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Dysphagia is associated with worse clinical outcomes in geriatric trauma patients

Heather R Kregel,[1] Mina Attia,[1] Claudia Pedroza,[2] David E Meyer,[1] Michael W Wandling,[1] Shah-Jahan M Dodwad,[1] Charles E Wade,[3] John A Harvin ,[1] Lillian S Kao,[1] Thaddeus J Puzio [1]

[1]Department of Surgery, McGovern Medical School at the University of Texas Health Science Center, Houston, Texas, USA
[2]Center for Clinical Research and Evidence-Based Medicine, McGovern Medical School at the University of Texas Health Science Center, Houston, Texas, USA
[3]Center for Translational Injury Research, McGovern Medical School at The University of Texas at Houston, Houston, TX, USA

Correspondence to
Dr Thaddeus J Puzio; thaddeus.j.puzio@uth.tmc.edu

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ABSTRACT

Introduction Dysphagia is associated with increased morbidity, mortality, and resource utilization in hospitalized patients, but studies on outcomes in geriatric trauma patients with dysphagia are limited. We hypothesized that geriatric trauma patients with dysphagia would have worse clinical outcomes compared with those without dysphagia.

Methods Patients with and without dysphagia were compared in a single-center retrospective cohort study of trauma patients aged ≥65 years admitted in 2019. The primary outcome was mortality. Secondary outcomes included intensive care unit (ICU) length of stay (LOS), hospital LOS, discharge destination, and unplanned ICU admission. Multivariable regression analyses and Bayesian analyses adjusted for age, Injury Severity Score, mechanism of injury, and gender were performed to determine the association between dysphagia and clinical outcomes.

Results Of 1706 geriatric patients, 69 patients (4%) were diagnosed with dysphagia. Patients with dysphagia were older with a higher Injury Severity Score. Increased odds of mortality did not reach statistical significance (OR 1.6, 95% CI 0.6 to 3.4, p=0.30). Dysphagia was associated with increased odds of unplanned ICU admission (OR 4.6, 95% CI 2.0 to 9.6, p≤0.001) and non-home discharge (OR 5.2, 95% CI 2.4 to 13.9, p≤0.001), as well as increased ICU LOS (OR 4.9, 95% CI 3.1 to 8.1, p≤0.001), and hospital LOS (OR 2.1, 95% CI 1.7 to 2.6, p≤0.001). On Bayesian analysis, dysphagia was associated with an increased probability of longer hospital and ICU LOS, unplanned ICU admission, and non-home discharge.

Conclusions Clinically apparent dysphagia is associated with poor outcomes, but it remains unclear if dysphagia represents a modifiable risk factor or a marker of underlying frailty, leading to poor outcomes. This study highlights the importance of screening protocols for dysphagia in geriatric trauma patients to possibly mitigate adverse outcomes.

Level of evidence Level III.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ The rate of dysphagia increases with age and the lifetime prevalence has been estimated to be as high as 38% in patients over age 65 years.
⇒ The number of injured geriatric patients admitted to trauma centers is increasing nationwide, but studies regarding prevalence, risk factors for, and impact of dysphagia in this vulnerable population are lacking.

WHAT THIS STUDY ADDS

⇒ Our study identified the prevalence of dysphagia in the absence of universal screening and demonstrated its clinical significance in a population of geriatric trauma patients.
⇒ We illustrated that in this group, those diagnosed with dysphagia were more likely to have worse outcomes including: unplanned intensive care unit (ICU) admission, non-home discharge, increased hospital, and ICU length of stay.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Our study demonstrates the clinical significance of dysphagia in this patient population and highlights a need for future studies to explore early recognition and treatment strategies to mitigate its impact.

