negative(GUSS 15-20)	4	33	NPV=89.2% (95%CI 78.2-94.9%) Prevalence=31.1% PLR=24.29 (3.42-172.27) NLR=0.29 (0.13-0.68)
	Sensitivity = 71.4% (95%CI 41.9-91.6%)	Sensitivity = 97.1% (95%CI 84.7-99.9%)	

Conclusion

GUSS and US are feasible tools for dysphagia assessment in critically ill trauma patients in the ICU, demonstrating strong validity and high inter-rater agreement. Although operator training is required, the learning period is short and quality control can be maintained through periodic education. Given the lack of established dysphagia assessment guidelines in the ICU, this study supports the implementation of an evidence-based protocol. Modified GUSS may serve as a viable and sufficient alternative, particularly in settings where FEES is not readily available.