INTRODUCTION

Dysphagia is a serious medical condition that can lead to increased morbidity (pneumonia, malnutrition, aspiration), mortality, and resource utilization in hospitalized patients.[1 2] The rate of dysphagia increases with age and the lifetime prevalence has been estimated to be as high as 38% in patients over age of 65 years.[3] Additionally, traumatic injury may result in additional risk factors for dysphagia such as cervical spine or traumatic brain injury.[1] Although the number of injured geriatric patients admitted to trauma centers is increasing nationwide, studies regarding prevalence, risk factors for, and impact of dysphagia in this highly vulnerable population are lacking.[1 4 5]

In severe forms, dysphagia can lead to aspiration, where ingested material enters the airway and is the etiology of pneumonitis and pneumonia.[5] Dysphagia can also propagate malnutrition by reducing oral intake in geriatric patients, a population with a high baseline susceptibility to malnutrition.[6 7] A strategy to mitigate these clinical consequences of dysphagia requires early recognition and treatment through bedside screening.[8] However, while screening tests are often universal following stroke,[9] in the trauma population, no consensus guidelines exist and unfortunately

dysphagia is often recognized retrospectively following occurrence of related adverse outcomes.

The prevalence of clinically apparent dysphagia in the absence of a standardized screening protocol and its impact on morbidity and mortality in geriatric trauma patients are unknown. In this study, we aimed to define the prevalence of dysphagia diagnosed following trauma without a universal screening protocol and to evaluate the association between dysphagia and clinical outcomes. We hypothesized that geriatric trauma patients with diagnosed dysphagia would have worse clinical outcomes compared with those without dysphagia.

METHODS

A retrospective cohort study was conducted of trauma patients aged ≥65 years admitted to an urban level 1 trauma center following trauma injury from January 1, 2019 to December 31, 2019. Demographic, injury, and outcome data were obtained from the institutional trauma registry and supplemented with manual review of the electronic medical record where indicated.

Outcome measures

All patients evaluated by speech therapy were identified with patient query from the speech therapy team, and manual chart review identified patients diagnosed with dysphagia based on speech therapy evaluation, and objective testing following provider referral. Diagnostic tests used were modified barium swallow (MBS) and fiberoptic endoscopic evaluation of the swallow (FEES).

Patients with dysphagia were compared with those without dysphagia. The primary outcome was in-hospital mortality. Secondary outcomes included intensive care unit (ICU) length of stay (LOS), hospital LOS, discharge destination, pneumonia, ventilator days, sepsis, acute respiratory distress syndrome, and unplanned ICU admission, which were obtained from the prospectively maintained trauma database. These outcome measures were recorded according to the standardized definitions by the National Trauma Data Standard.[10]

Statistical analysis

Median values with IQRs were used to describe continuous data, and discrete data were reported as frequency and percentage. Kruskall-Wallis and χ^2 tests were used to compare continuous and categorical demographic data and outcomes, respectively. Univariate and multivariable frequentist general linear and logistic models were used to determine the association between dysphagia and clinical outcomes. Potential confounders based on clinical judgement consisting of age, Injury Severity Score (ISS), mechanism of injury, and sex were selected a priori and included as covariates in all the models. Associations were reported as OR with 95% CIs.

Bayesian analyses were also conducted to calculate the probability of increased risk of adverse outcomes. Negative binomial models were used to estimate relative risk ratios for count continuous outcomes. Logistic regression models were used to determine ORs of dichotomous outcomes. Bayesian analyses use three components to estimate probability of magnitude of effect or harm. A *prior* probability is the hypothesized effect estimated from previous research. The *likelihood* comprises the evidence in the current study. These are then combined to generate a *posterior probability*, from which we obtain the point estimate and 95% credible interval (95% CrI) of effect, which demonstrates the magnitude and precision of this effect.[11–14] This probability can then be used to assess the probability of benefit or harm associated with the intervention or exposure being analyzed. In this study, we used a neutral prior centered at an OR/relative risk of 1.0 with values >1.0 indicating increased risk of outcome for subjects with dysphagia. For example, if the posterior probability of dysphagia is 50% for the primary outcome, it would be interpreted that dysphagia has a 50% probability of being associated with in-hospital mortality, suggesting that the presence or absence of dysphagia has a similar effect on in-hospital mortality. All data analyses were conducted in R V.3.53 (R Foundation for Statistical Computing, Vienna, Austria).

RESULTS

Patient and injury characteristics

Of 1706 geriatric patients identified for analysis after admission to the hospital following traumatic injury, 1690 patients (99%) had a blunt mechanism of injury, and 916 (54%) were women; 98 patients (5%) were screened for dysphagia, of which 69 patients (4%) were diagnosed with dysphagia. Nine patients (13%) had a gastrostomy tube recommended for feeding access. Patients with dysphagia were older and had a higher ISS (table 1).

Primary outcome

On univariate analysis, patients with dysphagia had higher rates of mortality (table 2). On multivariable frequentist analysis, increased odds of mortality did not reach statistical significance (OR 1.6, 95% CI 0.6 to 3.4, p=0.30) (table 3). On Bayesian analysis, there was a 73% posterior probability that dysphagia was associated with increased mortality (OR 1.2 (95% CrI 0.7 to 2.0)).

Secondary outcomes

On frequentist analysis, dysphagia was associated with increased odds of unplanned ICU admission (OR 4.6, 95% CI 2.0 to

Table 1 Demographics

	No dysphagia (n=1637)	Dysphagia (n=69)	All patients (n=1706)	P value
Age, years	77 (70–84)	81 (74–88)	77 (70–85)	<0.01
Female sex	881 (54%)	35 (51%)	916 (54%)	0.61
Injury Severity Score	9 (5–16)	10 (9–17)	9 (5–16)	<0.001
Blunt mechanism of injury	1625 (99%)	65 (94%)	1690 (99%)	0.55
Fall	1303 (80%)	47 (72%)	1350 (80%)	
MVC	148 (9%)	8 (12%)	156 (9%)	

Continuous data presented as: median (IQR).
Categorical data presented as: n (%).
MVC, Motor Vehicle Collision.

Table 2 Outcomes, univariate analysis

	No dysphagia (n=1637)	Dysphagia (n=69)	All patients (n=1706)	P value
Mortality	87 (5%)	8 (12%)	96 (6%)	0.02
Sepsis	9 (1%)	2 (3%)	11 (1%)	0.01
Acute respiratory distress syndrome	2 (0.1%)	0 (0%)	2 (0.1%)	0.78
Pneumonia	6 (0.4%)	1 (1.4%)	7 (0.4%)	0.17
ICU admission	597 (37%)	38 (55.1%)	635 (37.2%)	<0.01
Unplanned ICU admission	48 (3%)	9 (13%)	57 (3%)	<0.001
Intubated	167 (10.2%)	21 (32.3%)	188 (11.1%)	<0.001
Ventilator days	0 (0–1)	0 (0–2)	0 (0–1)	<0.001
ICU length of stay	0 (0–1)	2 (0–9)	0 (0–1)	<0.001
Hospital length of stay	5 (2–9)	15 (8–25)	5 (2–9)	<0.001
Discharge to home	686 (42%)	6 (9%)	692 (41%)	<0.001
Discharge to skilled nursing facility	453 (28%)	38 (55%)	491 (29%)	<0.001
Discharge to hospice	46 (3%)	7 (10%)	53 (3%)	<0.001

Continuous data presented as: median (IQR).
Categorical data presented as: n (%).
ICU, intensive care unit.

9.6) and non-home discharge (OR 5.2, 95% CI 2.4 to 13.9). Increased odds of sepsis (OR 5.6, 95% CI 0.1 to 23.7) did not reach statistical significance (table 3). Furthermore, dysphagia was associated with longer hospital and ICU LOS on adjusted linear regression (table 3). On Bayesian analysis, there was a >99% posterior probability that dysphagia was associated with increased hospital LOS, ICU LOS, and non-home discharge (table 4).

DISCUSSION

In this study, we found that patients with diagnosed dysphagia were more likely to have unplanned ICU admission, non-home discharge, increased hospital and ICU LOS after controlling for age, ISS, gender, and mechanism. The incidence of dysphagia diagnosed based on clinical concern and in the absence of universal screening was 4% in our geriatric trauma population. Our study demonstrates the clinical significance of dysphagia in this patient population and highlights the potential benefit of more rigorous screening protocols as no consensus screening guidelines currently exist for dysphagia in geriatric trauma patients.

Only 4% of patients in our study were diagnosed with dysphagia, due to underdiagnosis from a lack of screening protocol for asymptomatic patients. The incidence of dysphagia varies based on population but has been cited as afflicting 1 in 25 adults in the general US population.[15 16] Epidemiological reports cite a prevalence of dysphagia in one-third of hospitalized geriatric patients, 38% of elderly who live independently, and 68% of residents in long-term care settings.[16–22] Screening for dysphagia is heterogenous in practice, varies between hospitals, and depends largely on resources available. Dysphagia screening often begins with a bedside nursing screen, but these have only been validated in the stroke population and are limited in use due to time and training required for widespread utilization.[23–25] Confirmatory testing, including MBS or FEES, is used when dysphagia is suspected but often not until clinical ramifications of dysphagia, such as aspiration, have manifested.[26 27]

Dysphagia is multifactorial, with causes ranging from neurological impairment and medication side effects to direct trauma, and is associated sarcopenia, dementia, critical illness, and frailty.[23 28–31] Studies in trauma patients with dysphagia are limited and are primarily centered on patients with cervical spine injury and those postextubation. Age and ventilator days have been demonstrated as risk factors for dysphagia postextubation.[31–33] In traumatic cervical spine injuries, routine screening for dysphagia leads to increased number of diagnoses as well as decreased dysphagia-related complications.[34] These prior studies have recommended that patients with prolonged ventilatory requirements should routinely undergo screening for dysphagia. Our study showed that patients with dysphagia were older and had more severe injury patterns, prompting future studies to incorporate these variables into future risk stratification for adverse outcomes associated with dysphagia. Clinicians should consider these results

Table 3 Outcomes, frequentist multivariable analysis: adjusted for age, ISS, gender, and mechanism

	Risk ratio	95% CI	P value
ICU LOS (days)	4.9	3.1 to 8.1	<0.001
Hospital LOS (days)	2.1	1.7 to 2.6	<0.001
	OR		
Unplanned ICU admission	4.6	2.0 to 9.6	<0.001
Sepsis	5.6	0.1 to 23.7	0.05
Mortality	1.6	0.6 to 3.4	0.30
Discharge to home	0.2	0.1 to 0.4	<0.001
Non-home discharge	5.2	2.4 to 13.9	<0.001
Discharge to hospice	2.1	0.7 to 5.1	0.14

ICU, intensive care unit; ISS, Injury Severity Score; LOS, length of stay.

Table 4 Outcomes, Bayesian multivariable analysis: adjusted for age, ISS, gender, and mechanism

	Risk ratio	95% credible interval	Posterior probability
Hospital LOS	2.1	1.7 to 2.6	>99%
ICU LOS	4.2	2.8 to 6.6	>99%
	OR		
Unplanned ICU admission	1.8	1.0 to 3.1	97%
Sepsis	1.2	0.6 to 2.3	70%
Mortality	1.2	0.7 to 2.0	73%
Non-home discharge	2.2	1.4 to 3.5	>99%

ICU, intensive care unit; ISS, Injury Severity Score; LOS, length of stay.

when evaluating indications for dysphagia screening protocols in geriatric trauma patients.

Limitations

The primary limitations of this study are due to its retrospective design. The actual incidence of dysphagia is likely to be higher than 4% as no screening protocol was in place. While we demonstrated an association between dysphagia and poor outcomes, we were unable to assess frailty in this cohort, which is directly associated with dysphagia. Frailty and dysphagia have both been associated with worse outcomes, but there is uncertainty if either are true modifiable risk factors. A prospective study is required to further examine the interplay between these and to better understand how treatment of each can improve outcomes. Finally, significant differences in our population sizes limited our statistical conclusions.

CONCLUSION

Clinically apparent dysphagia is associated with poor outcomes, but it remains unclear if dysphagia represents a modifiable risk factor or a marker of underlying frailty, leading to poor outcomes. Future studies to further explore these relationships should focus on the impact of early recognition and treatment of dysphagia, as well as other risk factor identification in this vulnerable population.

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Competing interests CEW is a Co-Founder of Decisio Health and serves as a consultant to Cellphire.

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ORCID iDs
John A Harvin http://orcid.org/0000-0002-2081-6256
Thaddeus J Puzio http://orcid.org/0000-0003-4150-5956

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